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**Karen M. McCarthy**  
Clerk of the Legislature  
Old Erie County Hall  
92 Franklin Street, 4<sup>th</sup> Floor  
Buffalo, NY 14202

Dear Ms. McCarthy:

I am writing to follow up on specific requests about staffing ratios that were raised at last week's Health and Human Services Committee meeting. Additional information was requested concerning research on ratios and oversight of healthcare. The following is attached:

- A two-page summary of relevant research. The following additional documents are attached as PDFs:
  - Three research studies addressing implementation of staffing ratios in California. Numerous studies have been conducted and have not found a direct link between a mandated, specific ratio and improved outcomes. The research recognizes, as we do, the importance of staffing to patient care. However, the research does not conclude that a specific ratio or set of ratios is appropriate statewide for every patient and hospital.
  - Research about the importance of nurse education to improve the safety and quality of patient care.
  - A federal report about the national Partnership for Patients initiative that specifically recognizes New York's hospitals for making significant progress in improving outcomes and patient safety.
- A two-page summary describing the extensive government oversight of hospitals, and well as laws and regulations to ensure accountability and transparency. The summary covers:
  - Oversight by federal and state agencies and links to the Medicare Conditions of Participation and components of the New York State Hospital Code.
  - Reporting activities, including information about the federal "Hospital Compare" program and the associated link.

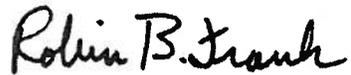
Karen M. McCarthy  
December 14, 2015

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- New York's requirement that information about nursing staffing plans and patient outcomes be made available to the public upon request (and the associated link).
- New York's Hospital Profile and a link to information on Hospital-Acquired Infections.

I hope that this information is helpful. Please feel free to contact me if you have any questions.

Sincerely,



Robin B. Frank  
Vice President  
Governmental Affairs, Continuing Care and Workforce

Enclosures (2): Research Summary (with attachments)  
Oversight Summary



## **Academic Research Does Not Support Specified Ratios**

Legislation has been introduced in the New York State Legislature that would impose specific statewide staffing ratios on hospitals and nursing homes. California is the only state that has mandated specific hospital-wide nurse staffing ratios, and researchers have been analyzing the impact. Findings from these studies have not found a direct link between a mandated, specified ratio and improved patient outcomes. The evidence shows that overall staffing is important, but determining a precise number of needed staff by occupation is a complicated calculation involving many variables. An arbitrary ratio does not ensure quality care or effective staffing.

Nurses and other direct care staff play a vitally important role in the delivery of hospital and nursing home services to thousands of New Yorkers each day. They are the cornerstone of providing quality patient/resident care. However, patients have widely varying service needs that change from day to day, and a variety of factors contribute to quality of care and patient outcomes.

*Findings from a number of studies addressing the implementation of specific staffing ratios in California have been inconclusive and have not found a direct link between a mandated, specified statewide staffing ratio and improved patient outcomes. Research indicates that a variety of complex factors must be considered when making critical staffing decisions. Some national healthcare organizations have also expressed their concerns about mandated, statewide ratios.*

Bolton et al. (2007) and Donaldson et al. (2005) conducted related studies and found no significant changes in falls, falls with injury, hospital-acquired pressure ulcers or use of restraints associated with California's nurse staffing ratios. While the study explored the relationship between staffing and nursing-sensitive outcomes, Bolton determined: ". . . anticipated improvements in nursing-sensitive patient outcomes were not observed." Bolton further concluded, "These findings highlight the challenge to better understand how characteristics and credentials of the direct care nursing staff, unit microsystem, and organizational culture of safety interact to impact patient outcomes, as mandated alterations in the volume of direct care staff alone has not resulted in expected reduction in two common adverse events in hospitals, falls and pressure ulcers." Spetz and Chapman et al. (2009) found that overall length of stay in California stayed the same. Other nursing-sensitive measures show similar results.

### Sources:

Bolton, L., et al., "Mandated Nurse Staffing Ratios in California: A Comparison of Staffing and Nursing-Sensitive Outcomes Pre- and Postregulation," Policy, Politics, & Nursing Practice, 2007.

Donaldson, N., et al., "Impact of California's Licensed Nurse-Patient Ratios on Unit-Level Nurse Staffing and Patient Outcomes," Policy, Politics, & Nursing Practice, 2005.

Spetz, J., and Chapman, S., et al., "Assessing the Impact of California's Nurse Staffing Ratios on Hospitals and Patient Care," Center for California Health Workforce Studies, University of California-San Francisco, California HealthCare Foundation: Issue Brief, February 2009.

### **Many Factors Impact Quality Outcomes**

*Research has identified several important factors to improve outcomes, including the education and preparation of nurses, adherence to evidence-based patient care protocols, teamwork, communications, and other factors.*

The level of nurse education provides an important roadmap to the most effective strategies to improve the safety and quality of patient care. Research is showing that higher proportions of nurses educated at the baccalaureate level or higher have resulted in improved patient outcomes. To this point, the Institute of Medicine recommends increasing significantly the proportion of nurses with a baccalaureate degree by the year 2020 as a strategy to create a nursing workforce best prepared to meet the growing and complex needs of patients. Given the considerable advances in online educational opportunities, consideration should be given to legislation that requires future nurses to obtain a B.S. in Nursing within 10 years of initial licensure.

Research further shows that adherence to evidence-based patient care protocols, effective teamwork, communication, and leadership enable healthcare professionals to quickly adapt to changing situations, have a shared understanding of the care plan, and lead to safer, reliable care. Healthcare professionals work every day to achieve quality patient care. As an example, the TeamSTEPPS® system is an evidence-based teamwork system developed by the U.S. Department of Defense's Patient Safety Program in collaboration with Agency for Healthcare Research and Quality (AHRQ), within the U.S. Department of Health and Human Services. This widely recognized strategy for improving quality was developed specifically for healthcare professionals to improve patient safety, focusing on four core areas of competency: team leadership, situation monitoring, mutual support, and communication.

Source: Institute of Medicine Report: "The Future of Nursing: Leading Change, Advancing Health," 2010.

New York hospitals participate in the national Partnership for Patients (PFP) initiative, created to reduce hospital-acquired complications and preventable readmissions. As a result of PFP, New York hospitals have seen 25,000 fewer patient readmissions, a 41% reduction in central-line associated bloodstream infections, a 30% reduction in falls with moderate or greater injury, and a 90% reduction in early elective deliveries. New York's hospitals were highlighted by the U.S. Department of Health & Human Services in its May 2014 report as making significant progress in improving outcomes and patient safety through best practices and clinical expertise.

Source: U.S. Department of Health & Human Services, "New HHS Data Shows Major Strides Made in Patient Safety, Leading to Improved Care and Savings," May 7, 2014.



### **Government Oversight of Healthcare is Extensive**

A variety of laws and regulations already ensure provider transparency and accountability to consumers and regulators. Hospitals in New York State must comply with a wide array of state and federal requirements under the oversight of the New York State Department of Health (DOH), federal Centers for Medicare and Medicaid Services (CMS), and accrediting organizations. These requirements cover a multitude of areas, including the adequacy of staffing, staff education, performance evaluation, credentialing, specific quality measures, processes of care, patient satisfaction scores, adverse events, and community health initiatives.

Compliance with the Medicare Conditions of Participation (CoPs) is evaluated through a very detailed set of CMS standards that includes strict inspection protocols and interpretative guidance when evaluating and determining compliance. Inspections are carried out through a contractual relationship between CMS and DOH. A team of healthcare professionals are employed by DOH to conduct inspections and are trained and certified by CMS, which may also accompany state inspectors. CMS may also use national accrediting organizations, such as The Joint Commission, to conduct inspections to determine compliance with the Medicare CoPs. The New York State Hospital Code (10 NYCRR Part 405) incorporates state rules for licensure purposes as well as the Medicare CoPs.

All such inspections are unannounced to the provider, are comprehensive, and can last from days to weeks, as every facet of facility structure and operation is scrutinized. If an area is identified for improvement to ensure compliance, a statement of deficiency is issued and remediation is required within a specified period. Significant findings of deficiencies can jeopardize the continuation of the provider's participation in Medicare and Medicaid. The results are reviewed by multiple layers of state and federal government to ensure completeness and compliance.

Surveillance/inspection standards have multiple levels of assessment grouped as 23 Conditions; 74 Standards under the Conditions; and many more specific Elements are evaluated for compliance with a Standard.

The 23 CoPs cover governing body; patient rights; quality assessment and performance improvement programs; medical staff; nursing services; medical record services; pharmaceutical services; radiologic services; laboratory services; food and dietetic services; utilization review; physical environment; infection control; discharge planning; organ, tissue, and eye procurement; surgical services; anesthesia services; nuclear medicine services; outpatient services; emergency services; rehabilitation services; respiratory services; and compliance with federal, state, and local laws.

The Nursing Services Condition includes standards addressing organization, staffing, delivery of care, and preparation and administration of drugs. Staffing is evaluated through quality performance across all hospital units, including direct observation of care, promptness, and timeliness of the care; review of staffing documents to determine if staff is adequate for the level of acuity of patients; interviews with patients; and personnel file review for evidence of proper training, credentialing, and performance. Inspectors review written staffing schedules in relation to patient care needs, physical layout and size of the hospital, number of patients, intensity of patient illness and nursing needs, availability of nurses' aides and orderlies and other resources for nurses, training and experience of personnel, and many other items.

**Sources:**

Medicare Conditions of Participation, Title 42 of the Code of Federal Regulations, Part 482: Conditions of Participation for Hospitals

<http://www.ecfr.gov/cgi-bin/text-idx?SID=5b16004def67c23008d808683fb0621d&mc=true&node=pt42.5.482&rgn=div5>

New York Hospital Code, Title 10 NYCRR (Compilation of the Rules and Regulations of the State of New York) Part 405

<http://w3.health.state.ny.us/dbspace/NYCRR10.nsf/Full%20Directory?OpenView&Start=6.71>

**Reporting**

Under the CMS Hospital Inpatient Quality Reporting Program, hospitals must report inpatient quality data on nearly 60 measures for health conditions common among Medicare beneficiaries and which typically result in hospitalization. Hospitals are also required to submit data for almost 30 specific quality measures through the Hospital Outpatient Quality Reporting Program.

The data are available to the public through the CMS “Hospital Compare” website, which allows a consumer to compare quality information about hospitals for certain aspects of care.

In its evaluation of hospitals, CMS uses metrics based on current evidence-based clinical guidelines that are consistent or aligned with nationally-approved quality measures. For example, hospitals submit data on heart attacks, heart failure, pneumonia, stroke, surgical care improvement, venous thromboembolism, perinatal care, pediatric care, and healthcare-associated infections. Data are also reported on imaging efficiency patterns, care transitions, emergency department throughput efficiency, care coordination, patient safety, and volume. Further analysis is performed on readmissions, surgical complications, mortality, and hospital-acquired conditions.

Source: <http://www.medicare.gov/hospitalcompare/>

In 2009, a New York State law was enacted that requires hospitals and nursing homes to make available to the public upon request, information on nurse staffing plans and patient outcomes. The following describes some of the information that must be made available:

- the number of registered nurses, licensed practical nurses, and unlicensed personnel providing patient care for each unit and shift;
- the incidence of certain adverse events; and
- methods for determining and adjusting staffing levels and patient care needs, including acuity.

Source: New York State DOH, Disclosure of Quality and Surveillance Related Information

[http://www.health.ny.gov/regulations/recently\\_adopted/docs/2015-01-07\\_disclosure\\_quality\\_surveillance.pdf](http://www.health.ny.gov/regulations/recently_adopted/docs/2015-01-07_disclosure_quality_surveillance.pdf)

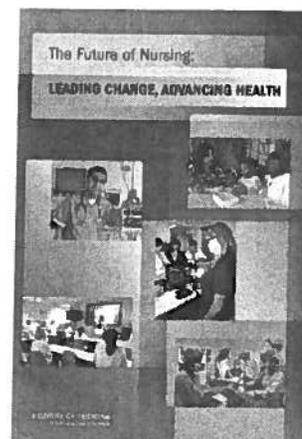
In addition, the New York State DOH Hospital Profile Quality Section includes information on quality of care measurements, and DOH similarly provides a Hospital-Acquired Infection (HAI) report. These reports are available to the public through the DOH website and include quality of care measurements and other information and can be used comparatively. The New York State Hospital Profile includes measurements related to heart conditions, pneumonia care, surgical site infection, and performance of coronary artery bypass graft, angioplasty, and pediatric heart surgery. The HAI report includes information on HAI rates in New York.

Source: New York State DOH

[http://www.health.ny.gov/statistics/facilities/hospital/hospital\\_acquired\\_infections/](http://www.health.ny.gov/statistics/facilities/hospital/hospital_acquired_infections/)

# The Future of Nursing

## Focus on Education



**The 2010 Affordable Care Act** represents the broadest health care overhaul since the 1965 creation of the Medicare and Medicaid programs. Transforming the health care system to provide safe, quality, patient-centered, accessible, and affordable care will require a comprehensive rethinking of the roles of many health care professionals, nurses chief among them. To realize this vision, nursing education must be fundamentally improved both before and after nurses receive their licenses.

In 2008, the Robert Wood Johnson Foundation (RWJF) and the Institute of Medicine (IOM) launched a two-year initiative to respond to the need to assess and transform the nursing profession. The IOM appointed the Committee on the RWJF Initiative on the Future of Nursing, at the IOM, with the purpose of producing a report that would make recommendations for an action-oriented blueprint for the future of nursing.

As part of its report, *The Future of Nursing: Leading Change, Advancing Health*, the committee considered many challenges that face the nursing education system and some of the solutions that will be required to advance the system. It determined that nurses should achieve higher levels of education and training through an improved education system that promotes seamless academic progression.

### The Need for Highly-Educated Nurses

In the 21st century, the health challenges facing the nation have shifted dramatically. The American population is older—Americans 65 and older will be nearly 20 percent of the population by 2030—as well as more diverse with

respect not only to race and ethnicity but also other cultural and socioeconomic factors. In addition to shifts in the nation's demographics, there also have been shifts in that nation's health care needs. Most health care today relates to chronic conditions, such as diabetes, hypertension, arthritis, cardiovascular disease, and mental health conditions, due in part to the nation's aging population and compounded by increasing obesity levels. While chronic conditions account for most of the care needed today, the U.S. health care system was primarily built around treating acute illnesses and injuries, the predominant health challenges of the early 20th century.

The ways in which nurses were educated during the 20th century are no longer adequate for dealing with the realities of health care in the 21st century. As patient needs and care environments have become more complex, nurses need to attain requisite competencies to deliver high-quality care. These competencies include leadership, health policy, system improvement, research and evidence-based practice, and teamwork and collaboration, as well as competency in specific content areas such as community and public health and geriatrics. Nurses also are being called upon to fill expanding roles and to master technological tools and information management systems while collaborating and coordinating care across teams of health professionals. To respond to these increasing demands, the IOM committee calls for nurses to achieve higher levels of education and suggests that they be educated in new ways that better prepare them to meet the needs of the population.

### **An Improved Education System**

Much of nursing education revolves around acute care rather than community settings that include aspects of primary care, public health, and long-term care. Nursing education frequently does not incorporate the intricacies of care coordination and transitions. Nor does it promote the skills

needed to negotiate with the health care team, navigate the regulatory and access stipulations that determine patients' eligibility for enrollment in health and social service programs, or understand how these programs and health policies affect patients and health outcomes. Nursing curricula need to be reexamined, updated, and adaptive enough to change with patients' changing needs and improvements in science and technology, the IOM committee says.

Many nursing schools have dealt with the rapid growth of health research and knowledge by compressing available information into the curriculum and adding layers of content that require more instruction. New approaches and educational models must be developed to respond to burgeoning information in the field. For example, fundamental concepts that can be applied across all settings and in different situations need to be taught, rather than requiring rote memorization. Competencies also must move from task-based proficiencies to higher-level competencies that provide a foundation for care management knowledge and decision-making skills under a variety of clinical situations and care settings. Additionally, emerging new competencies in decision making, quality improvement, systems thinking, and team leadership must become part of every nurse's professional formation.

### **Entering the Profession**

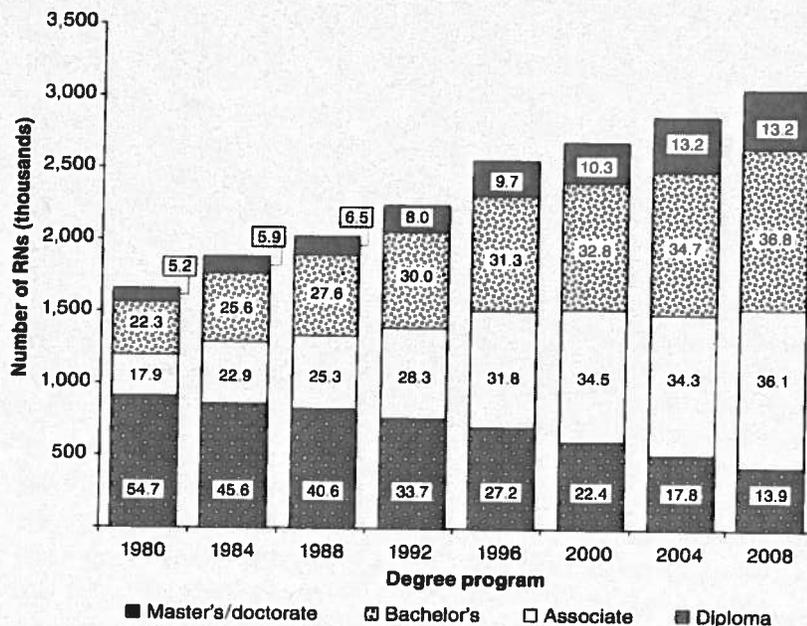
Nursing is unique among the health care professions in the United States in that it has multiple educational pathways leading to an entry-level license to practice. Nursing students are able to pursue three different educational pathways to become registered nurses (RNs): the bachelor's of science in nursing (BSN), the associate's degree in nursing (ADN), and the diploma in nursing. More recently, an accelerated, second-degree bachelor's program for students who possess a baccalaureate degree in another field also has become a popular option. These various pathways provide numer-

ous opportunities for women and men of modest means and diverse backgrounds to access careers in an economically stable field.

The qualifications and level of education required for entry into the nursing profession have been widely debated by nurses, nursing organizations, academics, and a host of other stakeholders for more than 40 years. Although a BSN education is not a panacea for all that is expected of nurses in the future, it does, relative to other educational pathways, introduce students to a wider range of competencies in such arenas as health policy and health care financing, community and public health, leadership, quality improvement, and systems thinking. Care within the hospital continues to grow more complex, with nurses having to make critical decisions associated with care for sicker, frailer patients and having to use more sophisticated, life-saving technology coupled with infor-

mation management systems that require skills in analysis and synthesis. Care outside the hospital is becoming more complex as well. Nurses are being called on to coordinate care among a variety of clinicians and community agencies; to help patients manage chronic illnesses, thereby preventing acute care episodes and disease progression; and to use a variety of technological tools to improve the quality and effectiveness of care. A more educated nursing workforce would be better equipped to meet the demands of an evolving health care system, and this need could be met by increasing the percentage of nurses with a BSN. An increase in the proportion of nurses with a BSN also would create a workforce poised to achieve higher levels of education at the master's and doctoral levels, required for nurses to serve as primary care providers, nurse researchers, and nurse faculty—positions currently in great demand across the

**Distribution of the registered nurse population by highest nursing or nursing-related educational preparation, 1980-2008.**



SOURCE: Health Resources and Services Administration

profession and within the health care system.

