

NURSE STAFFING AND
CARE DELIVERY MODELS:

A REVIEW OF THE EVIDENCE

March 2002

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Institute for Health Policy web site at www.kp.org/ihp

Acknowledgements

We would like to thank Marilyn P. Chow, RN, PhD, Diane Brown, RN, PhD, Karen Cox, RN, Nancy Donaldson, RN, DNSc, Gabriel J. Escobar, MD, Kathy Hoare, RN, DNS, Ann M. Mayo, Anna K. Omery, RN, DNSc, and Jean Ann Seago, PhD, RN for assistance in structuring and reviewing this paper.

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I. Introduction

The current nursing shortage is a looming national and global public health crisis that is expected to intensify as the baby boomer population ages and the demand for health care increase. Hospitals, health systems, policy makers and an array of other stakeholders are hurriedly examining all possible options to address this impending crisis.

Nursing shortages are not new phenomena in the health care industry. Historically, the demand for nurses has been vulnerable to the cyclical nature of the national economy. Nursing jobs are cut in economic downturns; nurses look to other professions; fewer students pursue nursing degrees—and then the demand starts to build again. However, the current nursing shortage is uniquely different from the historical pattern because it can largely be attributed to a long-term increase in demand and a shrinking supply of nurses. Thus, there is now significant pressure both on supply and demand. Moreover, over the past two decades nursing has become a less desirable profession that is increasingly perceived as overworked and undervalued. Because of the anticipated increase in demand for nurses, short-term supply-side solutions are not likely to provide relief as they have in the past. Rather, strategies are needed that focus on improving the organization of nursing care and improving the work environment.

How should nursing care be organized to achieve better outcomes as measured by: increased nurse satisfaction and retention; decreased adverse patient outcomes; improved patient perceptions of care; and cost effectiveness? This paper reviews the evidence related to nurse staffing and care delivery models on a variety of factors. The purpose of this document is to inform the process that Kaiser Permanente's California Division and other health care providers will undertake to identify and implement new care delivery models that reflect the fundamental changes that are required to address the current and future demand for nurses. The desired outcome is an improved work environment supported with appropriate resources that leads to better patient

outcomes and increased satisfaction for all stakeholders including patients, nurses, and physicians.

II. Background

A. The Problem: Current and Projected Shortage of Nurses

- The American Hospital Association estimates that 126,000 nurses are currently needed to fill vacancies in US hospitals. They report that 75% of hospital job vacancies are for nurses¹.
- The U.S. Labor Department projects a shortage of 450,000 nurses by 2008, according to a new Congressional General Accounting Office report.²
- The shortage of nurses is a particular concern in California, which has the second lowest ratio of registered nurses per 100,000 population in the nation. There are an estimated 544 working registered nurses per 100,000 population in California, compared to the national average of 782.³ The California Strategic Planning Committee for Nursing projects that by 2006, California will need to add 67,000 registered nurses to the workforce.⁴ This study was completed before the proposed nursing staffing ratios were announced so the figure does not include the estimated 5,000 additional registered nurses that will be required to implement California's proposed minimum nurse staffing ratios.
- According to the National Council of State Boards of Nursing, the number of nursing school graduates who sat for the NCLEX, the national licensing exam for all entry-level nurses, has declined by 26% from 1995-2001. A total of 25,000 fewer students sat for the exam in 2000 as compared with 1995.⁵
- Approximately 50% of California's nursing workforce is composed of registered nurses from another state or country. This trend reflects the fact that California does not educate enough nurses to keep up with the present, not to mention future, demand.⁶ The increasing national demand for nurses will make it increasingly difficult for California hospitals to recruit from other states.⁷

B. Factors contributing to the Nursing Shortage

The forces shaping health policy in the United States, particularly as they affect nursing and its place in the health care system, have changed dramatically over the past decade. A set of complex contributing factors are impacting the supply of nurses:

Aging Population—The current nursing shortage is deeply rooted in the demographics of the aging U.S. population. The population of senior Americans is projected to grow significantly in the future. The older population will grow rapidly between the years 2010 and 2030 when the "baby boom" generation reaches age 65.⁸ As the population ages and the prevalence of chronic illness and patient acuity increases, the demand for nurses will also increase.

Rising Demand—Despite declines in the number of hospitals and beds over the past two decades, RN demand is believed to be rising due to increasingly sick and older inpatients and increases in admissions since 1995. In addition, according to Buerhaus, the limited ability to apply the practice of substituting lesser skilled personnel (e.g., LVN/LPNs and unlicensed aides) for RNs has probably played a role in the increasing demand for RNs.⁹

Aging Nurse Workforce—According to a study by Buerhaus, Staiger, and Auerbach, the number of RNs in the workforce under 30 years of age dropped 41% between 1983 and 1998.¹⁰ The latest National Sample of Registered Nurses reports that the average age of the working registered nurse population was 43.3 in March 2000, up from 42.3 in 1996. The Government Accounting Office has forecast that 40% of all RNs will be older than age 50 by the year 2010.¹¹ And for every five RNs retiring during the next seven years, only two new nurses are expected to take their place.¹²

Economic Pressure on Hospitals—The growth of managed care, price competition, and reductions in Medicaid and Medicare payments have increased the economic pressure on hospitals. In response, hospitals have made substantial changes in organizational and staffing patterns. Reorganization has resulted in reduction in the number of professional

nursing staff and increased use of Unlicensed Assistive Personnel (UAPs), consolidation of patient care units, shifting patients into less costly outpatient and ambulatory facilities, the merging and consolidation of facilities, and decreases in patient length of stays.^{13,14}

Declining RN Wages—In California and the rest of the nation, inflation-adjusted wages rates for RNs actually fell in the mid-1990s and have risen very little if any since 1997.^{15, 16}

