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Effects of Public Reporting Legislation of Nurse Staffing: A Trend Analysis

Pamela B. de Cordova, PhD, RN-BC[1], Jeannette Rogowski, PhD[2], Kathryn A. Riman, BSN, BSPH, RN[3], and Matthew D. McHugh, PhD, JD, MPH, RN, FAAN[4]

Abstract

Public reporting is a tactic that hospitals and other health care facilities use to provide data such as outcomes to clinicians, patients, and payers. Although inadequate registered nurse (RN) staffing has been linked to poor patient outcomes, only eight states in the United States publicly report staffing ratios—five mandated by legislation and the other three electively. We examine nurse staffing trends after the New Jersey (NJ) legislature and governor enacted P.L.1971, c.136 (C.26:2H-13) on January 24, 2005, mandating that all health care facilities compile, post, and report staffing information. We conduct a secondary analysis of reported data from the State of NJ Department of Health on 73 hospitals in 2008 to 2009 and 72 hospitals in 2010 to 2015. The first aim was to determine if NJ hospitals complied with legislation, and the second was to identify staffing trends postlegislation. On the reports, staffing was operationalized as the number of patients per RN per quarters. We obtained 30 quarterly reports for 2008 through 2015 and cross-checked these reports for data accuracy on the NJ Department of Health website. From these data, we created a longitudinal data set of 13 inpatient units for each hospital (14,158 observations) and merged these data with American Hospital Association Annual Survey data. The number of patients per RN decreased for 10 specialties, and the American Hospital Association data demonstrate a similar trend. Although the number of patients does not account for patient acuity, the decrease in the patients per RN over 7 years indicated the importance of public reporting in improving patient safety.

Keywords

hospitals, inpatients, data accuracy, New Jersey

Public reporting is defined as a health policy strategy of presenting quality indicators to consumers, payers, and health care providers (James, 2012). The U.S. federal and state governments employed this strategy extensively when measuring health care outcomes such as mortality rates, provider performance, and patient satisfaction in hospitals (Faber, Bosch, Wollersheim, Leatherman, & Grol, 2009; Rechel et al., 2016). This process provides data transparency to the public and holds hospitals accountable for maintaining safe environments. Based on these data, consumers can make informed choices related to their health care, and hospitals can improve performance in an effort to increase their market share (Faber et al., 2009; Fung, Lim, Mattke, Damberg, & Shekelle, 2008). The purpose of this article is to present findings from a study that uses mandated public reporting data to identify trends in nurse staffing. The article begins with the rationale of public reporting—a policy aimed to improve the quality of care.

[1]Rutgers, the State University School of Nursing, Faculty Researcher for the New Jersey Collaborating Center, Newark, NJ, USA
[2]Department of Health Policy and Administration, The Pennsylvania State University, University Park, PA, USA
[3]Center for Health Outcomes and Policy Research, University of Pennsylvania School of Nursing, Philadelphia, PA, USA
[4]Nursing Education, Center for Health Outcomes and Policy Research, University of Pennsylvania School of Nursing, Philadelphia, PA, USA

Corresponding Author:
Pamela B. de Cordova, Rutgers, the State University School of Nursing, Faculty Researcher for the New Jersey Collaborating Center, 180 University Avenue, Room 244, Newark, NJ 07102, USA.
Email: pd306@sn.rutgers.edu

Next we describe how New Jersey (NJ) mandates public reporting to require hospitals to report the number of nurses working in acute care. We analyze these data and found that from 2008 through 2015, the number of patients per nurse decreased. Through a validation of these data, we conclude that hospitals report accurately. This policy may have influenced improvements in nurse staffing in NJ and patient safety.

Background and History of Public Reporting Policies in the United States

The process of reporting patient outcome data began with Florence Nightingale during the Crimean War, but public disclosure of unreleased information did not gain attention until U.S. President Lyndon B. Johnson signed the Freedom of Information Act in 1966 (Ireson, Ford, Hower, & Schwartz, 2002). In the 1980s, hospital administrators became increasingly concerned with adverse patient outcomes and the quality of care that hospitals were delivering. In 1987, the media released the first major report cards on hospital mortality, length of stay, and hospital readmission rates from the Health Care Financing Administration (now known as the Centers for Medicare & Medicaid Services (CMS; Marshall, Shekelle, Davies, & Smith, 2003). The CMS determined that the purpose of report cards was to allow consumers to compare rankings among hospitals in quality initiatives (Marshall et al., 2003; Medicare.gov, n.d.).

During the 1980s, the high incidence of adverse patient outcomes in New York led the New York Cardiac Surgery Reporting System to begin collecting mortality data following cardiac surgery (Shahian et al., 2011). This reporting system led to the development of the Maryland Quality Indicators Project in 1987 and the Cleveland Health Quality Choice Program in 1993. These state-level public reporting initiatives developed with the intent to allow consumers to make informed decisions about physicians and hospitals. Reporting systems may have also influenced consumers in their choice of providers or health care plans. Researchers have found, however, that consumers were not using the quality information when making health care decisions (Hussey, Luft, & McNamara, 2014). In 2013, CMS instituted a system of ''nudges'' to steer people to high-quality providers; as a result, consumers selected higher quality providers and plans (Haviland, Damberg, Mathews, Paddock, & Elliot, 2018).