The committee recommends that the proportion of nurses with baccalaureate degrees be increased to 80 percent by 2020. While it anticipates that it will take a few years to build the educational capacity needed to achieve this goal, the committee maintains that it is bold, achievable, and necessary to move the nursing workforce to an expanded set of competencies, especially in the domains of community and public health, leadership, systems improvement and change, research, and health policy.

Improving the education system and achieving a more educated workforce—specifically increasing the number of nurses with baccalaureate degrees—can be accomplished through a number of different programs and educational models, including: traditional RN-to-BSN programs; traditional 4-year BSN programs at both universities and some community colleges; educational collaboratives that allow for automatic and seamless transitions from an ADN to a BSN; new providers of nursing education such as proprietary/for-profit schools; simulation and distance learning through online courses; and academic-service partnerships.

In addition to increased numbers of BSN-educated nurses, schools of nursing must build their capacities to prepare more students at the graduate level who can assume roles in advanced practice, leadership, teaching, and research. While 13 percent of nurses hold a graduate degree, fewer than one percent have a doctoral degree. Nurses with doctorates are needed to teach future generations of nurses and to conduct research that becomes the basis for improvements in nursing science and practice. The committee recommends doubling the number of nurses with a doctorate by 2020.

### **Lifelong Learning**

Profound changes in the education of nurses, both before and after they receive their licenses,

are required to develop a more highly-educated workforce. Nursing education should serve as a platform for continued lifelong learning and should include opportunities for seamless transition to higher degree programs. The committee recommends that nurses and nursing students and faculty continue their education and engage in lifelong learning.

Bridge programs and educational pathways between undergraduate and graduate programs—specifically programs such as LPN-to-BSN, ADN-to-BSN, and ADN-to-MSN—are designed to facilitate academic progression to higher levels of education. The ADN-to-MSN program, in particular, is establishing a significant pathway to advanced practice and some faculty positions. Financial support to help build capacity for these programs will be important, including funding for grants and scholarships for nurses wishing to pursue these pathways. For example, diploma programs could be phased out, leaving federal resources that could be reallocated to expand baccalaureate and higher education programs.

Bridge programs and seamless educational pathways also offer opportunities for increasing the overall diversity of the student body and nurse faculty with respect to race and ethnicity, geography, background, and personal experience. Although the composition of the nursing student body is more racially and ethnically diverse than that of the current workforce, diversity continues to be a challenge within the profession. Greater racial and ethnic diversity among all health care providers leads to stronger relationships with patients in non-white communities, which are likely to grow as the U.S. population becomes increasingly diverse. Nursing schools and other relevant groups need to create programs to recruit and retain more individuals from racial and ethnic minorities, as well as men—who make up just seven percent of all RNs—into the nursing profession.

## Enough Nurses with the Right Skills

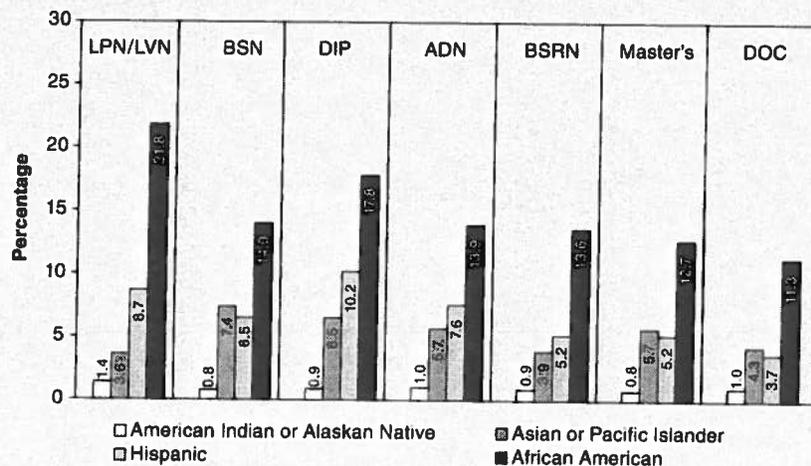
Significant barriers must be overcome if the shortage of nurses is going to be offset and more advanced and expanded nursing roles are going to be filled. Having enough nurses with the right kinds of skills will contribute to the overall safety and quality of a transformed health care system. One such barrier is high turnover rates, which continue to destabilize the nurse workforce in the United States. The costs associated with these turnover rates are significant, particularly in hospitals and nursing homes. The high rates among newly graduated nurses, in particular, highlight the need for a greater focus on managing the transition from school to practice.

Nurse residency programs, recommended by the Joint Commission in 2002, can provide important hands-on experience for newly graduated nurses or those transitioning into a new area of practice. These planned, comprehensive peri-

ods of time during which nursing graduates can acquire the knowledge and skills to deliver safe, quality care that meets defined standards of practice, can help new nurses develop skills in such important areas as organizing work; establishing priorities; and communicating with physicians and other professionals, patients, and families. In addition, transition-to-practice residency programs can help develop leadership and technical skills in order to provide quality care. Residency programs are supported predominantly in hospitals and larger health systems, with a focus on acute care; they also need to be developed and evaluated outside of acute care settings to accommodate the coming shift of care from hospital to community-based settings and the need for nursing expertise in chronic illness management, care of older adults in home settings, and transitional services.

While the evidence is limited because resi-

**Percentage of minority students enrolled in nursing programs by race/ethnicity and program type, 2008-2009**



NOTE: ADN = associate's degree programs; BSN = bachelor's of science programs; BSRN = RN-to-BSN programs; DIP = diploma nursing programs; DOC = nursing school programs offering doctoral degrees; LPN = licensed practical nursing programs; LVN = licensed vocational nursing programs.

SOURCE: Reprinted with Permission from the National League for Nursing.

dency programs are not widespread, they have been shown to help reduce turnover rates for new graduate RNs, reduce costs, increase stability in staffing levels, and help first-year nurses develop critical competencies in clinical decision making and autonomy in providing patient care. The committee recommends that actions be taken to support nurses' completion of transition-to-practice nurse residency programs after they have completed a prelicensure or advanced degree program or when they are transitioning into new clinical practice areas.

### **Conclusion**

With more than 3 million members, the nursing profession is the largest segment of the nation's health care workforce. Working on the front lines of patient care, nurses have a direct effect on patient care. Their regular, close proximity to patients and scientific understanding of care processes across the continuum of care give them a unique ability to effect wide-reaching changes in the health care system. Nurses must be prepared to meet diverse patients' needs; function as leaders; and advance science that benefits patients and the capacity of health professionals to deliver safe, quality patient-centered care. If new nurses are to succeed in this complex and evolving health care system, nursing education needs to be transformed.

### **Recommendations**

#### **Increase the proportion of nurses with a baccalaureate degree to 80 percent by 2020.**

Academic nurse leaders across all schools of nursing should work together to increase the proportion of nurses with a baccalaureate degree from 50 to 80 percent by 2020. These leaders should partner with education accrediting bodies, private and public funders, and employers to ensure funding, monitor progress, and increase the diversity of students to create a workforce prepared to meet the demands of diverse populations across the lifespan.

- The Commission on Collegiate Nursing Education, working in collaboration with the National League for Nursing Accrediting Commission, should require all nursing schools to offer defined academic pathways, beyond articulation agreements, that promote seamless access for nurses to higher levels of education.
- Health care organizations should encourage nurses with associate's and diploma degrees to enter baccalaureate nursing programs within 5 years of graduation by offering tuition reimbursement, creating a culture that fosters continuing education, and providing a salary differential and promotion.
- Private and public funders should collaborate, and when possible pool funds, to expand baccalaureate programs to enroll more students by offering scholarships and loan forgiveness, hiring more faculty, expanding clinical instruction through new clinical partnerships, and using technology to augment instruction. These efforts should take into consideration strategies to increase the diversity of the nursing workforce in terms of race/ethnicity, gender, and geographic distribution.
- The U.S. Secretary of Education, other federal agencies including the Health Resources and Services Administration, and state and private funders should expand loans and grants for second-degree nursing students.
- Schools of nursing, in collaboration with other health professional schools, should design and implement early and continuous interprofessional collaboration through joint classroom and clinical training opportunities.
- Academic nurse leaders should partner with health care organizations, leaders from primary and secondary school systems, and other community organizations to recruit and advance diverse nursing students.

### **Double the number of nurses with a doctorate by 2020.**

Schools of nursing, with support from private and public funders, academic administrators and university trustees, and accrediting bodies, should double the number of nurses with a doctorate by 2020 to add to the cadre of nurse faculty and researchers, with attention to increasing diversity.

- The Commission on Collegiate Nursing Education and the National League for Nursing Accrediting Commission should monitor the progress of each accredited nursing school to ensure that at least 10 percent of all baccalaureate graduates matriculate into a master's or doctoral program within 5 years of graduation.
- Private and public funders, including the Health Resources and Services Administration and the Department of Labor, should expand funding for programs offering accelerated graduate degrees for nurses to increase the production of master's and doctoral nurse graduates and to increase the diversity of nurse faculty and researchers.
- Academic administrators and university trustees should create salary and benefit packages that are market competitive to recruit and retain highly qualified academic and clinical nurse faculty.

### **Ensure that nurses engage in lifelong learning.**

Accrediting bodies, schools of nursing, health care organizations, and continuing competency educators from multiple health professions should collaborate to ensure that nurses and nursing students and faculty continue their education and engage in lifelong learning to gain the competencies needed to provide care for diverse populations across the lifespan.

- Faculty should partner with health care organizations to develop and prioritize competencies so curricula can be updated regularly to ensure that graduates at all levels are prepared to meet the current and future health needs of the population.
- The Commission on Collegiate Nursing Education and the National League for Nursing Accrediting Commission should require that all nursing students demonstrate a comprehensive set of clinical performance competencies that encompass the knowledge and skills needed to provide care across settings and the lifespan.

- Academic administrators should require all faculty to participate in continuing professional development and to perform with cutting-edge competence in practice, teaching, and research.
- All health care organizations and schools of nursing should foster a culture of lifelong learning and provide resources for interprofessional continuing competency programs.
- Health care organizations and other organizations that offer continuing competency programs should regularly evaluate their programs for adaptability, flexibility, accessibility, and impact on clinical outcomes and update the programs accordingly.

### **Implement nurse residency programs.**

State boards of nursing, accrediting bodies, the federal government, and health care organizations should support nurses' completion of a transition-to-practice program (nurse residency) after they have completed a prelicensure or advanced practice degree program or when they are transitioning into new clinical practice areas.

The following actions should be taken to implement and support nurse residency programs:

- State boards of nursing, in collaboration with accrediting bodies such as the Joint Commission and the Community Health Accreditation Program, should support nurses' completion of a residency program after they have completed a prelicensure or advanced practice degree program or when they are transitioning into new clinical practice areas.
- The Secretary of Health and Human Services should redirect all graduate medical education funding from diploma nursing programs to support the implementation of nurse residency programs in rural and critical access areas.
- Health care organizations, the Health Resources and Services Administration and Centers for Medicare and Medicaid Services, and philanthropic organizations should fund the development and implementation of nurse residency programs across all practice settings.
- Health care organizations that offer nurse residency programs and foundations should evaluate the effectiveness of the residency programs in improving the retention of nurses, expanding competencies, and improving patient outcomes.

**Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine**

**Donna E. Shalala** (Chair)  
President, University of Miami,  
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# Assessing the Impact of California's Nurse Staffing Ratios on Hospitals and Patient Care

## Introduction

In 2004, California became the first state to establish minimum nurse-to-patient staffing requirements in acute-care hospitals. Little is known about how these regulations affected California's hospitals, the market for nursing labor, or the quality of hospital care. While research and news reports do indicate that hospital staffing of licensed nurses increased between 2002 and 2004 and employment of unlicensed nursing assistants dropped,<sup>1-3</sup> some hospitals did not meet the ratios in the first year of their implementation<sup>4-6</sup> and no significant impact on the quality of patient care has been measured.<sup>7-9</sup>

Prior studies have focused on average changes in staffing and patient outcomes across all California hospitals. This study, in contrast, examines how the minimum staffing regulations affected different types of hospitals, categorizing them according to ownership, financial position before the ratios were enacted, and mix of patients. The research then probes three issues:

- What strategies did hospitals use to meet the staffing requirements?
- Are the ratios associated with changes in hospital financial status?
- Did the ratios improve the quality of hospital care?

The results show that the nurse staffing legislation resulted in higher use of registered nurses in most California hospitals. Implementation of the staffing regulations could not be tied to changes in hospital finances; rather, changes in Medicare and Medi-Cal payment rates and demands to

address seismic building requirements had far greater effects on finances. Hospital administrators found that it was challenge to meet the staffing requirements, particularly in ensuring that staff were available at all times, including during breaks and meals. Finally, many of the health care leaders interviewed for the study expressed an expectation that the minimum staffing ratios would increase the quality of care due to increased interaction with patients; however, there was no evident change in patient length of stay or adverse patient safety events. None of these findings were affected by hospital ownership, financial position, or patient mix.

## Background

In 1999, the California State Assembly passed AB 394, mandating that the state establish minimum nurse-to-patient staffing in acute-care hospitals. Between 1999 and 2002, the California Department of Health Services developed registered and licensed vocational nurse-to-patient ratios.<sup>10,11</sup> The law went into effect in January 2004 with specific ratios for different types of hospital units; for example, the minimum ratio in medical-surgical units was one nurse per six patients. The ratios were to be adjusted in January 2005 to require fewer patients per nurse in selected units; for example, the ratio in medical-surgical units would have dropped to one to five. This change was suspended in November 2004 by the Schwarzenegger administration, but the suspension was invalidated by the Sacramento County Superior Court in March 2005. Court challenges by the California Hospital Association proved unsuccessful, and the additional ratio regulations went into full effect on April 7, 2005.<sup>12</sup>

Licensed vocational nurses (LVNs) may make up half of the licensed nurses in this ratio, but whether they can be employed to this extent in practice depends on the needs of patients in the hospital. The legal scope of practice for LVNs, who must work under the direction of physicians or registered nurses (RNs), does not include administration of intravenous medications or the assessment of patients; thus, in most hospitals LVNs can have full responsibility for only a small share of patients. In addition, hospitals have tended to underuse LVNs by limiting their role to an even greater degree than the legal scope of practice requires.<sup>13</sup>

Little is known about how the minimum staffing regulations affected hospitals, nursing labor markets, or the quality of hospital care in California. In fact few studies had been conducted from which the state could develop the ratio requirements. A literature review conducted for the California Department of Health Services noted that only a handful of recent studies and reviews had demonstrated consistent relationships between staffing levels for licensed nurses and the quality of patient care, and none identified an ideal staffing ratio for hospitals.<sup>14,15</sup> The few publications that examined the effect of California's ratios reported that many hospitals did not appear to be meeting the standard in 2004—the first year of the regulation.<sup>16–18</sup> Recent research also found that licensed nursing staff increased notably between 2002 and 2004, while employment of unlicensed nursing assistants dropped; however, no significant improvement in the quality of patient care could be detected.<sup>19–21</sup>

Because the papers published to date have focused on average changes in staffing, patient outcomes, and hospital finances across all California hospitals, they may not capture the full impact of the ratios, since minimum staffing regulations may have had different effects on different types of hospitals. Previous studies have found that some hospitals—such as those with a high share of publicly insured patients—are more likely to report a shortage of nurses; these hospitals may have found it

particularly difficult to recruit and retain nurses to meet the staffing regulations. Hospitals that were in weak financial positions prior to the enactment of the ratio legislation may not have had the financial resources to pay for more nurses. Differences in hospitals' ability to respond to the regulations may in turn result in variation in the benefit to patients.

For the research reported in this issue brief, the methods used by hospitals to meet the staffing requirements were explored: Did permanent employment increase? Did hiring and retention change? Were more temporary agency nurses used? Changes in hospital financial positions were also examined. Finally, patient safety measures were compared to learn whether the implementation of the staffing regulations was associated with improvements in patient safety. For each of these three topics, hospitals were categorized by their ownership, financial position before the ratios were enacted, and mix of patients to learn whether the impact of minimum staffing ratios varied across hospitals.

## Methodology

This study combined quantitative analysis of several data sets with qualitative analysis of interviews conducted at 12 hospitals. Quantitative analysis of the impact of the regulations on staffing, fiscal, and health care outcomes was conducted for 410 general acute-care hospitals from 1999 through 2007. The main sources of data were three datasets collected by the California Office of Statewide Health Planning (OSHPD). With these data, changes in the hours worked by registered nurses, licensed vocational nurses, aides and orderlies, and agency-employed nurses were examined using the annual hospital disclosure reports. The fiscal health of each hospital was determined by comparing operating margins before and after ratios, using the quarterly hospital financial data. A set of nursing-sensitive metrics devised by the Agency for Healthcare Research and Quality (AHRQ) was calculated for hospitals reporting thirty or more patients at risk for

an incident during one time period, using the patient discharge data.

Changes in employment also were studied using the base wage file of the California Employment Development Department (EDD) from 1998 through 2007. These data compile wage and employment information that are primarily collected for unemployment insurance and disability insurance programs. The base wage file does not include occupation data, so it was not possible to identify registered nurses. Thus, all analyses of turnover were conducted for all hospital employees. Since RNs account for about one-third of hospital employees, it is expected that hospital-wide turnover rates will reflect proportional changes in nurse staffing. The final database included 244 employers. Due to the confidentiality of wage and employer information, all analyses of these data were performed by the EDD.

All quantitative data were first analyzed for all hospitals combined. The analyses were then repeated for three categorizations of hospitals: profit status (public, for-profit, and nonprofit), fiscal strength (fiscally strongest, fiscally weakest, and average fiscal position), and patient demographics (i.e., those serving higher-income populations with few recent immigrants; those whose patient mix includes a disproportionate share of lower-income, non-resident, or homeless patients; and average patient mix). Table 1 presents the number of each category of hospital included in this study.

**Table 1: Number of Hospitals in the Study, by Type**

Nonprofit	223
For-profit	125
District	41
Public	30
Fiscally Strong (average operating margin: 10.9 percent)	42
Fiscally Weak (average operating margin: -15.8 percent)	31
Lower-income Patients (average share of patients in public programs: 64.7 percent)	71
Higher-income Patients (average share of patients in public programs: 51.7 percent)	39
<b>TOTAL</b>	<b>410</b>

Interviews were conducted with 23 chief nursing officers, chief nurse executives, vice presidents of nursing, chief executive officers, emergency department directors, and other managers and directors. Hospitals selected for the case studies were chosen to represent a range of financial and recruiting positions from good to weak. Twenty hospitals were contacted for the study, with 12 agreeing to participate. Seven of the 12 hospitals are nonprofits, four are public hospitals, and one is for-profit. The researchers also interviewed several people currently or recently employed in the insurance industry to learn how the ratio regulations were addressed in contract negotiations between hospitals and payers.