Increase in Intensity of Nursing Care—As patients who would previously have been hospitalized are cared for instead in long-term care facilities, outpatient settings, and at home, the acuity of patients who remain in the hospital has risen. Hospitalized patient populations are sicker than ever, their stays shorter than ever, and their needs more intense than ever. It is estimated that "the cumulative real case mix change in hospitals has been on the order of a 20 percent growth in complexity between 1981 and 1992."¹⁷ The increase in intensity of nursing care needed and the increased use of nonprofessional nursing staff has raised concerns about the quality of care being provided in hospitals.¹⁸

Improvements in Spouse Income and Job Security—The robust national economy over the past few years has given some nurses greater economic security and income growth. This has allowed some RNs to withdraw from the labor market.¹⁹

Unsatisfactory Working Conditions—Many nurses are discontented with their current work environment. The physical demands and stress of the workplace attributed to increased workloads, inadequate staffing, inflexible scheduling, and mandatory overtime contribute to increased turnover and nurses withdrawing from the care delivery workforce. Some nurses decide to apply their skills in non-clinical in the insurance or pharmaceutical industries, for example, or decide to leave the workforce altogether.

Declining Applicants—There is a decline in the number of applicants to nursing educational programs. According to the American Association of Colleges of Nursing, enrollment in entry-level baccalaureate programs in nursing has declined dramatically and

consistently for six consecutive years. From 1995 to 2000 enrollees have declined 21.1% and graduates have declined 16.5%.²⁰

Nursing is not Perceived as a Positive Career Choice—According to Nevidjon and Erickson, adverse working conditions such as evening, night, and weekend shifts, or the exposure to contagious elements are cited as reasons that young people do not perceive nursing as a positive career choice.²¹

Stigma Turns Men Away—Men who would make excellent nurses are not attracted to the profession because of the "negative social consequences" of entering a profession that is perceived as feminine.²²

Lack of Racial/Ethnic Diversity in the Workforce—California's nurses are disproportionately white compared to state demographics. For example, Latinos comprise 30 percent of California's population, but only four percent of the state's nursing workforce.²³ Because ethnic minorities are currently underrepresented in nursing and because California's population will continue to become increasingly culturally diverse in the future, retaining and recruiting a diverse workforce is another key challenge

Faculty Shortage—"In addition to the nursing workforce shortage, there is a dangerous shortfall of nursing faculty nationally. Most baccalaureate and higher degree nursing programs across the country are experiencing a lack of well-prepared nurse educators. The faculty is aging and educational programs are in fierce competition with industry for nurses who hold advanced degrees."²⁴

C. Nursing Shortage has Implications on Quality and Patient Safety

The nursing shortage has serious implications for quality of care and patient safety. There is widespread belief and considerable evidence that higher levels of nursing staff positively impact the quality and safety of hospital care. Press coverage has focused on concerns that inappropriate staffing increases the pressure on nurses and the likelihood of medical errors. For example, the Chicago Tribune reported that thousands of patients are dying every year as hospitals lose staff

and are forced to manage their workload with less. According to the report, since 1995, more than 1,700 patient deaths could be attributed to mistakes made by overworked and inadequately trained nurses under pressure to provide patient care with shrinking resources.²⁵

D. Institute of Medicine Study

Following hearings held by Congress in 1993 regarding the condition of nursing and nursing care in the United States, the U.S. Department of Health and Human Services commissioned the Institute of Medicine (IOM) to examine the question of the adequacy of nurse staffing in hospitals and nursing homes to ensure quality patient care. The resulting 1996 IOM study, "Nursing Staff in Hospitals and Nursing Homes: Is It Adequate?" reviewed the state of the science linking the structure of nursing care to patient care quality and outcomes in hospitals. The authors found insufficient evidence to support public policy on specific staffing ratios. This finding echoed the results of several extensive literature reviews published in the 1980s and early 1990s. As a result, the IOM called for "empirical evidence examining the relationships of quality of inpatient care and staffing levels and mix".^{26, 27} A subsequent 1999 IOM report showing that systematic breakdowns and errors in health care cause increases in patient morbidity and mortality raised new concerns about nurse staffing and quality of care. Since then, several studies have been conducted that look specifically at the impact of nurse staffing on patient outcomes.

E. Nurse Staffing Legislation: California AB 394

In response to the current and emerging shortage of nurses there have been many inquiries by state and federal legislators regarding the government's role regarding nurse supply and demand. A variety of legislation has been introduced in the past several years to address the various facets of the problem. In California, Assembly Bill 394, sponsored by the California Nurses Association and signed into law by Governor Grey Davis in 1999, requires the Department of Health Services (DHS) to establish

minimum nurse-to-patient ratios by licensed nurse classification and hospital unit. In an attempt to establish baseline data and assess the potential effects of this new law on nurse manpower and costs across California hospitals, several groups of researchers analyzed existing staffing and discharge data from California hospitals. They found a great deal of variation exists across hospitals, in both the nurse-to-patient ratio and the hours of RN care per patient day provided in different types of hospital units.^{28,29} Assembly Bill 394 was designed to address unsafe staffing in acute care facilities by reducing some of this variation. The law also limits the nurse-related tasks that can be performed by unlicensed personnel. California is the first state to pass a minimum-staffing bill aimed at improving quality of care and patient outcomes.

The proposed regulations to implement AB 394, announced by Governor Davis on January 22, 2002, require a ratio of one nurse for every six patients on medical-surgical units (reduced 18 months later to a ratio of one-to-five), a one-to-one nurse-to-patient ratio for nurses and patients in trauma centers, a one-to-four ratio for pediatric units, a one-to-four ratio for emergency rooms (with a mandatory triage RN not counted in the ratio), and a one-to-two ratio for obstetric nurses and women in labor. The rules, which still must go through a normal regulatory review process, are expected to be implemented over two years, beginning in July 2003. The Governor's Office estimates the new ratios will require an additional 5,000 hospital staff when fully implemented.