In the United States, availability of publicly reported data varies among states and ranges from corporate to government websites; however, all of the sites containing these data are intended to lead to more informed consumer decision-making. For example, *Healthgrades* is a U.S. company that provides data to allow the consumer to compare individual physicians and nurse practitioners. For hospitals, federally regulated data that provide the consumer with information about a patient's experience in a hospital include satisfaction metrics from the Hospital Consumer Assessment of Healthcare Providers and Systems. This complements the clinical information for participating hospitals available on *Hospital Compare*, summarizing 57 quality measures, which was first published on March 28, 2008 (Giordano, Elliot, Goldstein, Lehrman, & Spencer, 2010).

The degree to which public reporting data are meaningful to patients has been extensively examined in the literature (Fargen, West, & Mocco, 2018). Of 203 patients with suspected or known cardiac disease, greater than 60% viewed publicly available mortality data as accurate, useful, and likely to improve care (Fernandez, Narins, Bruckel, Ayers, & Ling, 2017). Other recent evidence suggests, however, that public reporting in the form of report cards for hospital providers is not necessarily associated with consumer decisions about providers because of weaknesses in the report card content, design, and accessibility (Sinaiko, Eastman, & Rosenthal, 2012). Further, *Hospital Compare* allows the public to compare hospitals, but whether lay consumers have the health literacy skills to interpret these data is a concern. Evidence suggests that consumers place greater trust in their individual physicians than in government agencies, insurance companies, or even their employers, families, and friends (Alexander, Hearld, Hasnain-Wynia, Christianson, & Martsolf, 2011). These findings may suggest that consumers will trust data provided by physicians to recommend hospitals, but they may disregard quality data coming from other sources, such as CMS.

High-performing providers and hospitals will be rewarded for quality outcomes (Fargen et al., 2018). Evidence also suggests that public reporting for hospitals in conjunction with pay-for-performance requirements that financially reward hospitals for excellent care will result in modest improvements in hospital quality, compared with hospitals that only engaged in public reporting (Lindenauer et al., 2007). In addition, patients may value public reporting information but only if they can make effective choices regarding which hospitals they select for care (Giordano et al., 2010).

A variety of policy stakeholders have perceived efforts to report provider performance to patients as a way of motivating providers to improve their own performance (Sinaiko et al., 2012). With advances in measurement, data collection, and information technology, however, current efforts to disseminate provider performance information require significant changes to improve patient awareness of and engagement with these reports (Sinaiko et al., 2012). In 2014, researchers found that providing report cards online caused hospital administrators in competitive markets to use more resources per

patient and consequently achieve lower mortality among severely ill patients (Chou, Deily, Li, & Lu, 2014).

Nurse Staffing Policies

One aspect of hospital quality is sufficient nurse staffing. Extensive research suggests that inadequate numbers of registered nurse (RN) leads to adverse patient outcomes (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007; Lankshear, Sheldon, & Maynard, 2005), including urinary tract infections, patient falls, central line-associated bloodstream infections, hospital-acquired pneumonia, cardiac arrest, unplanned extubation, mortality, and increased patient length of stay (Kane et al., 2007; Lankshear et al., 2005; Ma, McHugh, & Aiken, 2015; Tubbs-Cooley, Cimiotti, Silber, Sloane, & Aiken, 2013). Hospital RN staffing took a central position in health care on October 1, 2012, when CMS began the Hospital Readmissions Reduction Program under the Affordable Care Act (CMS, 2019). At the time, researchers found that higher levels of RN staffing were associated with lower readmission rates (McHugh & Ma, 2013).

The nurse-to-patient ratio. Engaged policy stakeholders, including professional nursing organizations and labor unions, may inform both state and federal policymakers of the importance of RN staffing; however, there is currently no federal mandate requiring hospitals to maintain a specific ratio of RNs to patients (i.e., nurse-to-patient ratio). Despite the lack of a federal mandate, certain U.S. states have enacted RN staffing legislation aimed at improving patient safety in hospitals. For example, in the late 1990s, a nursing shortage in California (CA) resulted in the prioritization of nurse retention (Coffman, Seago, & Spetz, 2002). In 1996, differences between the CA Nurses Association and the American Nurses Association (ANA) on the issue of a nurse staffing ratios contributed to the decision by the CA Nurses Association to disassociate from the ANA (Jones, Bae, Murry, & Hamilton, 2015). CA then became the first state to mandate a nurse-to-patient ratio following the passage of Assembly Bill (AB394) in 1999 and its enactment in January 1, 2004.

This CA legislation resulted from several years of lobbying efforts by nursing unions, as well as media reports of declining hospital quality (Hodge et al., 2004). In addition, at the time of the law's passage in 1999 and enactment in January 1, 2004, the evidence examining the association between nurse staffing and patient outcomes was not well established. Shortly afterwards, researchers began conducting studies aimed at understanding how nurse staffing levels affect patient outcomes in hospitals. In 2002, Aiken, Clarke, Sloane, Sochalski, and Silber found that adding an additional patient per nurse was associated with a 7% increase in the likelihood of dying within 30 days of admission and a 7% increase in death resulting from a complication. In addition, Buerhaus and Needleman (2000) reported that nurse staffing research has provided a "rapidly expanding body of knowledge [however], readers are urged to use caution when using these findings to support mandated hospital nurse staffing levels" (p. 5).

