Minimum Nurse Staffing Ratios in California Acute Care Hospitals

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Executive Summary

In 1999, California passed Assembly Bill 394, the first comprehensive legislation in the United States to establish minimum staffing levels for registered nurses (RNs) and licensed vocational nurses (LVNs) working in hospitals. AB 394 directs the California Department of Health Services (DHS) to establish "minimum, specific, and numerical licensed nurse-to-patient ratios by licensed nurse classification and by hospital unit." The legislation also explicitly limits the range of tasks that may be performed by unlicensed personnel. Draft regulations are to be released in early 2001.

This report, prepared by researchers in the UCSF Center for the Health Professions as part of their California Workforce Initiative (CWI), provides objective research and analysis to inform the DHS in the development of minimum nurse staffing ratios. The authors examined the existing literature and conducted original research in a number of areas to shed light on the impact that nurse staffing ratios may have on patient care, nurses' working environment, hospitals, and the size and cost of the nursing workforce.

Nurse staffing and quality of care. Since concerns about quality of care will underlie DHS decision making, the authors looked at assumptions about the relationship between levels of nurse staffing and quality of care. Although the data are not conclusive, there is some evidence that an increase in nurse staffing is related to a number of positive patient outcomes. Unfortunately, the studies are not specific enough to provide ideal nurse-to-patient ratios. Several studies have found that higher percentages of RNs in the skill mix or higher RN FTEs per patient census were associated with decreased risk-adjusted mortality; decreased urinary tract infection, thrombosis, and pulmonary complications in surgical patients; decreased pressure ulcers; decreased pneumonia; lower rates of postoperative infection; and fewer medication errors. But several studies with both large and small sample sizes have found skill mix to be unrelated to mortality, treatment problems, medication errors, falls, patient injuries, and postoperative complications.

Current levels of staffing. Data from California's Office of Statewide Health Planning and Development (OSHPD) indicate that there is a wide range of nurse staffing ratios in the state's hospitals. For example, in medical-surgical acute care units, half of hospitals report RN hours per patient day between 3.35 and 5.10—these same hospitals have ratios ranging between 4.7 patients per RN to 7.2 patients per RN. Rural hospitals tend to have a larger number of staff per patient because they must

maintain a higher share of extra staff in case of unexpected admissions or changes in the illness levels of patients.

To look more closely at current staffing, the authors mailed a survey to all 410 acute care hospitals in California, receiving responses from 112. Comparisons with OSHPD data indicate that the sample of hospitals in this dataset (the "CWI survey") is reasonably representative of California hospitals. In the CWI survey hospitals, the range of patients per RN during the day shift was between 5 and 12; on the night shift the range was 6 to 26.

California staffing compared to other states. The American Hospital Association's Annual Survey of Hospitals was used to compare RN staffing in California to other states. California was found to have a higher average and median number of RN hours per adjusted patient day than the nation as a whole. Eighteen states have higher average RN hours per patient day than California, and California is ranked 19th in median RN hours per patient day.

Staffing in "best practices" hospitals. To further compare California's hospitals to others, the authors identified hospitals that might follow "best practices" with regard to nurse staffing and/or quality of patient care. Staffing was examined at hospitals that were: recognized by the American Nurses Association's Magnet Hospital program; commended by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO); listed in *USA Today's* Top 100 Hospitals; listed in *US News and World Report's* set of high-quality hospitals; noted for having better-than-expected mortality for heart attacks and newborn readmission rates by the Pacific Business Group on Health (PBGH); and/or recognized by the Bay Area Consumer Checkbook for high quality. Interestingly, staffing data for best-practices hospitals do not uniformly indicate that hospitals rated highly for quality of patient care have richer staffing than do other hospitals.

Cost factors. The cost of AB 394 will depend on the minimum staffing ratios established by the Department of Health Services. The regulations could affect very few hospitals or could impact a significant share of facilities. To help estimate potential costs, the authors looked at proposals for minimum staffing issued by the Service Employees International Union (SEIU) and the California Healthcare Association (CHA), as well as the original version of the bill, which included specific staffing ratios. They examined the share of hospitals that would be affected by each of these proposals and the associated costs of compliance. The CWI survey indicates that virtually no hospitals would need to change their medical-surgical staffing in response to the CHA proposal of one RN to 10 patients. OSHPD data show that about 17% of hospitals would need to increase medical-surgical staffing to meet CHA requirements. In contrast, both CWI and OSHPD data indicate that more than 80% of both rural and non-rural hospitals would have to increase staffing to meet SEIU's proposed ratio of one RN per four patients in medical-surgical units.

It follows that, depending on the staffing ratios eventually adopted, hospitals might see their expenditures for RNs increase between 4.6% and 30.7%. The Los Angeles region, where more than 40% of the state's hospitals are located, would be affected by all proposed minimum staffing ratios more than other regions; predicted RN expenditure increases in that region range between 6% and 35.6%. Although the three proposals would have substantially smaller effects in the Sacramento, San Diego, Northern Mountain, and Sierra Nevada regions, the proposals would nevertheless have a substantial impact on much of the state's hospital industry.

Implementation issues. The researchers examined potential pitfalls associated with implementation of AB 394. A key factor that will affect the overall impact of the minimum staffing standards is how they will relate to current regulations. Two decades ago, Title 22 of the California Code of Regulations mandated minimum licensed nurse-to-patient ratios for intensive care and coronary care units as one licensed nurse per two patients. More recently, Title 22 was revised to require that hospitals develop patient classification systems (PCSs) to predict their nursing staffing needs on a shift-by-shift basis, and to staff accordingly. Hospitals must submit their PCS to the state, but there is little guidance about what characterizes a valid PCS. These regulations will be in effect even after minimum nurse-to-patient ratios are established under AB 394. If a hospital's PCS dictates that the hospital should be staffing more richly than the minimum ratios, the hospital is expected to abide by its PCS.

It should be noted that there is widespread distrust of virtually all patient classification systems currently in use. Nursing unions, for example, allege that patient PCSs are developed to meet budget requirements rather than patient needs, and that compliance with PCSs is low. Many nurses and others believe such systems are not useful in predicting short-term staffing needs (although they are somewhat effective in predicting nursing needs and costs over a longer period such as a year or a month).

The researchers found concern about a potentially important pitfall of minimum staffing ratios: that the minimum becomes the average staffing level as hospitals reduce their staffing to the lowest level required. This danger may be ameliorated because hospitals will be required to adhere to Title 22. But enactment of new minimum staffing ratios could lead hospitals to redevelop their patient classification systems, which may result in a reduction in RN-to-patient ratios in many hospitals.

Realities of the current provider marketplace were also studied. A crucial factor in the implementation of minimum staffing ratios is California's current nursing shortage, a workforce deficit that demographic projections indicate will worsen over the next two decades.

Further, California's hospitals have been facing considerable financial difficulty in recent years, and minimum staffing ratios could place significant additional pressure on them. Hospital revenues have declined as a result of managed care, lower reimbursement for Medicare as a result of the Balanced Budget Act (BBA) of 1997, and low payments from Medi-Cal. Hospitals also are addressing several expensive federal and state mandates. The federal Health Insurance Portability and Accountability Act of 1996 is driving hospitals and insurers to develop expensive record-keeping systems, while California's Hospital Facilities Seismic Safety Act of 1994 requires that hospitals complete extensive seismic retrofits to guarantee their operation after a major earthquake. The Seismic Safety Act is estimated to cost California's hospitals more than $20 billion by 2030. AB 394 has the potential to increase the financial pressure on hospitals significantly, since, according to OSHPD data, nursing costs comprise approximately one-sixth of hospital budgets, on average. Any increase in nursing costs resulting from AB 394 will come at a time when some hospitals are closing and many hospitals are merging in response to financial challenges.

Conclusions and recommendations. The fundamental conclusion reached by the researchers is that the data and research literature do not indicate what minimum nurse staffing ratios might be ideal, and that required minimums are likely to incur cost, workforce, and other significant impacts. The researchers urge the DHS in its deliberations to: consider all research and data available; be sensitive to the political nature of the issues involved; ensure that hospitals do not use the minimum

standards as a justification for reducing their RN staffing; and be sensitive to the needs of financially troubled hospitals and the communities they serve.

In addition, the researchers noted that the implementation of minimum nurse-to-patient staffing ratios will provide a unique opportunity to learn about the relationship between nurse staffing and the quality of patient care. Because every source of data has limitations, the Department of Health Services and other interested parties should support multiple analyses of multiple data sources to evaluate the effect of AB 394. All researchers examining this issue should make their data publicly available at the conclusion of their research, to protect their studies from allegations of bias or incompetence, and to enrich the public debate. Thorough evaluation of the effects of AB 394 will not only help California policymakers and nursing and hospital industry leaders make decisions in the future but will add to the knowledge of other states that will look to California as a model for their own legislation.

Background

In 1999, California passed Assembly Bill 394, the first comprehensive legislation in the United States to establish minimum staffing levels for registered nurses (RNs) and licensed vocational nurses (LVNs) working in hospitals. It directs the California Department of Health Services (DHS) to establish "minimum, specific, and numerical licensed nurse-to-patient ratios by licensed nurse classification and by hospital unit" and explicitly limits the range of tasks that may be performed by unlicensed personnel.

Dearth of Information

AB 394 may have a major impact on demand for nursing personnel, the adequacy of nursing supply, and the quality of nursing care provided to patients. Stakeholders, such as hospitals and unions representing nurses, see the legislation's potential in very different terms, and hope for regulations that support their perspectives. Unfortunately, there has been little research examining the adequacy of nurse staffing in U.S. hospitals, and in 1996 the Institute of Medicine stated that the literature was inadequate to make a recommendation for minimum nurse staffing (Wunderlich, 1996). In fact, DHS and the organizations with an interest in minimum staffing have little information on which to base minimum nurse staffing requirements, although some related work has been done in the following areas:

Staffing in long-term care environment. Although there has been no recommendation for a particular minimum ratio in the research literature on acute care hospitals, specific recommendations have been made for other health care environments, such as nursing homes. Geriatric experts are advocating minimum ratios for long-term care, specifically one licensed nurse per 15 residents (patients) on day shift, one licensed nurse per 20 residents on evening shift, and one licensed nurse per 30 residents on night shift (Harrington, et al., 2000). Data analyses demonstrate that a higher ratio of RNs to residents in long-term care is correlated with positive patient care (Harrington, et al., 2000; Johnson-Pawlson and Infeld, 1996). The Health Care Financing Administration mandates minimum nurse staffing ratios in long-term care facilities as a condition of receipt of Medicaid and Medicare reimbursement. It requires that an RN be the director of nursing; that an RN be on duty for an eight-hour shift every day of the week; that a licensed nurse (RN or LVN/LPN) be on duty on evenings and nights; and there be sufficient other staff to provide care (Harrington, et al., 2000).

States' efforts. In acute care hospitals, DHS cannot rely on other states to provide examples for minimum nurse-to-patient ratios because California is the first state to pass such legislation. This is not the first time that California has taken the lead on nurse staffing regulations. Two decades ago, Title 22 of the California Code of Regulations mandated minimum licensed nurse-to-patient ratios for intensive care and coronary care units as one licensed nurse per two patients. Fifteen states have considered mandating comprehensive nurse staffing levels, including Hawaii, Massachusetts, Nevada, New Hampshire, New Jersey, Oregon, Rhode Island, Tennessee, and West Virginia (American Nurses Association, 2000). New York and Massachusetts have passed legislation requiring formulae to be developed that ensure safe patient care (Ballard, 2000; Ober, 2000). New Jersey regulations state that licensed nurses shall provide at least 65% of the direct care hours; and Massachusetts requires an acuity (severity of illness) system for patient classification ("Massachusetts Nurses Association wins…", 1997). Other states are proposing nurse staffing data be available to state authorities and/or the public. For example, New Mexico's legislature has appropriated funds to do a nursing workforce study, and New Hampshire approved a Health Care Quality Commission that will collect hospital reports on a number of variables, including rates of RNs per bed.

*Substitutes for staffing requirements.*Various patient classification systems (PCSs) are in use in California hospitals. The proliferation of such systems is the result, in part, of revisions to Title 22 in 1996, requiring hospitals to develop PCSs to predict their nurse staffing needs on a shift-by-shift basis and to staff accordingly (Title 22, Divison 5, Ch 1, Section 70053.1, p. 761). Hospitals must submit their PCS to the state, but there is little guidance about what characterizes a valid PCS.

In the absence of definitive research, some professional nursing organizations have created "guidelines" on staffing ("Staff models for the next millennium," 1999). Also, some individual hospitals have established nurse staffing policies, generally in response to union negotiations. In 1990, Liberty Medical Center in Baltimore, Maryland negotiated a 1-RN-to-8-medical-surgical-patients ratio for days and evenings and a 1-to-10 ratio for nights ("Maryland RNs win big…", 1990); in 1997, Cape Cod Hospital in Hyannis, Massachusetts negotiated a 1 RN-to-5-medical-surgical-patients ratio and a skill mix of 85% RNs and 15% aides ("Massachusetts Nurses Association wins…", 1997). Conversely, hospitals that have publicized their staffing ratio reductions have faced strong protests. For example, St. Francis Hospital in Milwaukee, Wisconsin, was criticized harshly when it dropped its ratio from 1-RN-per-6- medical-surgical patients to 1-RN-per-8 medical-surgical patients in 1998 ("Ratio ruckus", 1998). Mercy Hospital in Springfield, Massachusetts, had nurses file more than 180 unsafe staffing forms in 1998 while maintaining nurse-to-patient ratios of 1-to-10. (Unsafe staffing forms are generally the nurses' only recourse unless there is a negotiated agreement between the union and the hospital.)

History of AB 394: The Political Landscape

The passage of AB 394 came after several years of lobbying by nursing unions (Herscher, 1997); reports in the press of declining hospital quality (Kunen, 1996; Rosenthal, 1996; Shuit, 1996); research efforts to measure the effect of staffing on patient care (Wunderlich, 1996; Aiken, 1994 ; Blegen, 1998; Kovner, 1998); and previous attempts to enact similar legislation.

Nurse staffing ratios have been in the public eye for decades, largely due to ongoing cycles of shortages and surpluses of RNs since World War II (Friss, 1994). Through these cycles, hospitals have increased and reduced their staffing of RNs, relative to other licensed and unlicensed caregivers, based on the availability of staff, financial constraints, and managerial trends (Felton,

1975; Wobbe, 1978; Clifford, 1980). Changes in the proportion of RNs to total staff, and in workload configurations, have gone by many names, including primary nursing, team nursing, work redesign, and changes in skill mix. Although quality of patient care is usually the stated reason for changing the RN skill mix in hospitals, the overriding reason has been economic (Tidikis and Strasen, 1994; Walleck, 1994).

In the past decade, hospitals have faced significant pressure to reduce their costs, as managed care insurers have negotiated for lower reimbursements and capitated contracts. Hospital administrators and nurse executives have tried to reduce the amount spent on nurses' salaries because expenditures for nursing personnel are a large part of every hospital's budget. In the mid-1990s, newspaper articles reported that hospitals were reducing their use of RNs by replacing them with unlicensed assistive personnel in response to cost-cutting pressures (Rosenthal, 1996; Kunen, 1996; Shuit, 1996). In one example, Kaiser Permanente Northern California unsuccessfully tried to reduce the RN-to-total staff mix from more than 70% to 55% in the early 1990s and to 30% in 1995 (Robertson and Samuelson, 1996). Generally, such changes in skill mix have led to a perceived increase in workload for RNs, and eventually to nurse and consumer complaints ("Quality patient care…", 1996). Although registered nurses have worked with assistants for many years, they generally have mixed feelings about the assistant role. The assistant is able to assume many of the custodial and clerical duties that often are part of the RN job, but there is an anxiety that the assistant will assume too much responsibility and jeopardize the RN's position as the person primarily responsible for patient care (Brown, 1995; Cone, 1995; Dickinson and Jackson, 1999; Krainovich Miller, et al., 1997; Naish, 1998; Reisdorfer, Pankonin, and Larsen, 1993). RNs also have expressed concerns about the quality of care provided by unlicensed personnel.

Loud protests from nurses were heard in the mid-1990s following the latest round of redesign/downsizing, as exemplified by the organization of a nurses' march on Washington, D.C. (Abbott and Mahoney, 1995). Across the nation, state nurse newsletters have chronicled nurses' displeasure about staffing and other workplace issues, such as mandatory overtime ("Workplace issues…", 1995; "Survey find loss of RNs…", 1995; "National survey finds…, 1995). Patient advocates, nursing unions, and other observers argued that staffing changes have reduced the quality of care provided by hospitals (Rosenthal, 1996).