Many professionals are concerned that hospital administrators will interpret legislated minimum staffing as the maximum ceiling with which they will be legally required to comply. This could lead to an actual decline in the number of nurses at the bedside, an opposite effect to that intended by the law.

F. Kaiser Permanente Endorses Nurse Staffing Ratios

In an effort to address some of the workplace concerns of nurses, thereby improving recruitment

and retention, Kaiser Permanente has endorsed nurse staffing ratios proposed by the United Nurse Association of California (UNAC) and the SEIU Nurse Alliance. These standards, which call for one nurse to every four patients in medical-surgical units, exceed those proposed by Governor Davis. The ratios speak to licensed nurses, but do not dictate how the nursing team of RNs, LVNs, and aides should be organized to best deliver patient care. This has led to work, including this report, to better understand how best to organize nursing work to meet the proposed ratios and support good patient care.

G. Models of Care: Solutions for the Short and Long Term

The case for creating a more favorable work environment for nurses is more overwhelming than ever before. Workplace issues are a primary concern that impacts the quality of nursing care and the recruitment and retention of nurses. Physicians also have a stake in this and will be major contributors in this process, as changes in nurse roles and the organization of care delivery may impact their style of practice and the outcomes of their patients. As mentioned above, strategies that merely target resources at the supply side of the nurse staffing equation (e.g., signing bonuses, foreign nurse recruitment, use of registry staff, and relocation benefits) will not provide long-term relief. In order to address the fundamental problems of the nursing shortage, the health care industry must look past the short-term supply side fixes toward solutions that seek to improve the organization of nursing care and address problems in the work environment. Viable strategies focused on improving nursing care delivery are needed to retain mature, experienced nurses and to attract young people to the profession.

At the heart of this challenge is the imperative to maximize both nurse satisfaction with the work environment and effective and efficient care delivery, while maintaining highest standards for quality and patient safety. Nurses should also be encouraged and allowed to maximize their expertise in providing direct patient care. In any practical model of care a balance must be struck between: a) supply and demand, b)

quality and organizational effectiveness, c) staff satisfaction, and d) financial viability.³⁰ Coordinated efforts toward this goal will serve both the public and nursing profession's best interest. Initiatives to restructure care delivery and improve the working environment should be evidence-based, whenever possible. Any attempt to do this properly requires an understanding of the relationship between the structural and outcome variables involved.

The following sections of this paper examine the evidence in the literature about the relationships among the structural and outcome variables related to nursing care, including care delivery models, staffing levels, skill mix, staff and patient satisfaction, and patient outcomes. The alternative care delivery models and nurse practice models evidenced in the literature are also identified and described. Next, the elements of a business case for improving nurse staffing and care delivery models are outlined. The paper concludes with a summary of findings and their implication for structural changes in care delivery.

III. Nurse Staffing and Outcomes: Review of the Evidence

In this section we will present a literature review of nurse staffing level determinations, with a focus on describing how staffing levels affect outcomes, including nurse and patient satisfaction. Measures of nurse staffing include: (1) nurse to patient ratio; (2) mix of RNs, LVN/LPNs, and unlicensed staff caring for patients (generally referred to as the skill mix); (3) total nursing care hours provided per patient day (HPPD); and (4) RN or LVN full time equivalents (FTEs) per patient day. The primary outcomes indicators that have been examined in the literature include mortality (in-hospital and 30-day), adverse incidents, nosocomial infections (urinary tract infection, postoperative infection, and pneumonia, etc.), length of stay and other measures of service utilization, and patient and nurse staff satisfaction.³¹

We conducted a literature search using NEXIS/LEXIS and OVID for the years 1988 to 2001 using the key words nurse staffing, quality, adverse

events, satisfaction, and outcomes. We also consulted with Kaiser Permanente nurse executives and nurse researchers. The following summarizes evidence described in several review articles and a number of research articles.

A. Patient Outcomes

Although the evidence is not conclusive, it does suggest that increases in nurse-to-patient ratios and nursing skill mix are related to a number of positive patient outcomes. Measured at the hospital level, there is mixed evidence that nurse staffing is related to 30-day mortality; scarce but positive evidence that leaner nurse staffing is associated with unplanned hospital readmission and failure to rescue; and strong evidence that leaner nurse staffing is associated with increased length of stay, nosocomial infection, and pressure ulcers.³²

Possible reasons for inconsistent findings among studies include: a multiplicity of data sources, various sampling methods, case-mix adjustment, definition of terms, and whether the study was unit-based or hospital-wide.³³ More recent studies, with larger samples and more sophisticated methods for accounting for confounders, examined staff levels and adverse patient outcomes and provide substantial evidence that an adequately staffed unit and a richer staff mix has a beneficial effect on patient outcomes and satisfaction. Unfortunately, none of these studies specify staff ratios or hours of care that produce the best outcomes for different groups of patients or different nursing units.³⁴ Findings from these studies are briefly described below.

- Aiken et al. found that a richer staff mix in 39 “magnet hospitals” was associated with lower mortality rates compared to 39 control hospitals.³⁵
- Hartz reported that lower mortality rates were related to several factors, including a higher nursing skill mix.³⁶
- Scott et al. found that both a higher RN ratio and a longer tenure of RNs were associated with better outcomes for surgical patients in 17 hospitals.³⁷

