

Hospital Work Environments:
Implications for Nursing Practice and Patient Care Quality
Ann Hendrich, MS, RN, F.A.A.N

Introduction

Annie Dillard, in her book *The Writing Life*, notes that “in working class France, when an apprentice got hurt or when he got tired of the work, the experienced worker said: It is the trade entering his body¹.” Similarly, the hospital work environment has entered the body of the American nurse. Poorly designed work spaces, inefficient patient care layouts, too few process and technological solutions to reduce the nurses’ time spent ‘hunting and gathering’ have been slow to improve². Further, fragmented and duplicative documentation between paper and electronic records continue to contribute to human error. All of these factors detract from the professional nurse’s ability to deliver safe, efficient, effective, patient-centric care.

Numerous direct correlations exist between the work environment, the lack of teamwork, and the satisfaction and burnout of hospital nurses. Without bolder fundamental changes in the hospital work environment, the nursing shortage coupled with the retiring nursing workforce, will threaten the sustainability of the American hospital as part of the care delivery system within the next 10 years. Meanwhile, pervasive new hospital construction is underway to increase the number of acute-care hospital beds or to replace outdated facilities. Staffing these new hospitals with the familiar replicated, inefficient, designs will put further strain on an already tenuous situation³. These facilities present a unique opportunity to create and design transformational and innovative care centers that will alter how future care is delivered for the next 30-50 years.

There is growing evidence that hospitals, regulatory bodies, architects, designers and healthcare administrators are in a state of ‘readiness’ to receive research-based information on the work environment of caregivers and hospital design. Some of the current regulatory and federal reimbursement rules and guidelines, intended to improve the safety and quality of hospitals, can act to minimize and/or discourage significant design changes (acuity-adaptable rooms)⁴. Much can be done now to build a research

agenda responsive to findings in the November 2003, Institute of Medicine report, *Keeping Patients Safe: Transforming the Work Environment of Nurses*⁵.

Overview

Evidence-based links between available nursing time and adequate nurse staffing, registered nurse (RN) job satisfaction and patient outcomes demand innovative and bold approaches to resolve the escalating nursing shortage. Conventional recruitment and training strategies alone will not halt the erosion of the nurse workforce. We must examine the root causes for nurse burnout and dissatisfaction—and its consequent nurse shortage—in order to create a fresh model for retaining RNs in the hospital workforce. Work sampling studies of RN job functions provide the basis for streamlining those functions, but more importantly, for the redesign of the RN workplace. Such redesign will promote increased RN hours devoted to direct patient care, which will enhance job satisfaction and improve patient outcomes.

Background

As American health care providers hone short and long-range workforce plans, work trends and national demographics threaten to strain even the most well managed health care organization (HCO). Between the years 2000-2020 the nurse population is expected to grow by 6%, with an accompanying demand for nursing care expected to grow by 40%⁶. The U. S. Department of Health and Human Services (DHHS) reports the shortage of full-time equivalent (FTE) registered nurses expected to emerge in 2007 made an early debut in 2000 with a 6% shortage. According to DHHS 2002 statistics, the shortage is expected to double to 12% by 2010, to almost quadruple to 20% in 2015 and to rise to 29% in 2020⁷. The U.S. Census Bureau projects a 2010 population of 75 million adults 55 years of age and older, as compared to a population of 59 million of adults in the same age group in 2000⁸. This represents a 27 percent increase of this portion of the population, with an expected rise to 86 million in 2015 and 96 million in 2020⁹. The ever-increasing aging population not only helps create the nursing shortage, but also compounds the challenges of the shortage, due to the complicated nature of this population's health care needs. The convergence of an aging population with a decreasing number of nurses compels health care executives to closely study and manage the RN workforce.

The literature supports urgency in resolving the nursing shortage from a variety of perspectives. A growing body of research indicates a relationship between nurse staffing and patient outcomes. According to the Agency for Healthcare Research and Quality (AHRQ), hospitals with low nurse staffing levels tend to have higher rates of poor patient outcomes¹⁰. Needleman, et al., found a strong relationship between nurse staffing and five outcomes: urinary tract infections, pneumonia, shock, upper gastrointestinal bleeding and length-of-stay¹¹. Clarke et al., drew a connection between staffing, organizational climate and nurse safety (related to needlesticks)¹². Shortell et al. linked low nurse turnover to shorter length of stay in a study of 42 ICUs¹³.