Organizations Represent Differing Viewpoints

The lack of research on the relationship between nurse staffing and patient outcomes has been problematic for both nurse executives and staff nurses, because decisions about nurse staffing do not have a scientific basis and are instead based on economics and anecdotes. Nurse executives are charged with providing safe patient care at a responsible cost. The need to control the cost of nursing care is in conflict with the need of unions to protect jobs and wages and, some allege, in conflict with the needs of patients. Nurse executives and managers are frequently at odds with staff nurses over these matters, especially those staff nurses who are represented by labor unions.

A number of organizations represent nurses' and other stakeholders' interests in staffing matters. The most prominent organization representing nurses in California is the California Nurses Association (CNA). It was founded as the state affiliate of the American Nurses Association (ANA) and, over time, developed a strong emphasis on representing staff nurses in collective bargaining. In 1994 the CNA, which represents approximately 21% of RNs in California, severed ties with the

ANA, saying the national organization was no longer able to represent the interests of staff nurses, particularly with regard to staffing concerns.

Other major unions representing nurses in California include Service Employees International Union (SEIU) and United Nurses of California. SEIU is different from most nursing unions because it represents many categories of hospital personnel in addition to RNs, including clerks, LVNs, food service, and janitorial staff. There is some competition between CNA and SEIU because the two unions have tried to organize RNs in the same hospitals and have not honored each other's picket lines.

AB 394 was the culmination of several years of effort by the CNA to mandate minimum nurse staffing ratios. In 1996, the CNA cosponsored Proposition 216, which focused on universal health insurance in California but also would have required that DHS adopt standards to determine the numbers and classifications of licensed or certified direct caregivers necessary to ensure safe and adequate staffing at all health care facilities. During the 1997-98 legislative session, the CNA sponsored AB 695 (Kuehl), which was approved by the legislature but vetoed by former Governor Pete Wilson.

SEIU also has sponsored nurse staffing legislation. AB 675, introduced during the 1999-2000 legislative session, would have strengthened the Title 22 requirement for use of patient classification systems. It should be noted that there is widespread distrust of virtually all patient classification systems currently in use in California. Nurse unions allege that hospitals develop PCSs to meet budget requirements rather than patient needs, and that compliance with PCSs is low. AB 675 would have closed several perceived loopholes in the PCS requirements and called for unannounced inspections of hospitals to ensure compliance. AB 675 was passed by the legislature but was vetoed by Governor Davis in 2000.

Several organizations have vigorously opposed the establishment of minimum nurse-to-patient staffing ratios in California. The most prominent of these is the California Healthcare Association (CHA), which represents hospitals. This organization is often associated with the Association of California Nurse Leaders (ACNL), which supports the interests of the nurse executives. Many nurse executives, educators, and managers are involved in ANA\California, which was created as the California affiliate of the ANA when the CNA separated from the national organization, an event that reflected a bitter division among nurses in California. To date, ANA\C has not become a strong political player in California, most likely because its membership is much smaller than that of CNA.

While ACNL and ANA\C do not support minimum nurse staffing legislation, they have an interest in the relationship between nurse staffing and the quality of care. These organizations cosponsor the California Nursing Outcomes Coalition (CalNOC), the largest of seven American Nurses Association's state nursing quality indicator research and development projects. The members of CalNOC's Steering Committee include nurse consultants, nurse administrators, and representatives of CHA and ACNL. Their objective is to collect data in California acute care hospitals at the nursing unit level to examine the relationship between nurse staffing and various patient outcomes. Because CalNOC has close ties to the hospital organizations, the CNA and SEIU have expressed mistrust of the impartiality and validity of CalNOC's research.

The major organizations described above have provided substantial information to DHS about the nurse-to-patient ratios they recommend and the reasons for their proposals. It is no surprise that the

CHA and ACNL disagree with the CNA and SEIU about what the minimum nurse-to-patient staffing ratios should be in acute care hospitals. The original version of AB 394 included specific staffing ratios, presented in the first column of Table 1. The CNA has said it will release new recommended minimum nurse-to-patient ratios this winter.

SEIU released its own proposal in January 2000; their recommendations are in the second column of Table 1. Their ratios are similar to those of the original version of AB 394, with the main exception that SEIU recommends a richer nurse-to-patient ratio in medical-surgical acute care units. SEIU also has recommended minimum ratios for unlicensed and non-nursing personnel, but these recommendations are beyond the scope of AB 394 and thus unlikely to be implemented.

Finally, the CHA has issued its own recommendation, detailed in the third column of Table 1. They propose substantially leaner nurse-to-patient ratios than do the unions. Other organizations, including the University of California's hospitals, have provided DHS with their own recommendations for minimum nurse staffing; most fall somewhere between the SEIU and CHA proposals.

Table 1: Proposed Minimum Staffing Mandates

There are substantial differences in the proposals made by statewide organizations.

Unit	Original version of AB 394	SEIU proposal*	CHA proposal
Medical-Surgical Acute	1:6	1:4	1:10
Pediatric Acute	1:3	1:3	1:6
Critical Care; Intensive Care	1:2	1:2	1:2
Stepdown	1:3	1:3	1:6
Intermediate Care	1:3	1:5	1:6
Telemetry	1:4	1:3	1:10
Oncology	1:4		1:10
Emergency Room	†	†	1:6
Transitional Care	1:6		1:12
Behavioral Health		**	1:12
Nursery	1:4 – 1:6 §	1:4 – 1:6 #	1:8
Labor and Delivery	1:2	1:2	1:3
Postpartum	1:4 – 1:6 §	1:6	1:8
Operating Room	‡		1:1
Subacute Care	1:6		
Neurosurgical Radiological Intervention		1:1	
Recovery Room	1:2	1:2	

* SEIU proposal specifies RN or LVN in most cases. The SEIU proposal also specifies staffing ratios for non-RN personnel, such as clerks. The original version of the legislation specified RNs (not LVNs).
† The original version of the bill called for 1 RN to 2 critical care patients in ER. No specific ratio for other ER patients stated. SEIU proposal is 1 RN/LVN per 3 patients, 1 RN per trauma patient, and 1 RN/LVN per 2 critical care patients.
‡ One RN can serve as a circulating assistant for only one operating room.
§ Ratio depends on whether these units are defined as "specialty care".
# Ratio depends on status of infants: 1 RN/LVN to 4 close observation infants; 1 RN/LVN to 6 normal infants. In addition, 1 RN/LVN should be assigned to nursery for every 5 mothers in Labor and Delivery.
** One RN, LVN, or Psychiatric Technician per 3 patients.

The Literature on Nursing Staffing, Quality of Care, and Quality of Jobs

Studies of Nurse Staffing and Patient Outcomes

The overriding concern of DHS will be the effect that minimum nurse staffing ratios might have on the care that patients receive. Although the data are not conclusive, there is evidence that increases in nurse-to-patient ratios and nursing skill mix are related to a number of positive patient outcomes. Unfortunately, the studies are not specific enough to provide ideal nurse-to-patient ratios.

Studies of skill mix are relevant to the implementation of AB 394 because the legislation requires DHS to establish staffing ratios for all "licensed nursing personnel," including both RNs and LVNs. A number of studies aggregated data to the hospital level and found that higher percentages of RNs in the skill mix or higher RN FTEs per patient census was associated with decreased risk-adjusted mortality (Aiken, Smith and Lake, 1994; Aiken Clarke, and Sloane, 2000; Hartz, et al., 1989; Kuhn, et al., 1994). Other studies, also aggregating data to the hospital level, found that higher RN hours per patient day were associated with lower nosocomial infection rates (Archibald, et al., 1997); decreased urinary tract infection, thrombosis, and pulmonary complications in surgical patients (Kovner and Gergen, 1998); and decreased pressure ulcers, pneumonia, postoperative infection, and urinary tract infection (American Nurses Association, 1997; Lichtig, Knauf, and Milholland, 1999). These outcomes are considered to be particularly sensitive to nurse staffing levels and ratios. A study in 23 hospitals found that lower ratios were related to higher readmission rates but were not related to mortality rates (Hunt and Hagen, 1998).

Because of the cost of primary data collection, data by individual nursing unit are scarce. Early studies often involved only one or two hospitals or units, which, of course, limits the generalizability of the results. One study examined nurse-to-patient ratios in a single ICU and found that lower ratios (i.e., fewer RNs per patient) were related to an increase in bloodstream infections associated with central venous catheter (Fridkin, et al., 1996). A study of one NICU argued that understaffing and overcrowding of patients led to an outbreak of Enterobactor cloacae (Harbarth, et al., 1999). In another study of a surgical ICU, the authors found that an increase in the use of nurses from temporary placement agencies was related to an increase in bloodstream infection (Robert, et al., 2000).

More recent unit-level research has examined multiple units or facilities. In a study of 42 ICUs, Shortell et al. (1994) found that low nurse turnover was related to shorter length of stay. Another study of 65 hospital units associated an increase in nurse absenteeism with an increase in urinary tract infection and other patient infection, but not other adverse events (Taunton, et al., 1994). In studies of 39 and 42 nursing units, Blegen, Goode, and Reed (1998) and Blegen and Vaughn (1998) found that as the percentage of RNs per total staff (skill mix) increased there was a decrease in medication errors, decubitus ulcers, and patient complaints up to a skill mix of 87% RNs. Above 87%, there was an increase in these adverse events. (This increase in the adverse events may be explained by the inclusion in the sample of intensive care units, which typically have higher skill mixes and mortality rates; therefore the adverse relationship at the highest skill mix may be spurious.)

In some studies, increasing skill mix was associated with reductions in risk-adjusted mortality (Aiken, Smith, and Lake, 1994; Aiken, Clarke, and Sloane, 2000; Hartz, et al., 1989; Kuhn, et al., 1994), and in patient falls and length of stay (Grillo-Peck and Risner, 1995). However, several studies with both large and small sample sizes have found skill mix to be unrelated to mortality (Mitchell and Shortell, 1997; Robertson and Hassan, 1999; Silber, et al., 1995; Zimmerman, et al., 1993). Others have found skill mix to be unrelated to treatment problems, postoperative complications, unexpected death rates, or unstable condition at discharge (Wan and Shukla, 1987), and no relationship between skill mix or nursing hours per patient day and medication errors, falls, patient injuries, and treatment errors (Wan, 1992). In an early study of primary (all RN) versus team nursing care delivery systems, there was no relationship between percent of RNs and quality of care as measured by nurse report (Shukla, 1981). In another study of 23 hospitals in the Netherlands, there was no relationship between RN-to-patient ratio and incidence of falls (Tutuarima, et al., 1993).

Because many staffing studies have data aggregated to the hospital level, it is difficult to make decisions on staffing at the nursing unit level. Additionally, many studies, especially early ones, had a sample size too small to find an effect size, even if it existed, so conclusions may be flawed. Because most studies do not use random selection of units or hospitals, it is not possible to make generalizations to other institutions.

Studies of Nurse Staffing and Nursing Outcomes

Proponents of minimum nurse-to-patient legislation assert that increased staffing ratios will improve working conditions in hospitals and, thus, enhance recruitment and retention of RNs. And there is modest evidence that richer nurse-to-patient ratios are associated with better workplaces for nurses and a safer environment for patients.

A number of early studies demonstrated a relationship between high workload for nurses and nurse "burnout," defined as emotional exhaustion, depersonalization, and a feeling of a lack of personal accomplishment (McCranie, Lambert, and Lambert, 1987; Robinson, et al., 1991). Further, nurses working full time versus part time scored significantly higher on emotional exhaustion (Jackson, 1988). Job satisfaction for nurses was shown to be related to "safe nurse-to-patient ratios" (White, 1990).

There is some evidence, although not definitive, that nurses' satisfaction with their work is related to patient satisfaction (Beech, 1995). Studies of the Magnet Hospitals (those designated by ANA as good places for nurses to work) have found that an increase in RN-to-patient ratio decreases burnout, increases job satisfaction, and enhances quality of patient care as judged by nurses (Aiken,

Havens, and Sloane, 2000). Finally, increased self-reported stress of nurses has been found to be related to adverse patient events and nurse injuries (Dugan, et al., 1996).

Although results are not yet available, a nationwide survey was launched late in 2000 by the ANA to measure nurses' feelings about their working conditions, e.g., staffing levels, mandatory overtime, use of unlicensed assisting personnel, and other issues.

It should be noted that, while no studies directly address the issue, imposition of rigid staffing standards on an inherently dynamic workforce will have a cost (Buerhaus, 1997). Citing the proven ability of RNs, as a professional group, to adapt to new professional environments, changes in staffing structures, advances in technology, and numerous health system reforms, opponents of minimum staffing standards fear the requirements will limit the ability of hospital RNs to re-create themselves as their environment changes. On the other hand, supporters of minimum staffing regulations insist that the "adaptation" expected of them in the present health care environment has been detrimental to the practice of nursing (Institute for Health and Socio-Economic Policy, 1999).

Data Analysis Issues and Pitfalls

Data Sources

Two major sources of data on nurse staffing are available to the public: annual Hospital Disclosure Reports ("financial data") from California's Office of Statewide Health Planning and Development (OSHPD), and the Annual Survey of Hospitals from the American Hospital Association (AHA). Some researchers collect original data on hospital staffing, which are generally not publicly available. Each data source has its own advantages and disadvantages.

OSHPD data

Since 1975, OSHPD has been collecting information on California's nonfederal hospitals. The oldest survey, the Hospital Disclosure Reports, contains data about hospitals' staffing levels, financial status, patient loads, service mix, cost allocations, medical staff, and medical residency programs. All nonfederal hospitals are required to respond to at least part of this survey; Kaiser Foundation hospitals complete only the first few pages of the survey, but all other hospitals must complete the whole instrument. Most hospitals fill in the survey using their own accounting records; for example, the staffing data are usually provided from the payroll department's records. Data are available for many of the cost centers of hospitals, such as those in the groups of "total daily services" (inpatient care, including acute care units, intensive and critical care units, long-term care, observation care, etc.), "ancillary services" (laboratories, operating rooms, emergency room, diagnostic and therapeutic units), and "ambulatory services" (outpatient surgery, same-day-stay units). OSHPD examines the data for internal consistency and does other audits on occasion.

OSHPD's second major dataset related to acute care hospitals is the Patient Discharge Data. Since 1982, OSHPD has required that all nonfederal hospitals provide an abstract of each inpatient discharge. These data are used in staffing studies to examine the severity of illness (case mix) of patients.

The main advantages of the OSHPD data are that they are publicly available, have been collected for more than 20 years, and include nearly every hospital in California. OSHPD's survey of hospitals is considered the most comprehensive in the United States, and is upheld as a model for other states. The data are provided for each cost center, allowing users to examine regular acute care units separately from intensive care or ancillary service units. Finally, the staffing data provided are for the

number of productive hours (paid hours, not including vacation, sick leave, etc.) worked by staff, rather than the number of full-time equivalent personnel. The number of productive hours worked by nursing personnel can be divided by the number of patient days to obtain HPPD (hours worked per patient day). The skill mix at a hospital can be computed because each type of nursing staff is reported separately. Thus, the OSHPD data allow any researcher to examine a number of measures of nurse staffing, for different types of units, for nearly all hospitals in the state.

Despite its advantages, the OSHPD information has several shortcomings as well. First is the possibility of misreporting, both in general and by specific units. Because the data are self-reported by hospitals, they are subject to any errors in hospitals' financial, payroll, and data systems. A main concern with the staffing data is that hospitals may not report the unit in which the hours were worked accurately; some intensive care hours may be reported as acute care hours, and so on. Further, direct patient care hours are not reported. The hospital is asked to exclude vacation, sick, and other nonproductive hours from the staffing totals, but the hospital does not indicate whether these hours were associated with direct patient care or indirect support. The second major shortcoming of the OSHPD data is its aggregated nature. Hospitals report the data annually, for each of their fiscal years, rather than on a monthly or shift-by-shift basis. The third concern is that the data are not collected and released immediately – the newest survey is usually one to two years old. Finally, OSHPD does not collect full information from Kaiser Foundation hospitals; thus, about 5% of California's nonfederal hospitals do not provide staffing data.

American Hospital Association data

Researchers who want to examine national patterns of staffing have only one source of data available: the AHA's Annual Survey of Hospitals. The AHA has been collecting these figures from their member hospitals for decades. Most hospitals are members of the AHA, so although the survey is not a complete national sample, it captures a large share of the country's hospitals.