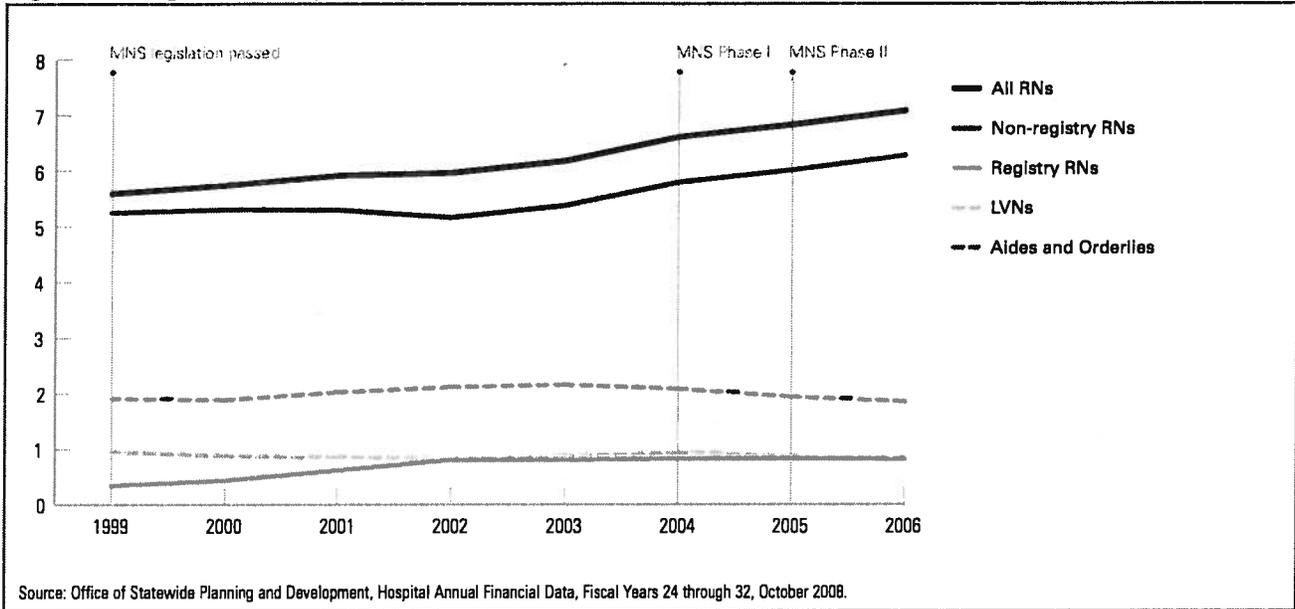
## Findings

### Staffing Changes and Challenges

The nurse staffing legislation resulted in higher employment of licensed nurses in most California hospitals. Figure 1 presents changes in hours worked by RNs, LVNs, and aides/orderlies between 1999 and 2006. The hours worked by regular RN employees and agency RNs also are indicated. RN hours per patient day increased throughout this period, with more rapid growth after 2002. Agency RN hours rose notably between 2000 and 2002. After 2002, RN hours per patient day for non-agency RNs increased. The levels of LVN and aide hours were fairly stable throughout the entire period.

Figure 2 compares RN hours per patient day before and after 2004, for all hospitals and by type of hospital. Prior to the enactment of the ratios, nonprofit hospitals had the highest number of RN hours per patient day, while district, for-profit, and fiscally weak hospitals had fewer RN hours per patient day. After the ratios were implemented, average RN hours per patient day increased for hospitals overall, as well as for each type of hospital. This growth varied by type of hospital. One might expect that staffing would have increased more among hospitals that had lower initial staffing; however, this is not the case for the groups presented in Figure 2. Less growth in RN

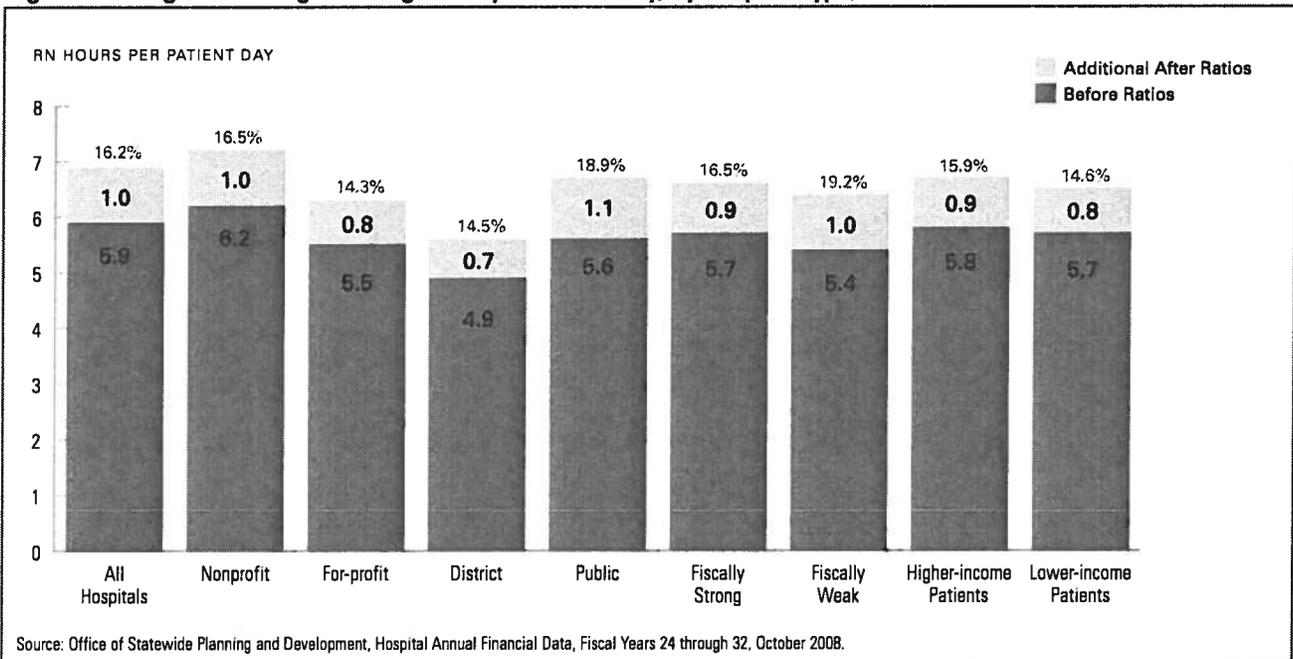
**Figure 1: Changes in Nursing Hours per Patient Day, 1999–2006**



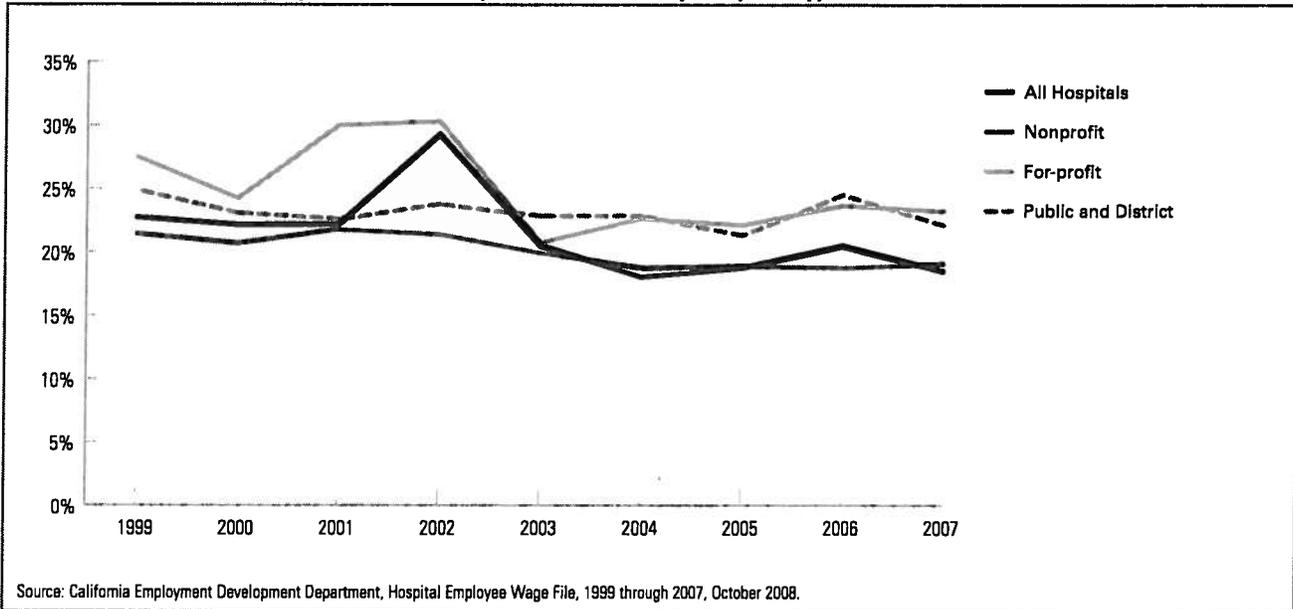
hours per patient day was observed for district hospitals, for-profit hospitals, and hospitals with lower-income patients—all of which had initial staffing below the statewide average.

Figure 3 examines hospital hiring of new employees from 1999 through 2007, as calculated from the EDD’s base wage file. Hiring peaked in 2002 for all hospitals, with an average of 29 percent of employees being new to their

**Figure 2: Changes in Average Nursing Hours per Patient Day, by Hospital Type, Before and After 2004**



**Figure 3: Percent of Employees New to Hospitals Each Year, by Hospital Type**



hospitals that year. For-profit hospitals increased their hiring earlier, in 2001. This is not surprising because staffing levels at for-profit hospitals were below the statewide average before the ratios were implemented, which meant they had a greater need to hire to meet the regulations. Hiring by nonprofit hospitals was comparatively stable over time, though it decreased somewhat after 2001. Hiring by public hospitals, which in Figure 3 includes district hospitals, also was fairly stable between 1999 and 2007. Hospitals that served a greater proportion of higher-income patients engaged in more hiring throughout this time period, with hiring rising notably in 2003, dropping in 2004, and then rising again through 2007. Hospitals that served more lower-income/non-resident patients increased hiring somewhat in 2001 and 2002, but decreased hiring after 2004. Fiscally strong hospitals did more hiring than fiscally weak hospitals, but the difference was not large. (In the interest of clarity, the data tracking patient demographics and financial strength were not included in Figure 3.)

The hospital leaders interviewed for this study reported that they faced many challenges as the staffing regulations were put in place. Prior to the implementation of the

ratios in 2004, most hospitals had completed financial and staffing assessments. A few interviewees reported that staffing ratios at their hospitals or units were already at or above the mandated levels, but most reported that they needed to hire more RNs to meet the requirements, particularly to cover meals and breaks. California's labor code regulates how many meal breaks employees must receive based upon shift length, and the interaction of this regulation with the minimum staffing requirement posed a particular challenge.

The majority of the individuals interviewed for this study, both at high-performing and under-performing hospitals, discussed the problems associated with meeting the "at all times" requirement of the ratios law in conjunction with meal breaks for staff. This challenge was addressed with a wide variety of solutions. Many created "float pools" to have a supply of staff to cover meal breaks. Charge nurses and nurses from registries are also used to cover meal breaks. One hospital created a position whereby a nurse works a truncated shift for the sole purpose of providing meal breaks. Several interviewees noted that the need to cross-train staff increased, particularly in specialty areas, in order to increase float coverage. Some interviewees

thought the implementation of the ratios increased tension between management and staff, and associated this with rules regarding meal breaks. The combination of meal break and staffing regulations was perceived as reducing the ability of staff nurses to use their professional judgment in determining the best time to take a break, and interviewees believed that nurses found this loss of autonomy frustrating.

Nine of the 12 hospitals that participated in the interviews reported that 90 percent or more of their nursing staff were RNs, and six hospitals said they employ traveling or agency nurses to meet staffing requirements. Many hospital leaders reported difficulty finding specialty nurses or experienced nurses holding bachelor's or master's degrees, noting that new graduates are not appropriate for some positions. Interviewees also noted that they could not readily use LVNs to meet the staffing regulations due to their limited scope of practice. Because only RNs can assess patients and administer intravenous medications those few hospitals that used LVNs had to partner them with RNs; some of the nursing managers reported that their RN staff thought this arrangement increased their workload, since they had to provide care to both their own and the LVN's patients while supervising the LVN. A reduction of ancillary staff support was reported at several of the hospitals. These reductions resulted in additional primary care duties for the RNs, such as giving baths to patients. Managers reported hearing from their RN staff that they were unhappy with these additional job tasks and the shift in their role in patient care. These issues were of equal importance among both high-performing and under-performing hospitals.

Overwhelmingly, interviewees said they want some flexibility in applying the ratios, particularly the removal of the "at all times" language. The lack of flexibility was singled out as the reason hospitals have trouble remaining in compliance, since it is expensive and challenging to maintain the mandated ratios at all times and in all contingencies, such as days when too many nurses call

in sick. Another recommendation focused on using acuity-based ratios, so as to avoid situations where the minimum staffing regulations dictate a lower ratio than was generally thought of as necessary, or vice versa. The night shift and patients waiting to be discharged were both cited as examples of situations requiring fewer nurses than the ratios prescribe. On the other hand, caring for patients with complex conditions, such as multiple and chronic illnesses, was cited as an example of an area where the staffing ratios fell short of meeting the patient's needs.

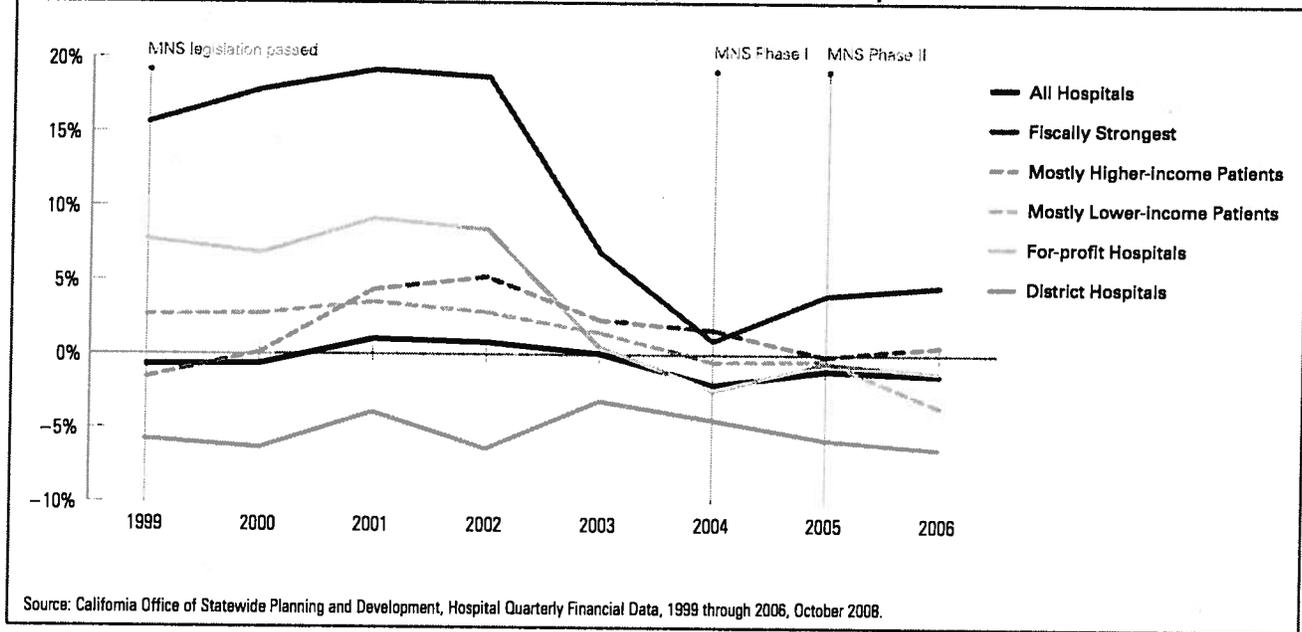
### Fiscal Stability and Change

Over the eight years examined in this study, California's hospitals experienced decreasing operating margins; however, these changes could not be tied directly to the nurse staffing legislation. A variety of financial policies had a substantial effect on hospitals from 1999 to 2007.

Medicare margins severely declined as the Balanced Budget Act of 1997 constricted government payment rates and Medicare significantly changed its billing procedures and payment streams.<sup>22,23</sup> After a series of emergency state funding bills, California had fewer hospitals reporting operating deficits in 2005 than in 1999. However, in late 2005, the state began enacting a series of changes in Medicaid funding that, along with new changes in Medicare funding, sought to decrease government transfers to safety-net hospitals.

As a result of these policies and trends, by 1999, the first year examined in this study, California hospitals had experienced significant declines in operating margins. Hospitals started to recover from these fiscal woes in 2001, but by 2004 margins had declined again. These declines occurred primarily in district hospitals, for-profit hospitals, hospitals serving higher-income or lower-income patients, and hospitals that prior to 2002 were fiscally strongest (Figure 4). Public, nonprofit, and the fiscally weakest hospitals experienced increases in operating margins over the same period, while public hospital margins declined after 2004. Due to

**Figure 4: Operating Margins Prior to Ratios for Selected Types of California Hospitals**



these pre-ratio trends, most hospital types experienced statistically significant variation in operating margin after ratios. (The two exceptions were district hospitals and those serving mostly higher-income patients.) While the ratio regulations may have influenced the amount of change experienced by each hospital type, this analysis cannot isolate any such effect. In fact, it is likely that the staffing requirements had at most a marginal impact on hospital financial stability.

