



Nurse Staffing, Nursing Intensity, Staff Mix, and Direct Nursing Care Costs Across Massachusetts Hospitals

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Objective: This study describes the distribution of patient-to-registered nurse (RN) ratios, RN intensity of care, total staff intensity of care, RN to total staff skill mix percent, and RN costs per patient day in 65 acute community hospitals and 9 academic medical centers in Massachusetts.

Methods: We conducted a retrospective secondary analysis of the Patients First database published by the Massachusetts Hospital Association for planned nurse staffing in 601 inpatient nursing units in the state for 2005 using a multivariate linear statistical model controlling for hospital type and unit type. Nursing unit types were identified as adult and pediatric medical/surgical, step down, critical care, neonatal level II, and neonatal level III/IV nurseries.

Results: Medical centers had significantly higher case-mix index (1.72 vs 1.20, $P < .001$), longer lengths of stay (5.18 vs 4.19, $P < .001$), more beds (574 vs 147, $P < .001$), discharges (31,597 vs 7,248, $P < .001$), and patient days (161,440 vs 31,020, $P < .001$) compared with to community

hospitals. Medical centers had significantly lower patient-to-RN ratios (3.22 vs 4.64, $P < .001$), higher nursing intensity and total nursing staff intensity (9.62 vs 7.43/11.75 vs 9.87, both $P < .001$), higher percent of RN to all staff mix (79% vs 71%, $P < .001$), and higher RN costs per patient day (\$385 vs \$297, $P < .001$) compared with to community hospitals. There were significant differences in adult med/surg units between community hospitals and medical centers for patient-to-RN staffing ratios (5.25 vs 4.08), nursing intensity (5.1 vs 6.2 hours daily), skill mix (67% vs 73% RN), and RN costs per patient day (\$203 vs \$248, all $P < .001$). There were no significant differences between the adult step-down units.

Conclusion: The significant differences between community hospitals and medical centers, unit type, as well as the high degree of variability in patient-to-RN ratios, nursing intensity, skill mix, and RN costs per patient day suggest that nursing resource expenditure at Massachusetts hospitals is complex and affected by case mix, unit size, and complexity of care.

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There are 18 states that require hospitals to set minimum staffing levels or request additional data to identify staffing patterns.¹ The impetus for these bills, as well as pending Congressional legislation, is the growing body of research that links poor patient outcomes to high nursing workload. Findings from several studies have fueled a debate

about the appropriate number of nurses needed to care for an increasingly sicker and shorter stay inpatient population.²⁻⁴

California was the first state in the nation to enact a law that set minimum licensed nurse staffing levels.⁵ Massachusetts is now vigorously debating this issue in the statehouse. Two separate pending bills illuminate the different positions. The first bill supported by the Massachusetts Nurses Association proposes strict minimum levels more stringent than exists in California and monetary fines or potential loss of facility license if hospitals do not meet these levels.⁶ The other bill supported by the Massachusetts Hospital Association, the Massachusetts Organization of Nurse Executives, and the Massachusetts Association of Registered Nurses proposes to monitor hospital nurse staffing plans, quality of care, as well as fund additional nursing education and faculty, but does not specify minimum patient-to-nurse levels.^{7,8}

There is no clear indication that laws regulating how hospitals address nursing workload improve the quality of care or outcomes of illness. For example, Buerhaus⁹ argues that imposing strict staffing ratios would negatively affect the dynamics between hospitals, availability of nurses, increase costs, and burden taxpayers. Unruh and Fottler¹⁰ believe that mandated ratios are not the best way to improve workload because of the myriad of factors that influence nurse staffing decisions. They recommend voluntary or mandated implementation of standardized staffing systems that take into account patient, staff, and unit characteristics contributing to workload.

In an effort to demonstrate the current status of hospital nursing care to the citizens of Massachusetts, the Massachusetts Hospital Association and the Massachusetts Organization of Nurse Executives created the Patients First database posting staffing levels on the Internet for all inpatient units at acute care hospitals throughout the state in late January 2006.¹¹ This database provides a unique opportunity to examine the relationships of nurse staffing, intensity, staffing mix, and direct nursing costs within and among all hospitals in Massachusetts. This is perhaps the first time statewide unit-level data have been readily available for study.