Unfortunately, the AHA data have many shortcomings. The most significant problem is that when hospitals do not respond to the survey or to a particular question in the survey, the AHA imputes a response for the hospital. Thus, some of the data are estimated rather than a true self-report, which may substantially reduce accuracy.

There are several problems with the staffing data provided by the AHA. First, the survey reports staffing of RNs and LVNs only (LVNs or Licensed Vocational Nurses are called Licensed Practical Nurses, or LPNs in most states); unlicensed nursing personnel are not included. Second, the survey asks hospitals to report the number of full-time staff and the number of part-time staff, but does not provide a guideline about how many hours a week a nurse must work to be considered a full-time employee; thus, hospitals may vary in their definition of full-time versus part-time staff. The numbers of staff are transformed into full-time equivalent employees (FTEs) by assuming that part-time staff works 20 hours per week on average. For nursing staff, this assumption is not valid. The National Sample Survey of Registered Nurses suggests that part-time nursing personnel average closer to 30 hours per week. Thus, the FTE employment tends to underestimate the number of hours worked by nursing personnel. Finally, the AHA does not disaggregate nurse staffing by hospital unit; the staffing data are for the entire hospital, including long-term care units, outpatient units, and, potentially, administration. Comparisons between these data and the number of days of patient care are problematic because the staffing data span a wider range of units than discharges and patient days measure. To partially accommodate for this problem, one can compare staffing

FTEs to "adjusted patient days," for which the AHA adds to inpatient days an estimate of the "load" of outpatient care. AHA also provides "adjusted discharges."

Data from private surveys

Numerous researchers have collected information from hospitals about their staffing and other characteristics. Such survey data have the advantage of being timely and containing the exact information the researchers need for their study. Researchers can obtain more information specific to nursing and ask a variety of questions about cultural and organizational characteristics of hospitals. Perhaps most important, surveys can obtain data for individual units of the hospital, thus avoiding the problems of aggregation described above.

While survey data may appear ideal for analyses of nurse staffing, they present several problems. First, because original data collection is very expensive, surveys are usually of limited size. The sample of hospitals or units may not represent a single category of hospital, state, region, or nation. In addition, the time period covered by the survey is usually short, and thus comparisons cannot be made over time. Surveys often ask questions that cannot be directly compared to other sources of data, so one cannot assess the extent to which a survey represents a broader sample or relates to changes over time.

This type of research also can suffer from reporting errors. Many surveys are sent to unit managers or nursing administration, and the person completing the survey may not have accurate data to complete the instrument. Managers and administrators may respond with their best guess of the correct information. In some cases, this is adequate, but unless the survey can be compared to other sources of information, the extent of the bias cannot be assessed.

A final difficulty with original surveys is that the data typically are not publicly available. As a result, the findings of the study cannot be replicated, different analytical techniques cannot be tested, and additional data cannot be added to the original survey to test new hypotheses. In the worst cases, the survey may be criticized for being collected and analyzed in a biased fashion, particularly if it is sponsored or funded by an interest group. If the data cannot be examined by outside researchers, the survey's validity may never be fairly established.

Methods of Measuring Nurse Staffing

There are several methods for measuring nurse staffing, all of which can be found in the research literature. Each measurement provides different information about how nurses might care for their patients and work with one another.

Nurse-to-patient ratio

This measure provides information about the workload each nurse might have at any given time, by measuring the number of patients each nurse cares for, on average. These ratios do not necessarily indicate, however, that a nurse has exclusive responsibility over a fixed number of patients. A unit might have all nursing staff work as a team, and several nurses might be jointly responsible for a group of patients. It is important to note that AB 394 requires that DHS establish specific nurse-to-patient ratios.

Hours per patient day

The number of nursing hours worked per patient day (HPPD) is closely related to nurse-to-patient ratios. Patient days typically are measured by a midnight census at the hospital. This measure of the amount of patient care required may underestimate or overestimate the actual care requirements in a unit or hospital for three reasons. First, the additional workload associated with admitting and discharging a patient is not captured by the aggregate number of patient days. Hospital units with high rates of patient turnover have a greater need for nursing staff than do units with low patient turnover. Second, the length of a patient day may be more or less than 24 hours. If a patient is admitted at 3 p.m. and discharged at 11 a.m. the next day, that patient had one patient day of 20 hours of care. Similarly, if a patient is admitted at 7 a.m. and discharged at 3 p.m. the next day, that patient received 32 hours of care. Most researchers assume that these variations will produce an average of 24 hours of care per patient day, but there are no systematic studies of this. The third problem with the conventional measurement of patient days is that some patients do not stay overnight in the hospital. Some are admitted to a regular hospital unit but are discharged before midnight; such patients are not counted in the midnight census, even though they affected the need for nursing care during the day and evening.

The main advantage to the HPPD measure of nurse staffing is that it can be easily computed with a number of datasets. The *OSHPD* data provide the number of productive hours worked by nursing personnel, and these productive hours can be divided by the number of patient days to obtain HPPD. It is difficult, however, to translate HPPD to nurse-to-patient ratios. In theory, the nurse-to-patient ratio can be computed as:

$$\text{Nurse/Patient} = \text{HPPD} / 24$$

But for the reasons discussed above, it may be appropriate for the denominator of the equation to be smaller or larger than 24.

Full-time-equivalent employees

A third commonly used measure of nurse staffing is full-time-equivalent employees (FTEs). As noted above, the AHA survey reports FTEs for RNs and LVNs. The main shortcoming of these data is that the calculation of FTEs usually requires some assumptions about the number of hours worked weekly by full-time and part-time personnel. To the extent that FTEs accurately measure the number of hours worked by staff, they can be translated to HPPD:

$$\text{HPPD} = (\text{FTEs} * 40) / \text{patient days}$$

Shell mix

RN staffing as a share of total nursing staffing (RNs, LVNs, and unlicensed personnel) is measured as skill mix. This can be computed from nurse-to-patient ratios, HPPD, or FTEs; the underlying measurement of staffing affects the resulting skill mix percentage. Skill mix indicates the extent to which an employer relies on RNs as compared to other staff; it is widely believed that a higher skill mix produces better patient outcomes, although this belief is not clearly substantiated by research (see above).

What the Nurse Staffing Data Show

OSHPD Survey Patterns over Time

The OSHPD financial data provide useful information about nurse staffing in California hospitals, despite the limitations of the data described above. While most of the analysis conducted for this project focused on year 14 of the data (fiscal years ending between June 30, 1998 and June 29, 1999), it is useful to look at general staffing patterns over time.

Figure 1 (see Figures 1-6 below) presents the average number of hours worked by nursing personnel per case-mix-adjusted patient day in California hospitals from 1984 through 1999. This is similar to HPPD, except that the number of patient days is adjusted to reflect differences in the severity of illness of patients.[1] As seen in this figure, average hours per patient day increased over this time, although they have remained stable since 1995. RN hours per case-mix- adjusted patient day rose substantially between 1984 and 1995, and also have been relatively unchanged since 1995. Aide hours are substantially fewer than RN hours, but have risen continuously since 1987. LVN hours per patient day have declined throughout this period.

One concern raised by nursing unions is that the intensity of nursing work has increased because the length of time that patients stay in the hospital has declined (Figure 2). Each day of a patient's stay requires more intense care than in past years. This concept is reflected in Figure 3, which presents the average number of nursing personnel hours per case-mix adjusted discharge from 1984 through 1999. Since 1994, total hours worked per discharge have declined, and they also have declined for RN hours per discharge. Only aides have experienced a small increase in the number of hours worked per case-mix adjusted discharge.

Figures 1 and 3 present data for all daily services units of hospitals. Analogous information for medical-surgical acute care units is presented in Figures 4 and 5. Figure 4 presents HPPD (without case-mix adjusting) from 1977 through 1999 for medical-surgical units. Total HPPD and RN HPPD

[1] Case-mix adjusting was done using the OSHPD discharge data. Health Care Financing Administration Diagnosis Related Group weights were used to weight each discharge, and the average of each year's DRG weights was used to adjust the number of patient days.

Figures 1 - 6

Figure 1: Average Nursing Service Personnel Hours per Case-Mix Adjusted Patient Day in California Hospitals, 1984-1999

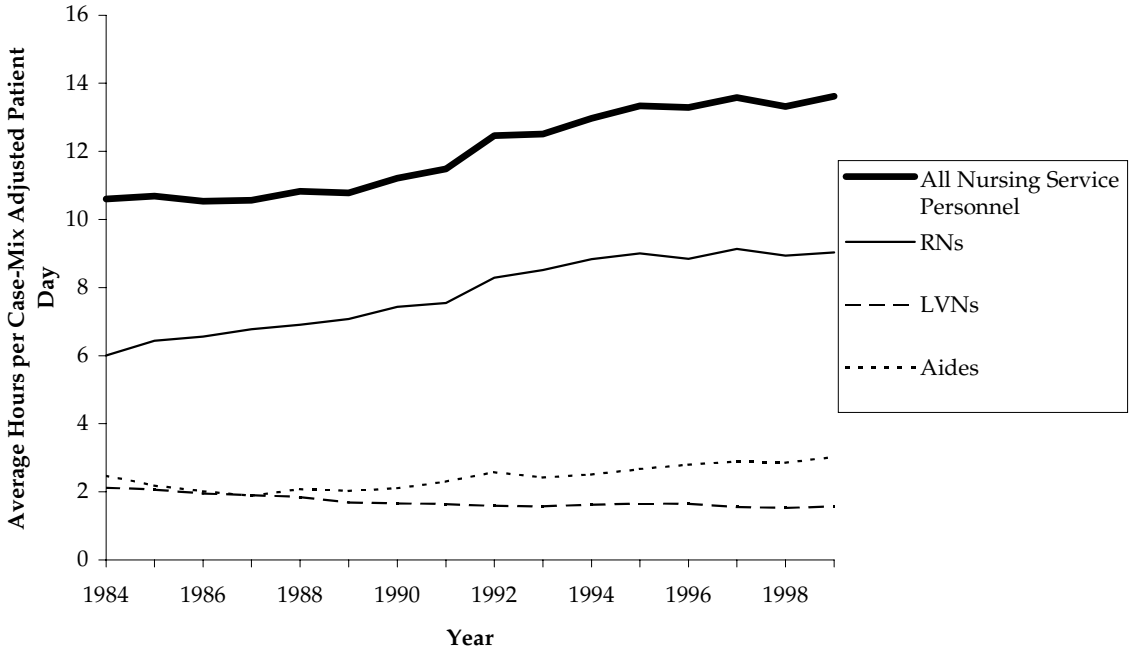


Figure 2: Average length of stay in California hospitals (number of days)

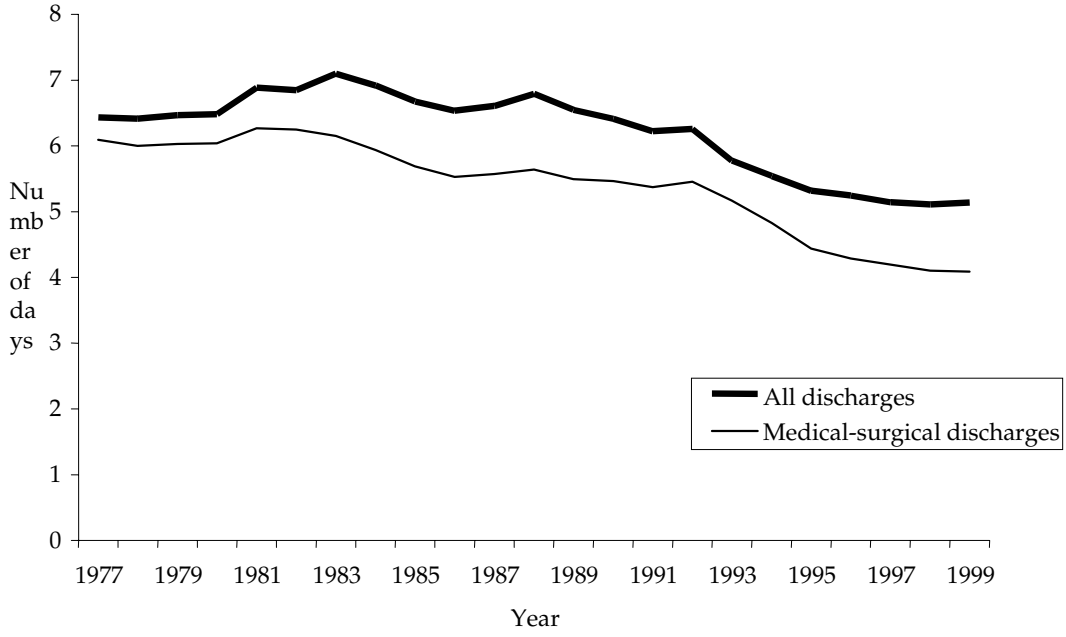


Figure 3: Average Nursing Service Personnel Hours per Case-Mix Adjusted Discharge in California Hospitals, 1984 - 1999

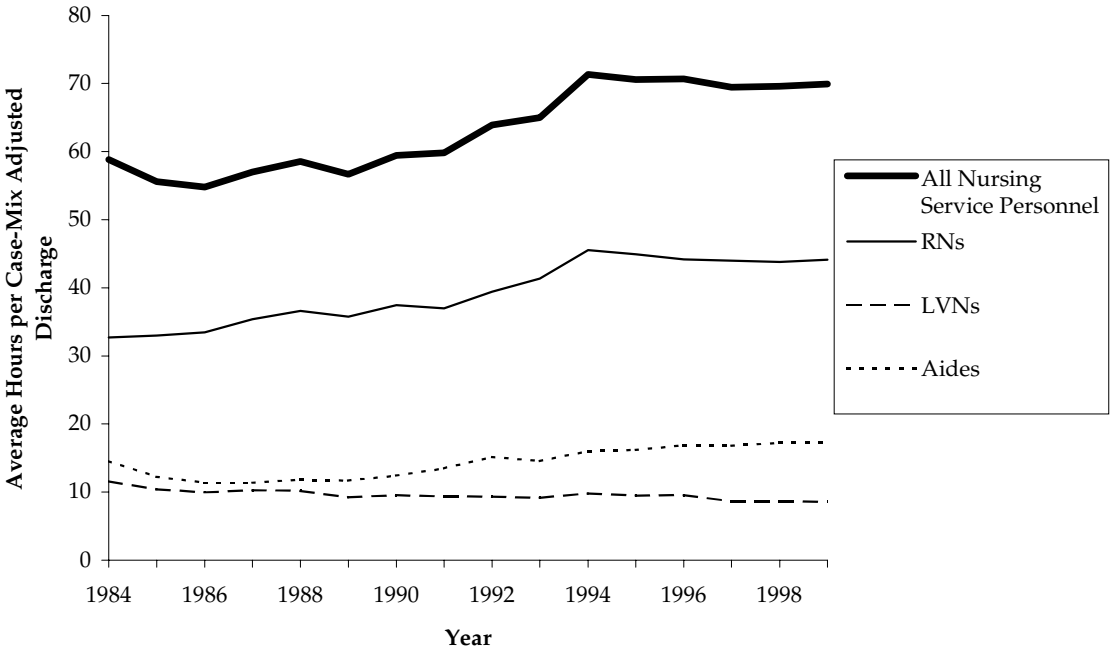


Figure 4: Average Nursing Service Personnel Hours per Patient Day in Medical-Surgical Units in California Hospitals, 1977-1999

