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Utilization of non-US educated nurses in US hospitals: implications for hospital mortality

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Abstract

Objectives. To determine whether, and under what circumstance, US hospital employment of non-US-educated nurses is associated with patient outcomes.

Design. Observational study of primary data from 2006 to 2007 surveys of hospital nurses in four states (California, Florida, New Jersey and Pennsylvania). The direct and interacting effects of hospital nurse staffing and the percentage of non-US-educated nurses on 30-day surgical patient mortality and failure-to-rescue were estimated before and after controlling for patient and hospital characteristics.

Participants. Data from registered nurse respondents practicing in 665 hospitals were pooled with patient discharge data from state agencies.

Main Outcomes Measure(s). Thirty-day surgical patient mortality and failure-to-rescue.

Results. The effect of non-US-educated nurses on both mortality and failure-to-rescue is nil in hospitals with lower than average patient to nurse ratios, but pronounced in hospitals with average and poor nurse to patient ratios. In hospitals in which patient-to-nurse ratios are 5:1 or higher, mortality is higher when 25% or more nurses are educated outside of the USA than when <25% of nurses are non-US-educated. Moreover, the effect of having >25% non-US-educated nurses becomes increasingly deleterious as patient-to-nurse ratios increase beyond 5:1.

Conclusions. Employing non-US-educated nurses has a negative impact on patient mortality except where patient-to-nurse ratios are lower than average. Thus, US hospitals should give priority to achieving adequate nurse staffing levels, and be wary of hiring large percentages of non-US-educated nurses unless patient-to-nurse ratios are low.

Keywords: patient outcomes (health status, quality of life, mortality), measurement of quality, surveys, general Methodology, health policy, health care system, mortality, complications, hospital care, setting of care, nursing, professions, workforce and workload, human resources

For over 60 years, US hospital employers have used non-US-educated nurses during nurse shortages to supplement their workforce [1]. After 1990, nurse migration drastically increased, and in 2005, when an estimated 15 000 non-US-educated nurses passed the US registered nurse licensure exam [2], the US surpassed the UK to become the world's largest importer of nurses. Because the majority of nurses educated outside of the US become citizens or permanent residents, their effects on the US nurse workforce are long-lasting. Although the migration of non-US-educated registered nurses (RNs) to the USA has slowed in recent years because of the economic downturn which impacted the growth of nursing jobs, the demand for nurses is projected to escalate as the economy recovers [3].

Concerns about the potential impact of non-US-educated nurses on quality of hospital care arise from several factors. Many non-US-educated nurses are from countries with transitional economies, such as the Philippines, where the health care system is substantially different from that of the USA. Nurses from countries with transitional economies have RN licensure exam pass rates significantly lower than that of US nursing school graduates [2]. While non-US-educated nurses must pass English fluency exams, their accents may be difficult to understand by hospitalized patients, many of whom are elderly.

The purpose of this paper is to determine whether US hospital employment of non-US-educated nurses is associated with adverse patient outcomes, and if so, under what

circumstances. Specifically, we examine the effects of the proportion of non-US-educated nurses on 30-day in-hospital mortality and failure-to-rescue following common surgical procedures.

Methods

We studied the nurse workforce and patient outcomes in 665 hospitals in four large states (California, Florida, New Jersey and Pennsylvania), three of which are among the top five states for employment of non-US-educated nurses [4].

Data sources

Data were linked from three sources: (i) a 2006–2007 survey of registered nurses who were employed by hospitals in the four states; (ii) patient discharge data that was available from state agencies and; (iii) the American Hospital Association Annual (AHA) Survey of hospitals. Three institutional review boards approved the study: the University of Pennsylvania, University of Florida and Rutgers University.

Sample and measures

Hospitals. The 665 non-federal adult acute care hospitals studied were from California ($n = 271$), Florida ($n = 168$), New Jersey ($n = 73$) and Pennsylvania ($n = 153$). Hospitals were characterized by size, teaching status and technology using AHA Annual Survey data. Hospital size was defined as small (<100 beds), medium (100–250 beds) and large (> 250 beds). Hospitals with no medical residents were classified as non-teaching, those with trainee to bed ratios of 1:4 or less were classified as minor teaching hospitals, and those with trainee to bed ratios greater than 1:4 were classified as major teaching hospitals. High technology hospitals were those that provided open-heart surgery, organ transplantation or both.