Since CA's enactment of AB394 in 1999, several research teams have studied the CA ratio and its impact on patient outcomes. In 2010, Aiken et al. designed a cross-sectional study using primary survey data from 2006 representing CA, PA, and NJ. They found that 88% of medical-surgical nurses in CA cared for five or fewer patients on their last shift, whereas the same was true of only 19% of nurses in NJ. Other researchers used CA state government agency data to evaluate staffing ratios on medical-surgical units before and after AB394's implementation and found improved staffing but not necessarily improved patient safety (Cook, Gaynor, Stephens, & Taylor, 2012). McHugh, Kelly, Sloane, and Aiken (2011) used a difference-in-difference model and found that the skill level of the nurses did not decrease after legislation, as well as improved staffing levels for safety-net hospitals (McHugh et al., 2012).

Critics of AB394 were concerned about its increased financial burden on hospitals, especially safety-net hospitals, to maintain a mandated ratio. Economists used difference-in-difference models and found that the mandated ratio resulted in financial pressure on hospitals (Mark, Harless, Spetz, Reiter, & Pink, 2012) and declining operating margins in CA hospitals compared with other states (Reiter, Harless, Pink, & Mark, 2011). In conclusion, although the CA ratio was intended to improve the quality of patient care, there is only mixed evidence that this goal was achieved (Spetz, Harless, Herrera, & Mark, 2013).

In 2018, due to the multitude of studies evaluating AB394, policy stakeholders in nursing organizations remain divided regarding mandated ratios. Traditionally, labor organizations representing nurses have advocated for nurse-to-patient ratio in state laws (Livanos, 2018). State policymakers who are opposed to strong labor union advocacy for a mandated ratio have supported less stringent and more flexible approaches, such as nurse staffing committees and public reporting of nurse staffing levels. In 2011, the ANA did not endorse a "rigid" nurse-to-patient ratio but rather afforded hospital administrators and nurses the flexibility to adapt nurse staffing to factors such as patient needs and nurses' experience. In addition, members of the American Organization of Nurse Executives, who generally oppose mandated ratios, often view staffing commitees as compromises (ANA, 2018a; American Organization of Nurse Executives, 2018). Policy stakeholders, mostly labor

organizations, continue to advocate for fixed ratios, however. For example, in November 2018, labor unions in Massachusetts (MA) successfully obtained a ballot initiative for a mandated ratio, although MA voters rejected that initiative, with 70% of voters opposed to the ratio and 30% in favor of it (ANA, 2018a).

In 2001, state policymakers in Oregon (OR), which is geographically close to CA, passed legislation that required hospitals to maintain staffing committees as a compromise to a rigid staffing ratio. Staffing committees were also mandated in Washington (WA) in 2008. In 2002 in Texas (TX), key policy stakeholders such as the TX Nurse Association and the TX Hospital Association initially supported a discretionary rule requiring nurse staffing committees (Jones et al., 2015). Following the implementation on March 24, 2002, of the discretionary nurse staffing rule known as the *Safe Nurse Staffing Rules*, union activity increased in TX, with the TX Nurses Association reporting suboptimal staffing (Jones et al., 2015). As a result of union activity, both the TX Nurses Association and the TX Hospital Association collaborated in drafting and lobbying for legislation. In 2009, the legislature approved TX Senate Bill 476 placing the *Safe Nurse Staffing Rules* into statute (Jones et al., 2015).

Mandated U.S. state nurse staffing laws. As of November 2018, 14 states implemented nurse staffing legislation (ANA, 2018b). In addition to CA, MA, OR, TX, and WA, the 14 states include Connecticut (CT), Illinois (IL), Minnesota (MN), Nevada (NV), NJ, New York (NY), Ohio (OH), Rhode Island (RI), and Vermont (VT; ANA, 2018b). As mentioned earlier, CA is the only state that has a mandated ratio for all inpatient hospital specialties; however, MA mandates the ratio for intensive care.

As of January 2019, seven states have regulations for hospitals to form staffing committees CT, IL, NV, OH, OR, TX, and WA (ANA, 2018b). These staffing committees are for staff RNs to participate in decisions for their hospitals. One research team studied the effect of staffing committees and found that after implementing staffing committees in TX, the levels of RN staffing improved 5% after legislation of staffing committees. This was smaller than the national trend of a 13.6% increase (Jones et al., 2015).

Five states have mandated legislation for hospitals to publicly report the number of RNs assigned to the number of patients on a unit (ANA, 2018b). These states include IL (legislation passed in 2003), NJ (2005), NY (2009), RI (2005), and VT (2006). Four of these states require hospital administrators to report this information to the state and post it in the facility. NY does not require hospitals to post RN staffing data in the facility or report these numbers directly to the state, however; rather, this information is available to the consumer by formal request from the state. Three states—MA, MN, and WA—publicly disclose RN staffing numbers on websites, but they do so electively (Patient Care Link, 2018). We present the 14 states with staffing legislations in Supplementary Table 1.

Public reporting of nurse staffing in NJ. NJ is one of the five states that has mandated public reporting aimed at improve RN staffing (Assembly Bill No. 1727, 2004). In the law C:26:2H-5f, the Senate and General Assembly of the State of NJ states that hospital patients are entitled to be informed about the quality of health care and have access to staffing information. This information is required to be posted and provided to the public under this act about direct patient staffing levels at the facility (Assembly Bill No. 1727, 2004). Legislation also requires hospitals to have a system in place where RN staffing numbers are written on a ''daily posting form'' and placed on each hospital unit on each shift, so consumers can see the levels of RN staffing during hospitalization (Assembly Bill No. 1727, 2004). This form includes the date, hospital, specialty unit, nursing shift, and number of patients assigned to each staff type (i.e., RNs, licensed practical nurses [LPNs], and unlicensed assistive personnel [UAP]).