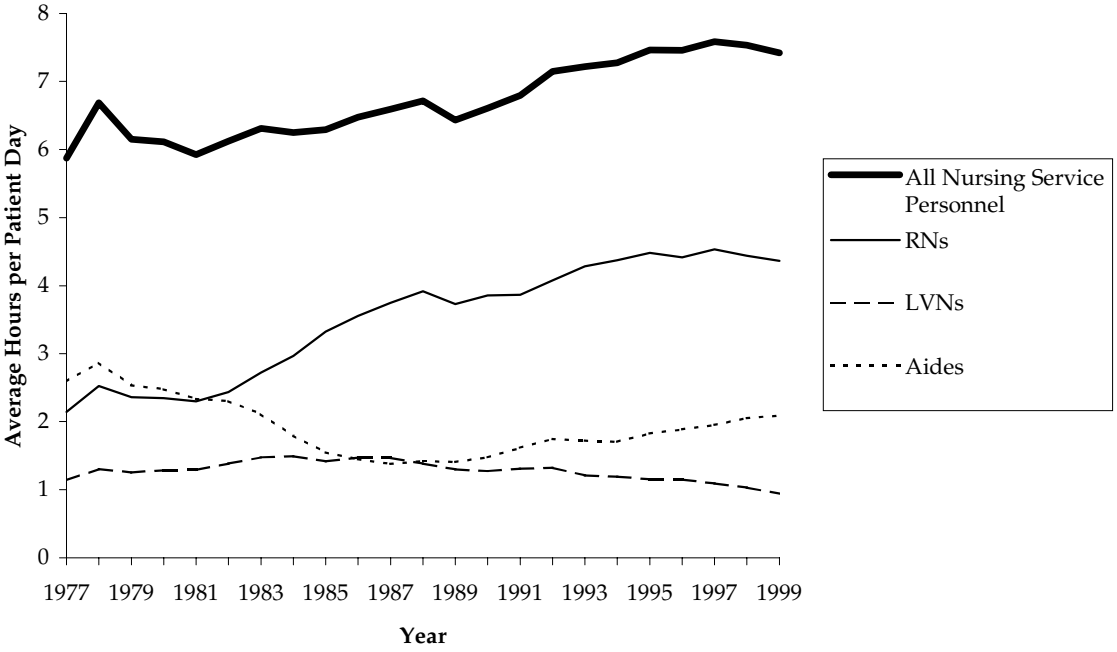


Figure 5: Average Nursing Service Personnel Hours per Discharge in Medical-Surgical Units in California Hospitals, 1977-1999

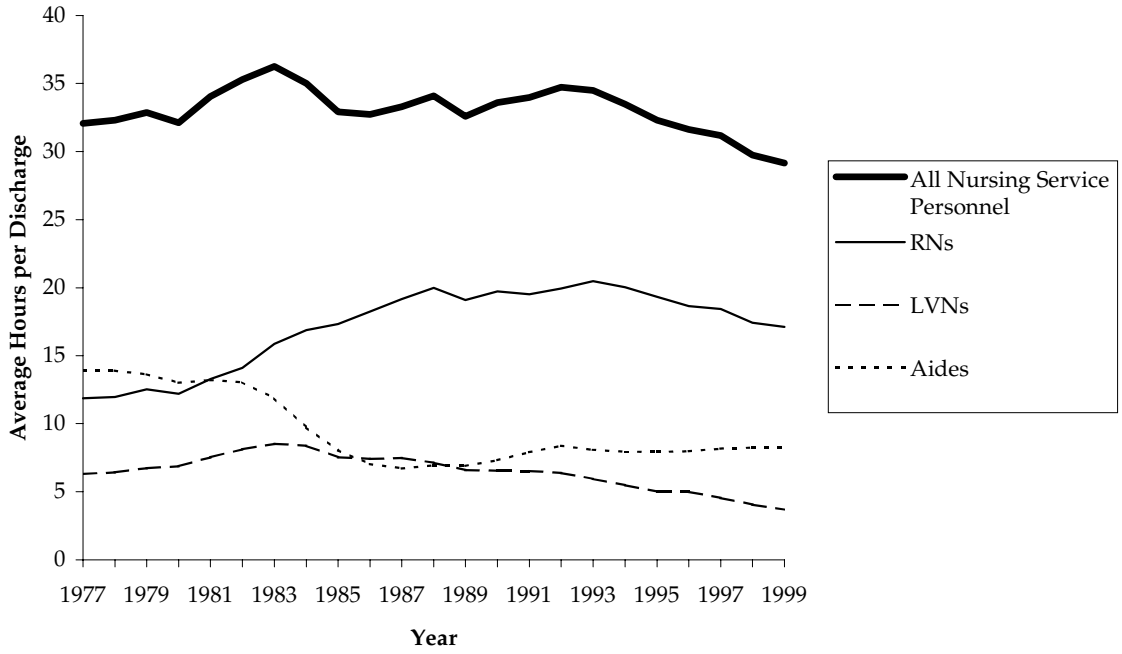
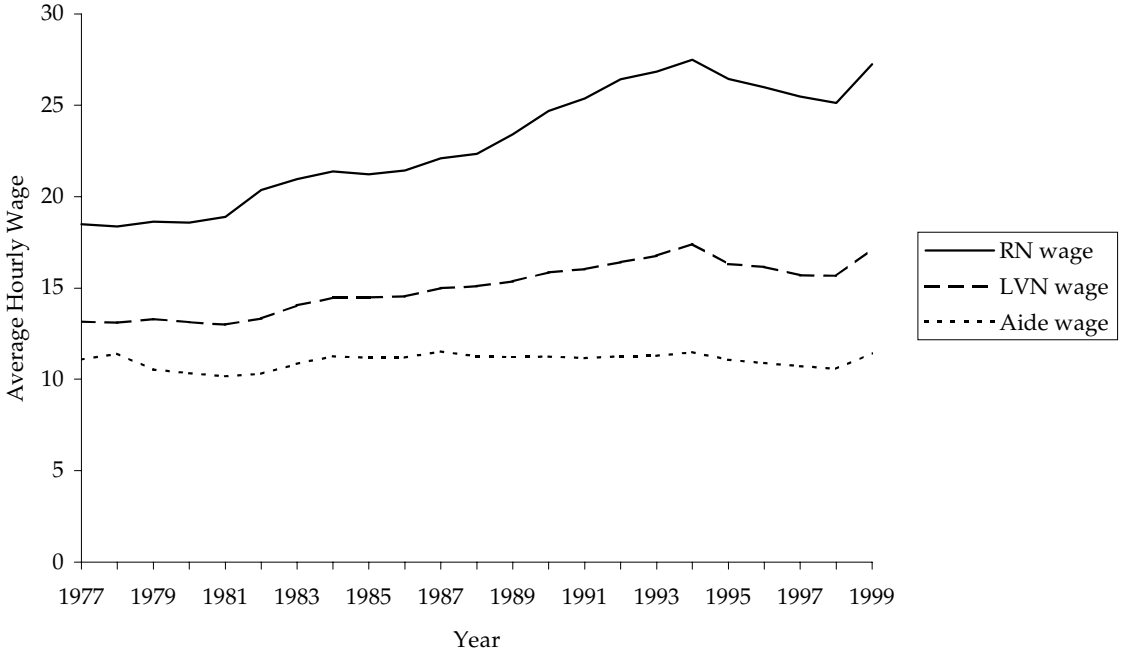


Figure 6: Average Hourly Wages Paid to Nursing Service Personnel in California Hospitals, 1977-1999



have risen, on average, from 1977 through 1997 and have declined slightly in the past two years. At the same time, unlicensed personnel HPPD have risen continuously since 1987. Figure 5 presents the number of hours worked per discharge for medical-surgical units. The decline in the average length of patients' hospital stays in the past decade is reflected in the substantial drop in the number of hours worked by nursing personnel per discharge between 1992 and 1999. RN and LVN hours per discharge were reduced while aide hours per discharge remained constant.

Figure 6 presents the average hourly wages (adjusted for inflation) paid to RNs, LVNs, and aides in California from 1977 through 1999. There were nearly continuous increases in RN and LVN wages from 1977 until 1994, after which time RN and LVN wages failed to keep pace with inflation. Between 1998 and 1999, however, there was a noticeable increase in the average wages of all nursing personnel. This is not surprising, since many hospitals in California are reporting shortages of nurses and are thus increasing their wages to attract scarce labor.

Nurse Staffing in the 1998-99 OSHPD Data

Year 24 of the OSHPD data provides information about hospitals for the fiscal year ending between June 30, 1998, and June 29, 1999. These data indicate that there is a wide range of nurse staffing ratios in California hospitals, as seen in Table 2, which presents averages and quartiles of the number of nursing hours (RNs, LVNs, and aides) per patient day (HPPD) for various units of California's acute care hospitals. In medical-surgical acute care units, 25% of hospitals have 6.21 HPPD or fewer and 25% have more than 8.42 HPPD. If one assumes that patient days average 24 hours, these figures equate to 25% of hospitals having fewer than 2.85 patients per nurse and 25% of hospitals having 3.86 or more patients per nurse. Other acute care units have similarly high HPPDs, and intensive care units (ICUs) have median HPPDs ranging from 11.9 to 18.2. However, it should be noted that these figures are for *all* nursing personnel (RNs, LVNs and unlicensed aides), and that AB 394 calls for specific staffing ratios for *licensed* nurses; thus, although the overall HPPDs shed some light on staffing patterns, they do not provide breakdown by licensure of nursing staff.

Table 2: Nursing Hours Per Patient Day: Means, Standard Deviations, and Quartiles

California hospitals display a wide range of staffing levels and ratios in all units.

Type of Unit	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Med-Surg Acute	344	7.91	6.31	6.21	7.28	8.42
Pediatric Acute	156	9.54	5.75	7.20	9.30	11.57
Obstetrics	246	7.55	4.18	5.24	6.71	9.26
Newborn Nursery	254	4.98	3.47	3.06	4.46	6.86
Sub-Acute Care	38	8.02	2.46	6.84	7.55	8.57
Definitive Observation*	143	10.79	25.79	6.75	8.06	9.41
Rehabilitation Care	68	7.25	2.81	6.06	6.72	8.41
Med-Surg ICU	309	17.70	11.46	13.92	15.69	19.00
Coronary ICU	94	14.58	8.11	12.42	15.02	17.07
Pediatric ICU	30	20.49	16.52	15.08	18.24	21.72
Neonatal ICU	148	11.32	7.98	9.46	11.89	13.78
Labor & Delivery †	239	19.90	11.38	14.90	18.09	23.03

Source: OSHPD data

* The level of nursing care between intensive care and standard medical-surgical care.

† Hours per delivery

RNs and LVNs

Tables 3 and 4 present averages and quartiles of RN and LVN staffing for the same units shown in Table 2. Similarily, there is significant variation in LVN staffing across all types of hospitals units. For medical-surgical acute care units, 25% of hospitals report RN HPPD less than 3.35, and 25% report RN HPPD greater than 5.10. These figures equate to 25% of hospitals having 4.7 or fewer patients per RN and 25% of hospitals having 7.2 or more patients per RN. As seen in Table 3, other hospital units have equally wide ranges of HPPD for RNs. While one might expect that LVNs are widely employed in the same units as are RNs, Table 4 indicates that this is not the case. Hospitals do not employ LVNs at a high rate; the only unit in which LVNs represent a high share of total HPPD is sub-acute care. In this unit, median RN HPPD are 1.63, while median LVN HPPD are 2.62. In all other major hospital units, the median hospital employs less than one LVN hour per patient day.

Table 3: RN HPPD: Means, Standard Deviations, and Quartiles

Type of Unit	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Med-Surg Acute	342	4.65	3.33	3.35	4.13	5.10
Pediatric Acute	156	7.52	4.80	4.90	6.99	9.62
Obstetrics	246	5.95	4.03	3.69	5.04	7.07
Newborn Nursery	254	4.19	3.35	2.38	3.50	5.64
Sub-Acute Care	38	2.19	1.41	1.30	1.63	2.76
Definitive Observation*	143	7.84	24.80	4.27	5.20	6.57
Rehabilitation Care	68	3.84	1.96	2.69	3.59	4.77
Med-Surg ICU	308	16.44	11.28	13.02	14.82	17.19
Coronary ICU	94	13.61	7.75	11.29	13.97	16.21
Pediatric ICU	30	19.53	16.65	13.84	16.82	21.11
Neonatal ICU	148	10.91	7.92	8.57	11.48	13.13
Labor & Delivery †	238	18.57	10.87	13.37	17.31	21.23

Source: OSHPD data
* The level of nursing care between intensive care and standard medical-surgical care. † Hours per delivery

Table 4: LVN HPPD: Means, Standard Deviations, and Quartiles

Type of Unit	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Med-Surg Acute	329	1.04	1.24	0.30	0.71	1.37
Pediatric Acute	156	0.74	1.33	0.01	0.31	0.83
Obstetrics	246	0.78	0.95	0.03	0.47	1.08
Newborn Nursery	254	0.45	0.96	0.00	0.05	0.54
Sub-Acute Care	38	2.42	1.39	1.68	2.62	3.06
Definitive Observation*	143	0.90	1.70	0.01	0.46	1.31
Rehabilitation Care	68	1.08	0.88	0.51	0.86	1.47
Med-Surg ICU	225	1.05	1.96	0.03	0.31	1.06
Coronary ICU	94	0.44	0.95	0.00	0.01	0.18
Pediatric ICU	30	0.30	0.58	0.00	0.03	0.21
Neonatal ICU	148	0.26	0.54	0.00	0.002	0.26
Labor & Delivery †	139	1.02	1.78	0.04	0.30	1.36

Source: OSHPD data
* The level of nursing care between intensive care and standard medical-surgical care. † Hours per delivery.

Regional disparities

Urban and rural hospitals have different staffing patterns, as seen in Tables 5 and 6. These differences are the result of two factors. First, rural hospitals must always have at least one nurse on duty, regardless of whether any patients are in the hospital, and these facilities are likely to need to guarantee a certain level of employment for their nursing staff to retain them. Second, hospitals must be prepared for the possibility of new admissions at any time. For small hospitals, the number of beds that must be available for unexpected admissions is a higher percentage of average occupancy than for large hospitals (Joskow, 1980). Thus, rural hospitals have a larger number of staff per patient because they must maintain a higher share of extra staff in case of unexpected admissions. This is seen in Tables 5 and 6. Median RN HPPD in urban medical-surgical acute care units are 4.08, while median RN HPPD in rural units are 5.01. Average HPPD also are higher in rural hospitals.

More disaggregated regional data indicate that some regions of California have higher staffing levels than others. The state is divided into nine regions, three of which are delineated by the Consolidated Metropolitan Statistical Area (CMSA, a Census designation): Los Angeles, Sacramento, and San Francisco. The other regions are San Diego, Central Valley, Central Coast, Northern Sacramento Valley, Northern Mountains, and Sierra Nevada. The regional definitions are shown in Figure 7.

Table 5: RN HPPD in Urban Hospitals: Means, Standard Deviations, and Quartiles

Urban hospitals have lower average and median levels of RN hours per patient day than do rural hospitals in most units. In addition, there is significant variation in RN HPPD across California hospitals.

Type of Unit	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Med-Surg Acute	306	4.46	3.08	3.34	4.08	4.98
Pediatric Acute	151	7.59	4.82	5.04	7.03	9.63
Obstetrics	221	5.54	3.63	3.61	4.94	6.39
Newborn Nursery	228	4.04	3.25	2.32	3.43	5.56
Sub-Acute Care	36	2.05	1.32	1.28	1.60	2.58
Definitive Observation*	139	5.44	3.10	4.27	5.18	6.43
Rehabilitation Care	67	3.81	1.96	2.66	3.58	4.62
Med-Surg ICU	281	16.37	11.68	13.01	14.82	17.06
Coronary ICU	93	13.60	7.79	11.29	13.85	16.21
Pediatric ICU	30	19.53	16.65	13.84	16.82	21.11
Neonatal ICU	145	10.78	7.88	8.56	11.48	13.05
Labor & Delivery †	212	18.48	10.76	13.40	17.35	21.24

Source: OSHPD data

* The level of nursing care between intensive care and standard medical-surgical care. † Hours per delivery

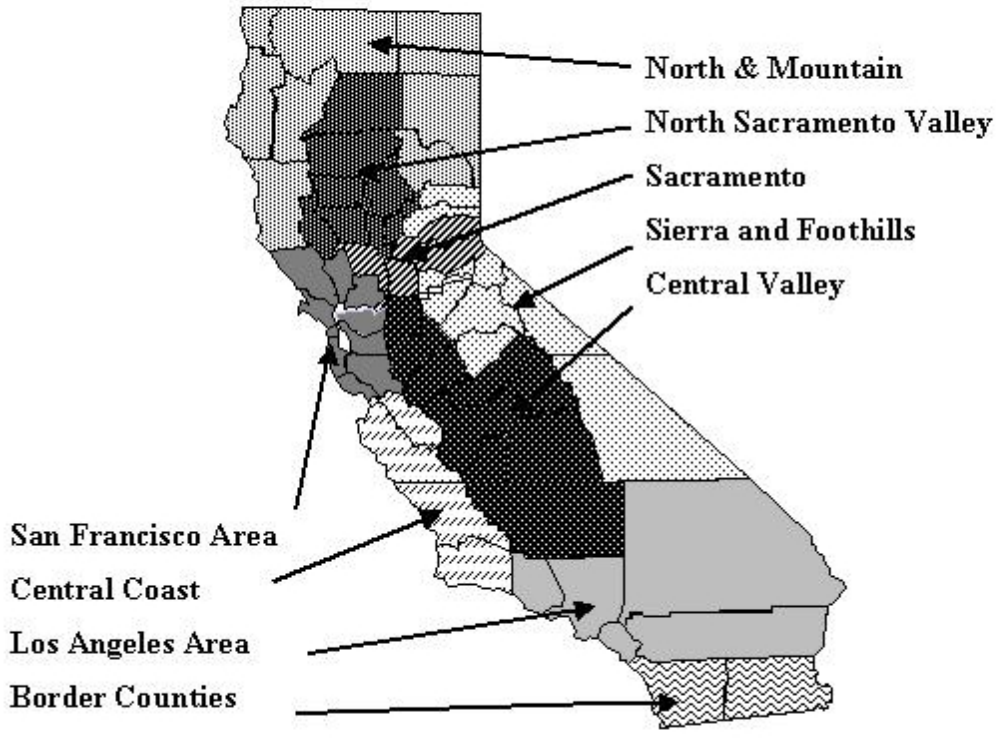
Table 6: RN HPPD in Rural Hospitals: Means, Standard Deviations, and Quartiles

Rural hospitals have higher average and median levels of RN hours per patient day than do urban hospitals.