Nurses. Using licensure lists available from boards of nursing in each state, we surveyed by mail a 35–50% random sample of RNs by state and obtained responses from over 95 000 nurses. Of these, 38 657 were staff nurses who provided direct patient care on inpatient units in hospitals; the rest worked in other settings or were not employed at all. The overall response rate was 39% yielding an average of 60 nurse respondents per hospital (a range of 10–282 nurses per hospital). We conducted an intensive follow-up with a random sample of 1300 non-respondents that included monetary incentives that would not have been feasible in the large initial survey, and were successful in obtaining responses from over 90% of non-respondents. No differences were found between nurses that responded initially and those that did not in terms of their reports about their hospitals [5–7].

Non-US-educated nurses were self-identified from a survey item that asked nurses about the country where they received their basic nursing education. We estimated the percentage of non-US-educated RNs per hospital by dividing the number of non-US-educated nurses in each hospital that responded to the survey by the total number of RNs that responded in each hospital. The percentage of nurses that responded to the survey that were non-US educated was 12% overall (19% in California, 17% in New Jersey, 13% in Florida and just under 2% in Pennsylvania), which is only slightly higher than the 9% estimate of non-US-educated nurses that can be derived for hospital nurses in the four states using data from the 2008 National Sample Survey of Registered Nurses [4]. Hospital nurse staffing was calculated for each hospital from nurse survey data by dividing the average number of patients reported by nurses on their units on the last shift by the average number of nurses on the unit [5]. Educational composition was computed as the percent of nurses in each hospital whose highest degree was a bachelor's degree in nursing or higher [8].

Nurse job satisfaction was measured with a single item: 'On the whole, how satisfied are you with your present job?' with response categories as very dissatisfied, a little dissatisfied, moderately satisfied or very satisfied. Nurse-assessed quality of care was measured with a single item: 'On the whole, how would you describe the quality of care delivered to patients on your unit?' with the response categories as excellent, good, fair or poor.

The nurse practice environment in the various hospitals was measured in two ways. The general difference between US and non-US-educated nurses in describing their work environments was assessed using a single item which asked 'How would you rate the work environment in your job (e.g. adequacy of resources, relations with coworkers, and support from supervisors)?' with four response categories: excellent, good, fair or poor. The nurse practice environment measure included in predictive models was assessed using the Practice Environment Scale of the Nursing Work Index (PES-NWI), which is an extensively validated instrument [9] that is endorsed by the National Quality Forum [10]. In earlier analyses, we used five subscales: nurse participation in hospital affairs (9 items), nursing foundations for quality care (10 items), nurse manager ability, leadership and support of nurses (5 items), staffing/resource adequacy (4 items) and nurse–physician relations (3 items). The staffing/resource adequacy subscale was excluded in the analyses here because it empirically overlaps our direct measure of nurse staffing. Subscale measures were calculated for each hospital by averaging the values of all items on each of the subscales for all nurses in the hospital. These four aggregated subscales were then averaged to produce a single composite measure of the practice environment. PES-NWI subscales and the composite scale range in value from 1 to 4, and in the regression models were standardized to have a mean of 0 and standard deviation of 1.

Nurse burnout was measured with the Emotional Exhaustion subscale of the Maslach Burnout Inventory, an instrument with well-established reliability and validity [11]. High emotional exhaustion, scores of 27 or higher, was designated following norms established by the developers' research.

Patients. Patient discharge data were obtained for the study hospitals from the California Office of Statewide Healthcare Planning and Development (OSHPD), the Florida Agency for Health Care Administration (AHCA), the New Jersey Department of Health and Senior Services (NJDHSS) and the Pennsylvania Health Care Cost Containment Council (PHC4).

Our sample included patients aged 19–90 years who were admitted to study hospitals between 2005 and 2006 for general, orthopedic and vascular surgical procedures. Surgical patient discharges were chosen for this study because of the availability of a well validated risk adjustment model [12] which was used in our prior research [5, 13]. Patient outcomes included 30-day mortality and failure-to-rescue (or death from complications) [12]. Failure-to-rescue was defined as death within 30 days of admission for the subset of hospitalized patients who experienced complications. Risk adjustment procedures included age, sex, transfer status, surgery type and comorbidities identified by Elixhauser *et al.* [14].