In most NJ hospitals, charge RNs or designated nursing supervisors will record the number of RNs, LPNs, and UAPs that are working for the shift, and it is the responsibility of the supervisor to ensure that these numbers are correct. The supervisor is also responsible for posting the form in a conspicuous place for each specialty. Then, the supervisor collects these forms at the end of a 24-hour period, and at the end of each month, the supervisor will submit the monthly staffing report for the hospital to the New Jersey Department of Health (New Jersey Department of Health (NJDOH), 2018). Staff at the NJDOH take the monthly hospital data and create quarterly averages by calculating the total number of patients in the facility for the shift over the quarter multiplied by the number of hours in the shift and then divided by the total hours worked by RNs in the quarter in that shift (New Jersey Department of Health (NJDOH), 2019). The law requires that the NJDOH make this information available to the public on a quarterly basis via the Internet (New Jersey Department of Health (NJDOH), 2018).

Eight states publicly report RN staffing; however, in 2018, no researchers evaluated the effectiveness of this policy. In this study, we aimed to evaluate public reporting and determined whether RN staffing in acute care hospitals increased. Public reporting data have the potential to identify whether there were changes in RN staffing postlegislation and also to identify if these trends varied among hospital specialties. Compared with administrative data sets that are aggregated at the

hospital level, these data are unit level, broken down by hospital specialty, allowing recognition that nurse staffing is not identical across all units. Therefore, the purpose of this study was twofold: The first aim was to determine whether NJ hospitals complied with public reporting legislation, and the second aim was to identify RN staffing trends identify staffing trends postlegislation.

Methods

Design and Sample

We conducted a secondary analysis of longitudinal, unit level nurse staffing data (patient-to-nurse ratios) from all hospitals in NJ between September 30, 2008, and December 31, 2015. From 2008 to 2009, NJ had 73 hospitals; from 2010 to 2015, the state had 72 hospitals. We excluded federally owned and operated hospitals (e.g., veterans' hospitals) because they were not subject to state legislation. Only one hospital in NJ was recognized as a state government hospital, but this hospital was also a not-for-profit because the hospital is managed through a private contract. These unit level nurse staffing data from the NJDOH represented 16 hospital specialties.

In order for a hospital specialty to be included in our sample, we required at least 75% of the data to be complete. Therefore, hospital specialties where nursing units closed, or where supervisors did not provide data, were eliminated. We eliminated 3 of the 16 specialties (orthopedics, postanesthesia care unit, and substance abuse) resulting in 13 specialties in our final sample. Data were from the third quarter of 2008 through the last quarter of 2015 in the following specialies: adult closed psychiatric, adult open psychiatric, closed child psychiatric, adult emergency department (ED), adult intensive care unit (ICU), medical-surgical, neonatal intensive care unit (NICU), neonatal step-down, newborn nursery, obstetrics or postpartum, pediatric ICU, pediatrics, and step-down. The institutional review board of Rutgers University reviewed and approved this study in May 2016 and renewed the protocol on September 20, 2017.

Data Collection

We obtained data in quarterly reports (Quarter 1: January–March, Quarter 2: April–June; Quarter 3: July–September; Quarter 4: October–December) from the New Jersey Hospital Association in Microsoft Excel format and cross-checked for accuracy on the Hospital Patient Care Staffing Quarterly Reports of the NJDOH website. We combined all quarterly excel reports into one master file and imported it into Stata SE 14. We merged data with the American Hospital Association (AHA) Annual Survey of Hospitals inclusive of the study period through 2015 because these data were the most comprehensive data resource representing NJ hospitals available. Then, we used the AHA data to validate the publicly reported staffing data and identify hospital characteristics. The public reporting data were unit level and broken down by hospital specialty, whereas the AHA data were hospital level. To compare RN staffing numbers in the AHA data, we aggregated the public reporting unit level data to the hospital level.

Study Variables

Nurse (RN) staffing. RN staffing was operationalized as a ratio of number of patients per RN for each specialty in the public reports. The AHA Annual Survey of Hospitals indicates number or full-time equivalents (FTEs) by RN, number of beds staffed, and adjusted patient days (Jiang, Stocks, & Wong, 2006). To determine inpatient activities, AHA analysts computed the adjusted patient days as equal to inpatient days multiplied by the ratio of total gross patient revenue to inpatient revenue, allowing researchers to construct four different measures for nurse staffing (Jiang et al., 2006).

We calculated staffing ratios in the AHA data using the variable "ftern," which is defined as RN hours converted from AHA FTEs. The fteren variable was constructed based on FTE RN positions per adjusted patient day. We used a standard conversion where one FTE position equals nursing hours divided by 1,768 which represents the potential productive hours per year for an FTE RN (Spetz, Donaldson, Aydin, & Brown, 2008). An FTE RN is assumed to work 52 weeks per year at 40 hours per week, resulting in 2,080 hours per year; however, some of these hours will be used for vacation, sick leave, and continuing education, resulting in fewer than 2,080 hours per year (Spetz et al., 2008). We used the AHA variable "adjusted patient days" in the denominator. Therefore, our formula was the adjusted patient days multiplied by 24 and divided by the product of *ftern* and 1,768 hours per year. This methodology, validated in other studies, (Lake, Shang, Klaus, & Dunton, 2010; McHugh et al., 2011) allowed us to calculate staffing ratios from AHA data and compare these ratios with the public reporting data.