We pose 2 primary research questions:

- What is the mean patient-to-registered nurse (RN) ratio, nursing intensity of care, staff mix of RN to total nursing staff, and direct RN costs per patient day among Massachusetts hospitals?

- To what degree do these staffing measures above vary across nursing units and hospitals in Massachusetts?

Cost of and Reimbursement for Nursing Care

Nursing care is one of the largest expenditures within US healthcare, accounting for approximately 25% to 30% of hospital total operating budgets^{12,13} and 40% to 50% of direct care costs.¹⁴ Heffler et al¹⁵ predict that hospital costs will double by 2014, resulting in expenditures for nursing care reaching a quarter of a trillion dollars within the next decade.

All hospitalized patients receive continuous nursing care from the moment of admission to discharge. The amount of care received by a patient varies by medical treatment complexity as well as a variety of factors related to characteristics of nurses, patients, and hospitals. For example, a patient requiring assistance with nutrition, mobility, and hygiene may consume more nursing time than a patient with a similar diagnosis who can perform these acts of self-care independently. Nursing intensity, or actual time and effort expended by RNs for the direct care of patients, is higher in those patients with greater dependency for their basic care needs. The assumption that all patients within a similar medical diagnosis or located on similar units receive the same care is outdated.

Differences in Nursing Intensity and Staff Mix

Staffing patterns differ across nursing care units in hospitals. This affects nursing intensity and the direct costs of nursing care. For example, patients admitted to an intensive care unit typically have patient-to-RN staffing ratios of 2:1 or 1:1. An adult medical/surgical (med/surg) ward may have ratios between 4:1 and 8:1. The patient-to-nurse ratio determines the mean hours of care delivered on the unit, yet individual patients may require more or less care than the mean. The degree of variability of nursing intensity determines the amounts of nursing staff needed to care for those patients. When patients have essentially the same care needs, staffing levels are predictable. If care needs vary by a wide margin, staffing becomes much more difficult to predict, potentially leading to shifts of high workload. Patient severity of illness and patient turnover are two additional contributing factors for increased need for nurses on a particular unit.¹⁶

The use of specialty units dates to the early 1950s. After the Second World War, new technologies such as mechanical ventilators, electrocardiogram monitoring, and continuous intravenous

infusion of medications were introduced in hospitals. This increase in treatment complexity created highly variable staffing needs on the large open wards of the time. The critical care unit was developed to allow greater control over nurse staffing and allow the concentration of expertise.^{17,18} As a result, nursing intensity in the critical care units is higher than that on the general ward. However, hospitals are now creating intermediate care or step-down units to address the growing severity of illness and increasing treatment complexity seen on the general med/surg floors.

Nursing Intensity

Daily hospital nurse staffing levels were reasonably predictable until the advent of prospective payment in the 1980s and introduction of managed care in the early 1990s. Routine patient care was moved out of acute care hospitals into ambulatory care settings and patients' homes. The overall effect was to admit patients sicker and send them home quicker—both of which affect nursing intensity independently and interactively. For example, Graf et al¹⁹ found that one Massachusetts tertiary care hospital decreased length of stay from over 8 days to 6 days from 1993 to 2001, with a subsequent increase in nursing acuity over the same period. Unruh and Fottler²⁰ estimated that there was a 21% drop in patient length of stay in Pennsylvania hospitals from 1994 to 2001, which led to an 11% to 20% decline in RN staffing over this period. When combined with an increase in patient severity of 16%, the decline in staffing was estimated to be between 16% and 26%.

Patients require more nursing care each day of stay than in the past and the variability of this care is greater as well.²¹ This has created a higher demand for nurses and an upward pressure on wages. These trends ultimately affect nurse staffing assignments and the patient-to-nurse ratios, especially in the adult med/surg units that traditionally have a stable and predictable staffing pattern. Hospitals that provide low patient-to-nurse ratios to compensate for higher nursing needs of their patients may have improved quality and care outcomes, but at higher payroll costs.²² Unfortunately, the current reimbursement for hospital care does not adjust payment for differences in severity of illness.

Optimum Staffing Ratios?

The call by nursing organizations and collective bargaining agents for specific patient-to-RN ratios raises a number of issues. First, what is the optimum ratio? Rothberg et al²³ suggests 4:1 RN staffing

in the adult med/surg units. This number is problematic as it does not account for differences in patient, nurse, or hospital characteristics. Arguing for arbitrary staffing ratios ignores the normal variability of the practice environment across hospitals or within similar units at the same hospital.²⁴ Unfortunately, there is a paucity of studies regarding the variability of nursing care and the relationship between individual nurses and patients to help guide policy development for hospital nurse staffing.