Lower patient-nurse ratios have been linked to lower failure-to-rescue rates in hospitals^{14, 15, 16}, and to a lower rate of adverse events¹⁷. Hospital-level data indicates a higher percentage of RNs in the skill mix, increased RN full time equivalents (FTEs) or hours per patient day or average daily census is associated with decreased risk-adjusted mortality^{18, 19, 20, 21}. In the wake of the Institute of Medicine's (IOM) groundbreaking report on healthcare safety in 2000²², healthcare executives cannot afford to dismiss RN staffing data that could provide the key to saving lives.

In addition to the correlation between RN staffing and patient outcomes, the literature attests to positive patient outcomes in hospitals in which RNs experience job satisfaction^{23, 24, 25}. Studies have found work environment effects nurse satisfaction and turnover^{26, 27, 28, 29} and at least two studies link satisfied nurses, satisfied patients and better quality of care^{30, 31}. A 1983 study describes a number of hospitals that appeared to have fewer problems recruiting and retaining nurses and were considered by nurses to be "good places to work"³². Described as "Magnet" hospitals for their ability to attract and hold staff, these hospitals were found to have many common characteristics. Among their attributes were low turn-over, flexible scheduling, strong nurse leadership, recognition of excellence in practice, good relationships with physicians, and staffing characterized by the nurses as adequate. To further study the RN workplaces, Aiken developed the Revised Nursing Work Index (NWI-R) and measured organization attributes that characterize an environment supportive of professional nursing practice: autonomy, control over the work environment, and relationships with physicians³³. In a 1994 study of Medicare mortality rates using the instrument, Magnet hospitals were

found to have lower mortality rates than the control group of hospitals; in addition, the Magnet hospitals had significantly higher NWI-R scale scores³⁴.

There is a good deal of evidence linking RN staffing and RN job satisfaction to positive patient outcomes. It is reasonable to conclude that a stable, adequate staff maximizes opportunities for nurses to attend to patients, complete their work, derive work satisfaction and provide safe, quality care.

Intensifying efforts to recruit and train nurses is the obvious solution to the shortage and its apparent link to patient outcomes. Incentive programs such as the federal government's 2002 Nurse Reinvestment Act³⁵, and marketing campaigns, such as "The Campaign for Nursing's Future" by Johnson & Johnson³⁶, work to drive interest in and bring new nurses to the profession. However, attracting new nurses does not necessarily result in long-term solutions. Aiken, in citing the wide disparity in numbers of nurses in Pennsylvania and California, noted that both states reported serious nurse shortages, which called into question the "effectiveness of supply-oriented strategies to ameliorate the nurse shortage."³⁷ Factors that dilute recruitment effectiveness include issues related to foreign-born RNs, and a large number of new, older RNs entering the workforce.

Foreign-born RNs constitute a portion of newly recruited RNs, a controversial matter lacking universal support, and therefore, not likely to provide more than an incomplete fix. The American Nurses Association (ANA) spoke out against the 2002 Rural and Urban Health Care Act and its 2003 reintroduction, citing concerns about subjecting foreign-born nurses to employer-exploitation, concerns about the professional standards for foreign-educated nurses, and the ethics of employing these nurses when there are worldwide shortages³⁸.

Along with foreign-born RNs, there has been an influx of new RNs older than age 50³⁹. According to Buerhaus, et al, despite increases of nurses' numbers in 2002, employment of RNs ages 35-49, which is the largest segment of the workforce, grew only 4.5%. In the same time period, employment of nurses younger than 35 declined 8.3%, resulting in no gain of nurses less than age 50. However, the employment of nurses age 50 and over increased 15.8%, accounting for 67% of the growth in hospital employment⁴⁰. The RN increases drawing from the 50+ market result in shorter employment spans in

the work force, and thus, provide a diluted benefit to the long-term problem nursing shortage.