- Shortell et al. and Al-Haider and Wan found no statistically significant relationship between skill mix or nursing hours per patient day and patient outcomes including mortality, medication errors, falls, patient injuries, and treatment errors.^{38,39}
- A 2001 U.S. Department of Health and Human Services study, “Nurse Staffing and Patient Outcomes in Hospitals”, found that higher RN-to-patient ratios resulted in lower rates of certain adverse outcomes. The study, based on 1997 data from more than five million patient discharges from 799 hospitals in 11 states, found a strong relationship between nurse staffing and five outcomes for medical patients – urinary tract infection, pneumonia, shock, upper gastrointestinal bleeding, and length of stay. In major surgery patients, the relationship between failure to rescue and nursing staff was strong, while a weaker relationship was found for urinary tract infections and pneumonia. A higher number of RNs was associated with a 3 to 12 percent reduction in the rates of adverse outcomes, while higher staffing levels for all types of nurses was associated with a decrease in adverse outcomes from 2 to 25 percent. However, no relationship was found between nurse staffing and skin pressure ulcers, deep vein thrombosis, sepsis, or mortality.⁴⁰
- Using data from 483 hospitals in California and New York, the American Nurses Association examined the relationship between nursing care hours, staff mix, and patient outcomes. Higher proportions of RNs were significantly associated with lower length of stay and lower rates of pressure ulcers, pneumonia, postoperative infection, and urinary tract infections.^{41,42}
- Blegen et al. examined the relationship between total hours of nursing care, skill mix, and adverse patient outcomes at the level of the inpatient nursing unit. Controlling for patient acuity, they found that the higher the RN skill mix (up to 87.5 percent RNs), the lower the incidence of medication errors, patient falls, skin breakdown, patient and family complaints, respiratory and urinary tract infections, and deaths. Of note, researchers also found as the proportion of RNs increased *above* 87.5 percent, the rates of adverse outcomes also increased.⁴³
- Blegen and Vaughn, controlling for patient acuity, found a similar non-linear relationship between RN proportion and medication errors. A higher proportion of RNs was associated with lower rates of medication errors (up to a proportion of 85 percent) and lower rates of patient falls. However, units with RN proportion greater than 85 percent had significantly *higher* medication errors.⁴⁴
- Fridkin et al. found that a decreased nurse ratio in the ICU was associated with an increase in blood stream infections associated with central venous catheter and that an increase in agency nurses was related to other negative patient outcomes.⁴⁵
- Kovner and Gergen found that RN-to-patient day ratios were inversely related to urinary tract infections, pneumonia, thrombosis, and pulmonary compromise in surgery patients.⁴⁶
- In 65 ICUs Taunton et al. found an increase in nurse absenteeism was related to an increase in urinary tract infection and bloodstream infections but not to other adverse events.⁴⁷

B. Utilization

Most studies of nurse staffing have focused on patient outcomes. A handful have also looked at the relationship between nurse staffing and measures of service utilization. There is strong evidence that leaner nurse staffing is associated with increased length of stay.

- The 2001 U.S. Department of Health and Human Services study cited above found that higher RN-to-patient ratios resulted in lower length of stay.⁴⁸
- Shortell et al. found that low nurse turnover was related to shorter length of stay in 42 ICUs.⁴⁹
- Shamian found that additional hours of nursing care per patient day were associated with a decreased length of stay.⁵⁰
- Hunt found that decreasing nursing staff ratios were related to increasing readmissions rates but were not related to mortality rates.⁵¹

C. Nurse and Patient Satisfaction

It is theorized that nurses' job satisfaction is related to quality nursing care, improved patient satisfaction and improved patient outcomes. Grindel found that quality patient care occurred in practice environments with high degrees of patient satisfaction, physician satisfaction with patient care, and nurse job satisfaction.^{52,53} Patient satisfaction with nursing care has also been found to be an important predictor of overall satisfaction with hospital care, and thus is of great importance to hospital executives. However, as is the case with the research on staffing, the evidence linking nurse job satisfaction to patient satisfaction is somewhat mixed. While some studies have found that job satisfaction among nurses predicted patient satisfaction and improved patient outcomes, other studies have found no significant relationship these factors.^{54,55,56}

- In a meta-analysis of 48 studies, Blegen identified 13 predictors of nursing satisfaction. These included personal variables such as age, education, years of experience and locus of control, and organizational variables such as supervisor communication, commitment, stress, autonomy, recognition, routinization, peer communication, fairness, and professionalism. Organizational variables were more strongly related to job satisfaction.^{57,58}
- Acorn et al reported that for nurse managers, decentralization had a positive effect on perceived autonomy, job satisfaction, and organizational commitment.⁵⁹
- Moore et al. found a positive relationship between both proportion of RNs and hours per patient day and increased patient satisfaction with the quality of nursing care, pain management, education, and overall care.⁶⁰
- Changes in work shift duration, either 8-hour or 12-hour, did not significantly affect patient's satisfaction, however more (90 percent vs. 80 percent) of those cared for by 12-hour shift nurses knew their nurse's name than those cared for by 8-hour shift nurses. In addition, less fatigue and more

complete documentation was reported by 12-hour shift nurses than those working 8-hour shifts.⁶¹

Other studies have found a strong relationship between job satisfaction and job turnover among nurses: those more satisfied are less likely to leave their jobs. High turnover among nurses may be related to adverse outcomes among patients. Therefore creating environments that retain nursing staff has been a focus of several care delivery models. Recent reports have suggested that RNs are dissatisfied with their jobs.⁶² A 1997 survey of nurses in California indicated that 20 percent of nurses who left their jobs did so because of dissatisfaction with the profession or their job or due to job-related stress. However, according to this survey, 75 percent of RNs were satisfied or very satisfied with their jobs, while only 13 percent were dissatisfied or very dissatisfied.⁶³ A more recent survey of nurses in Pennsylvania found that 43 percent scored in the "burnout" range on stress levels, 41 percent were dissatisfied with their present jobs, and 23 percent planned to leave their jobs within a year. Nurses report widespread concerns with staffing, workload, ancillary services, administrative support, and safety—both the patients' and their own.⁶⁴ Recently patient care delivery systems have been designed to address issues of nurse workload, satisfaction, and safety.

IV. Care Delivery Models: Review of the Evidence

The mechanisms for organizing and delivering inpatient care generally are called patient care delivery models. Patient care delivery models focus on structure, process and/or outcomes. Some have been developed using task approaches where patient care tasks are listed and categorized under the level of care required (i.e., requiring an RN or an LVN) to provide the task. More recent models have arisen out of a psychological approach, focusing on patient satisfaction with nursing care and job satisfaction among nurses.⁶⁵ The purpose of any delivery system is to provide high quality care, efficiently and effectively. The choice of delivery system should answer five questions⁶⁶:

- Who is responsible for making decisions about patient care?
- How long does that person's decisions remain in effect?
- How is work distributed among staff – by task or by patient?
- How is patient care communication handled?
- How is the whole unit managed?