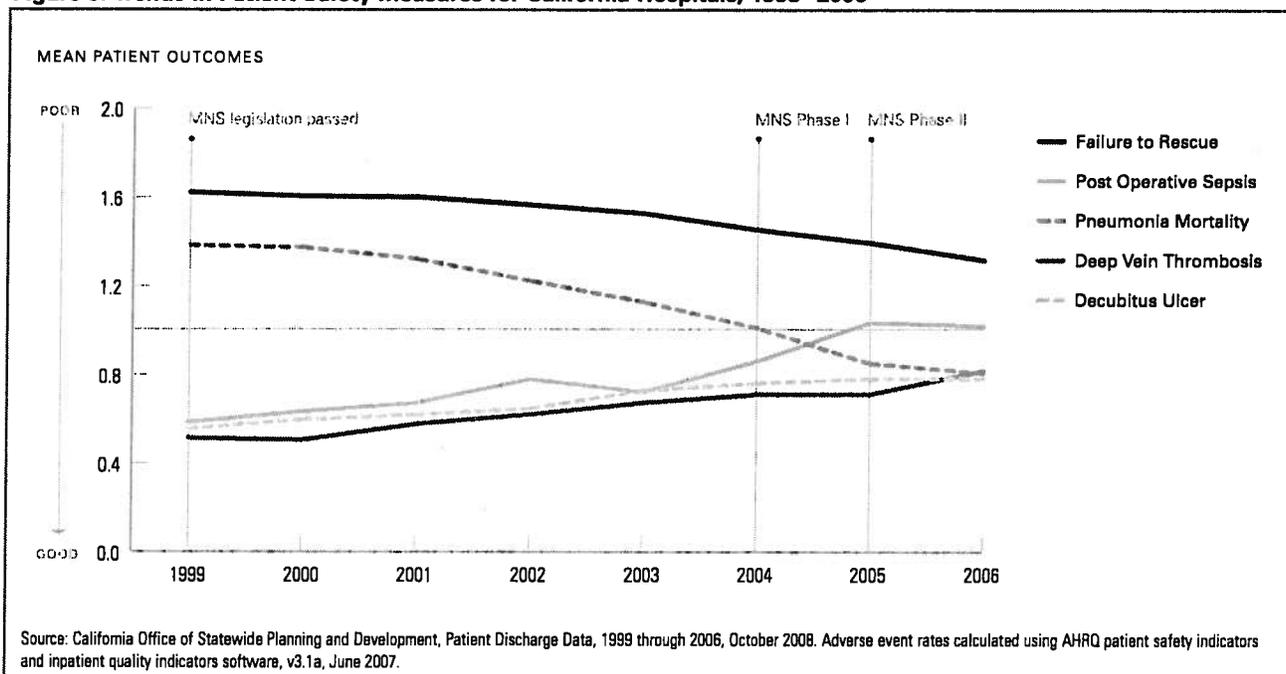
Several of the nursing executives and managers reported that the staffing legislation made it easier to secure additional funding or avoid budget cuts within their own hospitals, particularly for hiring nursing staff. However, CEOs at both high- and under-performing hospitals said that it was difficult to absorb costs related to the ratios. They noted that they needed to find funds from other budget areas, which in some cases involved the reduction of some services. A small number reported that their hospitals successfully obtained higher insurance reimbursement rates from insurers to defray some of the increased costs. The insurers interviewed for this study indicated that hospitals have cited the minimum ratios as

one reason for rising costs, and that these costs are likely passed on to the consumer.

#### Quality of Care

The desired outcome of minimum nurse staffing legislation was the improvement of patient outcomes; however, most of the quality measures analyzed for this study do not appear to have been directly affected by the increase in RN staffing. For example, one of the metrics sensitive to nursing care, average length of patient stay, showed very low rates of change during the study period. Average length of stay did not change for nonprofit hospitals, increased significantly in public hospitals, and decreased significantly among for-profit hospitals. As a result, the overall level of average length of stay in California has stayed the same since the ratios were imposed. Other nursing-sensitive measures such as decubitus (pressure) ulcers, failure to rescue after a post-surgical complication, deep vein thrombosis/pulmonary embolism (DVT), pneumonia mortality, and postoperative sepsis show similar results. Figure 5 shows the average ratio of observed patient incidents over expected patient incidents for all California hospitals.

**Figure 5: Trends in Patient Safety Measures for California Hospitals, 1998–2006**



Ratios greater than one indicate poorer quality, whereas rates less than one indicate better quality. California performed better than expected through the entire period for rates of DVT and decubitus ulcer. All California hospitals performed worse than expected for rates of pneumonia mortality and failure to rescue, but these rates improved throughout the study period and were improving well before the minimum staffing requirements were implemented.

Many of the healthcare leaders we interviewed expressed an expectation that the minimum staffing ratios would raise the quality of care due to increased interaction with patients. However, only a few interviewees felt that the ratios had resulted in such an improvement. Some expressed concern about the break in the continuity of care resulting from maintaining compliance between both the ratios and the meal break rules. Some interviewees reported that the ratios affected patients in their emergency departments. In those hospitals, emergency department waiting times increased, patients occasionally had to be held in the emergency department due to lack

staffing, or, in rare cases, the emergency departments were put on diversion so patients had to be transported to other hospitals. Very few hospitals had conducted any analysis of data related to the ratios. While many hospitals conduct regular patient satisfaction surveys, most of the leaders we interviewed said they did not believe there had been a significant change in patient satisfaction as a result of the nurse staffing regulations.

### Conclusion

Staffing changes have created challenges and adjustments for some hospitals, particularly with regard to the logistics of meal break compliance and the roles of RNs. The leaders we interviewed did not notice significant changes to the quality of patient care, though emergency departments became bottlenecks at some hospitals. Leaders reported difficulties in absorbing the costs of the ratios, and many had to reduce budgets, reduce services, or employ other cost-saving measures. The interviews did not reveal any important differences in the effects of the ratios upon high-performing and under-performing hospitals.

The minimum nurse staffing regulations did achieve one goal of the legislation: skill mix increased in California hospitals. The hours worked per patient by RNs and registry RNs significantly increased. These improvements in skill mix did not have a clear impact on hospital finances. While overall margins declined between 1999 and 2007, there was no clear relationship between those declines and the start of staffing ratios. This is likely due to other fiscal challenges facing California hospitals. Ratios did not appear to affect most nursing-sensitive outcomes. While the average length of stay changed after 2004, trends in rates of decubitus ulcer, failure to rescue, and deep vein thrombosis, were not changed. More detailed analysis of this and other nursing-sensitive outcomes is needed to fully explore the effect of nurse staffing ratios on the quality of patient care.

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# Mandated Nurse Staffing Ratios in California: A Comparison of Staffing and Nursing-Sensitive Outcomes Pre- and Postregulation

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## BACKGROUND

In October 1999, California became the first state in the United States to adopt legislation mandating unit-based minimum licensed nurse-to-patient ratios in acute care hospitals. That landmark legislation, introduced as Assembly Bill (AB) 394 (1999), required California's State Department of Health Services (now California Department of Public Health [CDPH]) to develop the specific regulatory language to implement this new mandate for staffing ratios. The new law and regulations expanded existing state licensing regulations adopted more than two decades earlier establishing nurse-to-patient ratios in acute care specialty

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*This article examines the impact of mandated nursing ratios in California on key measures of nursing quality among adults in acute care hospitals. This study is a follow-up and extension of our first analysis exploring nurse staffing and nursing-sensitive outcomes comparing 2002 pre-ratios regulation data to 2004 postratios regulation data. For the current study we used postregulation ratios data from 2004 and 2006 to assess trends in staffing and outcomes. Findings for nurse staffing affirmed the trends noted in 2005 and indicated that changes in nurse staffing were consistent with expected increases in the proportion of licensed staff per patient. This report includes an exploratory examination of the relationship between staffing and nursing-sensitive patient outcomes. However anticipated improvements in nursing-sensitive patient outcomes were not observed. This report contributes to the growing understanding of the impacts of regulatory staffing mandates on hospital operations and patient outcomes.*

**Keywords:** *nurse-to-patient ratios; nursing sensitive indicators; patient safety and quality; falls; pressure ulcers; outcomes*

units, and built on more recent state regulations requiring hospitals to use a patient classification system to ensure that staffing allocation and patient needs were aligned (Donaldson, Burnes Bolton, et al., 2005).

As the initial 3-year regulatory rulemaking process began, CDPH acknowledged that "essentially there was not hard, scientific evidence in the literature indicating the number of patients nurses can safely and effectively handle while providing quality patient care" (California State Department of Health Services, 2003, pp. 1, 13). Lang, Hodge, Olson, Romano, and Kravitz's 2004 integrative review of the effects of nurse staffing on outcomes also found that the literature offered no support for specific, minimum nurse-patient ratios, although total nursing hours and skill mix impacts, while inconsistent, were found to affect some important patient outcomes.

Since the initial ratios, particularly those impacting medical-surgical patient care units, came into effect in 2004, many states, considering enacting similar legislation, have been observing the California experience. In August 2005, the California Nursing Outcomes Coalition (CalNOC) published the first report tracing the unit-level impacts on licensed nurse staffing and patient care quality in medical, surgical, and definitive-observation units (including step-down and telemetry) from the preratio period (2002) through the implementation of ratios (2004) (Donaldson, Burnes Bolton, et al., 2005). Findings revealed significant changes in mean staffing levels after implementation of ratios. Despite the changes noted in nurse staffing and licensed nurse-patient ratios, however, CalNOC's preliminary findings, based on the first 6 months of postratio evidence, did not reveal statistically significant changes in the patient safety and quality outcomes studied, the incidence of patient falls and the prevalence of pressure ulcers. The present analysis is a follow-up and extension of that study.

Since CalNOC's preliminary analysis, further implementation of the ratios has taken effect for medical-surgical units. In the initial phase in 2004, mandated ratios required were 1:6 (1 nurse for 6 patients) for medical and surgical units. The requirements in the final phase of implementation moved to a 1:5 ratio in 2005, thus a larger change in staffing for medical and surgical units would be expected in the current analysis. Ratios for the two definitive observation unit categories were 1:4 for step-down and 1:5 for telemetry.<sup>1</sup> CalNOC's

step-down designation includes both of these unit types. There was no change in the 2005 final ratio requirements for definitive observation units.

### SIGNIFICANCE OF EXAMINING NURSE STAFFING ADEQUACY

Nurses play a vital and pivotal role in ensuring safe patient care in their roles at the sharp end of the point of service (Page, 2004; Savitz, Jones, & Shulamit, 2005). The study of nurse staffing and patient outcomes in hospitals became a national strategic and scientific imperative with the seminal Institute of Medicine (IOM) report on the adequacy of nurse staffing (Wunderlich, Sloan, & Davis, 1996) recommending new "scientifically sound research on the relationships between quality of care and nurse staffing levels and mix, taking into account organizational variables" (p. 17). During the next decade, a plethora of studies responded to the IOM call to action, although their methods, metrics, data sources, unit of analysis, and statistical conclusion validity varied widely. Although it may be argued that these studies, synthesized well by others (e.g., Hickam et al., 2003; Lang et al., 2004; Seago, 2001; Tourangeau, Cranley, & Jeffs, 2006), comprise different fields of inquiry despite their apparent common foci, the fact remains that a preponderance of evidence, albeit inconsistent, links the "dose" of nurse staffing (hours of care and skill mix of direct care nurses) and key patient outcomes (Brooten & Youngblut, 2006). As the national health care quality agenda has narrowed its focus to patient safety and adverse events, following the publication of the IOM's landmark book *To Err Is Human* (Kohn, Corrigan, & Donaldson, 1999), new studies have explored the impact of nurse staffing on catastrophic outcomes of acute care. Among other outcomes, these studies explored death and a range of adverse events, including some with limited plausible links to medical surgical ward nursing patient care practices, such as operative nerve injury, operative organ injury, and operative vessel injury (Weissman et al., 2007). It is noteworthy that inconsistent findings arising from among a new cluster of studies continue to be noted by investigators who have sought to replicate earlier results and/or add new evidence (Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005; Halm et al., 2005; Mark, Harless, McCue, & Xu, 2004; Stone et al., 2007; Weissman et al., 2007).

It is also interesting to note that two stalwart measures of nurse staffing effectiveness and patient safety continue to be studied—the incidence of patient falls and the prevalence or incidence of hospital-acquired pressure ulcers. First advanced as evidence-based indicators for nursing quality by the American Nurses Association a decade ago (American Nurses Association, 1997), these two indicators have been subjected to repeated scrutiny, and ultimately adopted by the National Quality Forum (NQF, 2004) as among the first 15 consensus standards for measuring hospital quality. With the ongoing accrual of evidence revealing the sensitivity of falls and pressure ulcers to nurse staffing (Stone et al., 2007; Weissman et al., 2007), the use of these measures in the present CalNOC analysis is timely, noting that CalNOC has been collecting these data from its member hospitals since 1996.

## CALNOC

CalNOC was established in 1996 as a joint project of the American Nurses Association/ California (ANA/C) and the Association of California Nurse Leaders (ACNL). CalNOC, as the largest regional nursing quality database in the nation, has as its core mission to

- build and sustain the CalNOC statewide nursing staffing and quality database repository,
- conduct research to advance evidence-based administrative and clinical decision making, and
- provide data to resolve public policy and clinical dilemmas in the cost and efficacy of patient care delivery influenced by nurse staffing and quality.

CalNOC's history, data collection methodology, and preliminary benchmark nursing quality data have been described in detail elsewhere (Aydin et al., 2004; Donaldson, Brown, Aydin, & Burnes Bolton, 2001; Donaldson, Brown, Aydin, Burnes Bolton, & Rutledge, 2005).

## METHOD

### Sampling Methods

*Skill mix, staffing, and falls variables.* CalNOC member hospitals (185+) submit monthly unit-level nurse staffing, patient days, and falls data as part

of CalNOC's ongoing nursing quality measurement and reporting database. Using the methods described below, the sample for the staffing and falls data was drawn from 252 units (187 medical-surgical units and 65 step-down units) in 108 hospitals with complete data available. The sample for this analysis represents more than 500,000 patient days for the 3 years analyzed.

As with CalNOC's 2005 report, the present analyses use preregulation data from the first 6 months of 2002 as a baseline for comparison. For the current analyses, two periods were used as postregulation data to assess trends in staffing and outcomes: 2004 (immediately after initial phase of regulation) and 2006 (following implementation of final phase). Monthly staffing and falls data were drawn from all units in CalNOC hospitals for which staffing, patient days, and falls data were available for a preration 6-month period in 2002 (months 1 to 6 of 2002) and both postration periods (months 1 to 6 of 2004 and months 1 to 6 of 2006). Patient care units with fewer than 2 months of data in each period were excluded to ensure representative data for each unit. Data for each variable for each unit were averaged across months into Quarter 1 (Q1) and Quarter 2 (Q2) of 2002, Q1 and Q2 of 2004, and Q1 and Q2 of 2006. Means from Q1 and Q2 of 2002 were averaged to produce preration period means; similar means for Q1 and Q2 of 2004, and Q1 and Q2 of 2006 were calculated to produce data for the two postration periods (2004 and 2006, respectively).

*Pressure ulcer and restraint use prevalence variables.* CalNOC hospitals conduct pressure ulcer prevalence studies at least annually and may submit data as often as quarterly. Each prevalence study is a visual inspection survey of every patient on step-down units and medical and surgical units in the participating hospital on the day of the study. (The CalNOC prevalence study methodology is described in detail in Aydin et al., 2004.) The sample for the pressure ulcer and restraint data, as described below, was drawn from 168 units with data from each of the three periods (128 medical-surgical units and 40 step-down units) in 67 hospitals representing 11,740 patients.

For preration data, the earliest prevalence study conducted in Q1 or Q2 of 2002 was included. If no studies were conducted during this target period, the prevalence study for the latest data from Q3

or Q4 of 2001 was accepted. For the first postratio data period (2004), the latest study either from Q3/Q4 of 2003 or from Q1/Q2 2004 was used. Similarly, for the second postratio period (2006) the latest study from Q3/Q4 2005 or Q1/Q2 2006 was used. Because many hospitals do not submit studies every quarter, data from only one study was used for each hospital for each period.

### Nurse Staffing and Falls Incidence Variables

Study variable definitions are consistent with the definitions used in CalNOC's first report (Donaldson, Burnes Bolton, et al., 2005) and CalNOC data collection and processing methods have also been described in detail elsewhere (Aydin et al., 2004). Monthly unit-based staffing variables collected included patient days, and hours of care separately for registered nurses (RNs), licensed vocational nurses (LVNs, known as licensed practical nurses [LPNs] in most other states), and other staff such as unlicensed staff and contracted staff. Patient falls variables included both total falls and falls with injury. From submitted data, CalNOC computed the number of patients per RN, number of patients per licensed staff, falls, and falls with injury per 1,000 patient days. Unit-level data were obtained for each variable by averaging across months into quarters and then by averaging across quarters to produce pre and post periods means.

Indicators used for pressure ulcer and restraint data were based on single-day prevalence studies conducted at least annually during specified time periods. Variables included percentage of patients on that day with pressure ulcers, hospital-acquired pressure ulcers, pressure ulcers stage II and above (stage II+), stage II+ hospital-acquired pressure ulcers; and percentage of patients in restraints.

### Analytical Procedures

The analysis was conducted in two steps to first understand the impact of the ratio mandate, and second to explore relationships between nurse staffing and patient outcomes. All analyses were performed for medical-surgical and step-down units separately. These categories of units have inherent differences in their patient populations with resulting differences in nurse staffing ratios. California regulations had previously set minimum staffing standards for intensive care units at one RN per two patients and one RN per

four patients for step-down units. Telemetry and general acute care units did not have set ratios. Therefore the expected change would primarily occur in these units.

First, to explore the impact of ratios, we compared the absolute change in each variable between 2002 and 2004, 2004 and 2006, and 2002 and 2006 to establish any trends observed over time. Comparison *p* values were obtained from repeated-measurements ANOVA with three observations per unit and with units nested within hospitals. The time period effects were compared adjusted for hospital size (categorized as an average daily census of < 100, 100 to 199, and > 200). The within-unit covariance matrix was assumed autoregressive of first order to allow for observations more adjacent in time to be more correlated than those further apart. As in our first study, we adjusted for multiplicity of testing in interpreting the skill mix/staffing/falls data set results. The customary 0.05 probability level was divided by 12 (the number of variables in the data set) and 0.0042 was used as the cut point for a significant *p* value. For the prevalence study data, 0.05 was divided by 5 (the number of variables in the pressure ulcer database) and 0.01 was used as the cut point for a significant *p* value.

Our second analysis was designed to explore if there was a relationship between staffing variables and nursing-sensitive patient outcomes over time. We fitted a repeated-measurements ANOVA with similar specification to that described above, but tested each staffing, ratio, and skill mix variable as a predictor of nursing-sensitive patient outcomes one at a time. This part of the analysis should be considered exploratory rather than confirmatory. Although we report the model coefficients with significance levels of 0.05 or below, we only considered the results with *p* values below the above cut-off points set for multiplicity of testing as significant.

## FINDINGS

### Trends in Staffing and Skill Mix

Table 1 summarizes the trends in staffing and skill mix variables for medical-surgical and step-down units. The means, standard deviations, and *p* values reported were obtained from repeated-measurement ANOVA models adjusting for hospital size.