Hospital characteristics. Using the AHA data, we created four hospital level variables: hospital ownership (for-profit and not-for-profit), bed size (<100 small, 101–250 medium, and >251 large), technology status (low technology and high technology, where a high-technology hospital was defined as one that had the capability to perform organ transplantation or open-heart surgery), and teaching status (nonteaching, minor and major) determined from full-time equivalent medical

and dental residents per total facility beds. We identified hospitals without any postgraduate medical residents as nonteaching and distinguished them from minor teaching hospitals (1:4 or smaller trainee-to-bed ratio) and major teaching hospitals (higher than 1:4 trainee-to-bed ratio).

Data Analysis

We used descriptive statistics to identify trends over time by each specialty unit and frequency counts, measures of central tendency, variance, and percentages to identify distributions of RN staffing by each specialty by year. After we cross-checked the data for reporting accuracy, we calculated theoretical cut offs based on RN experience. We then decided to eliminate outliers if they fell beyond the interquartile range for each specialty for that quarter (i.e., staffing ratios that were below the 25th percentile and above the 75th percentile were removed) and found that sufficient observations for our analyses remained.

Both means and medians were used to identify trends by quarter and by year. Incomplete data were also trended over the study period to determine whether specific specialties were more likely to have unit closures or report insufficient data. We aggregated public reporting data to the hospital level for comparison and validation to the AHA staffing variable, specifically by creating an average staffing variable for each hospital and year. We calculated Pearson's correlations between the publicly reported RN staffing variable and the AHA staffing variable. All data were analyzed using Stata Statistical Software: Release 14 (College Station, TX: StataCorp LP).

Results

Hospital Characteristics

For 13 hospital specialties, we analyzed 14,158 quarterly observations, with an average of 93% of the data complete. All hospitals had an ICU, medical-surgical specialty, and an ED. More than 50% of hospitals had specialties in obstetrics, general pediatrics, and adult step-down. The specialty with the most missing data was the newborn nursery, with about 81% of data complete, followed by adult open psychiatric (82%) and closed child psychiatric (84%). Both the adult ICU and the medical-surgical specialty provided nearly 100% of complete data. We present the hospital specialties with complete data in Table 1.

The number of NJ hospitals that participated in the AHA survey for the study period was 63 hospitals in 2014; 64 hospitals in 2008, 2010, 2011, 2012, and 2015; and 65 hospitals in 2009 and 2013. In 2015, there were 72 hospitals in NJ (73 hospitals in 2008 and 2009); among those 72 hospitals, 90% ($n = 65$) of them completed the AHA survey. Hospital characteristics such as hospital ownership, bed size, teaching, and technology status were stable over the study period. On average, greater than 95% of hospitals were not-for-profit institutions. In 2015, 91% ($n = 58$) of the hospitals were not-for-profit compared with six hospitals being for-profit. On average, the majority 58% ($n = 37$) of NJ hospitals were large with greater than 250 beds, 74% ($n = 48$) of the hospitals had low technology and 43% ($n = 28$) of the hospitals were considered minor teaching hospitals (see Table 2).

Table 1. Percentage of Complete Publicly Reported Data for New Jersey Acute Care Hospitals (2008–2015).

Hospital specialties	No. of observations	No. of incomplete observations	Complete data (%)
Adult closed psychiatriC	910	71	92.8
Adult open psychiatric	461	95	81.6
Closed child psychiatric	187	37	83.5
Emergency department	2,009	180	91.8
Intensive care	2,218	8	99.6
Medical surgical	2,220	5	99.8
Neonatal intensive care	611	28	95.6
Neonatal step-down	905	62	93.6
Newborn nursery	583	138	80.9
Obstetrics	1,596	98	94.2
Pediatric intensive care	394	33	92.3
Pediatrics	1,290	143	90.0
Step-down	1,562	116	93.1
Total	14,946	1,014	93.2

Notes. Substance abuse, orthopedics, and postanesthesia care unit were eliminated from their list due to incomplete data over the study period.

Staffing Trends

All participating hospitals demonstrated an increase in RN staff numbers for 10 out of 13 specialties (see Table 3). The three specialties in which the number of patients assigned to an RN increased or remained the same were the adult open psychiatric (number of patients assigned increased from 5.8 patients in 2008 to 6.1 patients in 2015), closed child psychiatric (no change in the number of patients assigned from 2008 to 2015), and the adult ICU (no change in the number of patients assigned from 2008 to 2015). The hospital specialties that demonstrated the greatest change of RN staffing from 2008 through 2015 were neonatal ICU (number of patients assigned decreased from 2.1 babies in 2008 to 1.9 babies in 2015), pediatrics (number of patients assigned decreased from 2.7 children in 2008 to 2.4

Table 2. Characteristics of New Jersey Acute Care Hospitals (2008–2015).