Most importantly, recruitment does not address the growing challenge of nurse retention. Sadovich cited burnout as one of the causes of the nursing shortage.⁴¹ Aiken, et al., found that nurses in hospitals with higher patient-to-nurse ratios were more likely to have burnout scores above published norms.⁴² Thus, the literature suggests the nursing shortage begets the nursing shortage, a situation that demands innovative solutions and a much closer look at the hospital work environment.

The exploding demographics of an aging population and lightning-speed growth of the nursing shortage may doom the singular solution of increased recruitment. Even if intense recruitment efforts result in mitigation of the nursing shortage, such relief will be short-lived. We must consider root cause analysis of this crisis in order to ensure retention of new nurses, examining nurse dissatisfaction and burnout, as well as the corresponding decline in positive patient outcomes for the fundamental causes of the dissatisfaction.

Just as other industries analyze work environments, healthcare researchers have begun RN work sampling as a basis for redesigning the RN workplace⁴³. Such redesign holds the potential to increase time spent with patients, which in turn, could achieve those elements of RN satisfaction that lead to positive patient outcomes. Two IOM reports, *To Err is Human* (2000) and *Crossing the Quality Chasm* (2001), call for better design of work processes to improve patient care and safety^{44, 45}. In addition to the well documented subject of medication administration, nurses' work hours, work processes and workspaces have been each have been studied as they relate to patient safety and efficiency.

Time at the bedsides—time RNs are performing work in direct care of patients—is remarkably brief, according to a number of studies. Linden and English found that nursing personnel spent 27.5% percent of their time in direct care and 48.8% in indirect care. Fifteen percent of their time was spent in unit-related activities and another 15.7% was spent in personal time⁴⁶. Several other work sampling studies show direct care percentages ranging from 26% to 32.8%^{47, 48, 49}.

Time and Motion Work Sampling

Hendrich and Lee found similar results when video-tape was used to capture nursing work patterns on medical-surgical units in a 1995/1996 study. Analysis confirmed the unit design, location and availability of equipment and supplies, and whether or not departments and systems designed to support and integrate patient care are effective, become critical predictors of how actual nursing time is spent. In other words, budgeted nursing hours per patient day (NHPPD) cannot be considered accurate predictors of actual care hours unless the related nursing unit and hospital environmental variables have been evaluated. A decade later, many of these identified environmental barriers are still prominent in hospital design and work environments adding to the nurse's frustration and increased workload index. These factors contribute to nursing turnover and dissatisfaction with the quality of work life when too little time is spent in delivering direct patient care.

An expanded three phase multi-site study is currently underway funded in part by Robert Wood Johnson (RWJ). Hendrich and Chow will study the impact of the built environment and the electronic health record (EHR) impact upon nursing time with four study tracks. It builds upon the previous work of Hendrich and Lee (2004) in which categorical data sets of direct and indirect care variables were used to evaluate more than 1,000 hours of continuous video capture of a nursing unit. In Phase I, seven AH and seven KP hospitals have selected one medical-surgical unit for study data collection. Six of the AH and KP hospitals will be pre-EHR installation and the seventh hospital, for each, has been selected as a control hospital. The two control hospitals are considered to be nearly fully electronically enabled with EHR and other smaller technologies.

In order to capture the activity and flow of the new study units, radio frequency tracking technology (RFID) is incorporated into the personal digital assistants (PDA) data collection. The study has advanced from the medium of video, previously used by Hendrich and Lee, to PDAs programmed to enable clinical nurses to self-report activities randomly measured during their shift. Pilot testing of these devices has already successfully been implemented within the RWJ Transforming Care at the Bedside (TCAB) project using Hendrich and Lee's methodology.