TABLE 1: Pre-Post Change Analysis Results: Staffing Variables

Variable	Pre Mean 2002	Post Mean 2004	Post Mean 2006	Absolute Change 02-04	Absolute Change 04-06	Absolute Change 02-06	% Change 02-06	Pre SD 2002	Post SD 2004	Post SD 2006	Hospital Size p Value
Medical-surgical (64 hospitals; 187 units)											
Staffing											
Hours of care/patient day	8.08	8.71	9.07	0.63**	0.36*	0.99**	12.25	1.50	1.77	1.58	
Hours RN care/patient day	4.76	5.77	6.31	1.01**	0.54**	1.55**	32.56	1.34	1.40	1.16	
Hours licensed/patient day	5.41	6.41	6.86	1.00**	0.45**	1.45**	26.80	1.33	1.45	1.08	
Ratios											
Number of patients/RN	5.41	4.44	3.96	-0.97**	-0.48**	-1.45**	-26.80	1.29	1.07	0.78	
Number of patients/licensed	4.70	3.95	3.60	-0.75**	-0.35**	-1.10**	-23.40	0.99	0.80	0.55	
Skill mix											
% RN hours	59.18	66.78	70.34	7.60**	3.56**	11.16**	18.86	11.94	11.01	11.11	.05
% licensed hrs	67.20	74.07	76.43	6.87**	2.36*	9.23**	13.74	10.75	9.42	9.42	.03
% LVN hours	8.01	7.29	6.09	-0.72	-1.20*	-1.92	-23.97	7.70	6.94	6.14	
% other	32.80	25.93	23.57	-6.87**	-2.36**	-9.23*	-28.14	10.75	9.42	9.42	.03
% contracted	8.33	8.40	7.59	0.07	-0.81	-0.74	-8.88	8.43	8.32	6.98	.02
Step-down (44 hospitals; 65 units)											
Staffing											
Hours of care/patient day	9.60	10.15	10.47	0.55*	0.32	0.87*	9.06	1.86	1.86	2.10	
Hours RN care/patient day	6.66	7.32	7.73	0.66**	0.41*	1.07**	16.07	2.00	1.81	1.87	.05
Hrs. licensed/patient day	7.03	7.59	7.95	0.56**	0.36	0.92**	13.09	1.88	1.68	1.79	
Ratios											
Number of patients/RN	4.00	3.53	3.33	-0.47**	-0.20	-0.67**	-16.75	1.41	1.04	0.89	
Number of patients/licensed	3.68	3.35	3.22	-0.33**	-0.13	-0.46**	-12.50	0.96	0.80	0.81	
Skill mix											
% RN hours	69.51	72.45	74.26	2.94*	1.81	4.75*	6.83	15.84	13.75	12.45	.01
% licensed hours	73.50	75.39	76.45	1.89*	1.06	2.95*	4.01	14.12	12.75	11.98	.01
% LVN hours	3.99	2.94	2.19	-1.05	-0.75	-1.80	-45.11	6.26	4.78	3.56	.01
% other	26.50	24.61	23.55	-1.89	-1.06	-2.95	-11.13	14.12	12.75	11.98	
% contracted	8.88	10.52	8.95	1.64	-1.57	0.07	0.79	8.53	8.83	8.59	

NOTE: All p values for hospital size under 0.05 shown, but are not significant after adjustment for multiple comparisons. SD = standard deviation; RN = registered nurse; LVN = licensed vocational nurse.  
\*p < .0042. \*\*p < .0001 (ANOVA p-values with hospital size in analysis for prechange to postchange).

*Registered nurses.* Hours of RN care per patient day increased significantly from 2002 to 2004 by an average of about 1 hr in medical-surgical units and 0.7 hrs in step-down units. A significant increase of about 0.5 additional hours was observed from 2004 to 2006 in medical-surgical units and about 0.4 additional hours in step-down units. Overall, significant average increases in RN care hours from 2002 to 2006 were about 1.5 hrs in medical-surgical units and about 1 hr in step-down units. Accordingly, the number of patients per RN decreased significantly from 2002 to 2006 by an average of 1.5 patients in medical-surgical units, and by an average of 0.7 patients in step-down units. The percentage of care provided by RN staff increased significantly from 2002 to 2006 in medical-surgical units by 11.2%. The corresponding increase in step-down units was 4.8%. The initial changes from 2002 to 2004 in staffing and patient-to-nurse ratios were approximately double the size of those from 2004 to 2006.

*Other nursing staff.* Trends in all licensed nursing staff reflected the significant increases in RN hours and decreases in patient-to-nurse ratios. Accordingly, the skill mix data reflected overall reductions in the use of LVNs in both medical-surgical (decreased from 8% to 6%) and step-down units (from 4% to 2%) over the 4-year observation period. The decline in percentage of LVN hours was statistically significant in medical-surgical units during the 2004-2006 period. Between 2002 and 2006 there were also reductions in the use of unlicensed nursing care staff. In medical-surgical units the percentage of care delivered by unlicensed personnel significantly decreased from 33% to 24%; in step-down units the reduction was not statistically significant (from 27% to 24%).

### **Trends in Nursing-Sensitive Patient Outcomes**

Table 2 summarizes the trends in nursing-sensitive outcomes for medical-surgical and step-down units. These results are also reported adjusting for hospital size.

*Falls.* There were no statistically significant trends found in falls or falls with injuries from 2002 to 2006 in medical-surgical units and step-down units. There were, however, several trends of

interest. A nonsignificant decreasing trend in falls per 1,000 patient days was observed in step-down units which we will continue to follow over time (2.95 to 2.43 falls per 1,000 patient days). A significant increase by 0.06 injury falls per 1,000 patient days ( $p = .004$ ) was observed in medical-surgical units from 2002 to 2004, which reversed in 2004 to 2006 resulting in a nonsignificant change overall. Of note is that the entire CalNOC falls data set, including the pre-post ratios matched units in this analysis as well as all other units participating in the CalNOC database project, show a similar nonsignificant increase in falls per 1,000 patient days in 2004 and subsequent return to 2002 levels in 2006. Medical-surgical units also showed a statistically significant association between falls and hospital size. Units in hospitals with an average daily census of more than 200 patients had increased fall rates over the time periods, from 2.60 in 2002 to 3.20 in 2006, converging toward the originally higher rates in smaller hospitals that had been decreasing. Table 3 illustrates this association between falls and hospital size.

*Prevalence study results.* We observed a general decrease in the percentage of patients with community- and/or hospital-acquired pressure ulcers from 2002 to 2006, however this was not statistically significant. There were interesting mixed-outcome patterns in these prevalence trends. For any pressure ulcers, there was a 14% reduction on medical surgical units and 9% reduction on step-down units over the 4-year period. For hospital-acquired pressure ulcers, there was approximately a 14% reduction in the total period of study (14.0% on medical-surgical units and 14.5% on step-down units); however, on medical-surgical units the means were essentially the same in 2002 and 2004, with a decrease only occurring in 2006. Medical-surgical units also showed a statistically significant association between pressure ulcers and hospital size. Units in hospitals with a higher average daily census had increased rate of pressure ulcers compared to smaller hospitals. Step-down units demonstrated an increase between 2002 and 2004, with a nonsignificant decrease in 2006 for any ulcers as well as any hospital-acquired ulcers. However, the percentage of patients with both ulcers stage II+ as well as hospital-acquired ulcers stage II+ increased in step-down units over the total time period. The

**TABLE 2: Pre-Post Change Analysis Results: Patient Safety and Quality Outcome Variables**

Variable	Pre Mean 2002	Post Mean 2004	Post Mean 2006	Absolute Change 02-04	Absolute Change 04-06	Absolute Change 02-06	% Change 02-06	Pre SD 2002	Post SD 2004	Post SD 2006	Hospital Size p Value
<b>Medical-surgical (64 hospitals; 187 units)</b>											
<b>Falls</b>											
Falls/1,000 patient days	3.12	3.22	3.12	0.10	-0.10	0.00	0.00	1.98	1.77	1.89	.004+
Injury falls/1,000 patient days	0.09	0.15	0.10	0.06*	-0.05	0.01	11.11	0.21	0.27	0.17	
<b>Prevalence studies</b>											
% with any ulcers	14.86	14.67	12.72	-0.19	-1.95	-2.14	-14.40	11.76	11.25	11.84	
% with stage II+ ulcers	8.93	8.93	8.47	0.00	-0.46	-0.46	-5.15	8.02	8.06	7.83	
% with any hospital-acquired	7.45	7.98	6.41	0.53	-1.57	-1.04	-13.96	8.04	8.28	10.35	.008+
% with hospital-acquired II+	3.81	3.94	3.06	0.13	-0.88	-0.75	-19.69	5.77	4.54	4.22	
% in restraint	4.60	3.60	3.73	-1.00	0.13	-0.87	-18.91	7.49	6.87	6.07	
<b>Step-down (44 hospitals; 65 units)</b>											
<b>Falls</b>											
Falls/1,000 patient days	2.95	2.63	2.43	-0.32	-0.20	-0.52	-17.63	2.21	1.56	1.53	
Injury falls/1,000 patient days	0.09	0.13	0.09	0.04	-0.04	0.00	0.00	0.18	0.29	0.21	
<b>Prevalence studies</b>											
% with any ulcers	13.97	17.76	12.72	3.79	-5.04	-1.25	-8.95	10.08	12.33	9.47	.02
% with stage II+ ulcers	8.50	11.85	10.19	3.35	-1.66	1.69	19.88	6.59	8.72	8.60	
% with any hospital-acquired	8.06	10.16	6.89	2.10	-3.27	-1.17	-14.52	9.24	11.36	7.04	
% with hospital-acquired II+	3.87	5.70	4.90	1.83	-0.80	1.03	26.61	5.31	6.71	6.09	
% in restraint	8.24	4.95	5.04	-3.29	0.09	-3.20	-38.83	11.37	6.11	7.34	

NOTE: SD = standard deviation.

+ Hospital size main effect statistically significant in 2002 to 2006. All hospital size p values under p < .05 shown, but others not significant after adjustment for multiple comparisons (p < 0.0042 for falls and < 0.01 for pressure ulcers).

\*p < .01.

**TABLE 3: Falls Per 1,000 Patient Days by Hospital Size for Medical-Surgical Units**

Hospital Size (Average Daily Census Category)	Time Period	Falls Per 1,000 Patient Days	
		Mean	Standard Deviation
Under 100 patients (N = 27)	Pre 2002	4.21	2.25
	Post 2004	4.12	2.07
	Post 2006	3.78	2.14
100 to 199 patients (N = 95)	Pre 2002	3.17	1.94
	Post 2004	3.07	1.67
	Post 2006	2.88	1.92
200+ patients (N = 65)	Pre 2002	2.60	1.73
	Post 2004	3.06	1.69
	Post 2006	3.20	1.67

same trends are also noted in the entire CalNOC data set.

Restraint prevalence also demonstrated a non-significant downward trend over this time period, which is again corroborated in the total CalNOC data set. During these 4 years, there was an 18.9% reduction in restraint use among medical-surgical units and a 38.8% reduction among step-down units. The trend occurred largely in the 2004 to 2006 period.

#### Relationship Between Staffing and Outcomes

The following analyses respond to the challenging task of establishing a relationship between staffing variables and nursing-sensitive outcomes over time. The findings were variable and are presented in Table 4 for selected variables grouped by outcome categories.

**Falls.** In medical-surgical units, one statistically significant finding and several trends were noted. A significant negative or inverse association was found between the percentage of contracted staff and falls with injury (coefficient =  $-0.003$ ,  $p = .008$ ). We estimated a decrease by 0.03 injury falls per 1,000 patient days associated with a 10% increase in contracted staff hours, which would result in an estimated 30.0% reduction in the 2006 medical-surgical unit average of 0.10. The skill level of the contracted staff is not known. Nonsignificant trends, which associated more staff with fewer injury falls, were noted for total hours of care, hours of RN care, and hours of care by licensed staff. A similar nonsignificant trend was noted that associated more patients per RN with increased injury.

In step-down units, we found a significant negative or inverse association between the percentage of care hours provided by RN staff and any falls (coefficient =  $-0.02897$ ,  $p = .008$ ). This result would predict that a 10% increase in RN hours in a step-down unit would result in an average drop of 0.3 falls per 1,000 patient days, which would translate to an estimated 12.3% reduction in the 2006 step-down unit average of 2.43. Nonsignificant trends associated more hours of RN care and higher percentages of licensed staff with fewer falls, and units with more patients per RN and higher percentages of LVNs and unlicensed nursing staff with higher fall rates.

**Prevalence of pressure ulcers and restraint use.** There were no significant findings associating nurse staffing variables with pressure ulcers or restraint use among medical-surgical units. We did note a nonsignificant trend for the prevalence of restraint use in medical-surgical units where units reporting higher numbers of patients per RN also report higher restraint use.

Among step-down units we observed a significant positive association of units reporting higher total hours of care per patient day with higher prevalence of hospital-acquired stage II+ pressure ulcers. This would represent an estimated increase of almost 1% (0.92%) in hospital-acquired stage II ulcers for each hour increase in total hours of care per patient day. This would correspond to an 18.8% increase from the 2006 step-down unit average prevalence of 4.9%. Multiple regression adjustment for additional unit-level risk factors available to us, including

**TABLE 4: Relationship Between Selected Staffing and Outcomes: Mixed ANOVA Model Results**

Outcome Variable	Staffing		Ratios		Skill Mix				
	Total Hours of Care/Patient Day (Coefficient; p Value)	Hours RN Care/Patient Day (Coefficient; p Value)	Hours Licensed Care/Patient Day (Coefficient; p Value)	Number of Patients/RN (Coefficient; p Value)	% RN Hours (Coefficient; p Value)	% LVN Hours (Coefficient; p Value)	% Licensed Hours (Coefficient; p Value)	% Other (Unlic) Hours (Coefficient; p Value)	% Contracted (Coefficient; p Value)
Medical-surgical injury falls/1,000 patient days	-0.013; .030	-0.016; .02	-0.014; .04	0.018; .03					-0.003; .008*
% any hospital-acquired ulcers				0.61; .04					0.143; 0.03
% in restraint									
Step-down Falls/1,000 patient days		-0.186; .02		0.253; .04	-0.029; .008*		0.081; .01	-0.02; .05	0.023; .05
% any hospital-acquired ulcers									
% hospital-acquired II+ ulcers	0.928; .004*								

NOTE: All p-values under .05 shown, but not statistically significant after adjustment for multiple comparisons. RN = registered nurse; LVN = licensed vocational nurse. \*p < .01.

average age of patients, percentage of patients assessed at-risk at admission, total Braden score, and percentage of patients in restraints, did not eliminate the significance of the finding. We found no apparent outliers that might explain this significance. We also observed an upward trend in the percentage of patients assessed at-risk for pressure ulcers at admission in step-down units. The means and standard deviations by period were 26.3% and 20.0, 31.9% and 17.3, and 39.6% and 23.5 for the 2002, 2004, and 2006 periods respectively. We found no significant results or trends relating staffing variables to restraint prevalence among step-down units.

## DISCUSSION

Since 2000, five systematic reviews have examined the impact of nurse staffing on patient outcomes (Hickam et al., 2003; Kane, Shamliyan, Mueller, Duval, & Wit, 2007; Lake & Cheung, 2006; Lang et al., 2004; Seago, 2001). It is noteworthy that only two of these reports (Lang et al., 2004 and Lake & Cheung, 2006) have included falls and pressure ulcers among the outcomes studied. Affirming Lange et al.'s finding, Lake & Cheung (2006) noted that the 11 studies included in their analysis "collectively have not identified the contributions of nurse staffing to patient falls and pressure ulcers" (p. 666). CalNOC's findings based on primary, prospective unit-level data sources for both staffing and outcome variables as well as a robust sample of hospitals and units are congruent with this conclusion.

The observed changes in nurse staffing and skill mix were consistent with the changes expected as a consequence of the mandated staffing ratios, just as CalNOC reported in 2005 (Donaldson, Burnes Bolton, et al., 2005). In medical-surgical units, the increase in nurse staffing and decrease in the number of patients per RN and licensed staff continued from 2004 to 2006, with approximately one third of the absolute change occurring in the later time period. In step-down units, the trends also continued from 2004 to 2006, but were not statistically significant. The larger change in medical and surgical units from 2004 to 2006 was expected because those units had a final ratio requirement of 1:5 that went into effect in 2005.

The decrease in the percentage of care provided by LVNs and other (i.e., unlicensed) staff also suggests that administrators have chosen to meet

regulatory requirements through the use of RNs rather than LVNs and unlicensed staff. Our findings also show greater variability in staffing among step-down units when compared to the medical-surgical units in our sample, reflecting the fact that the CalNOC step-down unit category includes all definitive observation units, including both the step-down and telemetry categories designated by the CDPH.

Results for clinical outcomes for the 4-year time period varied by indicator, type of unit, and hospital size. The only trend (though not statistically significant) toward improved patient outcomes was seen in falls per 1,000 patient days on step-down units. Analyses of the relationship between staffing and outcomes for medical-surgical units showed trends toward a relationship between staffing, ratios, and skill mix and injury fall rates. It is noteworthy that these data are gleaned from a period in which hospitals were addressing falls as a core indicator of The Joint Commission (TJC) as well as a focus of the national Institute for Healthcare Improvement's (IHI) 100,000 Lives campaign (IHI, 2007; TJC, 2007). In addition, 33 CalNOC hospitals were actively engaged in the CalNOC Partners for Quality Project (AHRQ Grant # U18 HS13704) with the aim of reducing patient falls. These convergent historical phenomena suggest that myriad factors were likely impacting observed reductions in patient falls and that the lack of significance is a valid measure of the association between falls and nurse staffing. The one significant finding for medical-surgical units indicated a negative relationship between percentage contracted staff and injury falls (more contract staff associated with fewer injury falls). Because injury falls are very rare events and it is difficult statistically to relate the occurrence of a rare event to changes in staffing which may be ongoing, these results should be interpreted with caution. Medical-surgical units also showed a significant association between falls and hospital size, with the smallest hospitals (average daily census under 100) showing a decrease in falls, whereas larger hospitals (200 and above) showed an increase in falls. For step-down units, there was a nonsignificant decrease in falls per 1,000 patient days over the three time periods and a significant finding relating a larger percentage of RN hours of care to fewer falls. There were also nonsignificant trends relating total RN hours of care and several skill mix variables to fewer falls on step-down units.

Prevalence study findings did not indicate a consistent trend in the association between staffing and hospital-acquired pressure ulcers or restraint use. Furthermore, the percentage of patients with all ulcers (both community- and hospital-acquired) decreased. This overall decrease and the lack of relationship to nurse staffing may also reflect the current historical context in which there are multiple local, state, and national initiatives targeted at patient safety and pressure ulcers in particular, making it difficult to reveal independent staffing associations (e.g., IHI, 2007).

Our analyses also showed an unexpected, statistically significant positive relationship in step-down units between the percentage of patients with hospital acquired pressure ulcers stage II and above (stage II+) and total hours of care per patient day (i.e. more hospital-acquired stage II+ ulcers associated with more hours of care). Our step-down unit data also showed a nonsignificant increase in both the percentage of patients with all stage II+ pressure ulcers and the percentage with hospital-acquired stage II+ pressure ulcers. We further examined these data for potential outliers and fitted multiple regression models controlling for other potential risk factors for hospital-acquired ulcers available to us. These exploratory analyses did not yield alternative explanations, although we did find an increased percentage of patients assessed at-risk at admission over time. Even after controlling for the positive effect of this variable on the outcome, however, total hours of care per patient day remained significant and positively associated with the incidence of hospital-acquired stage II+ ulcers. The combination of more serious pressure ulcers (stage II+) and higher total staffing in this analysis may be explained by a preponderance of patients with higher care needs and greater acuity not measured in the CalNOC data. CalNOC's revised 2007 prevalence study data collection tools include more specific questions on patient risk status and subsequent interventions undertaken to prevent hospital-acquired pressure ulcers and will provide the ability to "drill down" on similar findings in the future.