In this article, we examine planned nurse staffing ratios, nursing intensity, nursing staff mix, and direct care costs in Massachusetts hospitals at both the hospital and unit level of analysis. We hypothesize that there will be significant differences in these variables across hospitals and between similar nursing units. The primary reason for studying these relationships is to better understand the variability of nursing care intensity and costs across multiple hospitals and provide guidance how to optimize nurse staffing at other hospitals in the United States.

Methods

This study uses the Massachusetts Hospital Association public domain nurse staffing plans data for all acute care hospitals in the state published on the Patients First Web site.^{25,26} The Patients First database provides unit-specific staffing information about the planned number of RNs, licensed practical nurses (LPNs), and unlicensed assistive personnel for each 8-hour day, evening, and night shifts, daily mean patient census for the unit, and unit and hospital type.

We constructed new unit-level variables based on the existing data as follows:

- Patient-to-RN ratio: The mean unit census was divided by the number of RNs for each shift and unit.
- Registered nurse intensity of care (nursing intensity): the mean hours of RN care per patient per shift was calculated by dividing patient-to-RN ratios from the above new variable into the unit mean census. For example, if there were 12 patients as unit census and 4 RNs for the day shift for a particular unit, then on average, each patient would receive 12/4 or 3 hours of RN care for that shift. Nursing intensity was summed across all 3 shifts to estimate the total nursing intensity per day.
- RN-to-staff ratio (skill mix): total nursing intensity was divided by total staff intensity (RN, LPN, and nursing assistants) to

estimate the percent hours of RN care per total staff care hours.

- Registered nurse costs per patient day: was calculated as the product of nursing intensity and a Massachusetts statewide mean hourly wage and benefits estimate for RNs. The average RN hourly wage for Massachusetts in 2004 was \$30.46. An additional 28% of this wage was added to the base wage to account for benefits. Finally, the wage plus benefits was inflated by 3.39% to account for wage increases between 2004 and 2005. The final hourly wage was \$40.31, which was rounded to \$40.00.²⁷ This variable estimates the RN direct costs of care in each of the 601 nursing units. It does not account for indirect costs of nursing care, for example, salaries of nurse managers, clinical specialists, nurse educators, and so forth.

Additional variables used were case-mix index as an estimate of the patient severity mix at each hospital and Magnet hospital status.

Sample and Setting

The Patients First database contains the planned nurse staffing estimates collected in 2005 and reported in January 2006 for acute community hospitals, academic medical centers, rehabilitation hospitals, and long-term-care facilities that have acute inpatient units. Only community hospitals and medical centers were kept for the final analysis of this study. The individual nursing units were categorized as:

- adult: med/surg, step down, or critical care;
- pediatric: med/surg or critical care;
- nurseries: neonatal level II or neonatal level III/IV.

A small number of community hospitals had combined adult and pediatric nursing units. These were classified in the final study dataset as adult med/surg.

Medicare case-mix index was entered from the American Hospital Directory database.²⁸ Magnet hospital status was identified from the American Nurse Credentialing Center Web site.²⁹ The average RN hourly wage for Massachusetts was drawn from the US Department of Labor Bureau of Labor statistics for November 2004.²⁷

Analysis Plan

A secondary data analysis was performed by entering the data into the SPSS (Chicago, Ill) statistical program, version 12.0. A variety of statistical tech-

niques were used in the analysis, including analysis of variance, independent *t* tests, and the SPSS General Linear Model using fixed effects of hospital type and unit type as appropriate. The level of significance was set at .05 for all tests.

Limitations and Weaknesses

The data in this study represent planned, rather than actual, staffing numbers. Actual staffing may have been above or below the plan. We do not have information regarding the degree to which hospitals are able to staff according to plans, but hospitals have stated their intention to post actual staffing numbers in the future.¹¹

With any secondary data analysis, there is limited ability to verify the actual data used in the study. We assume hospitals used different personnel to identify planned staffing and patient census data, which were then entered into another database to produce the final Patients First Web reports. Any small transcription or coding errors can influence the results.