Type of Unit	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Med-Surg Acute	36	6.25	4.72	3.64	5.01	6.82
Obstetrics	25	9.65	5.38	6.11	8.93	12.58
Newborn Nursery	26	5.46	3.92	2.88	5.03	7.36
Med-Surg ICU	27	17.22	5.72	13.93	14.99	19.21
Labor & Delivery*	26	19.28	11.96	12.12	16.72	19.55

Source: OSHPD data
* Hours per delivery

Figure 7: Nine Regions of California



Tables 7 through 11 present average and quartiles of RN HPPD in medical-surgical acute, obstetrics, newborn nursery, medical-surgical intensive care, and labor and delivery units, by region of the state. For nearly every type of hospital unit, RN HPPD are higher in the Northern Mountain and Sierra Nevada areas than elsewhere in the state. Because these regions have a large share of small rural hospitals, it is not surprising to find that these regions have higher HPPD, for the reasons stated above.

Table 7: Means and Quartiles of RN HPPD in Medical-Surgical Acute Care Units, by Region

RN HPPD are higher in rural regions, such as the Northern Mountains and Sierra Nevada. Median RN HPPD are lowest in the Central Valley and Los Angeles areas.

Region	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Los Angeles CMSA	153	4.25	3.24	3.30	3.86	4.68
Sacramento CMSA	13	4.54	1.23	3.69	4.09	5.15
San Francisco CMSA	54	4.63	2.45	3.67	4.56	5.13
San Diego	23	4.16	1.50	3.57	4.61	5.10
Central Valley	42	4.40	2.65	3.05	3.74	4.49
Central Coast	17	4.65	1.92	3.78	4.42	5.40
N. Sacramento Valley	14	6.04	6.43	3.07	4.01	5.60
Northern Mountains	17	6.63	3.56	4.64	5.25	7.40
Sierra Nevada	9	8.12	7.72	3.20	6.65	8.42

Source: OSHPD data

Table 8: Means and Quartiles of RN HPPD in Obstetrics Units, by Region

RN HPPD are higher in rural regions, such as the Northern Mountains and Sierra Nevada. Median RN HPPD are lowest in the Los Angeles area.

Region	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Los Angeles CMSA	113	5.35	3.37	3.59	4.69	6.10
Sacramento CMSA	10	5.93	5.25	3.64	5.11	5.56
San Francisco CMSA	48	5.28	4.24	2.09	5.20	6.47
San Diego	10	4.69	1.24	3.75	5.15	5.54
Central Valley	26	5.67	2.55	4.10	5.01	7.73
Central Coast	13	6.97	2.99	4.94	5.91	8.73
N. Sacramento Valley	8	8.40	5.59	3.98	7.61	13.20
Northern Mountains	12	9.71	5.95	6.38	8.96	12.30
Sierra Nevada	6	13.11	4.32	9.36	12.07	16.94

Source: OSHPD data

Table 9: Means and Quartiles of RN HPPD in Newborn Nursery Units, by Region

Region	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Los Angeles CMSA	122	3.78	2.86	2.25	3.42	5.06
Sacramento CMSA	10	3.50	2.03	1.30	3.43	5.64
San Francisco CMSA	43	5.39	4.77	2.83	4.26	7.29
San Diego	13	3.24	2.35	2.16	3.15	4.25
Central Valley	26	3.06	2.43	1.86	2.61	3.24
Central Coast	13	5.38	2.52	3.17	5.98	7.10
N. Sacramento Valley	8	3.98	1.99	2.94	4.76	4.96
Northern Mountains	14	5.63	4.15	2.88	5.28	6.92
Sierra Nevada	5	6.76	4.81	3.45	5.35	8.05

Source: OSHPD data

Table 10: Means and Quartiles of RN HPPD in Medical-Surgical ICUs, by Region

Region	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Los Angeles CMSA	143	16.67	15.86	12.63	13.80	15.89
Sacramento CMSA	13	16.63	3.69	14.19	16.13	17.06
San Francisco CMSA	51	16.52	4.45	14.51	16.45	18.42
San Diego	22	16.36	3.28	13.78	15.14	18.99
Central Valley	33	14.83	4.05	13.47	14.61	17.18
Central Coast	16	16.94	5.23	14.39	17.30	19.12
N. Sacramento Valley	12	13.40	2.23	11.57	14.27	15.24
Northern Mountains	10	17.96	6.08	13.20	17.47	19.62
Sierra Nevada	8	20.10	6.62	14.80	16.90	26.36

Source: OSHPD data

Of the predominantly urban regions, the Los Angeles CMSA and the Central Valley tend to have lower RN HPPD than other regions. In fact, these are the only regions with a median of fewer than four RN HPPD in medical-surgical acute care units. The Northern Sacramento Valley region has comparatively low median RN HPPD in medical-surgical ICUs and in labor and delivery units. The Sacramento, San Francisco, San Diego, and Central Coast regions have richer staffing than other predominantly urban regions.

Table 11: Means and Quartiles of RN Hours per Delivery in Labor and Delivery Units, by Region

Region	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
Los Angeles CMSA	113	18.06	8.82	13.41	16.69	20.62
Sacramento CMSA	9	20.36	4.18	17.72	19.01	21.66
San Francisco CMSA	40	23.06	17.78	16.66	20.50	24.75
San Diego	11	20.25	5.56	17.65	19.57	22.57
Central Valley	26	12.66	5.30	9.50	13.34	15.17
Central Coast	13	16.88	7.49	8.56	17.47	22.68
N. Sacramento Valley	7	15.56	4.56	12.69	14.99	16.23
Northern Mountains	13	20.32	14.36	12.02	18.42	19.55
Sierra Nevada	6	21.42	10.47	12.26	17.84	31.53

Source: OSHPD data

The CWI Survey

In June 2000, California Workforce Initiative (CWI) researchers embarked on a data collection effort to discover unit-level information regarding hours of care provided, nurse-to-patient ratios, and patient classification system (PCS) information. A survey was mailed to all 410 acute care hospitals in California with a follow-up mailing to non-responders a month after the original mailing. Responses were received from 112 of those hospitals for a return rate of 27.3%. Although the sample is not random (hospitals had to be willing to return the survey voluntarily), it is reasonably representative of hospitals in California in terms of size, geography, ownership type, and other characteristics. In a comparison of the CWI responders with the OSPHD database for 1998, the CWI sample contains slightly more nonprofit hospitals, slightly more hospitals in the San Joaquin Valley and the North Mountain regions, and shows that CWI hospitals are somewhat larger than average, have slightly more medical-surgical discharges, a slightly higher average hourly wage, more RN hours, and a lower rate of RN staffing per patient day than the state average.

Focus on medical-surgical units

The CWI survey was designed to obtain information about medical-surgical nursing units in acute care hospitals. Although AB 394 directs DHS to establish ratios for *all* specialty units, the majority of inpatients are admitted to medical-surgical nursing units; therefore, those units are the focus of this data collection effort. Responders were asked to select one representative medical-surgical nursing unit and answer the survey questions in terms of that unit.

Rural/non-rural differentiation

For parts of this analysis, the responding hospitals are divided into rural and non-rural groups, as designated by OSHPD. In other parts of the analysis quartiles of the relevant variables are examined, which makes interpretation easier when there is considerable variation in the responses. Table 12 presents averages of important variables for urban and rural hospitals, and Table 13 contains quartiles of other characteristics of medical-surgical units. Rural hospitals tend to be in the lower quartile for many variables, such as average daily census and overall number of direct care providers. In contrast, rural hospitals are in the highest quartile in total hours per patient day (HPPD), probably

Table 12: Means for Rural and Non-Rural Hospitals

Non-rural hospitals have more and larger medical-surgical units, and higher total numbers of care providers. Nurses in these non-rural units are more likely to have a baccalaureate degree. Average number of hours per patient day are higher in rural hospitals.
(Standard Deviations in parentheses)

	Rural Hospitals	Non-Rural Hospitals
Number of hospitals	17	95
Number of Medical Surgical Units in the hospital	1.3 (.68)	3.4 (3.8)
Number of direct care providers for the Study Unit	20.7 (11.2)	40.7 (21.9)
Number of direct care providers who have an ADN	8.5 (4.9)	14.4 (8.3)
Number of direct care providers who have an BSN	2.1 (1.4)	9.0 (6.9)
Number of direct care providers who have a graduate degree	0.18 (0.4)	0.60 (1.1)
Average daily census for the Study Unit	13.5 (6.9)	26.7 (12.5)
Average Total HPPD (24 hours) for the Study Unit	11.15 (6.9)	7.8 (2.7)
Average RN HPPD (24 hours) for the Study Unit	5.8 (5.6)	4.9 (3.2)
Average number of weeks to recruit a new RN graduate	29.0 (27.3)	5.9 (7.2)
Average number of weeks to recruit an experienced RN	27.5 (25.3)	12.2 (12.6)

Source: CWI Survey

Table 13: Quartiles of Relevant Variables*

There are wide ranges of the numbers of direct care providers in hospital units, the size of these units, and hours per patient day.

	25th Percentile	50th Percentile	75th Percentile	Maximum
Number of Medical Surgical **Units** in the hospital	1	2	3	30
Number of **direct care providers** for the Study Unit	22	37	48	142
Number of direct care providers who have an **ADN**	8	12	17	46
Number of direct care providers who have a **BSN**	3	6	11	29
Number of direct care providers who have a **graduate degree**	0	0	1	5
Average **daily census** for the Study Unit	17	24	30	77
Total HPPD (24 hours) for the Study Unit	6.7	7.6	8.4	27.7
RN HPPD (24 hours) for the Study Unit	3.5	4.2	5.2	24
Number of weeks to **recruit** a new RN graduate	2	4	7.8	78
Number of weeks to **recruit** an experienced RN	4	8	15	78
Number of items measured in PCS	8	20	36	200

Source: CWI Survey
*N=111; numbers presented here reflect the highest response within each quartile of responding hospitals.

because the patient census is highly variable but requires a core staff, no matter how few patients are there. Rural hospitals also are in the upper quartile in average number of weeks to recruit either a new RN graduate or experienced RN.

Patient classification systems

Since AB 394 refers directly to the use of Patient Classification Systems (PCS), the CWI survey inquired about the current use of such systems. AB 394 requires hospitals to continue using a PCS to determine staffing requirements if the PCS recommendation is above the minimum ratio established by DHS. (However, it should be noted that hospitals are free to create a new PCS under AB 394.) Rural hospitals in the sample require a slightly higher total (RNs, LVNs, and aides) HPPD than non-rural hospitals (Table 14). However, rural hospitals have an average staffing level that is much richer than required by their PCSs (11.15 HPPD actual versus 7.4 required) (Tables 12 and 14). Non-rural hospitals staff much closer to the hours required by the PCS (7.8 actual versus 7.1 required).

As seen in Table 14, most hospitals in California use PCSs that have been locally developed, which makes it difficult to compare PCS scores across hospitals. Another problem with patient classification systems in California is the number of data items that must be completed two or three times a day for each patient. One-fourth of hospitals must complete at least 36 items for their PCS, and at least one PCS has 200 items (Tables 13 and 14). This can be an onerous task for nurses.

Table 14: Patient Classification System Information for Rural and Non-Rural Hospitals

The hours per patient day recommended by PCSs can be RN, LVN, or unlicensed personnel hours. On average, hospitals staff more richly than their PCSs require (see Table 12). Rural hospitals are more likely to use a hospital-developed PCS than are urban hospitals.

	Rural	Non-Rural
Number of hospitals	17	95
Average HPPD (24 hours) required by PCS for the Study Unit	7.4 (2.3)	7.1 (1.3)
Average number of items on PCS	34 (50)	27 (29)
% using GRASP or Medicus PCS	5.9%	20%
% using Evalysis or San Joaquin PCS	0%	10.5%
% using Hospital Developed Instrument	64.3%	57.6%

Source: CWI Survey

Assumptions about LVNs and length of shifts

AB 394 calls for nurse-to-patient staffing ratios to be set by type of licensed nurse and by shift for individual hospital units. As in the OSHPD data, very few hospitals reported that they use LVNs in their staffing mix; thus, LVNs are not included in the analysis of the CWI data. Hospitals staff

according to 8-hour or 12-hour shifts, so the sample is analyzed for both rural and non-rural hospitals and for hospitals with 12 or 8 hour shifts for RNs (Table 15). RN-to-patient ratios were computed from the number of RN hours per shift (Table 16). This was calculated by dividing RN hours into the number of hours of the shift. Using this computation, staffing ratios that ranged from 1 RN per 3 patients on evening and nights in rural hospitals with 8-hour shifts, to 1 RN per 5.2 patients on nights in non-rural hospitals with 12-hour shifts (Tables 15 and 16).

Table 15: Average RN Hours Per Patient Shift As Reported by Hospital, by Length of Shifts

Night and evening shifts are staffed with fewer RN hours per patient in non-rural hospitals. In rural hospitals, evening and night shifts often have more RN hours per patient.
(Standard deviations in parentheses)

	2 Shifts per day (12 hours each)		3 Shifts per day (8 hours each)	
	Rural	**Non-Rural**	**Rural**	**Non-Rural**
Number of hospitals	4	33	6	45
Average RN Hours Per Patient, Day Shift	3.0 (1.7)	2.7 (1.9)	1.3 (0.9)	1.9 (1.0)
Average RN Hours Per Patient, Evening Shift	Not applicable	Not applicable	2.7 (3.2)	1.7 (0.9)
Average RN Hours Per Patient, Night Shift	2.7 (3.3)	2.3 (1.8)	2.7 (3.3)	1.4 (0.7)

Source: CWI Survey

Table 16: Average Patient-to-RN Ratios, Computed from RN Hours Per Patient Shift*

	2 Shifts per day (12 hours each)		3 Shifts per day (8 hours each)	
	Rural	**Non-Rural**	**Rural**	**Non-Rural**
Number of hospitals	4	33	6	45
PT-to-RN ratio Day Shift	4	4.4	6.2	4.2
PT-to-RN ratio Evening Shift	Not applicable	Not applicable	3.0	4.7
PT-to-RN ratio Night Shift	4.4	5.2	3.0	5.7

Source: CWI Survey
* Calculated by dividing the RN hours into the number of hours in the shift; number of patients per RN.

Data gap

Hospitals were asked to directly report RN-to-patient ratios by shift. The reported ratios differed from the computed ratios in that the reported ratios were leaner (more patients per nurse) (Table 17). The difference between computed RN-to-patient ratios and reported ratios illustrates the difficulty of using data on HPPD to examine nurse-to-patient ratios. While the figures are correlated, they are almost never equal. This may be because HPPD includes nursing personnel who are not directly involved in patient care. It also may be because there is substantial turnover of patients during shifts, increasing the effective number of patients for whom each nurse is responsible.

Table 17: Average Patient-to-RN Ratios, Directly Reported by Hospital for the Study Unit*

Hospitals report more patient per RN than their reported hours per patient day imply.