### Public Policy Implications

These findings highlight the challenge to better understand how characteristics and credentials of

the direct care nursing staff, unit microsystem, and organizational culture of safety interact to impact patient outcomes, as mandated alterations in the volume of direct care staff alone has not resulted in expected reductions in two common adverse events in hospitals, falls and pressure ulcers.

Our findings also demonstrate interesting results for the use of contracted staff. An unintended outcome of mandated nurse-patient ratios in the presence of a shortage of qualified employees may be to recruit temporary workers from agencies, whose presence may add a new threat to patient safety. Thus, although a larger percentage of contracted staff on medical-surgical units is significantly associated with fewer injury falls, we found a nonsignificant trend associating a higher percentage of contracted staff and more hospital-acquired pressure ulcers. Perhaps a greater percentage of contracted staff on a unit implies more staff that are unfamiliar with unit practice and may compromise continuity of care, potentially exerting an impact on patient safety. It is also possible that some patient outcomes (e.g., falls) are more sensitive to raw numbers of staff, whereas others are more sensitive to continuity of care. To date there is little research literature on the impact of supplemental staff on patient outcomes, a topic that needs to be examined carefully in future research.

As the nation confronts the increasing demand for acute care by its exploding aged population, policy makers will turn to the health services research enterprise to assist them in optimizing costs, quality, and outcomes of hospital care. The California experiment in mandated ratios has increased patient access to licensed professional nurses in hospitals but has not yet improved their safety from falls or assurance that they will emerge from acute care with less likelihood of a hospital-acquired pressure ulcer. Further research using standardized metrics, unit-level primary data sources and integrating microsystem and organizational measures, as well as granular variables examining the characteristics of the workforce have been repeatedly called for (Hickam et al., 2003; Kane et al., 2007; Lake & Cheung, 2006; Lang et al., 2004; Seago, 2001) and this study affirms this imperative.

### Methodological Limitations

The significant findings and trends noted in these complex analyses must be considered exploratory. The CalNOC database brings to the analysis unit-based data with a high degree of standardization in data capture methodology, potentially adding power to the analysis by reducing variability in data collection (Aydin et al., 2004; Donaldson, Burnes Bolton, et al., 2005). As noted in 2005, however, these analyses are based on data from a convenience sample of California hospitals. Although these analyses generally represent hospitals statewide, it is not known how hospitals that do not participate in CalNOC differ from those that do. Furthermore, although we have controlled for time period and adjusted for differences in hospital size (average daily census) and between unit types, more complex stratification would be useful.

CalNOC data are aggregated as averages for units, clustered within hospitals, clustered within time periods. Beyond our analyses by unit type and adjustments for hospital size, these analyses do not adjust for variability in patient care needs among patients on units of the same type. CalNOC's monthly data cannot affirm compliance with ratios per shift, per unit, at all times. As hospitals prioritize improvement efforts to target opportunities to improve poor outcomes, these data likely reflect a continuum of units moving rapidly on improvements along with other units that are not—thus individual hospital or unit results may be able to demonstrate excellent outcomes, whereas the overall data set may not. These analyses also do not take into account historic trends toward older patients, increasingly severe case mix for inpatients, changes in technology, and increased patient or bed turnover on nursing units—all of which require more RN time.

### CONCLUSION

This analysis provided a follow-up and extension of CalNOC's 2005 report on the impact of mandated nursing ratios in California adult acute care hospitals. Findings continued to indicate that changes in nurse staffing were consistent with expected increases in licensed staffing. However, anticipated significant improvements in two key nurse-sensitive indicators of patient care quality

and safety, the incidence of falls and the prevalence of hospital-acquired pressure ulcers, were not observed. This report contributes to the growing understanding of the impacts of regulatory staffing mandates on hospital operations and patient outcomes and the nuances that may impact these phenomena.

### NOTES

1. The California Department of Public Health (CDPH) regulations define "step-down unit" as a unit that is organized, operated, and maintained to provide for the monitoring and care of patients with moderate or potentially severe physiologic instability requiring technical support but not necessarily artificial life support. Step-down patients are those patients who require less care than intensive care but more than that which is available from medical or surgical care (California Code of Regulations, Title 22, Section 70217, 2005). A "telemetry unit" is defined as a unit organized, operated, and maintained to provide care for and continuous cardiac monitoring of patients in a stable condition, having or suspected of having a cardiac condition or a disease requiring the electronic monitoring, recording, retrieval, and display of cardiac electrical signals (California Code of Regulations, Title 22, Section 70217, 2005). In addition to these types of units, AB 394 and the CDPH implementation regulations required staffing ratios for postpartum units, labor and delivery, emergency departments, pediatrics, specialty care (oncology), telemetry, psychiatric units, and mixed units. Mandated ratios had already been in place for other units, including intensive or critical-care units, operating rooms, well-baby nurseries, intermediate-care nurseries, and neonatal intensive care units.

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# Impact of California's Licensed Nurse- Patient Ratios on Unit-Level Nurse Staffing and Patient Outcomes

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*This article presents the first analysis of the impact of mandated minimum-staffing ratios on nursing hours of care and skill mix in adult medical and surgical and definitive-observation units in a convenience sample of 68 acute hospitals participating in the California Nursing Outcomes Coalition project. Findings, stratified by unit type and hospital size, reveal expected changes as hospitals made observable efforts toward regulatory compliance. These data cannot affirm compliance with ratios per shift, per unit, at all times; however, they give evidence of overall compliance. Assessment of the impacts of the mandated ratios on two common indicators of patient care quality, the incidence of patient falls and the prevalence of pressure ulcers, did not reveal significant changes despite research linking nurse staffing with these measures. These findings contribute to understanding unit level impacts of regulatory staffing mandates and the preliminary effect of this legislation on core quality of care indicators.*

**Keywords:** nurse-to-patient ratios; nursing sensitive indicators; patient safety and quality; falls; pressure ulcers; outcomes

**I**n October 1999, California became the first state in the United States to adopt legislation mandating minimum licensed nurse-to-patient ratios per unit in acute care hospitals. This landmark legislation, introduced as Assembly Bill (AB) 394, required California's State Department of Health Services (California DHS) to develop the specific regulatory language to implement this new mandate for staffing ratios. As the first agency to undertake this task, the California DHS was charged with the duty to establish regulations but acknowledged that "essentially there was not hard, scientific evidence in the literature indicating the number of patients nurses can safely and effectively handle while providing quality patient care" (California DHS, 2003, pp. 1, 13). Over the next 3 years of the regulatory process, DHS received input through testimony at three public hearings, received more than 24,000 written submissions, and conducted randomly selected hospital surveys to determine the specific staffing ratios it would mandate. At the conclusion of the rulemaking process, the proposed

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ratios reflected "a broader, more objective consensus of workable, reasonable standards that would improve nurse staffing levels and quality of care to patients," intended to establish minimum staffing standard for every shift on every unit, with the goal of "remediat[ing] the hospitals with the leanest staffing effectively raising the bar for the standard of acceptable staffing" (California DHS, 2003, p. 13). The new law and regulations

expanded existing state regulations adopted more than two decades earlier establishing nurse-to-patient ratios in critical care and built on more recent state regulations requiring hospitals to use a patient classification system to ensure that staffing allocation and patient needs were aligned.

Table 1 presents a summary of the required ratios for adult acute care medical and surgical and definitive-observation units (including step-down and telemetry units), two types of units particularly impacted by the ratios and included in the units analyzed for this article (Office of the Governor of California, 2002).<sup>1</sup>

These required staffing ratios apply to licensed nurses (i.e., both registered nurses [RNs] and licensed vocational nurses [LVNs]). The DHS regulations permit hospitals to use up to 50% LVNs among the licensed nurses in complying with these staffing requirements (California Code of Regulations, Title 22, Section 70217, 2005).

This article presents the first evidence tracing initial unit-level impacts of California's ratio legislation on licensed nurse staffing and patient care quality in medical and surgical and definitive-observation units. Part of a larger ongoing nursing quality repository research and development project conducted by the California Nursing Outcomes Coalition (CalNOC), the data reported here are gleaned from 268 patient care units in 68 hospitals with pre-ratio and post-ratio data. CalNOC data are unique in the field as they are drawn from a robust, statewide, unit-level sample of direct patient-care staffing and safety focused measures in an era when evidence to guide public policy on nurse staffing is needed. CalNOC data are collected at the point of service in real time by hospitals using current staffing data as well as falls incidence and pressure ulcer prevalence data. The alternative method of analysis, retrospective data

**TABLE 1: Required Ratios by Unit Type: 2004 to 2005**

<i>Unit Type</i>	<i>Initial Ratio 2004</i>	<i>Final Ratio 2005</i>
Medical and surgical	1:6	1:5
Definitive observation		
Step-down	1:4	1:4
Telemetry	1:5	1:5

capture, relies on the extraction of data from staffing and clinical information systems that may not link nurse staffing and outcomes as reliably.

### STRATEGIC CONTEXT AND RATIONALE FOR LEGISLATIVE INTERVENTION

In its preamble to AB 394, the California Legislature noted the increasing complexity of health care services in the midst of hospital changes in staffing catalyzed by managed care. The legislature also highlighted a growing body of evidence linking nurse staffing to patient care quality, safety, and outcomes.

The context of a gathering storm leading to legislative action included cost and reimbursement factors, increases in patient acuity and complexity, reduced length of stay, and public concerns about patient safety. Major redesign of acute-care delivery-systems intended to strategically align use of services, costs, and reimbursement incentives had resulted in reduced RN-to-patient ratios and increased demands on direct care RNs because of decentralization of ancillary services (Aiken, Clarke, & Sloane, 2000; Aiken, Havens, & Sloane, 2000; Aiken, Sochalski, & Lake, 1997; Curran & Mazzie, 1995; Walston, Burns, & Kimberly, 2000; President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, 1998; Wiener, 2000). Concomitantly increased patient acuity and reduced length of stay associated with episodes of acute care resulted in a markedly more complex, severely ill hospitalized patient population requiring more intensive nursing care (Aiken, Clarke, et al., 2000; Kohn, Corrigan, & Donaldson, 1999; President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, 1998; Wunderlich, Sloan, & Davis, 1996).

Prior to AB 394, hospitals set staffing requirements in nurseries, neonatal, and specialized

adult intensive and coronary care units per shift, per unit based on specifications prescribed by legislation enacted in 1976 and 1977 that established California's first nurse-patient ratios (California Code of Regulations, Title 22, Section 70217, 2005). Subsequent regulations issued in the 1990s required hospitals to adopt reliable patient classification systems as the basis for ensuring staffing that was well matched to patient needs (California Code of Regulations, Title 22, Section 70217, 2005). It was the intent of the legislature that existing RN-to-patient ratios be complemented by the use of patient classification systems, which are highly dependent on professional judgment and unique to each clinical setting and its patient population. In operationalizing this earlier regulatory effort to ensure safe staffing, hospital administrators had to manage within budgetary constraints while also adhering to regulatory mandates, thus contributing to wide variation in staffing across similar types of units (Donaldson, Brown, Aydin, & Bolton, 2001). These variations, along with efforts to link nurse staffing and patient outcomes, took place concurrently with a growing national focus on patient safety that galvanized the media, clinicians, consumers, and policy makers to conclude that the health care system was exposing patients to iatrogenic risks, errors, omissions and complications resulting in unnecessary suffering and complications, prolonged recovery, extraordinary costs and 44,000 to 98,000 unnecessary deaths nationally per year (Bates et al., 1997; Kohn, Corrigan & Donaldson, 1999; Page, 2004; President's Advisory Commission on Consumer Protection and Quality in the Health Care Industry, 1998; Quality Interagency Coordination Task Force, 2000).

### CALNOC

CalNOC was established in 1996 when the American Nurses Association\California (ANA\C) and the Association of California Nurse Leaders (ACNL; formerly Organization of Nurse Executives—California) collaborated in responding to a call from the American Nurses Association (ANA) for proposals to test the feasibility of the ANA's 1995 Nursing Quality Report Card Indicators. These indicators included

- mix of RNs, LPNs, and unlicensed staff;
- total nursing hours of care worked per patient;
- RN education;
- maintenance of skin integrity (hospital-acquired pressure ulcer prevalence);
- nurse staff satisfaction;
- nosocomial infection rate;
- patient injury rate (falls); and
- patient satisfaction with nursing care (Pollard, Andres, & Dobson, 1996).

In January 1996, the partnership between the ANA\C and the ACNL to launch CalNOC was formalized. CalNOC became one of ANA's six original state nurses association-sponsored quality indicator research and development projects (Donaldson et al., 2001; Grobe et al., 1998; Redmond, Riggleman, Sorrell, & Zerull, 1999; Sheehy et al., 2000).

CalNOC's core mission is to

- build and sustain the CalNOC statewide nursing staffing and quality database repository,
- conduct research to advance evidence-based administrative and clinical decision making, and
- provide data to resolve public policy and clinical dilemmas in the cost and efficacy of patient care delivery influenced by nurse staffing and quality.

CalNOC methods have been described in detail elsewhere (Aydin et al., 2004) and substantiate the integrity of this ongoing nursing quality measurement research and repository development project. CalNOC indicators used in this analysis are derived from and standardized with current ANA National Database for Nursing Quality Indicators (NDNQi) Coding Guidelines (NDNQi, 2005). Both NDNQi and CalNOC indicators have been cited by the National Quality Forum in its seminal initial indicator set for nursing-sensitive performance measurement (National Quality Forum, 2005). In an era when the majority of studies examining the effects of nurse staffing on patient outcomes rely on hospital-level data extracted from large public data sources, CalNOC is particularly able to contribute to the field with analysis of its large, longitudinal unit-level, hospital-generated dataset advancing understanding of the links between nurse staffing and patient-care safety.

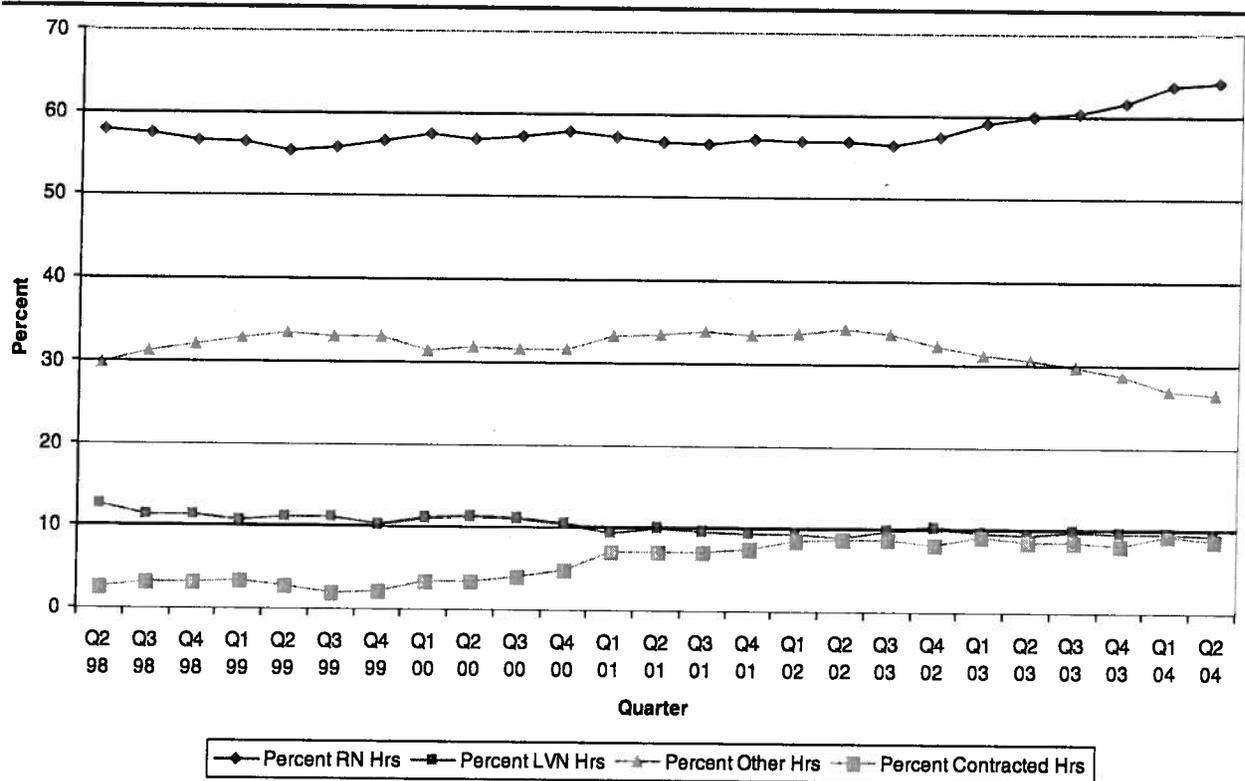


Figure 1: Skill Mix for Medical/Surgical Units—All Hospitals Reporting, 1998-2004

**ANALYSIS METHODS**

This article presents an analysis conducted specifically to examine the impact of mandated nurse-to-patient ratios on unit-level nurse staffing, the incidence of patient falls, and the prevalence of hospital-acquired pressure ulcers and restraint use in medical surgical and definitive-observation units drawn from a convenience sample of CalNOC hospitals with pre-ratio and post-ratio data.

California’s mandated nurse-to-patient ratios were implemented effective January 1, 2004. For the purpose of this analysis, the pre-ratio baseline was defined as the first 6 months (two quarters) of 2002, a period immediately following the governor’s announcement of the proposed ratios slated for implementation in 2004. The first 6 months of 2002 provided the most robust pre-ratio data period prior to the onset of observed changes in staffing trends attributed to anticipatory preparation for

implementation of the ratios. Figures 1 and 2 provide an overview of these data over time and the anticipatory trends observed in nurse staffing skill mix and ratios. An examination of trends in the CalNOC database indicated that the first two quarters of 2002 did not appear to differ from 2001 data. For the purpose of this preliminary analysis of mandated ratios impact, the post-ratio period was defined as the first 6 months (two quarters) of 2004, following implementation of the licensed nurse-to-patient ratios.

The key variables and related standardized operational definitions used in this analysis are defined below.