We searched the literature using NEXIS/LEXIS and OVID for the years 1988 to 2001 using the key words: nursing, care delivery models, primary nursing, team nursing, patient-focused nursing, quality, adverse events, and outcomes. We also consulted with Kaiser Permanente nurse executives and nurse researchers. The following summarizes evidence described in several review articles and a number of research articles.

The dominant care delivery systems mentioned in the literature include team/functional nursing, primary nursing, and patient-focused care. In addition to care delivery models, the past decade has also seen the rise of nursing practice models. Practice models are organizing systems within patient care delivery models.⁶⁷ The nursing practice models developed during the past decade differ from traditional models on one or more of the following dimensions: (1) the degree to which the practice of individual nurses is differentiated according to education level or experience; (2) the degree to which nursing practice at the unit level is self-managed, rather than managed by traditional supervisors; (3) the degree to which case management is employed; and (4) the degree to which “teams” are employed.⁶⁸ New practice models have been developed with the goal of increasing nurses' job satisfaction, retaining nurses in hospital practice, and producing greater efficiencies in care delivery. These models include professional nursing practice, differentiated nursing practice, shared governance, advanced nursing practice, and case management. Numerous variations exist to the patient care models listed above. Reasons for the variations include cost,

availability of personnel to fill roles, patient care needs, and individual and organizational preferences.⁶⁹

Few comprehensive studies examining care delivery models have been conducted. Much of the literature on this topic is based not on empirical evidence, but on anecdotal reports. Further, the empirical studies that do exist present contradictory findings. In this section we will describe the predominant delivery system models and discuss research findings related to their impact on patient satisfaction with nursing care, nurse staff satisfaction, patient outcomes, and cost.

A. Team/Functional Nursing

Team/Functional nursing focuses primarily on staff and skill mix structure. Implemented in the 1940s as a response to the nursing shortage resulting from the World War II, team nursing is based on the premise of collaboration and division of responsibilities for the nursing care of patients. A “team” is comprised of several health care staff, RNs, LVN/LPNs, and unlicensed staff (UAPs), working within separate, but complementary roles to perform patient care tasks.⁷⁰ Nursing tasks are allocated among team members according to skill level needed and qualifications of the person providing care. For example, the RN functions as the team leader and the LVN/LPNs and UAPs perform such activities as bathing, feeding, and other duties common to nurse aides and orderlies. Each team assumes the responsibility of nursing a group of patients for a given shift. The team leader coordinates the activities of the team staff, delegating the major aspects of work-flow, making assignments, and rounding with MDs.⁷¹ This model has been criticized as being too task-oriented, increasing fragmentation of care, and reducing the amount of direct nursing care provided by the RN.⁷² However, team nursing may conserve costs and human resources when the ratio of care givers to patients is low.⁷³ Outcomes related to this model are often examined in comparison to other models, such as primary nursing, as described below.

B. Primary Nursing

For the past 30 years, a care delivery model generally referred to as primary nursing has dominated nursing

practice. Primary nursing emerged in the 1970s as an alternative to team/functional nursing and was promoted as a means for improving the quality of patient care and enhancing the professional fulfillment of nurses. Primary nursing focuses on continuity of care, beginning with the admission and ending with the discharge. A primary nurse, usually an RN, is responsible for the same patient's care throughout the patient's stay. Associate nurses may be responsible for care when the primary nurse is absent, but UAPs are generally not used and unlicensed staff do not provide patient care.^{74,75} One of the criticisms leveled at primary nursing is that it is neither cost-effective nor efficient. RNs on primary units, because they comprise the majority of the care delivery staff, are required to perform both direct care activities and indirect care activities.

Most research on primary nursing has focused on the issue of quality of care. To date, the research is inconclusive. Early research often compared the effects of primary nursing and team nursing systems. In one early study, no relationship was found between percent of RNs (primary nursing) and quality of care as measured by nurse report.⁷⁶ In fact, this study found that the unit with primary nursing was perceived as having significantly higher omissions in care related to dietary needs, reaction to therapy, and contact with nurses than the unit with team nursing.⁷⁷ Based on these results the author concluded that team nursing was the more cost-effective model.⁷⁸ However, several other early studies reported more favorable outcomes for primary nursing than for team nursing. These early studies had several methodological limitations that constrain the generalizability of their results. A subsequent five-year longitudinal comparison of primary and team nursing conducted in the late 1980s found that patients cared for by primary nurses received a higher quality of care than patients in team nursing units. Primary nursing was related to higher levels of job satisfaction, significantly higher retention rates, and lower costs per patient day.⁷⁹

The evidence from more recent studies examining the impact of primary nursing is similarly mixed. A 1996 British study investigating whether patients cared for in primary nursing care environments would be more

likely to identify one nurse as being in charge of their care and to express greater satisfaction with nursing care found primary nursing no more successful than team nursing.⁸⁰ In Thomas' study describing how nurses and UAPs perceived their work in primary and team/functional practice settings, little difference was noted between the perceptions of nurses and that of UAPs. Both perceived greater supervisor support, autonomy, physical comfort and less work pressure in primary nursing environments than in team/functional nursing environments.⁸¹ Kangas et al. examined three hospitals representing team nursing, case management, and primary nursing and found no differences in nurses job satisfaction or patient satisfaction with nursing care by care delivery model.⁸² However, Horvath found that patients on primary nursing units had significantly lower stress scores than patients on team nursing units.⁸³