	2 Shifts per day (12 hours each)		3 Shifts per day (8 hours each)	
	Rural	Non-Rural	Rural	Non-Rural
Number of hospitals	7	35	7	48
PT-to-RN ratio Day Shift	6.7 (2.9)	5.9 (1.8)	6.8 (1.7)	6.1 (1.9)
PT-to-RN ratio Evening Shift	Not applicable	Not applicable	6.7 (2.5)	6.9 (2.0)
PT-to-RN ratio Night Shift	7.4 (3.0)	6.9 (1.8)	7.3 (3.0)	8.2 (3.8)

Source: CWI Survey
* Numbers of patients per 1 RN.

Table 18 presents quartiles of the number of RN hours per patient and the reported RN-to-patient ratios. The lowest quartile of hospitals has as few as five patients per RN during the day shift, while the highest quartile has as many as 12 patients per RN. On night shift, the lowest quartile of hospitals has as few as six patients per RN and the highest quartile has as many as 26 patients per RN. Generally, rural hospitals report a leaner ratio (more patients per nurse) than non-rural hospitals, which is different from the ratios computed from their reported hours.

Table 18: Quartiles of RN Hours per Patient Shift and Patient-to-RN Ratios by Shift*

	25th Percentile	50th Percentile	75th Percentile	Maximum
RN Hours Per Patient, Day Shift	1.4	2.0	2.6	12
RN Hours Per Patient, Evening Shift	1.1	1.4	2	9
RN Hours Per Patient, Night Shift	1.1	1.5	2.3	12
Patient-to-RN Ratio, Day Shift †	5	6	7	12
Patient-to-RN Ratio, Evening Shift †	5.1	7	8	12
Patient-to-RN Ratio, Night Shift †	6	8	9	26

Source: CWI Survey
* N=99; number reflects the highest response within each quartile of responding hospitals.
† Number of patients per 1 RN

Limitations of the survey

The CWI survey is limited in several ways. First, data were collected from only one medical-surgical nursing unit in each hospital and may not represent all such units in hospitals. Second, it is apparent from some of the responses that the answers were a best estimate rather than based on collected data. There is considerable difference between the ratios that were reported by hospitals and the ratios that were computed from hours reported by hospitals. This may be, in part, because the survey instrument could not accurately capture the actual length of the patient day or patient shift; the calculations presented here assume that the patient day was 24 hours and the patient shift was

either 12 or 8 hours. That assumption is, of course, erroneous. Further, the data do not capture the changes in nurse-to-patient ratios that occurred during a shift because of admissions and discharges, nor do the data address changes in patient condition during a shift that changes the nurse workload.

For these reasons, more in-depth data collection should be performed for all acute care hospitals in California to provide a more accurate picture of current practices.

AHA Data Compare California to Other States

Although the AHA's Annual Survey of Hospitals has numerous limitations, it is the only survey that enables comparison of staffing between California and other states. The AHA provides the number of RN and LPN full-time equivalent employment; these figures are divided by the number of adjusted patient days (adjusted for outpatient care) to obtain HPPD. But as discussed above, HPPD computed from the AHA data are likely to overestimate actual HPPD because the entire hospital's nursing staff is compared to patient days, rather than only nurses who are involved in patient care or work on inpatient units.

Tables 19 and 20 present averages and quartiles of RN and LPN HPPD for all states, the District of Columbia, and for the United States as a whole. As seen in Table 19, California has a higher average and median number of RN hours per adjusted patient day than the nation as a whole. However, California uses somewhat fewer LVNs than the national average (Table 20). Eighteen states have higher average RN HPPD than California, and 25 states have higher average LVN HPPD. California is ranked 19th in median RN and LVN HPPD, relative to other states.

Table 19: Means and Quartiles of RN Hours per Adjusted Patient Day, by State

California reports more RN hours per adjusted patient day than the national average.

State	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
USA	5127	5.75	5.53	3.70	5.29	6.87
AK	24	10.29	9.68	3.24	5.70	15.77
AL	111	6.91	13.30	4.25	5.32	7.04
AR	79	8.22	25.37	4.20	5.23	6.60
AZ	73	8.29	7.15	5.03	6.23	8.15
CA	414	6.21	4.42	4.08	5.65	7.16
CO	69	6.48	3.89	4.05	6.64	8.07
CT	34	6.39	3.89	5.12	5.98	6.82
DC	11	6.41	3.56	4.00	5.94	7.37
DE	7	9.00	9.20	3.46	5.94	9.58
FL	205	5.84	2.80	4.40	5.42	6.56
GA	159	6.04	5.14	3.29	5.33	7.39
HI	20	4.64	2.73	2.44	4.58	5.98
IA	119	4.85	2.83	2.46	4.98	6.67
ID	43	5.40	4.76	1.81	5.88	7.65
IL	205	5.50	2.48	3.96	5.38	6.84
IN	110	6.11	2.19	4.51	6.12	7.46
KS	131	4.61	3.79	1.77	4.27	6.51
KY	105	5.13	3.34	2.87	4.81	6.45
LA	129	5.61	2.43	4.02	5.37	6.40
MA	74	5.40	2.09	3.91	5.15	6.37
MD	51	8.55	14.31	5.38	6.31	7.14
ME	38	6.49	3.09	4.73	6.23	7.61
MI	151	5.27	2.77	3.76	5.35	6.60
MN	135	4.51	4.49	1.01	4.16	6.66
MO	128	5.78	4.59	4.00	5.17	6.64
MS	101	3.94	4.02	1.48	3.09	5.48
MT	58	3.78	4.76	1.04	1.82	5.67
NC	121	5.75	3.59	3.79	5.40	7.20
ND	47	4.25	4.54	1.35	3.15	5.32
NE	89	4.54	3.82	1.35	4.37	5.97

Table 19: Means and Quartiles of RN Hours per Adjusted Patient Day, by State *(continued)*

State	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
NH	27	6.01	2.52	4.01	6.33	8.30
NJ	79	5.47	1.92	4.49	5.34	6.37
NM	46	10.95	7.63	5.92	7.79	13.33
NV	23	7.46	6.33	3.49	5.28	10.16
NY	222	4.26	1.77	3.17	4.25	5.20
OH	165	6.22	2.35	5.02	6.30	7.07
OK	121	5.93	4.92	3.69	4.97	6.36
OR	62	7.90	3.23	6.50	8.32	10.23
PA	195	5.13	1.81	3.92	5.01	6.20
RI	11	5.17	1.60	3.61	5.36	6.35
SC	67	6.53	4.80	3.73	5.91	7.73
SD	56	5.49	5.01	1.35	4.12	7.29
TN	121	4.77	2.24	3.47	4.65	5.73
TX	387	5.95	4.47	4.14	5.41	6.92
UT	40	7.29	5.35	3.54	7.21	9.39
VA	94	5.64	2.77	3.90	5.61	7.00
VT	15	5.11	3.18	1.61	5.61	8.75
WA	90	6.77	4.10	4.58	6.72	8.29
WI	125	5.06	2.51	3.08	5.64	6.97
WV	58	4.62	1.96	3.28	4.62	5.86
WY	27	6.27	5.84	1.29	5.80	8.79

Source: AHA data

Table 20: Means and Quartiles of LVN/LPN Hours per Adjusted Patient Day, by State

California reports fewer LVN hours per adjusted patient day than the national average.

State	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
USA	5127	1.42	2.77	0.51	0.93	1.65
AK	24	2.5928	3.542	0.3406	0.9343	2.7605
AL	111	2.6678	10.0374	0.9275	1.3405	1.9985
AR	79	3.5268	8.6074	1.3873	2.2716	2.953
CA	414	1.1614	1.0596	0.6199	0.9402	1.4047
CO	69	0.9578	0.908	0.292	0.7282	1.2611
CT	34	0.6702	1.4807	0.2255	0.3841	0.723
DC	11	1.0951	1.3804	0.402	0.702	0.904
DE	7	2.0408	3.5638	0.427	0.6818	1.2285
FL	205	1.1138	0.9481	0.6197	0.9623	1.331
GA	159	1.688	1.6769	0.6431	1.2739	2.3303
HI	20	1.0197	0.9199	0.6117	0.8545	1.0615
IA	119	0.6672	0.5655	0.3286	0.5507	0.8789
ID	43	1.4573	1.1969	0.6254	0.9062	2.4011
IL	205	0.7148	0.6499	0.2179	0.5053	1.0518
IN	110	1.0523	0.7191	0.4948	0.9038	1.4687
KS	131	1.0264	1.408	0.3567	0.616	1.1952
KY	105	1.5069	2.2786	0.6897	1.0113	1.55
LA	129	2.0393	1.0906	1.2137	1.8432	2.7854
MA	74	0.5476	0.4727	0.2184	0.4315	0.8315
MD	51	1.1117	3.721	0.2016	0.4064	0.8326
ME	38	0.8422	0.602	0.3376	0.673	1.2796
MI	151	0.9997	0.8952	0.3678	0.7351	1.3367
MN	135	1.5306	1.60211	0.5598	0.8835	1.9652
MO	128	1.5061	1.63161	0.5559	1.0872	1.9827
MS	101	1.4772	1.20486	0.7046	1.2618	1.8549
MT	58	1.0036	1.3806	0.3111	0.5497	1.1326
NC	121	1.0184	1.10345	0.4598	0.7661	1.2413
ND	47	1.3153	1.34212	0.5394	0.8627	1.4533
NE	89	1.6688	1.31349	0.7246	1.38	2.1515

Table 20: Means and Quartiles of LVN/LPN Hours per Adjusted Patient Day, by State *(continued)*

State	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
NH	27	0.5789	0.46083	0.2684	0.4487	0.8115
NJ	79	0.6323	0.44038	0.3229	0.5783	0.9205
NM	46	2.3646	2.8205	0.9958	1.3306	2.6883
NV	23	1.5092	2.0207	0.5948	0.7995	1.4414
NY	222	0.7613	0.78967	0.3899	0.6292	0.9229
OH	165	1.0261	0.76122	0.4929	0.9239	1.4001
OK	121	2.6913	1.98187	1.2085	2.4341	3.5383
OR	62	0.6698	0.68216	0.1744	0.5664	0.835
PA	195	0.8816	0.56319	0.5064	0.7963	1.1863
RI	11	0.6527	0.51472	0.319	0.5061	0.8077
SC	67	1.5791	1.82172	0.6328	1.1912	1.7769
SD	56	1.5955	3.51155	0.1904	0.5822	1.4276
TN	121	1.7105	1.04931	0.9036	1.4302	2.3423
TX	387	2.6396	2.95479	1.0702	1.8915	3.3216
UT	40	1.6696	1.91306	0.6363	0.9986	1.8884
VA	94	1.2741	0.88437	0.6636	0.9838	1.7069
VT	15	1.0408	0.45123	0.5909	1.0766	1.3481
WA	90	1.3974	1.94291	0.4593	0.8584	1.5096
WI	125	0.654	0.59396	0.2084	0.49	0.9749
WV	58	1.4978	1.21337	0.8455	1.162	1.9752
WY	27	1.0406	1.84495	0.3046	0.4867	0.9214

Source: AHA data

Nurse Staffing in "Best Practices" Hospitals

As part of their research into staffing practices, CWI researchers sought to determine whether hospitals that are lauded as models of quality and as good workplaces have similar or different nurse staffing ratios and HPPD from other hospitals. Various organizations were asked to provide the names of hospitals that might have the "best practices" with regard to nurse staffing and/or quality of patient care; however, none of the organizations that were contacted provided the names of any hospitals they consider having good practices.

Several regional, statewide, and national rankings of hospitals that might be considered "best practices" facilities are available. These include the American Nurses Association's Magnet Hospitals, institutions recognized for good nursing care. Hospitals apply for recognition by the program and are evaluated using quantitative and qualitative methodologies. This is the only program that specifically examines the quality of the work environment. Twenty-two short-term acute care and one long-term facility are recognized by the Magnet Hospital program at this time. In California, UC-Davis Medical Center and Cedars-Sinai Medical Center have achieved recognition as Magnet Hospitals.

Other national listings of "best practices" hospitals include the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) commended hospitals (limited to hospitals in California); *USA Today's* Top 100 Hospitals (only two are in California); and *US News and World Report's* list of high-quality hospitals. *US News* provides high ratings for several categories of patient care; this analysis focuses on their "National Honor Roll" (three of 15 hospitals are in California) and all hospitals in California that received recognition in any category. The main statewide source of information about hospital rankings is the Pacific Business Group on Health (PBGH). Hospitals rated by PBGH as having better-than-expected rates for mortality after heart attack (AMI) and/or lower-than-expected newborn readmissions as "best practices" facilities were examined. Finally, the Bay Area Consumer Checkbook conducted a survey of physicians and patients to develop a list of San Francisco Bay Area hospitals with high quality. The Checkbook also asked physicians to identify hospitals throughout the nation that provide exceptionally high-quality care. Both lists are studied here.

Table 21 presents the means and quartiles of RN hours per adjusted patient day, as computed from the AHA data, for "best practices" hospitals, California hospitals as a whole, and U.S. hospitals. In general, best practices hospitals have higher average and median RN hours per adjusted patient day than do other hospitals. California hospitals on *US News's* list appear to have the higher average and median RN staffing levels. These figures may overstate the staffing ratio in these facilities, however. Hospitals on the *US News* list tend to be large academic medical centers, which maintain a wide range of ancillary and outpatient services in addition to inpatient services. RNs working in ancillary and outpatient departments are counted in the RN FTEs, but adjusted patient days do not accurately measure the workload of these staff. A similar problem may apply to all the best practices hospitals, except the *USA Today* Top 100 and the PBGH low newborn readmission rate list, which do not include a high share of academic medical centers. Accordingly, these best practices hospitals have the lowest average RN hours per adjusted patient day of all the best practices categories, and the average staffing level is lower for the *USA Today* list than for California in general. All best practices groups have higher 25th percentile, median, and 75th percentile staffing levels than California and the United States.

Table 21: Means and Quartiles of RN Hours per Adjusted Patient Day for Best Practices Hospitals

National best practices hospitals typically have higher mean and median RN hours per adjusted patient day.

	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
USA	5127	5.75	5.53	3.70	5.29	6.87
CA	414	6.21	4.42	4.08	5.65	7.16
ANA Magnet Hospitals	20	7.35	2.60	5.96	6.93	8.23
JCAHO commendation	13	7.22	2.37	5.39	7.13	9.12
US News – California hospitals	10	8.80	2.33	6.61	8.73	10.50
US News – Honor Roll	20	7.34	2.13	6.11	7.19	8.93
USA Today Top 100	100	6.13	2.23	4.86	5.97	7.40
PBGH Low AMI Mortality	12	6.65	2.74	5.12	6.18	8.76
PBGH Newborn Readmissions	43	6.30	2.86	4.17	6.42	7.98
Bay Area Consumer Checkbook	22	6.45	2.49	4.68	6.59	7.45

Source: AHA data

Tables 22 and 23 present RN HPPD in medical-surgical acute and intensive care units, calculated from OSHPD data. In contrast to the AHA figures, the OSHPD data do not indicate that the best practices hospitals staff uniformly more richly than do other hospitals. This may be because the OSHPD data better associate the number of RN hours worked with the number of patient days in each unit. For medical-surgical acute care units, the ANA Magnet Hospitals and *US News* hospitals have noticeably higher average and median HPPD. In contrast, California hospitals that have received commendation from JCAHO have lower average and median RN HPPD in medical-surgical acute care units. Intensive care units reveal a different pattern of RN HPPD. Only the *US News* hospitals have RN HPPD that are substantially higher than the statewide average and median.

Most other best practices groups have average and median RN HPPD in medical-surgical ICUs that are lower than those of the state.

Table 22: Means and Quartiles of RN Hours per Patient Day in Medical-Surgical Acute Care Units for Best Practices Hospitals

California best practices hospitals do not clearly have greater RN hours per patient day than the California average. ANA's magnet hospitals, *US News and World Report's* hospitals, and Bay Area Consumer Checkbook's top-quality hospitals have higher average and median staffing than the state average; other best practices groups do not have higher average or median staffing.