	2008		2009		2010		2011	
	$n = 64$	(%)	$n = 65$	(%)	$n = 64$	(%)	$n = 64$	(%)
Ownership								
For-profit	3	4.7	1	1.5	2	3.1	4	6.3
Not-for-profit	61	95.3	64	98.5	62	96.9	60	93.8
Bedsize								
Small (<100 beds)	2	3.1	2	3.1	2	3.1	2	3.1
Medium (101–250 beds)	24	37.5	26	40.0	24	37.5	27	42.2
Large (>251 beds)	38	59.4	37	56.9	38	59.4	35	54.7
Technology status								
Low	47	73.4	49	75.4	47	73.4	46	71.9
High	17	26.6	16	24.6	17	26.6	18	28.1
Teaching status								
None	33	51.6	30	46.2	26	40.6	27	42.2
Minor (1:4 trainee-to-bed)	22	34.3	27	41.5	30	46.9	31	48.4
Major (>1:4 trainee-to-bed)	9	14.0	8	12.3	8	12.5	6	9.4
	2012		2013		2014		2015	
	$n = 64$	(%)	$n = 65$	(%)	$n = 63$	(%)	$n = 64$	(%)
Ownership								
For-profit	5	7.8	6	9.2	6	9.5	6	9.4
Not-for-profit	59	92.2	59	90.8	57	90.5	58	90.6
Bedsize								
Small (<100 beds)	2	3.1	2	3.1	1	1.6	2	3.1
Medium (101–250 beds)	25	39.1	25	38.5	26	41.3	24	37.5
Large (>251 beds)	37	57.8	38	58.5	36	57.1	38	59.4
Technology status								
Low	48	75.1	49	75.4	46	73.0	50	78.1
High	16	24.9	16	24.6	17	27.0	14	21.9
Teaching status								
None	28	43.8	27	41.5	24	38.1	24	37.5
Minor (1:4 trainee-to-bed)	29	45.3	29	44.6	27	42.9	28	43.8
Major (>1:4 trainee-to-bed)	7	10.9	9	13.8	12	19.0	12	18.8

children in 2015), and the neonatal step-down unit (number of patients assigned decreased from 2.3 babies in 2008 to 2.0 babies in 2015). For the medical-surgical specialty, RN staffing improved with almost a 7% decrease in the number of patients assigned (5.5 patients in 2008 to 5.1 patients in 2015). The specialties that showed a small decrease in the number of patients assigned from 2008 through 2015 were the adult closed psychiatric units (number of patient assigned decreased from 6.4 patients in 2008 to 6.1 in 2015), the newborn nursery (number of babies decreased from 3.6 babies in 2008 to 3.5 babies in 2015), and the adult step-down units (no change in the number of patients assigned from 2008 to 2015). When comparing the specialties to the AHA RN staffing ratio, we found a steady decrease in the number of patients assigned to an RN with 3.7 patients in 2008 to 3.4 patients in 2015, resulting in almost an 8% change in RN staffing.

To validate the public reporting data, we compared the two ratios from each data source to each other. When we aggregated the unit level RN staffing ratios to the hospital level, we found a weak positive correlation ($r = 0.21$, $p < .01$) between the AHA staffing variable and the public reporting variable. We then tested the AHA measure of RN staffing to each hospital specialty and found positive moderate correlations for four specialties including the adult open psychiatric, adult ICU, and medical-surgical and step-down specialties ($r \geqslant 0.30, p < .01$).

Table 3. Trends of New Jersey RN Staffing (Patient to RN ratio) by Specialty (2008–2015).

			2008		2009		2010		2011	
Hospital specialties	*n*[a]	IQR	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Adult closed psychiatric	859	1.80	6.4	1.4	6.5	1.6	6.3	1.5	6.4	1.4
Adult open psychiatric	445	2.40	5.8	1.5	6.0	1.6	5.9	1.6	6.1	1.6
Closed child psychiatric	180	2.30	5.9	1.9	6.0	2.1	6.7	2.2	6.2	2.2
Emergency department	1951	5.40	9.9	4.7	9.6	4.5	9.5	4.1	9.5	3.9
Intensive care	2023	0.30	1.9	0.2	1.9	0.2	1.9	0.2	2.0	0.2
Medical surgical	2062	0.90	5.5	0.6	5.4	0.6	5.3	0.6	5.2	0.7
Neonatal intensive care	565	0.50	2.1	0.4	2.0	0.4	1.9	0.4	1.9	0.4
Neonatal step-down	872	1.10	2.3	0.8	2.3	0.8	2.2	0.8	2.2	0.8
Newborn nursery	569	2.50	3.6	1.6	3.6	1.7	3.6	1.8	3.5	1.7
Obstetrics	1539	2.50	4.3	1.7	4.3	1.8	4.2	1.7	4.2	1.7
Pediatric intensive care	349	0.40	1.6	0.3	1.6	0.3	1.5	0.4	1.6	0.3
Pediatrics	1249	1.60	2.7	1.1	2.7	1.0	2.7	1.1	2.8	1.0
Step-down	1495	1.20	4.3	0.8	4.3	0.9	4.3	0.9	4.3	0.9
AHA RN staffing			3.7	1.0	3.7	1.0	3.7	1.0	3.5	0.8