The Patients First data are publicly reported and subject to scrutiny by both patients and healthcare professionals. Because actual staffing numbers may be reported in the future, there may be a bias toward truthfulness. Hospitals would be held accountable for data that are not representative of actual staffing or blatantly in error resulting in possible embarrassment or bad publicity.

Portions of the data used in this study were derived from separate Web available data source using concurrent Medicare cost reporting or aggregate statistical abstracts. Again, the same issues apply for transcription, computing, or other similar errors in using large secondary data sources. The study was reviewed by the Medical University of South Carolina Institution Review Board and classified as exempt status.

Results

Table 1 describes hospital-level variables by acute hospitals and medical centers. Analysis of variance means were significant at $P < .001$.

Table 2 shows the comparison between community hospitals and medical centers by unit type. There were no pediatric critical care units in the community hospitals and there was only 1 level III/IV nursery, therefore some of the table cells contain null values indicated by a minus sign.

Figure 1 depicts the differences in patient-to-RN ratios by shift. There were significantly higher ratios for the night shift in the adult med/surg and pediatric med/surg units ($P < .001$). The difference

Table 1. Hospital Descriptive Variables

	Hospital Type*					
	Community Hospitals			Medical Centers		
	N	Mean	Standard Deviation	N	Mean	Standard Deviation
Critical access hospitals	3			–		
Magnet hospitals	2			2		
All hospitals	65			9		
Inpatient nursing units	401			199		
Hospital case-mix index		1.21	0.16		1.72	0.21
Hospital mean length of stay		4.19	0.50		5.18	0.50
Hospital discharges		7,248	5,002		31,597	13,699
Hospital patient days		31,020	22,091		161,440	68,229
Unit patient-to-RN ratio (daily mean)		4.64	2.97		3.22	1.44
Unit RN intensity (total hours RN care)		7.43	5.27		9.62	5.50
Unit nurse staffing intensity (total hours all staff)		9.87	5.20		11.75	5.35
Unit RN-to-nursing staff intensity ratio		0.71	0.20		0.79	0.13
Estimated direct RN cost per patient day		297.34	210.70		384.71	219.97

*All means of community hospitals versus medical centers, $P < .001$.

in patient-to-RN ratios between community hospitals and medical centers in the adult med/surg units was also significant ($P < .001$).

Discussion

Key Findings

Medical centers had significantly higher case-mix index (1.72 vs 1.20, $P < .001$), longer lengths of stay (5.18 vs 4.19, $P < .001$), more beds (574 vs 147, $P < .001$), discharges (31,597 vs 7,248, $P < .001$), and patient days (161,440 vs 31,020, $P < .001$) compared with community hospitals. For nursing resource variables, the medical centers had significantly lower unit patient-to-RN ratios (3.22 vs 4.64, $P < .001$), nursing intensity and staff intensity (9.62 vs 7.43/11.75 vs 9.87, both $P < .001$), higher skill mix (79% vs 71% RN, $P < .001$), and higher RN costs per patient day (\$385 vs \$297, $P < .001$) compared with community hospitals.

In examining differences in individual types of units, medical centers overall had lower patient-to-RN ratios, higher nursing intensity, and higher RN costs per patient day in adult med/surg and adult critical care compared with community hospitals. There were no significant differences in adult step-down units between community hospitals and medical centers across the 4 nursing resource variables. Community hospitals interestingly had lower patient-to-RN ratios, higher nursing intensity, and higher RN costs per patient day in pediatric med/surg and neonatal level II nurseries compared with medical centers. There were also significant differences between day, evening, and night shift patient-

to-RN ratios in adult med/surg with higher ratios on the night shift compared to days and evening shifts. This difference was not seen in the step-down or critical care units. The higher ratios on the night shift may be partially explained by high staff vacancies on night shift related to nurses not wanting to work at night on these units.³⁰

Interpretation of Findings

The main findings of this study support what is generally known about the differences in types of hospitals and nursing units. Academic medical centers, by their very nature, accept the sickest and most complex patients. The distribution of patient-to-RN ratios, nursing intensity, and direct RN costs across Massachusetts hospitals generally reflects this different level of care. The variability of nursing resources care is notable. In adult med/surg, nursing intensity varied from 3.2 to 9.2 hours (mean 6.2, SD 1.50) at medical centers and 1.6 to 8.6 (mean 5.1, SD 1.7) at community hospitals. Associated RN costs per patient day varied from \$128 to \$368 or \$240 per day range and \$65 to \$341 or \$276 per day range, respectively. In adult critical care, the RN costs per patient day range were \$573 (mean \$774) at the medical centers and \$657 per day (mean \$610) for community hospitals. Again, these are based on planned or expected staffing levels. Overall, nursing intensity and nursing direct costs of care are higher at the medical centers.