	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
California	342	4.65	3.33	3.35	4.13	5.10
ANA Magnet Hospitals	2	5.80	1.81	4.52	5.80	7.08
JCAHO commendation	11	3.97	1.71	3.38	3.89	4.97
US News – California hospitals	9	5.52	0.96	4.97	5.31	5.81
US News – Honor Roll	3	6.02	0.84	5.31	5.81	6.94
USA Today Top 100	2	4.23	0.63	3.78	4.23	4.68
PBGH Low AMI Mortality	8	4.46	0.75	3.84	4.55	4.81
PBGH Newborn Readmissions	41	4.68	2.59	3.57	3.98	5.20
Bay Area Consumer Checkbook	6	4.74	0.86	4.47	4.61	5.31

Source: OSHPD data

Table 23: Means and Quartiles of RN Hours per Adjusted Patient Day in Medical-Surgical Intensive Care Units for Best Practices Hospitals

	No. of Hospitals	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
California	308	16.44	11.28	13.02	14.82	17.19
ANA Magnet Hospitals	2	15.76	1.84	14.45	n.a.	17.06
JCAHO commendation	10	14.71	2.62	13.21	14.00	16.31
US News – California hospitals	9	17.11	2.35	15.89	17.06	18.42
US News – Honor Roll	2	18.15	0.51	17.56	18.42	18.47
USA Today Top 100	2	13.06	0.77	12.51	n.a.	13.60
PBGH Low AMI Mortality	8	14.69	1.98	13.21	14.86	16.06
PBGH Newborn Readmissions	36	15.63	4.60	12.48	14.41	18.05
Bay Area Consumer Checkbook	6	16.74	1.45	15.30	16.63	18.39

Source: OSHPD data

The staffing data for best practices hospitals do not uniformly indicate that hospitals rated highly for quality of patient care have richer staffing than other hospitals. These comparisons are anecdotal, as the "best practices" lists are developed using a variety of metrics and are not consistent over time or across sources. The uncertainty about whether best practices hospitals staff more richly than do other hospitals is a reflection of the difficulty of identifying and measuring the relationship between staffing and patient outcomes. It is possible that nurse staffing ratios and HPPD are of marginal importance in a hospital's reputation for quality.

Potential Costs of Minimum Nurse-To-Patient Ratios

One of the concerns about AB 394 is that hospitals may not be able to meet the minimum staffing ratios because they cannot afford to hire the number of nurses required. The cost of increasing staffing to meet new requirements must be passed along to insurance companies, and this is very difficult for hospitals to do. Many California hospitals are facing significant losses and large future expenditures to meet seismic safety requirements.

The Current Status of Compliance

A key question is: What share of California hospitals are not presently in compliance with various proposed minimum staffing ratios? The cost of AB 394 will depend on the minimum staffing levels established by the DHS. Because DHS has not yet issued draft regulations, it is hard to predict what staffing levels will result from the implementation process.

Using the OSHPD data and the staffing ratio proposals presented in Table 1, the share of hospitals that are not in compliance with the proposed ratios for various hospital units was computed. The staffing data focus on RNs because, as noted above, LVN staffing is not very important in California's hospitals. The findings do not change substantially if LVNs are included in the calculations.

Table 24 presents the percent of hospitals that staffed below the minimum ratios proposed by SEIU, the CNA, and the CHA for several inpatient units that will be affected by the new minimum staffing ratios. Note that intensive and critical care units are omitted from this table because staffing regulations already exist for these units. There is significant variation in the percent of hospitals that would need to increase staffing for each of the three proposals. The SEIU proposal is the most demanding, requiring that more than 88% of hospitals increase their medical-surgical staffing. The CHA proposal is the least stringent, and would result in 17% of hospitals increasing their staffing in medical-surgical units. The CNA and SEIU proposals are in agreement for most other hospital units, and more than half of California's hospitals would need to increase staffing in most units to comply with these proposals. In contrast, less than 20% of hospitals would be expected to increase their staffing under the CHA proposal.

Table 24: Share of Hospitals That Are Not in Compliance With Proposed Minimum Staffing Ratios, by Unit

Unit	Number of Hospitals	Original version of bill (CNA)	SEIU proposal	CHA proposal
Medical-Surgical Acute	342	50.8%	88.5%	17.3%
Pediatric Acute	156	60.8%	60.8%	15.2%
Obstetrics Acute	246	65.1%	65.1%	17.9%
Labor and Delivery	238	14.1%	14.1%	13.4%
Newborn Nursery	254	78.2%	78.2%	38.7%
Other Acute Care	15	66.7%	66.7%	13.3%
Definite Observation	143	84.1%	84.1%	21.4%
Rehabilitation Care	68	61.8%	61.8%	10.3%

Source: OSHPD data

The data collected in the CWI survey also can be used to calculate the share of hospitals that would have to increase their staffing under various minimum staffing ratios. Table 25 shows those percentages, based on the staffing ratios reported by hospitals. These data indicate that virtually no hospitals would need to change their medical-surgical staffing in response to the CHA proposal of one RN to 10 patients. About 80% of both rural and non-rural hospitals would have to increase staffing to meet a minimum day shift ratio of one RN per four patients.

Table 25: Percent of Hospitals That Require Increases in Day Shift Staffing to Meet Specified Minimum Ratios *

	Rural Hospitals	Non-Rural Hospitals
1:10 ratio	0.0%	3.6%
1:6 ratio	66.7%	28.6%
1:4 ratio	80.0%	81.7%

Source: CWI Survey
*Computed from the RN Shift Ratios as Reported by Hospital

On average, hospitals would need to hire 28 new full-time RNs to meet the requirements of the SEIU proposal, 17 RNs to comply with the original version of the bill, and 6 RNs to fulfill the CHA's proposal (Table 26). The exact number of full-time equivalent RNs that each hospital would need to hire would depend on the final minimum ratios, the size of the hospital, and the hospital's current staffing level. There is substantial variation in the number of new RN FTEs that would be needed in different regions of the state. Hospitals in the northern mountain and Sierra Nevada regions would need to hire no more than about six FTEs under any proposal, while the SEIU proposal would result in Los Angeles hospitals needing an average of 35 RN FTEs each. The total statewide demand for RNs in California would increase, ranging from 2300 RNs under the CHA proposal to more than 10,000 RNs under the SEIU proposal. The SEIU proposal would require an increase in RN supply of about 5%.

Table 26: Average Predicted Increases in FTE RN Employment Required by Minimum Staffing Proposals (number of FTEs)

	Percent of hospitals	Original version of bill (CNA)	SEIU proposal	CHA proposal
All Hospitals	100%	17.11	27.86	5.90
Los Angeles CMSA	44.4%	21.92	34.68	6.84
Sacramento CMSA	4.0%	20.41	31.16	7.10
San Francisco CMSA	17.6%	20.55	30.86	10.55
San Diego	6.7%	12.78	25.04	4.86
Central Valley	11.4%	15.34	27.76	3.57
Central Coast	4.8%	7.28	12.31	1.88
N. Sacramento Valley	4.0%	8.01	15.81	1.65
Northern Mountains	4.8%	0.88	3.70	0.19
Sierra Nevada	2.4%	2.14	6.12	0.04

Source: OSHPD data

Potential Costs of Minimum Staffing Ratios

The potential cost of minimum staffing ratios are computed using the following formula:

$$\text{Total Increase}_h = \text{Max}(\text{PropHours}_{hi} - \text{Hours}_h, 0) * \text{Wage}_h$$

where the subscript h denotes each hospital. Hours_h is the hospital's annual RN hours (reported in the 1998-99 OSHPD data), and Wage_h is the hospital's average hourly wage for RNs. PropHours_{hi} is the number of annual RN hours required by each of the three proposals analyzed in this paper (subscripted i). This is computed with the following formula:

$$\text{PropHours}_{hi} = \sum_k Ratio_{hik} * PatientDays_{hk}$$

where the subscript k refers to each hospital unit for which a minimum staffing ratio is specified and Ratio_{hik} is the staffing ratio for unit k required by proposal i. The cost increase obtained from the above formula can be compared to current RN expenditures by dividing the Total Increase by the current cost of RNs:

$$\text{Percent Increase}_h = \text{Total Increase}_h \; / \; (\text{Hours99}_h * \text{Wage}_h)$$

Table 27 presents the average dollar increases in expenditures needed to comply with staffing proposals of SEIU, the CNA, and the CHA, and Table 28 presents the average percent increases. Depending on the staffing ratios eventually adopted, the statewide average cost of new staffing per hospital would rise between $198,880 and $1,311,946 (Table 27). Individual hospital increases would vary, according to the hospital's size and current staffing practices. These figures correspond to

increases in RN expenditures between 4.6 and 30.7% (Table 28). Not surprisingly, the CHA proposal produces the lowest expenditure increase, with an average cost increase of 4.6% per hospital. The SEIU proposal results in the highest expenditure increase, 30.7%, largely as a result of the 1 RN per 4 patients ratio proposed for medical-surgical units. The total cost to all of California's hospitals of the SEIU proposal would be nearly $50 million.

Table 27: Average Predicted Increases in RN Expenditures per Hospital Caused by Staffing Mandates

	Percent of hospitals	Original version of bill (CNA)	SEIU proposal	CHA proposal
All Hospitals	100%	$789,607	$1,311,946	$198,880
Los Angeles CMSA	44.4%	$1,091,808	$1,675,894	$261,640
Sacramento CMSA	4.0%	$758,405	$1,262,308	$118,110
San Francisco CMSA	17.6%	$685,908	$1,341,094	$259,859
San Diego	6.7%	$521,486	$1,029,988	$126,525
Central Valley	11.4%	$843,952	$1,425,553	$183,532
Central Coast	4.8%	$430,751	$652,925	$103,549
N. Sacramento Valley	4.0%	$389,953	$773,632	$78,326
Northern Mountains	4.8%	$42,191	$163,699	$10,105
Sierra Nevada	2.4%	$111,209	$320,590	$2,374

Source: OSHPD data

Table 28: Average Predicted Percent Increases in RN Expenditures Caused by Staffing Mandates

	Percent of hospitals	Original version of bill (CNA)	SEIU proposal	CHA proposal
All Hospitals	100%	18.5%	30.7%	4.6%
Los Angeles CMSA	44.4%	23.6%	35.6%	6.0%
Sacramento CMSA	4.0%	10.9%	23.1%	2.0%
San Francisco CMSA	17.6%	13.9%	26.2%	5.4%
San Diego	6.7%	14.1%	24.1%	3.6%
Central Valley	11.4%	19.8%	37.9%	3.6%
Central Coast	4.8%	21.4%	23.0%	5.8%
N. Sacramento Valley	4.0%	19.7%	34.9%	3.1%
Northern Mountains	4.8%	2.8%	11.3%	0.6%
Sierra Nevada	2.4%	7.8%	21.7%	0.1%

Source: OSHPD data

All proposed minimum staffing ratios affect the Los Angeles region more than other regions. On average, Los Angeles hospitals would experience increases of more than $1 million per hospital with either the original version of the bill or the SEIU proposal, an increase of 23%. More than 40% of California's hospitals are in the Los Angeles region; thus, the minimum staffing ratios could have a large effect on a substantial share of the state's hospital industry. All three proposals have substantially smaller effects in the Sacramento, San Diego, Northern Mountain, and Sierra Nevada regions. The CHA and CNA proposals would produce larger percentage increases in RN expenditures in the Central Coast region, while the SEIU proposal would have a large percentage impact on the Central Valley and Northern Sacramento Valley regions.

Potential Problems Implementing Nurse-to-Patient Ratios

Interactions with Patient Classification Systems

A key factor that will affect the overall impact of the minimum staffing standards is how they will relate to the patient classification system already provided for in Title 22. The requirements for patient classification systems will be in effect even after minimum nurse-to-patient ratios are established under AB 394. If a hospital's PCS dictates that the hospital should be staffed more richly than the minimum ratios, the hospital is expected to abide by its PCS. Because data on patient classification systems are not collected routinely by the state, it is not clear whether the minimum staffing standards of AB 394 or individual hospitals' patient classification systems will take precedence in determining final staffing outcomes.

As noted above, the patient classification system required by Title 22 is the subject of much criticism. The California Nurses Association describes the use of the PCS as "acuity fraud," claiming that the staffing matrices that are linked to the PCS are determined by the hospital budget, not by the needs of the patients or the competency of the nursing staff.

PCSs are typically promoted by their vendors to the nurse executive as way to collect longitudinal data on nursing workload to more accurately estimate future labor budgets. The system is then presented to nurse managers as a means to compare workload across units so labor budgets can be objectively documented as nurse managers negotiate within the hospital. In turn, the systems are promoted to staff nurses as being able to accurately predict staffing for the next shift. Generally, no matter how good the system, a PCS is only able to fulfill the first promise of providing data for annual budgeting purposes. Most PCSs are designed to be specific to each hospital unit, so across-unit comparisons are not possible. No system can accurately predict the staffing needs for the next shift because new admissions and changes in patient acuity cannot be foreseen. In fact, the ability of the PCS to predict workload is decreasing as the frequency of admissions and discharges has increased and patients have become more acutely ill and less stable.

The co-existence of the patient classification system and the new minimum staffing ratios may help California avoid one pitfall of minimum staffing ratios: that the *minimum* becomes the *average* staffing

level as hospitals reduce their staffing to the lowest level required. Because hospitals will be required to adhere to Title 22, it will be more difficult for them to reduce their staffing. However, hospitals will not be prevented from creating new patient classification systems that closely reflect the minimum staffing ratios contained in the new regulations.

The Nursing Shortage

California faces a nursing shortage, and hospital leaders have expressed concern that they will not be able to hire staff to meet minimum staffing ratios (Kilborn, 1999). In response, union leaders claim that the supply of RNs will increase when staffing ratios, and thus working conditions, improve in hospitals. While it may be true that some RNs would return to the labor force if working conditions improved, most RNs in California who are not working are unlikely to reenter the RN workforce. Several pieces of evidence support this contention. First, more than 83% of California RNs are presently employed in nursing.[2] Second, California's nursing workforce is aging, and a large share of California's nurses are at or near retirement age.

In a 1997 survey, the California Board of Registered Nursing asked RNs who had left the nursing profession why they had chosen to do so. Some 20% reported that they left nursing because of dissatisfaction with the profession or their job or due to job-related stress. If all these RNs returned to nursing, the supply of RNs would increase by 4%. Another potential source of nursing staffing power is an increase in the number of hours worked by RNs employed part-time. If all part-time RNs increased their employment to full-time, the overall RN labor supply in California would increase by approximately 11%. These inflows would certainly help alleviate the current nursing shortage and help hospitals meet the requirements of AB 394, but they cannot provide a long-term solution to the shortage. In the long run, California's nursing workforce continues to age, and expected retirements will rapidly outpace new graduations in the coming decades.

Even if minimum staffing ratios increase the desirability of nursing as a profession, California's universities and colleges do not have enough space to train all the RNs needed over the next 20 years (Coffman and Spetz, 1999; Sechrist, Lewis, and Rutledge, 1999). California State University (CSU) and community college officials report that large numbers of qualified applicants are turned away from basic RN education programs because of lack of resources. This problem must be remedied to remedy the nursing shortage in the long term.

If the minimum ratio mandate increases the demand for RNs and the supply of RNs does not grow accordingly, the wages of RNs will rise. The expenditure estimates presented in this paper are based on the assumption that wages will remain stable and fringe benefits have no cost. The nursing shortage could result in substantial increases in RN wages, as hospitals bid against one another for scarce labor, thus increasing the cost of the minimum ratios even further.

Overtime work by nursing staff

One way that hospitals might meet minimum staffing requirements is through increased mandatory overtime for nursing staff. Nurses have complained about mandatory overtime, and this has become a major issue in negotiations between hospitals and labor unions (CNA press release, August 30, 2000; Workman, 2000; Zoellner, 2000). In June 2000, the California Industrial Welfare Commission amended Wage Orders 4 and 5 to restrict mandatory overtime for RNs on alternative workweek

[2] This figure comes from a 1997 survey conducted by the California Board of Registered Nursing. The 1996 National Sample Survey of Registered Nurses indicates that 78% of RNs in California are presently employed in nursing.

schedules (e.g., 12-hour days) who are employed by non-governmental health care facilities. These amendments permit mandatory overtime for these RNs only in situations in which a "health care emergency" has been declared and prohibit employers from requiring RNs to work more than 16 hours per day (Assembly Committee on Labor and Employment analysis of SB 146). The CNA sponsored a bill, SB 146, that would have extended similar limits on mandatory overtime to RNs who work a regular 8-hour day and to those employed by public facilities. This bill was not approved by the state legislature.

Restrictions on tasks performed by unlicensed personnel

The analyses presented in this report do not consider the potential effect of AB 394's prohibition against using unlicensed personnel to perform particular tasks. This portion of AB 394 could have a substantial effect on the ability of hospitals to substitute less-expensive unlicensed personnel for RNs and LVNs. Data are not available about the extent to which unlicensed personnel currently perform the tasks listed in AB 394, and thus it is impossible to assess the impact of this portion of the legislation.