	2012		2013		2014		2015		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	% Change
Adult closed psychiatric	6.2	1.4	6.1	1.4	6.2	1.2	6.1	1.2	−3.9
Adult open psychiatric	5.8	1.6	5.8	1.7	6.2	1.5	6.1	1.4	3.8
Closed child psychiatric	6.6	1.6	6.4	1.7	6.5	1.6	5.9	1.6	0.0
Emergency department	9.5	3.9	9.5	4.0	9.3	4.0	9.4	4.0	−4.3
Intensive care	1.9	0.2	2.0	0.3	1.9	0.3	1.9	0.3	1.6
Medical surgical	5.2	0.6	5.2	0.6	5.2	0.6	5.1	0.6	−6.6
Neonatal intensive care	2.0	0.3	1.9	0.3	1.9	0.3	1.9	0.3	−9.2
Neonatal step-down	2.1	0.8	2.1	0.8	2.0	0.9	2.0	0.9	−11.1
Newborn nursery	3.5	1.6	3.5	1.6	3.4	1.7	3.5	1.8	−1.4
Obstetrics	4.1	1.7	3.9	1.7	3.9	1.7	3.9	1.6	−8.6
Pediatric intensive care	1.6	0.3	1.6	0.2	1.7	0.3	1.5	0.3	−3.8
Pediatrics	2.7	1.1	2.5	1.1	2.5	1.1	2.4	1.2	−12.0
Step-down	4.3	0.9	4.3	0.9	4.2	0.9	4.3	0.9	−0.9
AHA RN staffing	3.6	1.1	3.4	0.8	3.5	0.9	3.4	0.9	−7.8

Note. AHA = American Hospital Association; IQR = Interquartile range; RN = registered nurse.
[a]Adjusted number of observations after applying the IRQ to address outliers.

We found negative weak correlations between the public reporting RN staffing variable and the AHA measure of RN staffing for four specialties including the ED, neonatal step-down, newborn nursery, and pediatrics. The remaining specialties had positive weak correlations with the public reporting variable (see Supplementary Table 2).

Discussion

We evaluated publicly reported, unit level data mandated by NJ legislation to identify RN staffing trends. Hospital supervisors have been providing complete data for 13 hospital unit types since 2008.This is not surprising, given that the statute is clear regarding compliance. For example, should a hospital "fail to comply with the provisions of this act, [the hospital] shall be subject to a penalty as determined by the commissioner" (New Jersey Hospital Patient Care Staffing Quarterly Reports, January 24, 2005, C.26:2H-13). The exact financial penalty for failure to report is not stated in the regulation and would be determined on a case-by-case basis by the commissioner pursuant to sections 13 and 16 of P.L.1971, c.136 (Assembly Bill No. 1727, 2004). Other

than being reminded by a NJDOH staff member, there have not been any penalties placed on hospitals for failure to report (A. Holmes, personal communication, September 8, 2014).

Trends of RN Staffing

Although we found a decrease in the average numbers of patients assigned to each RN across 10 specialties, we cannot conclude that the NJ public reporting legislation caused this result. It seems likely that this change in RN staffing may have resulted from hospital administrators' fear of loss of market share from competitor hospitals, as well as the fear of public criticism regarding low RN staffing numbers. Administrators may have used the publicly available data to benchmark RN staffing ratios against competitor hospitals.

Nationally, hospitals have steadily increased RN staffing and we found this effect for NJ. Researchers who examined the National Database of Nursing Quality Indicators found that the total nursing hours per patient day in general care units increased from 11.5% in 2004 to 22.9% in 2011 (Staggs & He, 2013). Using data from the Arizona State Board of Nursing, researchers also found an increase in the supply of hospital RNs resulting from delayed retirements and higher relative hospital wages inducing nurses in other sectors to return to the hospital (Johnson, Butler, Harootunian, Wilson, & Linan, 2016). Other explanations for the increase in RN staffing may be related to hospital value-based measures from CMS requiring an increase in the number of RNs to decrease readmission rates. Also, increases in patient acuity coupled with improvements in hospital finances may have allowed administrators to hire more nurses especially in NJ. In the United States, hospital administrators may recognize the importance of nurse staffing (Staggs & He, 2013). Also, the vacancy-to-unemployment ratio dropped from about 8-to-1 in 2007 to about 2-to-1 in 2010 among a sample of U.S. metropolitan hospitals, chief nursing officers reported that these vacancies were predominantly in managerial and specialty positions, rather than entry-level positions such as direct care providers (Benson, 2012).

In our study, we aimed to validate the NJ public reports, and through that process, we found many strengths of the RN staffing data. For example, unlike AHA data, the public reports are unit level and more accurately reflect staffing for nursing specialties. We found a similar increase in the number of RNs assigned to a patient among AHA data. This finding is congruent with existing work. When researchers compared AHA data to CA Office for Statewide Health Planning and Development data, they found that both sources could be used to monitor nurse staffing at the aggregate level (e.g., national and state); however, OSHPD data were a stronger resource for studies for focusing on individual hospitals (Jiang et al., 2006). Therefore, this longitudinal, public reporting data of RN staffing may be a free, easily accessible data source researchers can use in an era of big data.

State-Specific Limitations of Public Reporting Legislation

On January 24, 2005, NJ lawmakers passed the law mandating that hospitals need to complie, post, and make available to the public daily information on staffing levels in hospitals. The legislature declared that hospital patients, in the interest of being fully informed about the quality of health care, are entitled to have access to staffing information (Assembly Bill No. 1727, 2004). But the lay public and patients as consumers are likely unaware that this legislation exists. For example, we were unable to identify any press releases from the when the law was enacted except for one blurb from a website that appeared as a public announcement (Nurse Leader Insider, 2005). The legislation would have been strengthened if the NJDOH and the New Jersey Hospital Association, in conjunction with local media outlets, broadly publicized the passage of the legislation. It is possible that once a consumer is hospitalized, he or she may become aware of the reports because they are posted in conspicuous areas on the unit; however, this knowledge would come too late for that consumer to make an informed decision about which hospital to select for care.