The difference between pediatric med/surg and the level II nurseries is intriguing. The community hospitals had lower patient-to-nurse ratios and

Table 2. Unit Variables by Hospital Type

		Hospital Type					
		Community Hospitals		Medical Centers		Significance	
		Mean	Standard Deviation	Mean	Standard Deviation	F	P
Adult med/surg	Patient-to-RN ratio (daily mean)	5.25	2.88	4.08	0.93	12.974	<.001
	RN intensity (total hours RN care)	5.10	1.70	6.20	1.50	26.071	<.001
	Nursing staff intensity (total hours all staff)	7.60	1.60	8.50	1.20	23.079	<.001
	RN-to-nursing staff intensity ratio	0.67	0.13	0.73	0.11	10.736	<.001
	Estimated direct RN cost per patient day	203.51	69.15	248.00	59.90	26.071	<.001
Adult step-down	Patient-to-RN ratio (daily mean)	3.09	0.75	3.13	0.73	0.861	NS
	RN intensity (total hours RN care)	8.30	2.50	8.50	4.20	0.015	NS
	Nursing staff intensity (total hours all staff)	10.50	2.10	10.80	4.00	0.078	NS
	RN intensity-to-staff intensity ratio	0.78	0.10	0.77	0.11	0.132	NS
	Estimated direct RN cost per patient day	333.07	101.63	338.50	167.86	0.015	NS
Adult critical care	Patient-to-RN ratio (daily mean)	1.65	0.29	1.37	0.24	24.502	<.001
	RN intensity (total hours RN care)	15.20	4.10	18.10	3.60	12.722	<.001
	Nursing staff intensity (total hours all staff)	17.30	5.80	20.40	3.90	8.549	<.001
	RN-to-nursing staff intensity ratio	0.90	0.11	0.89	0.06	0.387	NS
	Estimated direct RN cost per patient day	609.94	164.31	722.75	143.27	12.722	<.001
Pediatric med/surg	Patient-to-RN ratio (daily mean)	1.96	0.94	2.99	0.60	16.134	<.001
	RN intensity (total hours RN care)	15.20	7.60	8.30	1.70	15.025	<.001
	Nursing staff intensity (total hours all staff)	16.70	7.50	9.90	1.60	14.958	<.001
	RN intensity-to-nursing staff intensity ratio	0.94	0.39	0.84	0.09	1.135	NS
	Estimated direct RN cost per patient day	609.50	303.45	333.16	66.97	15.025	<.001
Pediatric critical care	Patient-to-RN ratio (daily mean)	–	–	1.39	0.21	–	N/A
	RN intensity (total hours RN care)	–	–	17.50	2.30	–	N/A
	Staff intensity (total hours all staff)	–	–	17.90	2.50	–	N/A
	RN-to-nursing staff intensity ratio	–	–	0.98	0.03	–	N/A
	Estimated direct RN cost per patient day	–	–	701.09	91.53	–	N/A
Neonatal Level II	Patient-to-RN ratio (daily mean)	2.39	0.72	4.08	–	5.080	<.05
	RN intensity (total hours RN care)	10.80	3.10	5.90	–	2.349	NS
	Nursing staff intensity (total hours all staff)	10.90	3.20	8.20	–	0.664	NS
	RN-to-nursing staff intensity ratio	1.00	0.01	0.72	–	531.584	<.001
	Estimated direct RN cost per patient day	434.00	124.93	235.29	–	2.349	NS
Neonatal Level III/IV	Patient-to-RN ratio (daily mean)	1.86	–	1.93	0.41	0.023	NS
	RN intensity (total hours RN care)	12.90	–	13.00	2.90	0.001	NS
	Nursing staff intensity (total hours all staff)	13.90	–	13.60	2.90	0.010	NS
	RN-to-nursing staff intensity ratio	0.93	–	0.96	0.07	0.120	NS
	Estimated direct RN cost per patient day	516.00	–	520.10	117.91	0.001	NS

NS indicates not significant.

higher nursing intensity and RN costs per patient day compared with the medical centers. The most likely explanation of this unexpected finding is that pediatric med/surg and neonatal level II nurseries in the community hospitals are very small and require minimum RN staffing levels even at low census. For

example, a 4-bed pediatric unit would still require 2 RNs if the unit only had 2 patients.