Statistical analysis

In the descriptive tables below we show characteristics of the surgical patients in the study, compare characteristics of non-US and US-educated nurses in the study hospitals and compare characteristics of hospitals with low, moderate and high proportions of non-US-educated nurses. Logistic regression models were used to estimate the effects of nurse staffing and percent of non-US-educated nurses on mortality and failure-to-rescue before and after taking account of patient characteristics and hospital characteristics, including the nurse work environment. In these models, we included interactions with non-US-educated nurse utilization and nurse staffing, technology status, teaching status and hospital size. We also included an interaction between nurse staffing and the nurse practice environment that was shown to be significant in an earlier paper [5]. The interaction between nurse staffing and the proportion of non-US-educated nurses is explained by estimating the different effects of non-US-educated nurses in hospitals with different levels of nurse staffing. All regression models were estimated using Huber–White (robust) procedures to account for clustering within hospitals. Analyses were conducted using SAS V9.2 (SAS Institute, Cary, NC, USA) and STATAV10 (STATA Corp, College Station, TX, USA).

Results

The characteristics of the nearly 1.3 million surgical patients included in the study are given in Table 1. The average age across all patients was just over 61 years. Forty-three percent of the patients were men, and 28% were emergency admissions. Overall, 2.2% of these surgical patients died within 30 days of admission, and among the 35% of the patients who developed complications during their hospital stay, 5.4% died within 30 days of admission (failure-to-rescue). The most common operations undergone by these patients were orthopedic operations (52%), followed by operations for digestive system diseases and disorders (22%) and hepatobiliary systems diseases and disorders (11%). The most common comorbidities among this group of patients were hypertension (48%), chronic pulmonary disease (15%), uncomplicated diabetes (15%) and congestive heart failure (14%).

Demographic characteristics of non-US and US-educated nurses are given in Table 2. The majority of non-US-educated nurses in the study were educated in the Philippines (63.5%). Compared with US-educated nurses, non-US-educated nurses were slightly younger, more likely to be male, and decidedly more likely to have obtained a baccalaureate degree in nursing (68 vs. 40%). A significantly larger proportion of US-educated nurses (23 vs. 17%) were dissatisfied with their jobs; however, despite their greater dissatisfaction, US-educated nurses were slightly less likely than non-US-educated nurses to report intentions to leave their current jobs (13 vs. 14%). There were no significant differences between the two groups regarding burnout or their ratings of the nurse practice environment and the quality of care in their hospitals.

Hospitals

Across 665 hospitals in the four states for which we had patient data, non-US-educated nurses as a proportion of all registered nurses ranged by hospital from 0 to 77%. The percentage of non-US-educated nurses was <5% in 224 study

Table 1 Characteristics of the surgical patients in the study hospitals ($n = 1\,295\,179$)

Characteristic	No. (%)
Age, mean (SD)	61.3 (18.0)
Men	552 507 (42.7)
Emergency admissions	362 712 (28.0)
Deaths within 30 days of admission	28 826 (2.2)
Patients with complications	456 410 (35.2)
Deaths among patients with complications	24 514 (5.4)
Major diagnostic categories (MDCs)	
General surgery	
Digestive system diseases and disorders (MDC 6)	290 002 (22.4)
Hepatobiliary system diseases and disorders (MDC 7)	141 652 (10.9)
Diseases and disorders of the skin, subcutaneous tissue and the breast (MDC 9)	46 027 (3.6)
Endocrine, nutritional, metabolic diseases and disorders (MDC 10)	70 869 (5.5)
Orthopedic surgery	
Musculoskeletal system diseases and disorders (MDC 8)	676 108 (52.2)
Vascular surgery	
Circulatory system diseases and disorders (MDC 5)	70 524 (5.5)
Medical history (comorbidities)	
Hypertension	622 338 (48.1)
Chronic pulmonary disease	188 495 (14.6)
Diabetes without chronic complications	189 242 (14.6)
Hypothyroidism	121 856 (9.4)
Congestive heart failure	75 006 (5.8)
Deficiency Anemias	174 632 (13.5)
Obesity	104 193 (8.0)
Pulmonary circulation disease	13 501 (1.0)
Valvular disease	63 067 (4.9)
Peripheral vascular disease	56 176 (4.3)