*Nursing-care hours* were defined as the productive (excluding non-productive education, vacation, and sick time) hours worked by all RN, LVN, non-RN, and non-LVN caregiver staff that are on the hospital’s payroll who have direct patient-care responsibilities and assignments on the defined unit and are included in the staffing matrix (direct

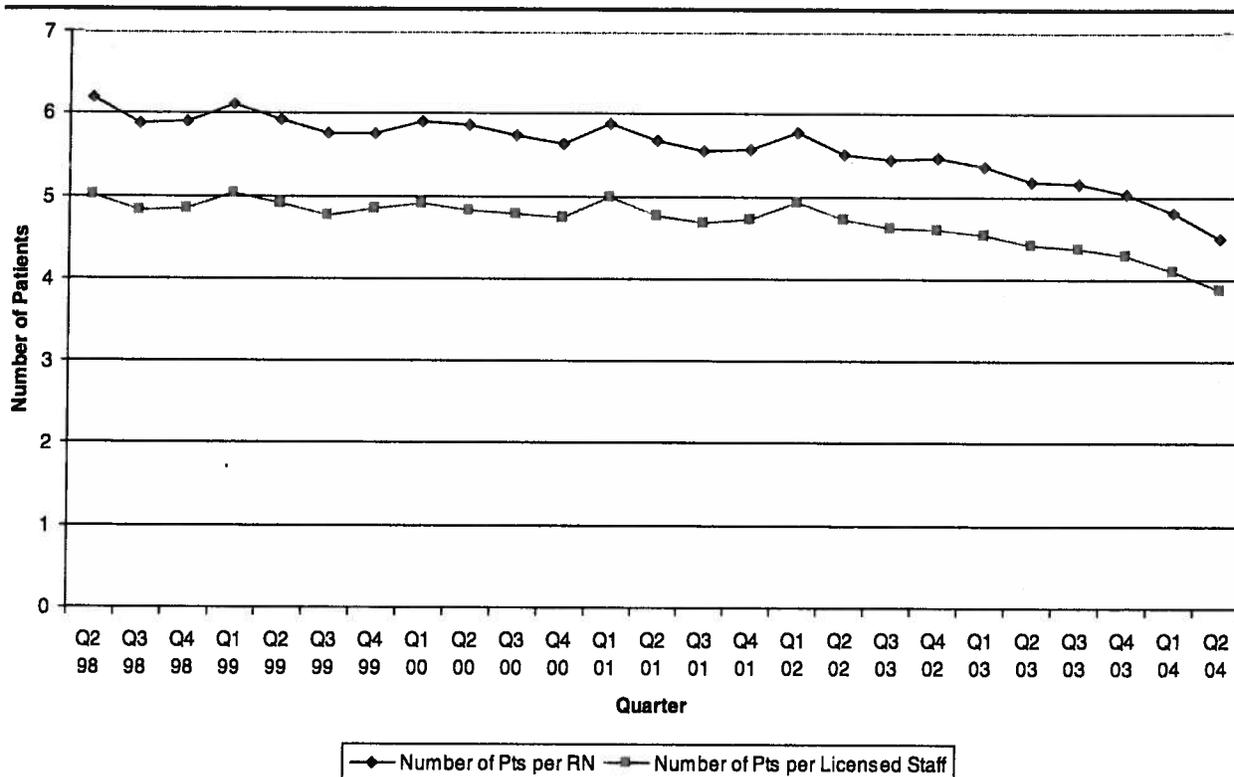


Figure 2: Number of Patients per Caregiver for Medical/Surgical Units—All Hospitals Reporting, 1998-2004

care staffing assignment system based on patient volume, patient acuity, and nursing workload). If there are direct patient-care providers not included in the staffing matrix, they are included in the nursing-care hours if they provide greater than or equal to 50% direct patient care.

*RN nursing-care hours* were defined as the total number of productive hours worked by all RNs (including contracted staff) with direct patient care responsibilities.

*LVN nursing-care hours* were defined as the total number of productive hours worked by all LVNs (including contracted staff) with direct patient care responsibilities.

*Non-RN and LVN caregiver care hours* were defined as the total number of productive hours worked by other staff (i.e., including contracted staff, aides and other direct care providers included in the staffing matrix).

*Contracted hours* were defined as the total number of productive hours worked only by those

with direct patient-care responsibilities who are contract staff (registry, travelers). This does not include per diem or internal float staff on the facility's payroll. Contracted hours were reported as RN hours, LVN hours, non-RN caregiver contracted hours, and non-LVN caregiver contracted hours (all nursing staff with direct patient care responsibilities in the staffing matrix).

*Skill mix* was calculated by the CalNOC database from the above indicators. Skill mix variables include the percentage of RN nursing-care hours from the total nursing-care hours, the percentage of LVN nursing-care hours from the total nursing-care hours and the percentage of all non-RN and LVN nursing-care hours from the total nursing-care hours.

*Total patient days* were defined as the total patient days and are used as a denominator in CalNOC database calculations for each participating patient care unit, for each individual calendar month. Many hospitals use the midnight census

and add the number of observation patients who received care to their midnight census data.

*Patient falls incidence* was defined as the rate per 1,000 patient days at which patients experience an unplanned descent to the floor. All falls to the floor are reported and described by level of injury or no injury and circumstances (observed, assisted, or restrained) at the time of the fall.

*Hospital-acquired pressure ulcer prevalence* was defined as the total number of patients within a facility that have Stage I, II, III, or IV pressure ulcers on the day of the prevalence study, regardless of whether the ulcer was acquired during hospitalization or present on admission (data are also collected to allow CalNOC to compute a distinction between hospital-acquired versus community-acquired pressure ulcers). Prevalence is expressed as a percentage, in relation to the total number of patients surveyed (number of patients with ulcers and number of patients in study).

#### **SAMPLING METHOD—SKILL MIX AND STAFFING AND FALLS VARIABLES**

Data were drawn from all units in CalNOC hospitals for which staffing, patient days, and falls data were all available for a pre-ratio 6-month period in 2002 (months 1 to 6 of 2002) and a post-ratio 6-month period in 2004 (months 1 to 6 of 2004). Patient-care units without at least 2 months of data in each period were excluded.

Data for each variable for each unit were averaged across months into Quarter 1 (Q1) of 2002, Quarter 2 (Q2) of 2002, Q1 of 2004, and Q2 of 2004. Means from Q1 and Q2 of 2002 were averaged to produce pre-ratio period means; means from Q1 and Q2 of 2004 were averaged to produce post-ratio period data. The resulting sample for the staffing and falls data was drawn from 268 units: 68 definitive-observation step-down units and 200 medical and surgical units from 68 hospitals, representing a total of about 196,000 patient days.

#### **SAMPLING METHOD— PRESSURE ULCER AND RESTRAINT USE PREVALENCE VARIABLES**

CalNOC hospitals conduct pressure ulcer prevalence studies at least annually and may submit data as often as quarterly. Each prevalence study

is a visual inspection survey of every patient on definitive-observation step-down units and medical and surgical CalNOC units in the participating hospital on the day of the study. (The CalNOC prevalence study methodology is described in detail in Aydin et al., 2004.) Indicators used for this analysis include percentage of patients with pressure ulcers, percentage of patients with hospital-acquired pressure ulcers, and percentage of patients in restraints.

For pre-ratio data, the earliest prevalence study conducted in Q1 or Q2 of 2002 was included. If no studies were conducted during this target period, the prevalence study for the latest data from Q3 or Q4 of 2001 was accepted. For post-ratio data period, the latest study from 2004 was used. Because many hospitals do not submit studies every quarter, data from only one study was used for each hospital for each period. The final sample for the prevalence study data was obtained from  $n = 162$  units:  $n = 43$  definitive-observation step-down units and  $n = 119$  medical and surgical units, drawn from  $n = 38$  hospitals.

#### **ANALYTICAL PROCEDURES**

Following explication of the time period and delimitation of the sample and data set, separate analyses were performed for the two unit types: definitive-observation step-down units and medical and surgical units. Analyses of pre-ratio and post-ratio differences were conducted within each of two unit types in two ways.

1. A repeated measures analysis of variance (ANOVA) using pre-ratio and post-ratio results was computed to compare pre-ratio results versus post-ratio results, to compare hospital size (average daily census) categories (< 100 beds, 100 to 199, 200 to 299,  $\geq 300$  beds), and to detect any interaction between hospital-size categories and any pre-ratio and post-ratio change. Sample sizes for medical surgical or definitive-observation unit type, stratified by hospital size are presented in Tables 2 and 3 for each of the two outcome variables examined.
2. A second repeated measures ANOVA using pre-ratio and post-ratio results was computed to compare pre-ratio versus post-ratio, to compare results for two large systems participating in CalNOC and results for all other hospitals, and

**TABLE 2: Sample Size for Staffing and Falls Variables by Hospital Size**

Hospital Size	Number of Units per Average Daily Census Category				Total
	< 100	100 to 199	200 to 299	300+	
Unit type					
Step down	5	34	18	11	68
Medical and surgical	30	99	36	35	200
Total	35	133	54	46	268

**TABLE 3: Sample Size for Prevalence Study Variables by Hospital Size**

Hospital Size	Number of Units per Average Daily Census Category				Total
	< 100	100 to 199	200 to 299	300+	
Unit type					
Step-down	1	19	13	10	43
Medical and surgical	8	56	25	30	119
Total	9	75	38	40	162

to detect any interaction between hospital system categories and any pre-ratio and post-ratio change. Sample sizes for unit type by hospital system are shown in Tables 4 and 5. Separate analyses for hospital size and hospital system were necessary because the two large systems did not have facilities in all of the hospital-size categories, leading to imbalance and empty cells when both variables were included in the same analysis. As shown in Tables 4 and 5, both systems had a total of more than 40 patient-care units in the 2002 to 2004 dataset used for this analysis.

Pre-ratio and post-ratio means and standard deviations across units are presented in Tables 6 and 7. An overview of trends for these variables have been described elsewhere (Donaldson, Brown, Aydin, Bolton, & Rutledge, 2005). Results from comparisons of pre and post-periods using ANOVA are shown separately for each unit type. To adjust for multiplicity of testing in interpreting the skill mix, staffing, and falls data set results, the customary .05 probability level was divided by 12 (the number of variables in the data set) and .0042 was used as the cut-point for a significant *p* value. For the prevalence study results, 0.05 was divided by 5 (the number of variables in the pressure ulcer database) and a rigorous alpha level of 0.01 was selected as the significant *p* value.

## FINDINGS—IMPACT OF MANDATED RATIOS ON NURSE STAFFING AND TWO PATIENT SAFETY AND QUALITY INDICATORS

### Nurse Staffing

Study findings show that the mean total RN hours of care per patient day increased by 20.8% on medical and surgical units after the implementation of mandatory nurse-patient ratios in this sample of California hospitals (see Table 6.) The mean total nursing hours of care per patient day (RN, LVN, and unlicensed hours of care combined) in the sample increased by 7.4%. The mean total licensed hours of care (RN and LVN) increased post-implementation over the pre-ratio by 17.8%. The number of patients per licensed nurse decreased post-implementation by 16.0%, whereas the number of patients per RN decreased by 17.5%. All changes were statistically significant. Definitive-observation step-down units showed no statistically significant changes post-implementation. There were no significant changes in contracted staff for medical and surgical or step-down units, despite concerns that hospitals would not be able to meet the new ratio standard with existing staff resources. No significant interactions between the change in staffing and

**TABLE 4: Sample Size for Staffing and Falls Variables by Hospital System**

Hospital System	Number of Units per System Category			Total
	Large System #1	Large System #2	Other Institutions	
Unit type				
Step-down	25	12	31	68
Medical and surgical	67	29	104	200
Total	92	41	135	268

**TABLE 5: Sample Size for Prevalence Study Variables by Hospital System**

Hospital size	Number of Units per System Category			Total
	Large System #1	Large System #2	Other Institutions	
Unit type				
Step-down	18	8	17	43
Medical and surgical	46	17	56	119
Total	64	25	73	162

hospital size categories or the change in staffing and hospital system categories were identified, suggesting that changes were consistent across hospital types. Hospital system was a statistically significant predictor in the analyses, indicating that findings varied by system.

### Compliance With Legislation

In addition to examining changes in mean staffing before and after the implementation of ratios, the analysis investigated individual unit compliance with the new licensed nurse-to-patient numerical ratios prescribed in the AB 394 regulations. CalNOC data provide an overview of compliance from the perspective of an overall monthly average but cannot fully measure compliance with the regulations, which mandate compliance with the ratios at all times, on each unit and each shift. With that said, results of this analysis showed that 90% ( $n = 180$ ) of the 200 medical and surgical units had average staffing for the baseline periods of Q1 and Q2 2002 that already met the anticipated 2004 1:6 ratio requirement. In addition, 97% ( $n = 194$ ) units had two quarter averages that demonstrated overall compliance with the regulations during the first two post-implementation data periods (Q1 and Q2 2004). As of Q1 and Q2 2004, 91% ( $n = 182$  units) demonstrated anticipatory compliance the medical and

surgical ratio of 1:5 slated to take effect in the second phase of ratio implementation, effective January 2005.

For definitive-observation step-down units, assessing compliance with the ratios from the CalNOC data is less precise. The CalNOC definitive-observation step-down category includes units meeting both the DHS definition of *step down* (required 1:4 ratio) and *telemetry* (required 1:5 ratio).<sup>2</sup> Before implementation, two quarter averages in 2002 for 88% ( $n = 60$ ) of 68 units met the 1:5 ratio and 66% ( $n = 45$ ) of 68 met the 1:4 ratio. In the 2004 post-ratio implementation period, noting that the actual requirement for each definitive-observation unit depends on the classification filed by the hospital with California DHS, 94% ( $n = 64$  units) met the 1:5 ratio and 82% ( $n = 56$  units) met the 1:4 ratio.

The analysis also examined the potential for units to decrease RN staffing while increasing overall licensed staffing, a theoretical potential impact of the ratios, because the DHS regulations allow hospitals to use up to 50% LVNs in meeting the ratios requirements. Findings showed that only 2 of the 200 medical and surgical units (1%) and none of the definitive-observation step-down units showed any increase in the number of patients per RN along with a decrease in the number per licensed staff.

TABLE 6: Pre-Ratio and Post-Ratio Analysis Results: Staffing Variables

Variable	Number of Units	Number of Facilities	Pre-Mean	Post-Mean	Percentage Change	Pre-Standard Deviation	Post-Standard Deviation	ANOVA p Values Hospital Size		ANOVA p Values Hospital System	
								Hospital Size	Pre-Ratio and Post-Ratio Change	Hospital System	Pre-Ratio and Post-Ratio Change
<b>Medical and surgical Staffing</b>											
Hours of care/patient day	200	68	8.08	8.68	7.4	1.54	1.77		0.0024		0.0001
Hours RN care/patient day	200	68	4.76	5.75	20.8	1.36	1.42		0.0001		0.0001
Hours licensed/patient day	200	68	5.44	6.41	17.8	1.37	1.46		0.0001		0.0001
<b>Ratios</b>											
Number of patients/RN	200	68	5.43	4.48	-17.5	1.33	1.12		0.0001		0.0001
Number of patients/licensed	200	68	4.70	3.95	-16.0	1.01	0.81		0.0001		0.0001
<b>Skill mix</b>											
Percentage RN hours	200	68	59.20	66.67	12.6	12.13	11.46		0.0001		0.0001
Percentage licensed hours	200	68	67.52	74.29	10.0	11.37	9.93		0.0001		0.0001
Percentage LVN hours	200	68	8.32	7.62	-8.4	8.05	7.30	0.0024			0.0001
Percentage other	200	68	32.48	25.71	-20.8	11.37	9.93		0.0001		0.0001
Percentage contracted	200	68	8.43	8.04	-4.6	8.34	8.13		0.0001		0.0001
<b>Step-down Staffing</b>											
Hours of care/patient day	68	48	9.59	10.11	5.4	1.81	1.81				0.0001
Hours RN care/patient day	68	48	6.59	7.28	10.5	1.96	1.80				0.0001
Hours licensed/patient day	68	48	6.98	7.59	8.7	1.83	1.68				0.0002
<b>Ratios</b>											
Number of patients/RN	68	48	4.02	3.56	-11.4	1.38	1.05				0.0001
Number of patients/licensed	68	48	3.70	3.36	-9.2	0.93	0.83				0.0001
<b>Skill mix</b>											
Percentage RN hours	68	48	68.79	72.19	4.9	15.33	13.37	0.0009			0.0001
Percentage licensed hours	68	48	72.99	75.54	3.5	13.62	12.36				0.0001
Percentage LVN hours	68	48	4.20	3.35	-20.2	6.59	5.51				0.0001
Percentage other	68	48	27.01	24.46	-9.4	13.62	12.36				0.0001
Percentage contracted	68	48	9.22	10.74	16.5	8.57	8.86				0.0001

NOTE: LVN = licensed vocational nurses; RN = registered nurse.

### Patient Safety and Quality Indicators

Table 7 details the impact of decreased nursing workload (defined as the number of patients assigned to licensed nursing personnel) and increased RN hours per patient day on the incidence of falls and the prevalence of hospital-acquired pressure ulcers and restraint use quality indicators. Despite the changes noted above in nurse staffing and licensed nurse-patient ratios, there were no statistically significant changes observed in the patient safety and quality outcomes selected for this study.

### DISCUSSION

The observed changes in acute care staffing and nurse skill mix are consistent with the intended and expected changes attributable to mandated staffing requirements. The greatest variation in staffing prior to implementation of mandated ratios was found in medical and surgical units, where increased patient care complexity, acuity and staffing variability had raised professional and public concern for patient safety. This analysis confirms that California's mandated ratios significantly altered hours of care and skill mix on medical and surgical units, increasing the exposure of patients to the skills of RNs as well as LVNs. These data suggest overall that this sample of California hospitals met the legislated mandate to increase nursing care provided by licensed staff, although these data cannot account for compliance per shift, per unit, at all times. If the dose of RN hours of care and percentage of total care giving hours is associated with improved patient outcomes, then it is also noteworthy that post-ratios, the proportion of care provided by RNs increased in definitive step-down units and medical and surgical units.

In an effort to assess the impact of the ratios on commonly measured nurse sensitive indicators of patient care quality and safety, the incidence of patient falls and the prevalence of hospital-acquired pressure ulcers and restraint use were examined before and after required staffing ratios went into effect. Despite significant impacts of the ratios on nurse staffing, no significant differences in falls reduction or the prevalence of hospital-acquired pressure ulcers and restraint use were observed.

CalNOC experience with falls and pressure ulcer indicators and insights from the literature suggest improvements in these key indicators of patient safety may be multifactorial rather than simply altered by manipulating nurse staffing. Characteristics of the patient population, hospital design and material resources to aid prevention and the processes of care, for example, may be of equal and yet-to-be-measured influence on these selected patient outcomes ("Guidelines for the prevention and management of pressure ulcers", 2003; Shorr, 2005). Clearly, this report presents preliminary impacts of California's ratios, and these findings will be supplemented by ongoing analyses of CalNOC data and the work of other investigators who share an interest in studying California's natural experiment in advancing legislative solutions to optimize hospital patient safety and quality of care related to the nursing workforce and its deployment in clinical settings.

### METHODOLOGIC LIMITATIONS AND IMPLICATIONS FOR FURTHER STUDY

This report is based on data collected from a convenience sample of California hospitals. Although the CalNOC sample is generally representative of hospitals statewide, it is not known how hospitals that do not participate in CalNOC differ from those that do. Although CalNOC data and this analysis do adjust for differences across hospitals and between unit types using stratification, this analysis would benefit from more complex risk adjustment than is yet possible for this dataset.