The four study tracks include “A”, “B”, “C” and “D” as shown in the Study Schematic (Figure 1). Data is collected for seven consecutive days on each of the medical-surgical units providing thousands of randomly sampled work processes. Track A has five nurses who carry PDAs that collect specific data in the category of documentation time. Track B has five nurses who collect categorical data sets on work sampling to measure how medical-nurses spend their time during their work shift. Track C has five nurses who carry RFID tags to measure the distance traveled in relation to the physical layout of the nursing unit. The RFID tag will efficiently and accurately measure the location of the nurse and the duration of activity in any one spot. Track D is an optional track with a wireless body media device that tracks physiological data from the individual nurse (galvanic skin temperature, body position, heart rate) during work shifts compared to non-work shifts. Ascension Health (AH) and Kaiser Permanente (KP) are large systems that are on the verge of extensive informatics installations in direct care areas. This provides a unique research opportunity to measure pre and post-installation impact of technology on nursing time and work processes. Additionally, the related demographics of the work environments and environmental variables will be simultaneously measured and recorded to assure interrelated variables can be controlled and quantified in the final data analysis. A standardized data collection tool is used to collect extensive nursing unit demographic variables including technology assessment.

A software program, Layout IQ Optimizer, has been developed by Lee to validate flow and environmental optimization for each study unit. This program incorporates computerized architectural drawings (CAD) with the actual RFID measured movement of staff and equipment to calculate the environmental impact upon the nurse’s time and workload index.

Research Imperatives

A strong relationship exists between the work environment and the professional satisfaction of the professional nurse. The RN workforce data and its relation to hospital staffing, patient safety and quality creates a compelling interdisciplinary research agenda. The agenda should seek to answer the following questions (and others) related to the impact of hospital work environments upon nurses and other caregivers.

1. Is there a pattern of baseline nursing activities across hospitals and types of nursing units? For example, can we predict heavy traffic patterns of repeated activities within certain types of nursing unit layouts?
2. Does unit size, geography, staffing models, etc. make a difference in available nursing time and patient care quality?
3. Is there a pattern of nursing activity that differs in hospitals that have successfully implemented and adopted small and large technologies to reduce workload and improve efficiencies?
4. Is there any statistical relationship to the time nurses spend documenting, locating equipment and supplies, when unit variables (process and systems) are measured?
5. Is there any relationship between the nurse's physical and stress response in different types of units? Can we predict patterns of failure related to environmental factors?
6. Are there workflows that would inform opportunities for Lean thinking (Toyota Production System techniques)? Can this be incorporated into design?
7. Can improvement opportunities for workflow, etc. be identified based on these findings? Location of equipment, nursing stations? Medication access? Number of computers on wheels (COWS), wireless devices, communication devices.
8. Can research findings culminate into a business case for hospital design and care delivery aligned with the IOM recommendations?

Summary

Improvements in the hospital work environment holds significant promise for patient care quality, safety and retention of the professional nurse. It can also provide appropriate conservation strategies for the nursing workforce given the longevity and severity of the nursing shortage. Simply adding more nurses in inefficient work environments or mandating staff to patient ratios may simply deepen the shortage while ignoring the 'root cause' of hospital nursing turnover. The culture of a nursing unit is multifaceted. Design and technology alone cannot compensate for lack of effective leadership or safety climate teamwork. However, the built environment represents a nearly untapped opportunity for transformation. Some hospitals have already successfully initiated LEAN methods and/or the Toyota Production System (TPS) techniques to

reduce waste (time, supplies, equipment, space, etc.), improve the work life of caregivers and to reduce labor cost and supplies. When this knowledge is combined with the IOM rules for transformation, an enormous opportunity exists to quantify and measure numerous environmental variables. Understanding the difference between the various nursing unit types and the related impact upon nurses and patient care delivery will help to assure continued, safer, more affordable healthcare access in the years to come.