Table 2 Characteristics of non-US-educated and US-educated nurses

Characteristic	Non-US educated-nurses (n = 4933) No. (%)	US-educated nurses (n = 33 724) No. (%)	P-value
Country/region of nursing education			
United States	0 (0.0)	33 724 (100.0)	
Africa	88 (1.8)		
Canada	358 (7.4)		
Europe	370 (7.7)		
India	242 (5.0)		
Latin America	187 (3.9)		
Other Asian country	302 (6.3)		
Philippines7	3057 (63.5)		
Other	209 (4.3)		
Age, mean (SD)	44.4 (14.6)	45.3 (12.4)	< 0.01
Male	364 (7.7)	2129 (6.4)	< 0.01
Bachelor degree in nursing or higher	3263 (67.9)	13 537 (40.1)	< 0.01
High on burnout	1575 (33.5)	10 761 (33.0)	0.44
Dissatisfied with job	770 (16.6)	7459 (23.0)	< 0.01
Intend to leave current job	666 (14.1)	4244 (13.0)	0.03
Describes work environment in hospital as fair or poor	1727 (36.5)	11 763 (35.8)	0.38
Describes quality of care on unit as fair or poor	780 (18.2)	4701 (17.1)	0.08

The P-value in the final column is the probability associated with the statistic (t-test or χ^2 test) testing the difference between foreign-educated and US-educated nurses in the characteristic measured.

hospitals (or in 34% of them), from 5 to 25% in 327 (49%) of the hospitals and >25% in 114 (17%) of the hospitals. Hospitals with >25% non-US-educated nurses are referred to below as 'high utilization'. Table 3 also shows there were no significant differences between the percentages of non-US-educated nurses in hospitals by technology status, though non-teaching hospitals and small hospitals in general were less likely to employ higher proportions of these nurses.

Mortality and failure-to-rescue. Table 4 shows the effects, estimated by odds ratios, of nurse staffing, the nurse practice environment and the percentage of foreign-educated nurses on mortality and failure-to-rescue, derived from unadjusted (bivariate) models and from two fully adjusted models. One of the fully adjusted models allows only the main effects of staffing and the percent of non-US-educated nurses whereas the other includes two significant interactions involving the nursing characteristics. The fully adjusted models control for patient characteristics (age, gender, transfer status, diagnosis-related group and the comorbidities specified by the Elixhauser Comorbidity Index), nurse characteristics (including the nurse practice environment, proportion of nurses with bachelor's degrees (BSN), proportion of nurses in ICU, proportion of nurses in medical-surgical units) and hospital characteristics (bed size, teaching status and technology status).

When we estimate the effects on the mortality measures of staffing, percent of non-US-educated nurses and the nurse practice environment from bivariate models, only the practice environment is significant. In the main effects model with controls (middle panel Table 4) both the effects of nurse staffing and the practice environment are significant, on both outcomes, while the main (or direct) effect of the percentage of non-US-educated nurses is not significant. However, the main effects model is not the appropriate model to use to describe the effects of the three nursing factors, because the fully adjusted model with interactions (final panel of Table 4) suggests that there are highly significant interactions between staffing and the practice environment, and between staffing and the percentage of non-US-educated nurses. The interaction between staffing and the work environment involves a more pronounced effect of nurse staffing in hospitals with better work environments, as we have described in detail in a previous paper [5]. The interaction between staffing and the percentage of non-US-educated nurses can be best understood by considering Table 5.

Table 5 shows the relationship between the proportion of non-US-educated nurses and mortality and failure-to-rescue in hospitals with different staffing levels. For hospitals that are well staffed, there was no significant relationship between high non-US-educated nurse utilization and mortality. For hospitals with higher ratios of patients to nurses (5 patients per nurse or more), high non-US-educated nurse utilization was associated with increased mortality. The odds on 30-day mortality and failure-to-rescue were both significantly higher in hospitals with 25% or more non-US-educated nurses than in hospitals with >25% of these nurses by factors of 1.1, 1.2 and 1.3 in hospitals with 5:1, 6:1 and 7:1 patient to nurse ratios,

Table 3 Numbers and percentages of hospitals with low, moderate and high proportions of non-US educated nurses, by selected characteristics.