Policy Implications

Policymakers from other states who support mandated public reporting of hospital staffing can learn lessons from NJ. For example, when NJ's 2005 law was enacted, each hospital made a decision regarding implementation. The legislation is silent on how the hospital should implement the policy; therefore, each hospital has different ways of calculating the staffing numbers. Although NJ provides a standard template for calculating necessary staffing, supervisors use personal judgment when completing these forms. The legislation lacks specification regarding what type of RN should be counted. For example, a charge RN or a newly licensed RN on orientation—neither of whom have patient assignments—may be included in the count. Therefore, policymakers who consider public reporting of hospital staffing need to work closely with hospital administrators to craft legislation that attempts to capture the most accurate counts of staff.

Policies, programs, or other inititiaves to ensure that the public reports are online for consumers are one way to increase patient engagement. Although the evidence is unclear whether patients,themselves, use the report card

grades to choose better hospitals, the growth in the numbers of people using the web to access health information may lead to greater use in the future (Chou et al., 2014). In addition, once reports are more easily available online, hospital clinicians may mention them to patients and more likely, use the hospital grades, themselves, to recommend hospitals to patients (Chou et al., 2014).

In 2018, the ANA supported data transparency and submitted comments to CMS recommending that nurse staffing and staff skill mix data be added to the Hospital Inpatient Quality Reporting (IQR) Program and in the CMS' five-star ratings on *Hospital Compare* for acute care hospitals (ANA, 2018c). If approved, hospitals would be required to submit additional information to CMS pertaining to nurse staffing measures (ANA, 2018c). Although CMS elected for these two nurse staffing measures not to be required in 2018, staff at CMS are considering adding them in fiscal year 2019 (ANA, 2018c).

Limitations

To our knowledge, we are the first research team to evaluate public reporting staffing legislation in NJ; however, there were limitations. We only conducted a postanalysis after the NJ legislation was implemented because we were unable to obtain comparable unit level data prior to the implementation of the law. We conducted our analysis in one state, limiting the generalizability of findings and recognizing that NJ hospitals may not be reflective of all U.S. hospitals. For example, NJ has only one state-government hospital that is actually a not-for-profit facility. Also, NJ has the greatest percentage of Magnet® facilities (24 hospitals in 2015, the latest year of our study) compared with non-Magnet® hospitals. In addition, NJ is only 7,417 square miles with an estimated population of 9,005,644 people, and none of the hospitals in the state are considered rural (Rural Health Information Hub, 2017).

In our study, we limited our trend analyses to RN ratios, even though hospitals also report LPN and UAP data. We found that these reporting data for LPNs and UAPs were unreliable because LPN data were reported in hours, rather than as a patient-to-nurse ratio and UAPs who were assigned as one-to-one patient sitter were included as staff inflating the averages. Future research may need to consider the skill mix as well as the ratios.

Finally, we found a weak correlation between the pubic reporting RN staffing variable and the AHA variable. This effect may be a result of using administrative hospital level data sets as opposed to comparing unit level data sets. With AHA data, if hospitals do not report data, the AHA analysts impute for missing data (Jiang et al., 2006). In addition, AHA data analysts incorporate all RNs in their calculation of RN FTEs (i.e., nurse educators and managers) that may not provide direct patient care, therefore impacting the strength of the correlation.

Conclusion

We found that NJ hospitals complied with mandated public reporting nurse staffing legislation and that the number of patients per RN decreased for 10 specialties during a 7-year period. Policymakers can use these unit level RN staffing data, which are easily available on the NJ's Department of Health website; however, it is unclear how the public uses these data when selecting hospitals. Nurses need to be aware that some U.S. states have mandated staffing legislation besides for the nurse-to-patient ratio. Public reporting of nurse staffing data allows for transparency of staffing practices, which may lead to better quality of care.

Author's Note

Matthew D. McHugh is now affiliated with Center for Health Outcomes and Policy Research, University of Pennsylvania School of Nursing, Philadelphia, PA, USA.

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ORCID iD

Pamela B. de Cordova http://orcid.org/0000-0003-4737-8652

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Author Biography

Pamela B. de Cordova is an assistant professor of Nursing at Rutgers, the State University of New Jersey. Dr. de Cordova also is the faculty researcher for the New Jersey Collaborating Center for Nursing. In both roles, she conducts health services research focusing on evaluating nurse staffing legislation and conducting studies aimed at improving patient safety in acute care hospitals.

Jeannette Rogowski is a professor of health Policy and Administration in the Center for Health Care and Policy Research at Penn State University. Dr. Rogowski's research focuses on the structure, financing and organization of the health care delivery system and the impact to population health.

Kathryn A. Riman is a first-year predoctoral fellow in the Center for Health Outcomes and Policy Research at the University of Pennsylvania School of Nursing. Her research focuses on examining organizational characteristics and policies and their relationships to patient outcomes. Ms. Riman's undergraduate training includes a Bachelor degree in both Public Health and Nursing from Rutgers , the State University of New Jersey.

Matthew D. McHugh is the independence chair for Nursing Education and professor of Nursing at the University of Pennsylvania School of Nursing. Dr. McHugh is Associate Director of the Center for Health Outcomes and Policy Research at Penn where he conducts health services and policy research focusing on the impact of nurses and nursing on patient outcomes, quality of care, and costs. He is a Robert Wood Johnson Foundation Nurse Faculty Scholar, a Fellow in the American Academy of Nursing, and a Senior Fellow at the Leonard Davis Institute of Health Economics.