Magnet versus Non-Magnet Hospitals

In this cohort of Massachusetts hospitals, there were 2 Magnet hospitals within each medical center and

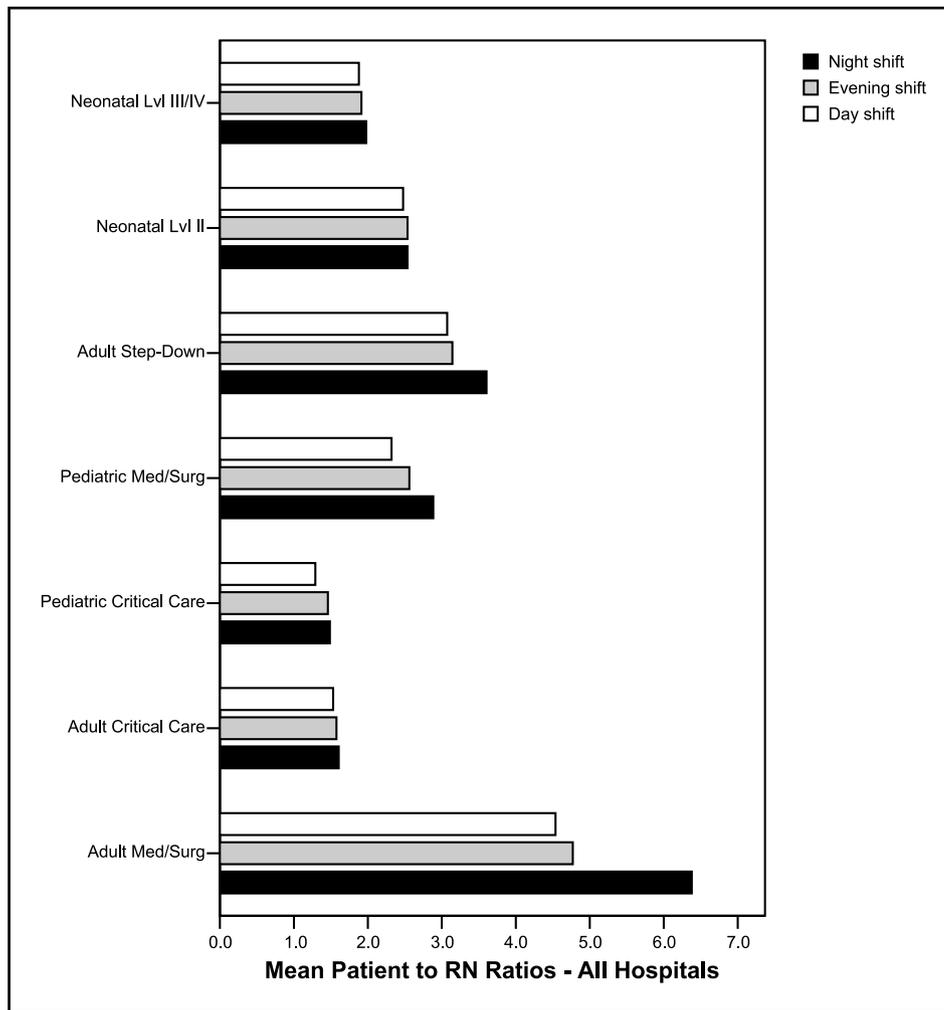


Figure 1. Patient-to-RN ratios.

community hospital category. Magnet hospitals are well known for their exemplary patient care, high quality, and better outcomes compared with other hospitals.³¹⁻³³ How do Magnet hospitals in Massachusetts compare to other similar hospitals in the

state regarding staffing, intensity, staff mix, and nursing costs? In Table 3, the 4 Magnet hospitals are compared to the mean for each hospital type. One magnet hospital was higher and one was lower than the mean within each hospital type. The difference

Table 3. Comparison With Magnet Hospitals by Hospital Type, Mean, and Standard Deviation