Financial Difficulties Faced by Hospitals

In recent years, California's hospitals have faced great financial difficulty, and the prospects for improvement are dim. The growth of managed care insurance plans has put pressure on hospitals to reduce their costs, and many have complained that reimbursements are too low to cover the cost of care. The Balanced Budget Act (BBA) of 1997 substantially reduced Medicare payments to all hospitals, with teaching and rural hospitals experiencing the biggest losses. The impact of the financing changes brought about by the BBA will become more intense in coming years. Additionally, many hospitals claim that Medi-Cal reimbursement does not adequately cover the cost of providing care to patients, particularly those with expensive or complex illnesses.

As hospitals are experiencing declines in revenue, they also are facing several expensive federal and state mandates. The federal Health Insurance Portability and Accountability Act of 1996 (HIPAA) is driving hospitals and insurers to develop expensive record-keeping systems, while California's Hospital Facilities Seismic Safety Act of 1994 requires that hospitals complete extensive seismic retrofits to guarantee their operation after a major earthquake. The Seismic Safety Act is estimated to cost California's hospitals more than $20 billion by 2030.

AB 394 has the potential to increase the financial pressure on hospitals significantly. According to OSHPD data, nursing costs comprise approximately one-sixth of hospital budgets, on average. Any increase in nursing costs resulting from AB 394 will come at a time when some hospitals are closing, discontinuing unprofitable services, and merging in response to financial challenges.

Evaluating the Effects of Minimum Nurse Staffing Requirements

As California implements its minimum staffing legislation, it is more important than ever that researchers continue to examine the relationship between RN staffing and quality of care. Research does not support the general assumption that more RN staffing is *always* better; policymakers and hospital executives need to learn whether there are thresholds below which quality of care is unacceptable or above which there can be little improvement. After the minimum staffing ratios are established in California, researchers need to examine the extent to which hospitals change actual RN staffing and adjust their costs.

Many new research efforts may guide an evaluation of the new requirements. Nationally, the Association for Healthcare Research and Quality (AHRQ) is funding a project led by Peter Buerhaus (Vanderbilt University) and Jack Needleman (Harvard University) to examine the relationship between staffing and nurse-sensitive outcomes (such as patient complications, medication errors, etc.) using public sources of data. Other researchers, listed above in the literature review, are continuing with related research. In California, CalNOC has developed a rich database of unit-level nurse staffing and nurse-sensitive outcomes that provides a model for real-time data collection.

Because every source of data has limitations, DHS, nursing unions, the hospital industry, and other interested parties should support a variety of analyses of multiple data sources to evaluate the effects of AB 394. Focusing an evaluation on only OSHPD data or a special survey may produce inaccurate findings or biased results. All researchers examining this issue should make their data publicly available at the conclusion of their research, not only to add to the general knowledge but to protect their studies from allegations of bias or incompetence. Inevitably, the impact of such research will reach far outside California's borders as other states look to California's experience in making decisions about their own nurse staffing levels.

Conclusions and Recommendations

The purpose of AB 394 is, presumably, to improve the quality of patient care, but, as discussed above, currently available research is inconclusive as to whether nurse staffing requirements will have the intended result. Not only do the data fail to conclude that minimum standards would be beneficial, they fail to conclude that such standards would not be detrimental. The task of California's DHS is made especially difficult since there is no research or data that define "safe" staffing levels.

The proposals received by DHS offer a wide range of minimum staffing ratios and produce radically different estimates of the cost of compliance. If DHS accepts lower minimum staffing ratios, these ratios would have only a small impact on cost. In fact, hospitals could respond to the minimum ratios by reducing their employment of RNs, in which case the legislation will have had the opposite of its intended effect. On the other hand, if DHS chooses to take an aggressive stance, issuing minimum ratios that are substantially higher than current staffing patterns, hospitals in some regions may be forced to close their doors, cut needed services, or merge.

Some cost increase will result from nearly any minimum staffing ratio DHS establishes, unless hospitals use the minimum standards as a justification for reducing their RN staffing. Expenditures on RNs are likely to increase most in Los Angeles, the Central and Northern Sacramento Valleys, and the Central Coast. Small and rural hospitals will face smaller increases in costs. However, rural hospitals are struggling financially, and a disproportionate share of hospital closures in the past 20 years have been in rural areas (Sinay, 1998). Even modest cost increases could be devastating to the finances of some rural facilities.

In their deliberations, policymakers should consider the potential effects of the minimum ratios on financially vulnerable hospitals in all areas of the state, as well as the needs of the communities they serve.

References

Abbott M, Mahoney B. Nurses march on Washington. *New Mexico Nurse*. 1995; 40:1.

Aiken LH, Clarke SP, Sloane DM. Hospital Restructuring: Does it Adversely Affect Care and Outcomes? *Journal of Nursing Administration*. 2000; 30:457-465.

Aiken LH, Havens DS, Sloane DM. The Magnet Nursing Services Recognition Program: A Comparison of Two Groups of Magnet Hospitals. *American Journal of Nursing*. 2000; 100:26-36.

Aiken L, Smith H, Lake E. Lower Medicare mortality among a set of hospitals known for good nursing care. *Medical Care*. 1994; 32:771-787.

American Nurses Association. State Legislative Trends: Sufficient Staff and Staffing Ratios (In Other Than Long-Term Care Facilities), March 10, 2000. American Nurses Association.

American Nurses Association, Network I. Implementing nursing's report card: A study of RN staffing, length of stay, and patient outcomes. Washington, DC: American Nurses Publishing; 1997; 32.

Archibald LK, Manning ML, Bell LM, Banerjee S, Jarvis WR. Patient density, nurse:patient ratio and nosocomial infection risk in a pediatric cardiac intensive care unit. *Pediatric Infectious Disease Journal*. 1997; 16:1045-8.

Ballard K. Legislating Patient Advocacy: Nurse Staffing Ratios. in Curtin L, ed. *A Staffing Crisis: Nurse/Patient Ratios*. Washington, DC; 2000.

Beech BM. Patient satisfaction and nursing staff work satisfaction in an urban public teaching hospital. The Univ. Of Texas H.S.C. At Houston School of Public Health 1995 Dr.P.H.; 1995.

Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. *Nurse Research*. 1998; 47:43-50.

Blegen MA, Vaughn T. A Multisite Study of Nurse Staffing and Patient Outcomes. *Nursing Economic$*. 1998; 16:196-203.

Brown J. The handmaiden's tale: practice nurses, support workers. *Practice Nurse*. 1995; 10:257-60.

Buerhaus PI. What Is the Harm in Imposing Mandatory Hospital Nurse Staffing Regulations? *Nursing Economic$*. 1997; 15:66-72.

California Nurses Association. Novato RNs Approve New Agreement. (press release: http://www.can.org.) August 30, 2000.

Clifford JC. Primary nursing: a contemporary model for delivery of care. *American Journal of Hospital Pharmacy*. 1980; 37:1089-91.

Coffman J, Spetz J. Maintaining an adequate supply of RNs in California. *Image - The Journal of Nursing Scholarship*. 1999; 31(4), 389-93.

Cone M, Conner McGovern C, Barnard K, Riegel B. Satisfaction with a new model of professional practice in critical care. *Critical Care Nursing Quarterly*. 1995; 18:67-74.

Dickinson K, Jackson K. Staffing levels on children's wards: a snapshot survey. *Journal of Child Health Care*. 1999; 3:5-11.

Dugan J, Lauer E, Bouquot Z, Dutro BK, Smith M, Widmeyer G. Stressful nurses: the effect on patient outcomes. *Journal of Nursing Care Quality*. 1996; 10:46-58.

Felton G. Increasing the quality of nursing care by introducing the concept of primary nursing: a model project. *Nursing Research*. 1975; 24:27-32.

Fridkin SK, Pear SM, Williamson TH, Galgiani JN, Jarvis WR. The role of understaffing in central venous catheter-associated bloodstream infections (see comments). *Infection Control and Hospital Epidemiology*. 1996; 17:150-8.

Friss L. Nursing Studies Laid End to End Form A Circle. *Journal of Health Politics, Policy and Law*. 1994; 19:598-631.

Grillo-Peck AM, Risner PB. The Effect of a Partnership Model on Quality and Length of Stay. *Nursing Economic$*. 1995; 13:367-74.

Harbarth S, Sudre P, Dharan S, Cadenas M, Pittet D. Outbreak of Enterobacter cloacae related to understaffing, overcrowding, and poor hygiene practices. *Infection Control and Hospital Epidemiology*. 1999; 20:598-603.

Harrington C, Kovner C, Mezey M, et al. Experts recommend minimum nurse staffing standards for nursing facilities in the United States. *Gerontologist*. 2000; 40:5-16.

Hartz AJ, Karkauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. *New England Journal of Medicine*. 1989; 321:1720-5.

Herscher E. Nurse Talks Focus on Staff Levels. *San Francisco Chronicle*. San Francisco; 1997:A17.

Hunt J, Hagen S. Nurse to patient ratios and patient outcomes. *Nursing Times*. 1998; 94:63-6.

Institute for Health and Socio-Economic Policy. California Health Care: Sicker Patients, Fewer RNs, Fewer Staffed Beds. California: Institute for Health and Socio-Economic Policy; 1999.

Jackson FEC. Measuring the burnout of Michigan hospice nurses. Wayne State University 1988 Ph.D.; 1988.

Johnson-Pawlson J, Infeld DL. Nurse staffing and quality of care in nursing facilities. *Journal of Gerontological Nursing*. 1996; 22:36-45.

Joskow PL. "The Effects of Competition and Regulation on Hospital Bed Supply and the Reservation Quality of the Hospital." *Bell Journal of Economics*. 1980; 11:421-47.

Kilborn PT. Current Nursing Shortage More Serious Than Those of the Past. *New York Times*. New York; 1999.

Kovner C, Gergen PJ. Nurse Staffing Levels and Adverse Events Following Surgery in U.S. Hospitals. *Image - The Journal of Nursing Scholarship*. 1998; 30:315-321.

Krainovich Miller B, Sedhom LN, Bidwell Cerone S, Campbell Heider N, Malinski VM, Carter E. A review of nursing research on the use of unlicensed assistive personnel (UAP). *Journal of the New York State Nurses Association*. 1997; 28:8-15.

Kuhn EM, Hartz AJ, Krakauer H, Bailey RC, Rimm AA. The relationship of hospital ownership and teaching status to 30- and 180-day adjusted mortality rates. *Medical Care*; 1994: 1098-108.

Kunen, J. "The New Hands-off Nursing." *Time*. 1996; 148 (16):56-57.

Lichtig LK, Knauf RA, Milholland DK. Some impacts of nursing on acute care hospital outcomes. *Journal of Nursing Administration*. 1999; 29:25-33.

Maryland RNs win big in a pact that sets patient-load limits. *American Journal of Nursing*; 1990:127; 134.

Massachusetts Nurses Association wins a 1 to 5 nurse-patient ratio in contract. *New Jersey Nurse*. 1997; 27:1;11.

McCranie EW, Lambert VA, Lambert CE. Work Stress, Hardiness, and Burnout Among Hospital Staff Nurses. *Nursing Research*. 1987; 36:374-8.

Mitchell PH, Shortell SM. Adverse outcomes and variations in organization of care delivery. *Medical Care*. 1997; 35:NS19-32.

Naish J. Friend or foe? Health care assistants, RCN membership. *Nursing Times*. 1998; 94:26-9.

National survey finds cutbacks in nursing care diminish the safety of care patients receive. *Massachusetts Nurse*. 1995; 65:3-4.

Ober S. Legislating Patient Advocacy: Nurse Staffing Ratios. in Curtin L, ed. *Staffing Crisis: Nurse/Patient Ratios*. Washington, DC; 2000.

Quality patient care is a public concern. *Washington Nurse*. 1996; 26:2-3.

Ratio ruckus. *Modern Healthcare*. 1998; 28:48.

Reisdorfer J, Pankonin L, Larsen B. Making the transition to nursing assistant: retaining satisfied staff. *Recruitment and Retention Report*. 1993; 6:1-5.

Robert J, Fridkin SK, Blumberg HM, et al. The influence of the composition of the nursing staff on primary bloodstream infection rates in a surgical intensive care unit. *Infection Control and Hospital Epidemiology*. 2000; 21:12-7.

Robertson RH, Hassan M. Staffing intensity, skill mix and mortality outcomes: The case of chronic obstructive lung disease. *Health Services Management Research*. 1999; 12:258-68.

Robertson R, Samuelson C. Should nurse patient ratios be legislated? Pros and cons. *Georgia Nursing*. 1996; 56:2.

Robinson SE, Roth SL, Keim J, Levenson M, Flentje JR, Bashor K. Nurse Burnout: Work Related and Demographic Culprits. *Research in Nursing and Health*. 1991; 14:223-8.

Rosenthal, E. "Once in Big Demand, Nurses Are Now Targets for Hospital Cutbacks." *New York Times* (August 19, 1996): A16.

Sechrist KR, Lewis EM, Rutledge DN. (1999). The California Nursing Work Force Initiative Planning for California's Nursing Work Force Phase II Final Report. Sacramento, CA: California Strategic Planning Committee for Nursing/Colleagues in Caring.

Shortell SM, Zimmerman JE, Rousseau DM, et al. The performance of intensive care units: does good management make a difference? *Medical Care*. 1994; 32:508-25.

Shuit DP. "Hospital Nurses Feel Pain of Health System's Restructuring." *Los Angeles Times* (July 1, 1996): A1, A17.

Shukla R. Structure vs. people in primary nursing: An inquiry. *Nursing Research*. 1981; 30:236-41.

Silber JH, Rosenbaum PR, Schwartz JS, Ross RN, Williams SV. Evaluation of the complication rate as a measure of quality of care in coronary artery bypass graft surgery (see comments). *Journal of the American Medical Association*. 1995; 274:317-23.

Sinay UT. Hospital Mergers and Closures: Survival of Rural Hospitals. *The Journal of Rural Health*. 1998; 14:357-365.

Spetz J. (2000). Hospital Use of Nursing Personnel: Holding Steady Through the 1990s. *Journal of Nursing Administration*. 30(7/8), 344-346.

Staff models for the next millennium. *Texas Nurse*. 1999; 73:6-7; 10.

Survey finds loss of RNs jeopardizes patient safety. *Nevada RNormation*. 1995; 4:18-9.

Taunton RL, Kleinbeck SVM, Stafford R, Woods CQ, Bott MJ. Patient outcomes: Are they linked to registered nurse absenteeism, separation, or workload? *Journal of Nursing Administration.* 1994; 24:48-55.

Tidikis F, Strasen L. Patient-focused care units improve service and financial outcomes. *Healthcare Financial Management.* 1994; 48:38-40, 42, 44.

Tutuarima JA, de Haan RJ, Limburg M. Number of nursing staff and falls: a case-control study on falls by stroke patients in acute-care settings. *Journal of Advanced Nursing.* 1993; 18:1101-5.

Walleck CA. Nursing and labor cost reduction. *New Horizons.* 1994; 2:291-5.

Wan TT. Hospital variations in adverse patient outcomes. *Quality Assurance Utilization Review.* 1992; 7:50-3.

Wan TT, Shukla RK. Contextual and organizational correlates of the quality of hospital nursing care. *QRB Quality Review Bulletin.* 1987; 13:61-4.

White AM. Work factors important and satisfying to staff registered nurses employed in midsize hospitals across the United States. Columbia University Teachers College 1990 Ed.D.; 1990.

Wobbe RR. Primary versus team nursing. *Supervisor Nurse.* 1978; 9:34-7.

Workman, B. Stanford Nurses Offered 10% Raise: 'Tough Vote' Foreseen on Deal to End 7-week Walkout at Two Hospitals. *San Francisco Chronicle* (July 25, 2000).

Workplace issues. Safety and quality of patient care in hospitals. *Florida Nurse.* 1995; 43:4.

Wunderlich GS, Sloan FA, Davis CK. Nursing staff in hospitals and nursing homes: Is it adequate? Washington, D.C.: National Academy Press; 1996.

Zimmerman JE, Shortell SM, Rousseau DM, et al. Improving intensive care: observations based on organizational case studies in nine intensive care units: a prospective, multicenter study (see comments). *Critical Care Medicine.* 1993; 21:1443-51.

Zoellner, T. UC and Nurses' Union in Tentative Agreement: Membership to Vote on 3 Percent Raise. *San Francisco Chronicle* (May 26, 2000).