At the heart of the matter, data standardization, or the lack of it, has plagued efforts to synthesize and meta-analyze results across nurse staffing and quality of care datasets. CalNOC data brings to the field and this analysis a high degree of data capture standardization that has emerged over time and potentially adds power to this analysis by reducing data collection variability. It is noted that future analyses of these data will benefit from differentiating step-down and telemetry units within CalNOC's definitive-observation unit type.

### CONCLUSION

This article has presented the first analysis of the impacts of mandated licensed nurse-to-patient

TABLE 7: Pre-Ratio and Post-Ratio Analysis Results: Patient Safety and Quality Outcome Variables

	Number of Units	Number of Facilities	Pre-Mean	Post-Mean	Percentage Change	Pre-Standard Deviation	Post-Standard Deviation	ANOVA p Values Hospital Size		ANOVA p Values Hospital System	
								Hospital Size	Pre-Ratio and Post-Ratio Change	Hospital System	Pre-Ratio and Post-Ratio Change
Medical and surgical Falls											
Falls/1,000 patient days	200	68	3.06	3.19	4.2	1.95	1.74				
Injury falls/1,000 patient days	200	68	0.09	0.15	66.7	0.21	0.27	0.0007			0.0005
Prevalence studies											
Percentage with any ulcers	119	38	14.07	14.48	2.9	11.07	10.39				
Percentage with stage II+ ulcers	119	38	8.32	9.29	11.7	7.27	7.98				
Percentage with any hospital-acquired	119	38	3.70	3.79	2.4	5.17	4.38				
Percentage with hospital-acquired II+	119	38	7.11	7.50	5.5	7.43	7.20				
Percentage in restraint	119	38	4.40	2.94	-33.2	7.18	4.85				
Step-down Falls											
Falls/1,000 patient days	68	48	3.01	2.62	-13.0	2.22	1.56				
Injury falls/1,000 patient days	68	48	0.09	0.14	55.6	0.18	0.28				
Prevalence studies											
Percentage with any ulcers	43	28	13.52	16.29	20.5	10.78	10.27				
Percentage with stage II+ ulcers	43	28	7.67	11.31	47.5	6.49	7.74				
Percentage with any hospital-acquired	43	28	3.52	6.54	85.8	5.46	7.21				
Percentage with hospital-acquired II+	43	28	8.18	9.66	18.1	10.24	9.47				
Percentage in restraint	43	28	7.39	4.76	-35.6	10.91	6.76				

ratios on nurse staffing hours of care and skill mix in adult medical and surgical and definitive-observation units drawn from 68 acute hospitals participating in the CalNOC database project. Findings reveal significant changes in variables of interest as hospitals made early and observable efforts to achieve regulatory compliance. These data cannot affirm compliance with ratios per shift, per unit, or at all times; however, they give evidence of overall compliance. A preliminary assessment of the impacts of the mandated ratios on two common indicators of patient care quality and safety, the incidence of patient falls and the prevalence of pressure ulcers, did not find a significant change despite a preponderance of research linking nurse staffing with these measures. These findings may be expected to contribute to growing understanding of unit level impacts of regulatory staffing mandates and the relative power of legislation to affect hospital operations and patient outcomes.

## NOTES

1. In addition to these types of units, AB 394 and the DHS' implementing regulations required staffing ratios for post-partum units, labor and delivery, emergency departments, pediatrics, specialty care (oncology), telemetry, psychiatric units, and mixed units. Mandated ratios had already been in place for other units, including intensive or critical-care units, operating rooms, well-baby nurseries, intermediate-care nurseries and neonatal intensive-care units.

2. California DHS regulations define *Step down unit* as a unit that is organized, operated, and maintained to provide for the monitoring and care of patients with moderate or potentially severe physiologic instability requiring technical support but not necessarily artificial life support. Step-down patients are those patients who require less care than intensive care but more than that which is available from medical or surgical care (California Code of Regulations, Title 22, Section 70217, 2005). A *Telemetry unit* is defined as a unit organized, operated, and maintained to provide care for and continuous cardiac monitoring of patients in a stable condition, having or suspected of having a cardiac condition or a disease requiring the electronic monitoring, recording, retrieval, and display of cardiac electrical signals (California Code of Regulations, Title 22, Section 70217, 2005).

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**New HHS Data Shows Major Strides Made in Patient Safety, Leading to Improved Care and Savings**

The data in this report shows a substantial nine percent decrease in harms experienced by patients in hospitals in 2012 compared to the 2010 baseline, and an eight percent decrease in Medicare Fee-for-Service (FFS) 30-day readmissions. National reductions in adverse drug events, falls, infections and other forms of harm are estimated to have prevented nearly 15,000 deaths in hospitals, and saved \$4.1 billion in costs, and prevented 560,000 patient harms in 2011 and 2012. These historic improvements are a result of strong, diverse public-private partnerships, active engagement by patients and families, and a wide range of aligned federal programs and initiatives – including new tools provided by the Affordable Care Act – working in concert towards shared aims.

**Hospital-Acquired Conditions (HAC) and Readmission Rates Show Improvement**

Preliminary data compiled by the Agency for Healthcare Research and Quality (AHRQ) indicate substantial improvement on a range of measures for hospital-acquired conditions (HACs). CMS data is also showing large reductions in 30-day readmissions rates for Medicare patients.

**Table 1: Improvement in Hospital-Acquired Conditions, 2010-2012**

Measure Focus	Baseline Rate	Most Recent Rate
<b>Incidence of Hospital-Acquired Conditions</b>	145 HACs per 1,000 discharges in 2010 <sup>1</sup>	132 HACs per 1,000 discharges in 2012 <sup>2</sup>

Preliminary nationwide data from 2012 indicates that the HAC rate declined by nine percent from the 2010 level. This corresponds to a reduction in the measured harm rate from 145 harms per 1000 discharges in 2010 to 132 harms per 1000 discharges in 2012. This has resulted in a cumulative total of 560,000 fewer HACs in two years.<sup>3</sup> The reductions in adverse drug events, falls, infections and other forms of harm are estimated to have prevented 15,000 deaths in hospitals, and saved \$3.2 billion in 2012 alone. This represents \$4.1 billion in cumulative savings from the start of the Partnership for Patients.

The efforts underway are leading to concrete differences in terms of dollars saved for our health care system, and even more importantly, saved lives. National leading indicators datasets from the Centers for Disease Control and Prevention’s (CDC) National Healthcare Safety Network (NHSN), the Centers for Medicare & Medicaid Services (CMS), the American Nurses Association’s (ANA) National Database of Nursing Quality

<sup>1</sup> Agency for Healthcare Research and Quality (AHRQ), Centers for Disease Control and Prevention (CDC), and Centers for Medicare & Medicaid Services (CMS), 2010.

<sup>2</sup> Preliminary data from AHRQ, CDC, and CMS, 2012. See Eldridge, ‘Methods Used to Estimate the Annual Partnership for Patients National Hospital-acquired Condition (HAC) Rate’, AHRQ, May, 2014, available at: <http://www.ahrq.gov/professionals/quality-patient-safety/index.html>.

<sup>3</sup> The total 2010 baseline number of HACs is 4,745,000. The 2012 preliminary estimate is 4,316,000 HACs.

Indicators, and the Hospital Engagement Networks (HENs) are also showing dramatic improvements, as indicated in the below table.

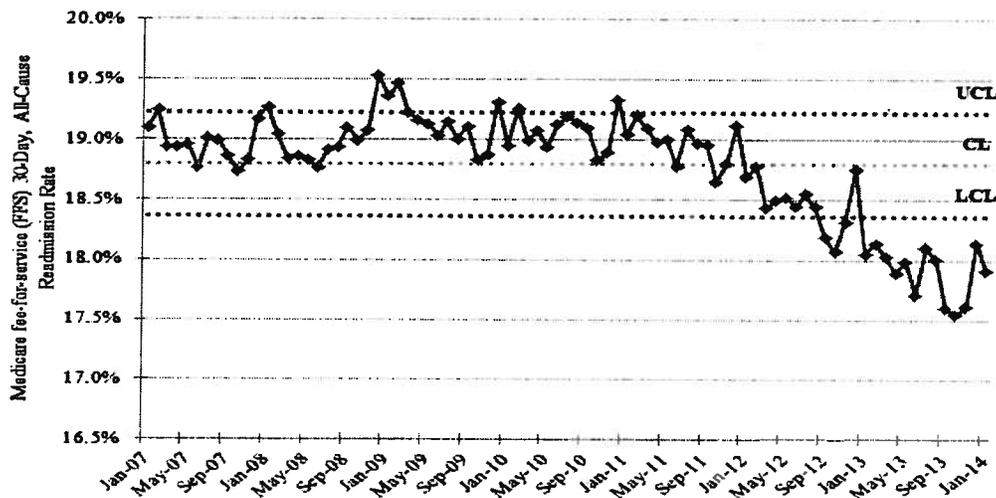
**Table 2: Improvement in Select Hospital-Acquired Conditions from 2010 baseline through 4<sup>th</sup> Quarter 2013**

	Ventilator-Associated Pneumonia (VAP)	Early Elective Delivery (EED)	Obstetric Trauma Rate (OB) <sup>4</sup>	Venous thromboembolic complications (VTE)	Falls and Trauma	Pressure Ulcers
<b>Results to Date</b>	53.2% ↓	64.5% ↓	15.8% ↓	12.9% ↓	14.7% ↓	25.2% ↓
<b>Source<sup>5</sup></b>	NDNQI	HENs	HENs	CMS	NDNQI	NDNQI

The Affordable Care Act is also helping to lead the way in delivery system reform in other large health programs. For instance, the all-cause 30-day hospital readmission rate among Medicare fee-for-service beneficiaries held constant from 2007 to 2011, generally between 19-19.5 percent of beneficiaries readmitted to the hospital within 30 days. This rate fell to 18.5 percent in 2012, thanks in part to provisions of the Affordable Care Act. The Affordable Care Act includes tools – such as tying Medicare reimbursement for hospitals to their readmission rates and the Hospital Value-Based Purchasing Program – to improve the quality of health care that can also lower costs for taxpayers and patients. This means avoiding costly mistakes and readmissions, keeping patients healthy, and rewarding quality instead of quantity.

The all-cause 30-day hospital readmission rate among Medicare fee-for-service beneficiaries plummeted further to approximately 17.5 percent in 2013, translating into an estimated 150,000 fewer hospital readmissions between January 2012 and December 2013.<sup>6</sup> This represents an 8 percent reduction in the Medicare fee-for-service all-cause 30-day readmissions rate.

**Figure 1: Medicare FFS All-Cause, 30-day Readmission Rate<sup>7</sup>**



<sup>4</sup> Obstetric Trauma Rate – Vaginal Delivery Without Instrument (PSI-19).

<sup>5</sup> National Database of Nursing Quality Indicators (NDNQI), Centers for Medicare & Medicaid Services (CMS), and Hospital Engagement Network (HEN) submitted April 2014 data. In HEN-reported data, baseline and current periods vary across HENs.

<sup>6</sup> CMS Office of Information Products and Data Analytics.

<sup>7</sup> CMS Office of Information Products and Data Analytics.

## Partnership for Patients

In April 2011, the Department of Health and Human Services (HHS) joined leaders representing hospitals, employers, health plans, physicians, nurses, and other health professionals, patient advocates, and State and Federal governments to launch the Partnership for Patients, a nationwide public-private initiative to keep patients from being harmed in hospitals and heal without complication. The Partnership for Patients, created by the CMS Innovation Center through authority in the Affordable Care Act, is sharing best practices with over 3,700 hospitals enrolled in the initiative. The primary goals of the Partnership for Patients are to reduce preventable hospital-acquired conditions by 40 percent and 30-day readmissions by 20 percent between 2010 and 2014. The Partnership for Patients is one part of a larger effort within HHS to reduce hospital acquired conditions and readmissions. HHS is working together with public and private partners to move the national needle on patient safety issues.

A core element of the Partnership for Patients is the 27 Hospital Engagement Networks (HENs). The HENs work at the regional, state, national, or hospital system level to help identify solutions already working and disseminate them to other hospitals and providers. The 27 HENs are:

- America's Essential Hospitals Institute (formerly National Public Health and Hospital Institute)
- American Hospital Association
- Ascension Health
- Carolinas HealthCare System
- Dallas-Fort Worth Hospital Council Foundation
- Dignity Health (formerly Catholic Healthcare West)
- Georgia Hospital Association Research and Education Foundation
- Healthcare Association of New York State
- Hospital & Healthsystem Association of Pennsylvania
- Indian Health Service
- Intermountain Healthcare
- Iowa Healthcare Collaborative
- Joint Commission Resources, Inc.
- Lifepoint Hospitals, Inc.
- Michigan Health & Hospital Association
- Minnesota Hospital Association
- New Jersey Hospital Association
- Nevada Hospital Association
- North Carolina Hospital Association
- Ohio Children's Hospital Solutions for Patient Safety
- Ohio Hospital Association
- Premier
- Tennessee Hospital Association
- Texas Center for Quality & Patient Safety
- UHC (formerly University Health System Consortium)
- VHA
- Washington State Hospital Association

Better patient safety also reduces healthcare costs by decreasing the amount of unnecessary medical care that patients and Medicare beneficiaries need. Ten years after publication of the Institute of Medicine's report To Err Is Human, researchers identified rates of medical harm —that is, injuries to patients associated with their

care—in excess of 25 events per 100 admissions. A November 2010 study by the Office of the Inspector General (OIG) found that 13 percent of hospitalized Medicare beneficiaries experience adverse events resulting in prolonged hospital stay, permanent harm, life-sustaining intervention, or death. Almost half of those events are considered preventable.

The Partnership for Patients has identified ten core patient safety areas of focus that include nine hospital-acquired conditions. The work is not limited to these areas, but the following areas of focus are important causes of harm representing the initial focus:

- Adverse Drug Events (ADE)
- Catheter-Associated Urinary Tract Infections (CAUTI)
- Central Line Associated Blood Stream Infections (CLABSI)
- Injuries from Falls and Immobility
- Obstetrical Adverse Events, including Early Elective Deliveries (EED)
- Pressure Ulcers (PrU)
- Surgical Site Infections (SSI)
- Venous Thromboembolism (VTE)
- Ventilator-Associated Pneumonia (VAP)
- Readmissions

As Table 2 illustrates, the Partnership for Patients has found that rapid progress on these patient safety risks can be achieved through implementation of best practices and care improvement collaboration between HHS and the nation's hospitals and health care providers.

#### **Partners in Action to Improve Patient Safety**

The success in reducing readmissions and harm was made possible through the teaming and cooperation of many partners. These partners include the Quality Improvement Organization (QIO) Program, the Medicare Readmissions Reduction Program, the Hospital Value Based Purchasing Program, the Community Based Care Transitions Program, the Agency for Healthcare and Research Quality (AHRQ), the Health Resources and Services Administration (HRSA), the Centers for Disease Control and Prevention (CDC), Hospital Engagement Networks (HENs) listed above, the Administration on Community Living (ACL) aging services networks, the Indian Health Service (IHS), Hospital Engagement Networks, private partners, and many others.

These preliminary successes occur across entire systems of hospitals and across entire States. For instance, through the collaboration with the Healthcare Association of New York State HEN and other patient safety programs and partners, hospitals have achieved significant state-wide results in safety across the board. The results in the 152 hospitals assisted by the Healthcare Association of New York State are shown in the following table:

**Table 3: Healthcare Association of New York State HEN Achievements from 2010 to 2013**

<b>Healthcare Association of New York State HEN 152 Hospitals</b>	<b>ADE: 6.5 % decrease in Rate of Adverse Drug Events (ADEs) for High Alert Drugs Per 1,000 Patient Days [Anti-Coagulants, Insulin, and Opiates]</b>	<b>CAUTI: 36.1% decrease in CAUTI Population Rate Per 10,000 Patient Days</b>	<b>CLABSI: 48.0% decrease in CLABSI Standardized Infection Ratio (SIR) for ICUs Only</b>
<b>Falls: 16.6% decrease in Falls with Injury per 1,000 patient days (NDNQI)</b>	<b>EED: 78.2% decrease in Rate of Scheduled Deliveries &lt;39 Weeks</b>	<b>OB-Other: 4.4% decrease in PSI-19: Obstetric Trauma Rate - Vaginal Delivery Without Instrument</b>	<b>PrU: 45.5% decrease in PSI-03 (Medicare)</b>
<b>SSI: 27.0% decrease in Hip Prosthesis (HPRO) Surgical Site Infection Standardized Infection Ratio (SIR)</b>	<b>VAP: 30.4% decrease in Possible Ventilator-Associated Pneumonia (POVAP) Rate Per 1,000 Ventilator Days</b>	<b>VTE: 20.1% decrease in PSI-12 (Medicare)</b>	<b>Readm: 10.2% decrease in 30-Day All Cause Readmission Rate</b>

Similarly, the hospitals assisted by the Dignity Health HEN have also significantly reduced harm on a system-wide basis across its 35 hospitals.

**Table 4: Dignity Health HEN Achievements from 2010 to 2013**

<b>Dignity Health HEN 35 Hospitals</b>		<b>ADE: 70.6% decrease in hypoglycemic rate (POC results&lt;40 mg/dl)</b>	<b>CAUTI: 52.7% decrease in CAUTI per 1,000 catheter days (house-wide)</b>
<b>CLABSI: 31.4% decrease in CLABSI per 1,000 central line days</b>	<b>Falls: 25.5% decrease in falls with injury (NDNQI definition)</b>	<b>EED: 97.6% decrease in EED rate (PC-01); sustaining rate &lt;1%</b>	<b>PrU: 55.3% decrease in rate of HAPU (all stages)</b>
<b>SSI: 36.3% decrease in SSI/100 targeted procedures</b>	<b>VAP: 52.1% decrease in VAP per 1,000 vent days</b>	<b>VTE: Sustaining low (benchmark) VTE rate (PSI-12) for the Medicare population</b>	<b>Readm: 14.3% reduction in Medicare FFS readmissions</b>

## Conclusion

These improvements are a result of strong, diverse public-private partnerships, active engagement by patients and families, and a wide range of aligned federal programs and initiatives. In 2014, HHS will continue to accelerate delivery system reform efforts by working with its nationwide partners to capitalize on these recent successes to achieve its patient safety goals. We will continue the close teamwork with hospital systems, governmental organizations, patients, providers, and private partners that are the foundation for success.

The efforts by HHS and its partners to improve care while achieving savings, including the Partnership for Patients and in conjunction with new tools provided by the Affordable Care Act, show that we are well on the way towards increasing patient safety, reducing healthcare costs, providing a more sustainable healthcare system for providers, all while bringing the best, safest possible care to patients. There is more to do to improve patient safety, including further reducing readmissions, and we intend to leverage the work that has been accomplished already to make more improvements in patient safety. Groups that want to join us in our efforts to improve patient safety should visit: <http://partnershipforpatients.cms.gov/>.