	CMI	PTRNR	RNI	NSI	RNTNSIR	RNCPPD
Baystate Medical Center	1.699	4.2 (1.5)	6.9 (3.7)	9.8 (3.6)	0.68 (0.15)	277 (155)
Massachusetts General Hospital	1.856	2.9 (0.8)	9.4 (3.9)	10.8 (3.9)	0.86 (0.06)	376 (157)
All academic medical centers	1.715	3.2 (1.5)	9.6 (5.5)	11.8 (5.3)	0.79 (0.13)	385 (220)
Jordan Hospital	1.194	3.2 (0.9)	8.3 (3.5)	9.8 (2.7)	0.83 (0.11)	332 (138)
Winchester Hospital	1.228	4.2 (1.4)	6.5 (3.0)	8.8 (2.9)	0.72 (0.14)	260 (122)
All acute community hospitals	1.205	4.6 (3.0)	7.4 (3.5)	9.9 (5.2)	0.71 (0.20)	297 (211)

CMI indicates Medicare case mix index; PTRNR, Unit patient-to-RN ratio; RNI, RN intensity (hours of RN care/day); NSI, Nursing staff intensity (hours RN, LPN, unlicensed assistive personnel care/day); RNTNSIR, RN-to-nursing staff intensity ratio (% RN care hours to all staff); RNCPPD, RN cost per patient day.

Table 4. Comparison of California and Massachusetts Hospital Nurse Staffing

Variables		California Before	California After	Massachusetts Community Hospitals	Massachusetts Medical Centers
Adult med/surg	Patient-to-RN ratio	5.43 (1.33)	4.48 (1.12)	5.25 (2.88)	4.08 (0.92)
	Hours per patient day: RN	4.76 (1.36)	5.75 (1.42)	5.09 (1.73)	6.20 (1.50)
	Hours per patient day: all staff	8.08 (1.54)	8.68 (1.77)	7.56 (1.60)	8.49 (1.17)
	Percent RN hours to total hours	59.20 (12.13)	66.67 (11.46)	67.50 (13.49)	72.73 (11.02)
Adult step-down	Patient-to-RN ratio	4.02 (1.38)	3.56 (1.05)	3.09 (0.75)	3.13 (0.73)
	Hours per patient day: RN	6.59 (1.96)	7.28 (1.80)	8.33 (2.54)	8.46 (4.20)
	Hours per patient day: all staff	9.59 (1.81)	10.11 (1.81)	10.52 (2.10)	10.80 (3.97)
	Percent RN hours to total hours	68.79 (15.33)	72.19 (13.37)	78.15 (9.95)	77.01 (10.58)

Values are presented as mean (SD).

in case-mix index between the Magnet hospitals is evident and may be influencing the staffing ratios, intensity, and costs of care.

We expect Magnet hospitals to be better staffed and perform better overall than comparable hospitals. The sample size of Magnet hospitals (4) was too small to draw firm conclusions, but it appears that nurse staffing alone at community hospitals or medical centers is not associated with Magnet or non-Magnet hospital status. Additional study will be needed to examine other nurse, patient, and hospital characteristics that are predictive of higher quality of nursing care.

Comparison of Massachusetts to California Hospitals

California was the first state to create a law specifying minimum nurse staffing levels in US hospitals.^{5,34} Donaldson et al³⁵ have examined the effects of that legislation comparing patient-to-RN ratios, nursing intensity, staff intensity, and skill mix before and after implementation. Table 4 compares Massachusetts hospitals with those in California for adult med/surg and adult step-down units.

Overall, Massachusetts hospitals have staffing plans that indicate better staffing, higher RN and staff intensity, and higher percentages of RN to total nursing staff percentages than California hospitals even after the minimum nurse staffing law was implemented. The only exception is community hospitals in Massachusetts have lower total nursing staff intensity in the adult med/surg units compared with the California hospitals. This seems to reflect the higher skill mix found in Massachusetts community hospitals compared with California.

Nursing Staff Mix and Nursing Intensity

In our study, all critical care areas in community hospitals and medical centers had a higher percentage of RNs to all nursing staff (skill mix) compared to adult med/surg units and step-down units: (critical care 90% vs 89%, not significant; step down, 76% vs 77%, not significant; med/surg 67% vs 73%, $P < .001$). One potential explanation is that as complexity of care increases to match higher severity of illness, fewer tasks can be delegated to LPNs or unlicensed assistive personnel. The difference in skill mix percent between community hospitals and medical centers in the adult med/surg units may indicate the greater complexity of care found in academic medical centers and difficulty in substituting LPNs and unlicensed assistive personnel for RNs in those care environments.