C. Patient-focused Care

Patient-focused care (PFC) is a model popularized during the hospital reengineering era of the 1990s. This model involves the use of multi-skilled workers and a team approach to nursing. Mayo describes the aims of PFC as "appropriately group[ing] patients, structur[ing] services for improved responsiveness, decentraliz[ing] services, empower[ing] employees, and provid[ing] continuity of care in order to achieve pre-determined outcomes."⁸⁴ The four main principles, simplifying processes, grouping similar patient populations together, bringing services closer to patients, and broadening staff skills by cross-training care providers, are designed to improve the quality of care, create a working environment that will attract and retain staff, enhance physician efficiency, and decrease costs.⁸⁵ PFC explicitly recognizes the importance of support systems in the efficient delivery of quality nursing care. Adequate support systems, including the distribution of medication from pharmacy to patients, linen from laundry to patient rooms, supplies from central supply to patients and staff on the units, and the transportation of patients, are critical in allowing nurses time to care for patients.⁸⁶ Inadequate support systems necessitates utilizing nursing resources to perform these support (i.e., non-nursing) functions.⁸⁷ PFC uses RNs as care

managers and UAPs in expanded roles such as drawing blood, performing EKGs, and performing certain assessment activities.⁸⁸ PFC redesigns commonly comprise: (1) major infrastructure changes (e.g., equipping units with pharmacy, lab, and registration desk; moving locations of work stations); (2) enhanced telecommunication and information systems (e.g., wireless phones and/or pagers for RNs); (3) redesign of staff roles to produce multi-skilled personnel; and (4) the incorporation of clinical case management into work processes.⁸⁹

An early evaluation of PFC found increased patient, nurse, and physician satisfaction for PFC-units relative to the comparison unit; admission time decreased significantly from a mean of 448 minutes to a mean of 23 minutes; and productive hours per patient day increased from 8.6 to 15.1.⁹⁰ Other early studies of PFC pilot sites found increased physician, RN, and patient satisfaction, a 9 percent reduction in staff, an increase in the amount of time RNs spent in direct care, and decreased lengths of stay.⁹¹ A more recent study found there was a significant reduction in medication errors between the pre-model change and the post-model change, but no difference in measures such as falls, pressure ulcers, and patient satisfaction. There was no significant difference in skill mix and an increase in hours per patient day. In contrast to earlier studies, this study also found an increase in job dissatisfaction among RNs, LVN/LPNs, and UAPs, a decreased feeling of collaboration by physicians and managers, and an increased feeling by LVN/LPNs and UAPs that they had less discretion in their work.⁹²

V. Nursing Practice Models: Review of the Evidence

The relative paucity of research on the effectiveness of one delivery system model compared to another makes it difficult to advocate the use of a particular model. Merely rearranging the numbers, types, roles, and location of care providers may not produce the best results in terms of patient and staff outcomes.⁹³ Research examining other structural variables, such as hospital and/or nursing unit culture and governance structure, including the manager-to-FTE (full-time equivalent) ratio and manager-to-bed ratio, provides

additional evidence on how to optimally organize nursing care. The ratio of manager-to-FTE varies widely across hospitals. Some researchers believe the front-line manager has the greatest impact on staff retention and that the issue of manager-to-FTE ratio should be studied further as an effective staff retention strategy.⁹⁴ The three practice models receiving greatest attention today are professional practice/magnet hospitals, case management, and differentiated practice. Case management addresses the structural design and organization of the care delivery system. Professional practice, differentiated practice, and shared governance all focus on enhancing the professional accountability of nurses.⁹⁵ Evidence suggests that hospitals which have formal structures in place for nurses to participate in decision making tend to have lower vacancy and turnover rates.⁹⁶

A. Professional Nursing Practice Model and Magnet Hospitals

Magnet Hospital is a term for hospitals that embody a set of organizational attributes that nurses find desirable. These hospitals are characterized by nurses as being good places to work and are recognized for administering exceptional patient care, for providing good nursing environments, including flat organizational structures, unit-based decision-making processes, and influential nurse executives, and for their ability to attract and retain nurses.^{97, 98} Magnet hospitals have slightly higher RN-to-patient ratios and a richer skill mix than equivalent hospitals. They also exhibit higher rates of patient satisfaction, lower nurse burnout, and a safer work environment.⁹⁹ The Professional Nursing Practice Model (PNPM) has been identified as the core feature of magnet hospitals. PNPM is characterized by nurse autonomy over practice, nurse control over the practice environment, and effective communication between nurses, physicians, and administrators.¹⁰⁰ While magnet hospitals do not necessarily have all-RN staffs, many are moving in that direction. Aiken et al found a strong relationship between the nursing organization found in magnet hospitals and lower adjusted Medicare mortality rates. The authors attribute the decrease in mortality to "... the greater status, autonomy and control afforded nurses in the magnet

hospitals, and their resulting impact on nurses' behaviors on behalf of patients."^{101,102} Other studies have shown increased patient satisfaction, increased professional satisfaction, and enhanced workplace safety for nurses in the magnet hospital/professional nursing practice environment.¹⁰³ Nurses in these environments report lower levels of emotional exhaustion and lower rates of needle-stick injuries.¹⁰⁴ Several studies examining the cost of care delivery found PNPMs to be cost neutral.¹⁰⁵

B. Nursing Case Management

Nursing case management (NCM) refers to a diverse group of programs, linked by a common set of identified problems and proposed strategies. NCM became more prominent following the advent of prospective payment systems in the 1980s. Proposed as a means to control nursing care costs while improving quality through interdisciplinary collaboration, nursing case management focuses on specific patient populations, following the patient through an entire episode of care.¹⁰⁶ Two broad categories of Nursing Case Management exist: hospital-based and community based. Hospital-based programs are often organized around specific patient types and use such methods as critical paths. Community-based NCM developed in response to concerns about defragmentation of services and decreased reimbursement and are designed to reduce expenses by preventing hospitalization or rehospitalization by admitting patients earlier and therefore at a lower level of acuity.¹⁰⁷ Within the hospital, an RN acts as an advocate for the patient and, with others on the case management team, focuses on daily evaluation of patient progress toward specific outcomes, modifying care based on the evaluation, and preparing patients for timely discharge.¹⁰⁸ The goals of nursing case management include: decreasing fragmented care; improving patient self-care and quality of life; optimizing efficient use of resources, and decreasing costs.¹⁰⁹