Reference List

-
- ¹ Dillard, A., A Working Life. New York, New York. Harper and Row Publishers. 1989.
- ² Institute of Medicine (US). Committee on the Work Environment for Nurses and Patient Safety: Crossing the Quality Chasm: A New Health System for the 21st Century. pp 270-275 (Hendrich), Washington, DC: National Academy Press, 2004.
- ³ Hendrich, A., Lee, N., The cost of Intra-Unit Hospital Patient Transfers. *Nursing Economics*. 2005.
- ⁴ Hendrich, A. Fay, J., Sorrells, A., Effects of Acuity-Adaptable Rooms on Flow of Patients and Delivery of Care. *American Journal of Critical Care*, 13 (1) Jan. 2004.
- ⁵ Institute of Medicine (US). Committee on the Work Environment for Nurses and Patient Safety: Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: National Academy Press, 2004.
- ⁶ Health Resources and Services Administration, Bureau of Health Professions, National Center for Health Workforce Analysis. Projected supply, demand and shortages of registered nurses: 2000-2020. HRSA <http://bhpr.hrsa.gov/healthworkforce/reports/rnproject/default.htm>. (Stanton, Mark W., M.A., Research in Action, Agency for Healthcare Research and Quality, Issue 14, March 2004, www.ahrq.gov)
- ⁷ U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA), <http://phpr.hrsa.gov/nursing/2003NELRPNSPRTC/Chapter2.htm>
- ⁸ United States Census Bureau, National Population Projections, www.census.gov/population/www/projections/natustum-T3.html
- ⁹ Ibid
- ¹⁰ Stanton, Mark W., M.A., Research in Action, Agency for Healthcare Research and Quality, Issue 14, March 2004, www.ahrq.gov
- ¹¹ Op Cit, Needleman et al, 2002. Curtin, Leah L. An integrated analysis of nurse staffing and related variables: effects on patient outcomes. 2003 online *Journal of Issues in Nursing*, September 30, 2003.
- ¹² Clarke SP, Rockett JL, Sloane DM, Aiken LH: Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. From the Center for Health Outcomes and Policy Research, University of Pennsylvania School of Nursing, the University of Pennsylvania Health System and the Department of Sociology, University of Pennsylvania. *Association for Professionals in Infection Control and Epidemiology, Inc.*, 2002.
- ¹³ Shortell SM, Zimmerman JE, Rousseau DM, et al: The performance of intensive care unites: does good management make a difference? *Medical Care*. 1994;32:508-525)
- ¹⁴ Silber JH, et al.: Evaluation of the complication rate as a measure of quality of care in coronary artery bypass graft surgery. *JAMA* 1995;274(4):317-23 (Clarke SP, Aiken LH: Failure to rescue, *AJN*, Vol 103, no. 1, January 2003, pp 42-47)
- ¹⁵ Aiken LH, et al: Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. *JAMA* 2002;288(1):1987-93 (Clarke SP, Aiken LH: Failure to rescue, *AJN*, Vol 103, no. 1, January 2003, pp 42-47)
- ¹⁶ Needleman J, et al: Nurse-staffing levels and the quality of care in hospitals. *NEJM*, 2002;346(22):1715-22.

-
- ¹⁷ U.S. DHHS: HHS study finds strong link between patient outcomes and nurse staffing in hospitals. HRSA News, April 20, 2001, Retrieved January 11, 2006.at <http://newsroom.hrsa.gov/releases/2001%20Releases/nursestudy.htm>
- ¹⁸ Hartz AJ, Krakauer H, Kuhn Em, et al: Hospital characteristics and mortality rates. NEJM; 1989:1720-1725 (Seago, JA: Chapter 39, Nurse staffing, models of care delivery and interventions)
- ¹⁹ Pierce SF: Nurse-sensitive health care outcomes in acute care settings: an integrative analysis of the literature. Journal of Nursing Care Quality; 1997:60-72
- ²⁰ Aiken LH, Smith HL, Lake ET: Lower Medicare mortality among a set of hospitals known for good nursing care. Medical Care, 332, 771-787, 1994.
- ²¹ Aiken LH, Clarke SP, Sloane DM: Hospital restructuring: does it adversely affect care and outcomes? J Health Hum Serv Adm. 2001 Spring;23(4):416-42
- ²² Kohn LT, Corrigan JM, Donaldson MS: To err is human: building a safer health system. Washington, DC: National Academy Press, 2000.
- ²³ Hegyvary ST, Haussman RK. Correlates of the quality of nursing care. Journal of Nursing Administration, 6 (9), 22-27, 1976. . (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ²⁴ Weisman CS, Nathanson CA. Professional satisfaction and client outcomes: a comparative organizational analysis. Medical Care, 23, 1179-1192, 1985. (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ²⁵ Op Cit Aiken, Smith, Lake, 1994.(Aiken LH, Patricia PA: Measuring Organization Traits of Hospitals: The Revised Nursing Work Index, Nursing Research, online, Volume 49(3), May/June 2000, pp 146-153, <http://gateway.ut.ovid.com/gw1/ovidweb.cgi>)
- ²⁶ Davidson, H, Folcarelli,PH, Crawford S, Drprat LJ, Clifford JC. The effects of health care reforms on job satisfaction and voluntary turnover among hospital-based nurses. Medical Care, 35, 634-645, 1997. (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ²⁷ Irvine DM, Evans MG. Job satisfaction and turnover among nurses: integrating research finding across studies. Nursing Research, 44, 246-253, 1995. (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ²⁸ Lake E. Advances in understanding and predicting nurse turnover. Research in the Sociology of Health Care, 15, 147-171, 1998. (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ²⁹ Levek ML, Jones CB. The nursing practice environment, staff retention, and quality of care. Research in Nursing & Health, 19, 331-143, 1996. . (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ³⁰ Op Cit, Hegyvary ST, Haussman RK.