The Cost of Nursing Care and Hospital Reimbursement

Our findings demonstrate significant differences in unit RN costs per patient day between community hospitals and medical centers (\$297 vs \$385, $P < .001$). This cost difference presents an interesting dilemma in an era of prospective reimbursement for patient care. The variability of RN intensity and RN costs per patient day, even within similar units of the same hospital, refutes the underlying assumption of the existing hospital reimbursement system that patients receive essentially the same nursing care within a nursing unit. If nursing care is bundled within a set per diem fee room and board fee, hospitals could potentially be undervaluing nursing care.³⁶

Welton and Halloran³⁷ found that nursing diagnosis was an independent predictor of common hospital outcomes, such as death or discharge to a nursing home, and resource utilization, such as charges and length of stay, compared to the diagnostic-related groups. The results of the study challenge the prevailing notion that the medical diagnosis wholly explains all nursing care.

In another study, Welton et al found a high degree of variability in nursing intensity within nursing unit and a significant difference in intensity across similar med/surg units at an academic medical center.³⁸ The direct cost of this nursing care was not consistent with the daily room and board per diem billing for nursing care that treated patient care by nurses as a fixed cost. Changing daily hospital per diem billing from a flat rate to one based on nursing intensity reduced the variance between cost to charge ratio and provided additional billable revenue.³⁹ The results of these studies support the contention that nursing intensity and related costs vary by patient, unit, and hospital. The Patients First data support this conclusion by demonstrating significant differences across nursing units and hospitals in Massachusetts.

Paying hospitals directly for nursing care provides an intriguing alternative to current policy initiatives to mandate nurse staffing levels. Changing the current hospital payment system to adjust for nursing intensity and reimburse hospitals for nursing care would create an economic incentive for hospitals to improve nurse staffing.^{40,41} This could have significant, if not profound, effects on the healthcare system. For example, one of the most perplexing problems facing healthcare finance is the growing discrepancy between costs and pricing for hospital services.^{42,43}

The Centers for Medicare & Medicaid Services has recently announced a major revision of the diagnostic-related group based payment system to hospitals. Essentially, the Centers for Medicare & Medicaid Services wants to change from a charge based to costs based and severity adjusted payment formula.⁴⁴ Unfortunately, the new proposal continues to roll up nursing care into traditional room and board categories. Because nursing has been demonstrated to be a variable, if not highly variable cost to hospitals, the effect of adjusting reimbursement

using nursing intensity could potentially narrow the difference between costs and reimbursement. It would create a fairer reimbursement scheme, decrease economic uncertainty, and provide needed information for nurse executives and policymakers about hospital nursing care.

Implications for Nurse Executives

This study produced several important findings. The degree of variability in nurse staffing, nursing intensity, staff mix, and nursing costs among all Massachusetts hospitals provides insights into the complex nature of the care environment and the concomitant need to avoid simplistic remedies to address perceived high nursing workload, such as mandatory minimum staffing ratios. The difference in these variables between community hospitals and medical centers is expected due to greater severity of illness and increased complexity of care at the tertiary care hospitals.

The findings of this study neither support nor oppose the need for legislative action to define minimum nurse staffing levels at hospitals. The salient conclusion is that the nursing care needs of patients are complex and varying. An optimized healthcare system will balance need and cost. Solutions to perceived high workload and decreased quality of care must identify the unique needs and characteristics of patients, nurses, and hospitals. There is no single solution that can be identified. Indeed, implementing mandatory patient-to-RN ratios may exacerbate the underlying staffing and quality-of-care issues due to the inflexibility it introduces into the system.

We close with a recommendation. The current hospital reimbursement scheme does not acknowledge the variability of nursing care intensity or associated costs as we see in this study and others. This may be a key factor why hospitals are reluctant to add additional nursing staff—there is no economic incentive to do so. We propose an alternative healthcare payment scheme that adjusts for nursing intensity. Such an approach would encourage hospitals to improve staffing as costs of nursing care would be aligned with reimbursement for that care. This alternative payment model would change the fundamental relationship between hospitals and nurses and provide a market-driven method to improve the nursing work environment.

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