Studies of the effectiveness of nursing case management have primarily focussed on the achievement of fiscal and clinical outcomes. Several studies have found that case management increases

patient, nurse and physician satisfaction, improves quality of care, and reduces length of stays, thereby reducing costs.¹¹⁰ A study on the effects of nursing case management with patients who received total hip replacements and those with respiratory disease found that length of stay was reduced by 2.1 days for the first group, 3.5 days for the second.¹¹¹ Etheridge compared more than 700 case-managed patients enrolled in an HMO senior plan to national and state Medicare patients and found that case-managed patients had 53 fewer annualized hospital admissions, 895 fewer bed-days, and an average length of stay 1.73 days lower than other Medicare patients in the state.¹¹²

C. Differentiated Nursing Practice

Differentiated nursing practice is a philosophy that focuses on the division of labor required to meet patient needs, the value of complementary educational preparation and clinical experience, the need for collaboration to maximize effectiveness, and compensation based on academic preparation and performance.¹¹³ The goals of differentiated nursing practice include: (1) optimal nursing care matching patient's needs with the nurse's competencies; (2) effective and efficient use of scarce nursing resources; (3) equitable compensation; (4) increased career satisfaction among nurses; (5) greater loyalty to employer; and (6) enhanced prestige of nursing profession.¹¹⁴ The American Organization of Nurse Executives, the American Association of Colleges of Nursing, and the National Organization for Associate Degree Nursing have all endorsed differentiated nursing practice as a way of maximizing scarce nursing resources.

Published studies report increased in patient satisfaction, decreased length of stay, and decreased patient cost under differentiated nursing practice. Most authors report positive or neutral effects on nurse satisfaction.¹¹⁵

D. Shared Governance

Shared governance, a philosophy popularized by Porter-O'Grady, is designed to create organizational structures that ameliorate high turnover and dissatisfaction among nursing staff. Shared governance uses a decentralized participatory approach to management; staff nurses make decisions impacting their work and working environment, professional development, and personal fulfillment. This contrasts with the more hierarchical and bureaucratic traditional form of governance, under which a head nurse plans, organizes, and controls the administration of the unit and staff.¹¹⁶ The research is mixed regarding the effectiveness of this approach. Several studies found nurses working in a shared governance environment to have significantly higher job satisfaction than nurses working in a traditional environment.^{117,118} Another study, however, did not support this finding. Further, the sense of increased autonomy associated with greater influence in decision making was not sustained over time.¹¹⁹ No studies measuring the impact of shared governance on patient outcomes have been found.

E. Interprofessional Care Delivery Model

The Interprofessional Care Delivery Model integrates teams of nurse practitioners (NPs) and physicians to deliver care. Research regarding the impact of this model on patient care and outcomes is limited.¹²⁰ Schmidt believes that interprofessional care delivery models are most useful in organizations concerned with care coordination, best practice thinking, continuity of efforts of multiple professions, and use of care protocols.¹²¹

F. Advanced Nursing Practice Models

Advanced Practice Nursing (APN) is a label used to describe Master's prepared, licensed, registered nurses with nationally recognized clinical advanced certification.¹²² These professionals include Clinical Nurse Specialists (CNS), Nurse Practitioners (NPs), nurse anesthetist, and nurse midwives. APNs practice

in a variety of settings from community-based primary care clinics to surgical suites and critical care units in tertiary care referral centers. The role of the APN depends on their scope of practice and clinical privileges, which vary by state.

Whereas Nurse Practitioners tend to work in outpatient settings, Clinical Nurse Specialists play important roles in both inpatient and outpatient environments. Central to the CNS role are core competencies that include clinical expertise, collaboration, consultation, education, research, and management activities. There is evidence that CNS clinical intervention increases quality of patient care across settings and reduces costs over time by decreasing length of stay, reducing unnecessary tests and procedures, preventing complications, improving collaboration with physicians, and facilitating quality control.¹²³ In its 1996 study on nurse staffing the IOM found that "high-quality, cost-effective care for certain types of patients, particularly those with complicated or serious conditions, will be fostered by the use of ... advanced practice nurses."¹²⁴ The IOM recommended that hospitals expand their use of RNs with advanced practice preparation to provide clinical leadership and cost-effective care.¹²⁵

VI. The Case for Organizational Change

Building a strong case for improved nurse staffing and care delivery models is crucial for garnering support for such organizational change. In an era of escalating health care costs, a compelling business case must demonstrate that improving working conditions and reengineering the organization of nursing care can have a neutral or positive financial impact, while improving the quality of care. There are several solid business reasons for improving nurse staffing and care delivery models.

First, as evidenced in the previous sections, there are links between nurse staffing, nursing care delivery models, and positive patient outcomes. Appropriate organization of work and nurse staffing levels are cost-effective because more time is available for patient assessment and interventions to improve outcomes¹²⁶

and therefore, patients are less likely to develop complications or have to be re-admitted.

Second, improvements in the work conditions are likely to result in better patient safety outcomes, which impact the health care bottom line. The average direct costs of an adverse event range between \$1,900 and \$5,900.¹²⁷ According to Lucian Leape, an estimated 38% of adverse drug events can be attributed to nurses.¹²⁸ Working conditions and staffing policies may lead to increased stress and fatigue on the job that can contribute to medical errors and "near-misses".