Characteristic	Overall ($n = 665$)	Low proportion non-US educated (<5%) ($n = 224$)	Moderate proportion non-US educated (5–25%) ($n = 327$)	High proportion non-US educated (>25%) ($n = 114$)	*P*-value
Technology status					0.54
High	403	142 (35.2)	192 (47.6)	69 (17.1)	
Low	261	82 (31.4)	135 (51.7)	44 (16.9)	
Teaching status (%)					0.045
Major teaching	46	21 (45.7)	16 (34.8)	9 (19.6)	
Minor teaching	266	75 (28.2)	139 (52.3)	52 (19.6)	
No teaching	352	128 (36.4)	172 (48.9)	52 (14.8)	
Hospital size				<0.01	
Small (≤100 beds)	100	50 (50.0)	41 (41.0)	9 (9.0)	
Medium (101–250 beds)	300	108 (36.0)	140 (46.7)	52 (17.3)	
Large (>250 beds)	262	66 (25.2)	145 (55.3)	51 (19.5)	
State					<0.01
California	271	33 (12.2)	171 (63.1)	67 (24.7)	
New Jersey	73	13 (17.8)	35 (34.2)	25 (34.2)	
Pennsylvania	153	139 (90.8)	14 (9.2)	0 (0.0)	
Florida	168	39 (23.2)	107 (63.7)	22 (13.1)	
Patient to nurse ratio					
<3	1	0 (0.0)	1 (100.0)	0 (0.0)	
3	62	11 (17.7)	40 (64.5)	11 (17.7)	
4	183	44 (24.0)	110 (60.1)	29 (15.9)	
5	229	78 (34.1)	104 (45.4)	47 (20.5)	
6	121	54 (44.6)	50 (41.3)	17 (14.1)	
7	52	25 (48.1)	19 (36.5)	8 (15.4)	
>7	17	12 (70.6)	3 (17.7)	2 (11.8)	

The *P*-value in the final column is the probability associated with the χ^2 statistics testing the difference in the proportion of non-US educated and US-educated nurses across categories of the other hospital characteristics measured.

respectively, even after controlling for selected nursing factors (% bachelor's nurses and nurse practice environment) and hospital characteristics (bed size, teaching status and technology).

In our sensitivity analysis, we reassigned the 358 Canadian nurses (7.4%) in our sample to the US-educated group and reran all regression models. We found no differences in the significance of all odds ratios in Tables 4 and 5.

Discussion

We provide the first empirical evidence demonstrating that hospital employment of non-US-educated nurses in US hospitals is associated with adverse patient outcomes under certain circumstances. In sum, we found that in hospitals where patient to nurse staffing was good—that is, nurses care on average for no more than four patients each—the proportion of non-US-educated nurses has no effect on mortality or failure-to-rescue. However, in hospitals where nurses, on average, cared for five patients or more, mortality and failure-to-rescue were increased for hospitals with ≥25% non-US-educated nurses. Thus, the impact of a significant share of non-US-educated nurses on these two patient outcomes is nil in well-staffed hospitals, but is detrimental when overall nurse staffing is only roughly average (~5–1 patients per nurse) and increasingly detrimental when staffing is even poorer.

It is possible that in hospitals with low patient-to-nurse workloads, non-US-educated nurses act as supplements to US-educated nurses, leading to no impact on mortality or failure-to-rescue. In hospitals with higher patient-to-nurse ratios, non-US-educated nurses may be substituting for US-educated nurses, leading to adverse effects on mortality and failure-to-rescue. In any event, we find no evidence of a negative impact on mortality of hospitals employing a higher proportion of nurses educated outside the USA unless the nurse workloads of all nurses are higher.

A limitation of the study is its reliance on cross-sectional data and the attendant problem with establishing causality. Also, we cannot rule out the possibility that variables excluded from our models may be responsible for the associations found, even though our patient level risk adjustment is extensive and we used all of the hospital characteristics in available

Table 4 Odds ratios indicating the effects of nurse staffing, high percentages of non-US educated nurses, and PES on mortality and failure-to-rescue, from unadjusted and adjusted models

	Unadjusted			Fully adjusted			Fully adjusted with interactions		
	OR	95% CI	*P*-value	OR	95% CI	*P*-value	OR	95% CI	*P*-value
30-day mortality (n = 1 295 179)									
Staffing (patients per nurse)	1.01	(0.99, 1.04)	0.213	1.03	(1.01, 1.06)	0.006	1.03	(1.00, 1.06)	0.019
>25% non-US educated nurses	1.06	(0.97, 1.17)	0.207	1.06	(0.97, 1.16)	0.213	1.06	(0.97, 1.16)	0.175
Practice environment scale (PES)	0.92	(0.89, 0.85)	<0.001	0.93	(0.90, 0.96)	<0.001	0.93	(0.90, 0.96)	<0.001
Staffing × PES interaction							1.03	(1.01, 1.05)	0.004
Staffing × non-US educated interaction							1.06	(1.00, 1.12)	0.047
Failure-to-rescue (n = 460 722)									
Staffing (patients per nurse)	1.01	(0.99, 1.03)	0.489	1.03	(1.01, 1.06)	0.012	1.03	(1.00, 1.05)	0.020
>25% non-US educated nurses	1.03	(0.94, 1.13)	0.472	1.05	(0.96, 1.15)	0.293	1.05	(0.96, 1.15)	0.257
PES	0.92	(0.89, 0.95)	<0.001	0.93	(0.90, 0.96)	<0.001	0.93	(0.90, 0.96)	<0.001
Staffing × PES interaction							1.03	(1.02, 1.05)	<0.001
Staffing × *non-US educated interaction							1.07	(1.01, 1.12)	0.022