Third, organizations that improve their nurse staffing and working conditions will find it easier to recruit and retain nurses, thus reducing the cost associated with high nurse turnover. A survey conducted by the Advisory Board Company suggests that the national turnover rate among hospital staff nurses increased from 12 percent in 1996 to 15 percent in 1999. According to Linda Aiken, the total cost of replacing a specialty nurse is estimated to be approximately \$70,000.¹²⁹ The Advisory Board Company estimates the savings to a 500-bed hospital of reducing nurse turnover from 13 percent to 10 percent is on the order of \$800,000 annually.¹³⁰

Fourth, improved nurse staffing facilitates reductions in hospital utilization. For example, 60% of patients who develop pressure sores do so while in hospitals, and these patients incur up to five times longer length of stay than average and cost an estimated \$8.5 billion in aggregate.¹³¹ Pressure sores are caused by many factors associated with nursing care, including patient handling, hygiene, and wound care provided.¹³² Nosocomial infections (e.g., urinary tract infections, upper respiratory infections, intravenous and certain septicemia infections, etc) also add to patient length of stay and escalate costs.¹³³ A recent study by Reed, Blegen, and Goode (1998) found that nosocomial infections are related to nursing care.¹³⁴

Fifth, improved working conditions can lead to a reduction in workers compensation claims. Nursing personnel are the fifth largest source of workers' compensation claims in the nation. Back injuries from patient handling alone account for 35 percent of

hospital workers' compensation costs and 58 percent of nursing home costs. According to the Bureau of Labor Statistics, back injuries among nursing home staff average more than \$8,400 each in workers' compensation costs. Successful injury prevention strategies and work reengineering are essential to reduce the high incidence and severity of occupational injury in health care delivery.¹³⁵

When the factors above are considered together, the case for improving nurse staffing and care delivery models is strengthened. Inefficiencies in nursing care delivery and sub-optimal working conditions contribute to both increased costs and decreased quality of care and service. There is a significant opportunity to address some of the major drivers of quality and health care costs by targeting workplace issues.

VII. The Evolving Roles and Responsibilities of the Nursing/Patient Care Team

As Kaiser Permanente implements new staffing ratios, it will be important to continue to examine the relationship between RN staffing and quality of care. Patient care is most effectively delivered by a team whose composition varies according to patient need, acuity, case and staff mix. The research to date does not support the assumption that more RN staffing is *always* better. However, there is ample evidence that an adequately staffed unit and a richer staff mix have a positive effect on patient outcomes and nurse and patient satisfaction. Therefore, nurse and hospital executives will need to learn whether there are thresholds below which quality of care is unacceptable or above which there is little improvement.¹³⁶

A. Emerging Themes

While the evidence does not support a clear choice for patient care delivery system, certain themes do emerge from the literature. Our review suggests the following are elements we should consider as we move forward implementing the new ratios.

- Quality patient care occurs in practice environments with high degrees of patient satisfaction, physician satisfaction with patient care, and nurse job satisfaction.
- Professional nursing practice environments are positively related to perceptions of autonomy, control over practice, and job satisfaction, and have been found to improve staff retention and patient outcomes.
- Innovative nursing delivery practices, such as the use of clinical nurse specialists and case management, are related to improved cost savings, patient satisfaction, and patient care coordination.

B. The Importance of Workforce Culture

The importance of organizational culture on the redesign of work should not be ignored nor underestimated. The success of care delivery implementation initiatives will hinge on the identification and management of the various workforce cultural dimensions. Huq and Martin suggest that workplace culture within a hospital dictates which behaviors are acceptable, establishes the ways problems are addressed, spells out how relationships are defined and supported, and establishes how work is done.¹³⁷ The various players in the care delivery model will likely oppose changes they perceive as threatening to their job security, self-esteem, or autonomy. Active involvement of frontline staff in care delivery improvement efforts will promote cultural change in the workplace that makes the desired outcome more likely. In addition, garnering the involvement and support of physicians will be critical to the success of any proposed redesign.

C. Research Opportunities

Kaiser Permanente is uniquely suited to explore innovations in the care delivery model and to better understand the factors influencing successful implementation of nurse staffing ratios in a wide variety of geographic areas and care settings. As Kaiser Permanente implements new staff ratios and

considers changes in nurse practice and delivery models, it has an opportunity to systematically re-think, test and study a number of aspects of nursing care delivery. The lack of strong evidence in favor of one model over another enables us to create a care delivery system and adopt a practice model(s) that are uniquely Kaiser Permanente. It is recommended that both internal and external factors be considered in deciding upon a model.¹³⁸ These include:

- Establishing working definitions for each of the models, so that decision-makers have common understandings;
- Assessing how Kaiser Permanente's current or projected skill mix would impact the ability to operationalize a particular model;
- Examining the care delivery models in terms of quality and cost indicators.

Moving forward, Kaiser Permanente might consider the following:

- Establishing baseline nurse and patient satisfaction data at the unit, hospital, and regional level. These data would assist nurse executives to better understand the themes and issues that are important to nurses and patients within Kaiser Permanente and could be used to help assess the effectiveness of future care delivery models.
- Collaborating with external researchers to build on the body of evidence that exists in the literature regarding work satisfaction and patient outcomes
- Supplementing quantitative research with qualitative research (e.g., focus groups) to give greater insight into facility-specific issues.
- Implementing the staffing ratios using different approaches throughout Kaiser hospitals, so that a case-control study might be conducted. At the same time, different care delivery/practice models could be adopted in some Kaiser Permanente hospital units to explore the importance of organization relative to staffing levels.

- Developing an evaluation model that includes clinical, fiscal, productivity, and care provider variables to assist nurse leaders in assessing the impact of the different models.

The resulting studies will provide Kaiser Permanente and the nursing community with critical information about which staffing structures and care models have the most beneficial effects on mortality, patient outcomes and satisfaction, medical errors, employee injuries, employee satisfaction, and employee retention. The experience of Kaiser Permanente in implementing new ratios and care delivery models at a facility-specific level, based on the unique characteristics of each facility, will be broadly applicable to other health care organizations attempting to improve working conditions for nurses.

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