Odds ratios compare surgical mortality for hospitals with a high proportion of FEN (>25%) to all other hospitals in the sample.
Fully adjusted models adjust for patient characteristics (age, gender, transfer status, diagnosis-related group and the comorbidities specified by the Elixhauser Comorbidity Index)nurse characteristics (practice environment, percent BSN education, proportion of nurses in ICU, proportion of nurses in medical-surgical units), hospital characteristics (bed size, teaching status, technology status) and dummy variables for state.

Table 5 Association odds ratios indicating the effects of using high percentages (>25%) of non-US educated nurses on mortality and failure-to-rescue at various hospital staffing levels

Hospital staffing level (patients per nurse)	30-day surgical mortality (n = 1 295 179)			30-day failure-to-rescue (n = 460 722)		
	Odds ratio	95% CI	*P*-value	Odds ratio	95% CI	*P*-value
3 patients:nurse	0.93	(0.80, 1.08)	0.33	0.92	(0.79, 1.07)	0.27
4 patients:nurse	1.01	(0.92, 1.11)	0.83	1.00	(0.91, 1.11)	0.93
5 patients:nurse	1.10	(1.02, 1.18)	0.01	1.10	(1.02, 1.19)	0.01
6 patients:nurse	1.20	(1.09, 1.31)	<0.01	1.21	(1.09, 1.34)	<0.01
7 patients:nurse	1.30	(1.13, 1.49)	<0.01	1.32	(1.12, 1.56)	<0.01

Odds ratios compare surgical mortality for hospitals with a high proportion of non-US-educated nurses (>25%) to all other hospitals in the sample. All regressions were adjusted for nurse (practice environment, percent with BSN education, proportion of nurses in ICU and proportion of nurses in medical-surgical unit) and hospital characteristics (bed size, teaching status and technology status) and dummy variables for state.

administrative data to control for potential confounds. The percentage of non-US educated hospital nurses in our study is also somewhat higher than the overall percentage of non-US educated hospital nurses estimated from the 2008 National Sample Survey of Registered Nurses (NSSRNs) [4] (12 vs. 5%), though it is not that different from the percentage of non-US educated hospital nurses estimated by the NSSRNs for the four states for which we have data (12 vs. 9%). Three of those states—New Jersey, California and Florida—are among the top five states that employ non-US-educated nurses.

Recruiting nurses from other countries, often countries with greater burdens of illness than the USA, has been criticized in terms of its impact on global health [2]. Now, we also have evidence that utilization of a substantial proportion of non-US-educated nurses by US hospitals appears to adversely affect quality of care. That is, when the average patient-to-nurse ratio is higher than 4:1, high proportions of non-US-educated nurses are associated with higher mortality and failure-to-rescue. Only 37% of hospitals in our study have patient to nurse ratios of 4:1 or less, so in practical terms high proportions of non-US-educated nurses appears to be a potential risk factor for higher mortality.

Our findings suggest that the USA should become more reliant on its own domestic supply of nurses to prevent future shortages. Nursing education policies should take advantage

of the strongest applicant pool for nursing in US history by providing sufficient public funding to enable US nursing schools to expand. Currently, large numbers of qualified US applicants to nursing schools are being turned away even in the face of projections of future nurse shortages [15].

Our findings add to the substantial body of evidence showing how important good hospital nurse staffing [16] and good hospital work environments [17, 18] are to patient outcomes. If hospital work environments are good, better staffing has more of an effect on good patient outcomes [5]. Also, if there are enough registered nurses at the hospital bedside, the outcomes for patients are better whether nurses are educated in the USA or not. However, in the absence of good hospital nurse staffing, substantial hospital employment of non-US-educated nurses is associated with higher mortality. Thus, creating opportunities for hospitals to achieve good registered nurse staffing and good work environments is a worthy policy goal likely to contribute to improved quality of hospital care.

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