-
- ³¹ Op Cit, Weisman CS, Nathanson CA
- ³² McClure ML, Poulin MA, Sovie MD, Wandelt MA: Magnet hospitals: attraction and retention of professional nurses. Kansas City, MO: American Academy of Nursing, 1983. (Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ³³ Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.
- ³⁴ Op Cit, Aiken, Smith, Lake, 1994.(Aiken, LH, Patrician PA. Measuring Organizational traits of hospitals: the revised nursing work index. Nursing Research, Volume 49(3), May/June 2000, PP 146-153.)
- ³⁵ Donley SR, Flaherty SM, Sarsfield E, Taylor L, Maloni H, Flanagan E: What does the nurse reinvestment act mean to you? Online Journal of Issues in Nursing, December 20, 2002, http://nursingworld.org/ojin/topic14/tpc14_5.htm
- ³⁶ Johnson & Johnson Launches Ad, Recruiting Campaign To Reduce Nursing Shortage, February 6, 2002, www.jnju.com/news/jnj_news/20020418_1558.htm
- ³⁷ Aiken LH: Nurse staffing and the quality of patient care, Medscape Nurses 5(1), 2003, http://www.medscape.com/viewarticle/452829_print
- ³⁸ Glazer G: Nurse immigration. Legislative column, l2003 Online Journal of Issues in Nursing, November 10, 2003. http://nursingworld.org/ojin/tpcleg/leg_13.htm
- ³⁹ Buerhaus P. Nursing Executive Watch interview 11/18/03, advisory.com/members/Print. Discussion of Health Affairs November/December 2003 article.
- ⁴⁰ Ibid, Buerhaus
- ⁴¹ Sadovich M: Work excitement in nursing: an examination of the relationship between work excitement and burnout. Nursing Economic\$, Vol. 23, No. 2, April 2005.
- ⁴² Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. JAMA, Vol 288, No. 16, October 23/30, 2002.
- ⁴³ Urden Ld, Roode JL: Work Sampling: a decision-making tool for determining resources and work redesign. Journal of Nursing Administration, Volume 27(9), September 1997, pp 34-41.
- ⁴⁴ Op Cit, Kohn LT, Corrigan JM, Donaldson MS, 2000
- ⁴⁵ Institute of Medicine (US). Committee on Quality of Health Care in America: Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: National Academy Press, 2001.
- ⁴⁶ Linden L, English K: Adjusting the cost-quality equation: utilizing work-sampling and time study data to redesign clinical practice. J Nurs Care Qual. 1994;8(3):34-42. (Urden Ld, Roode JL: Work Sampling: a decision-making tool for determining resources and work redesign. Journal of Nursing Administration, Volume 27(9), September 1997, pp 34-41.)
- ⁴⁷ Watson PM, Lower MS, Wells SM, et al.: Discovering what nurses do and what it costs. Nursing Management. 1991;22(5):38-45. (Urden Ld, Roode JL: Work Sampling: a decision-making tool for determining resources and work redesign. Journal of Nursing Administration, Volume 27(9), September 1997, pp 34-41.)

⁴⁸ Hendrickson G, Doddato TM, Kovner CT: How do nurses use their time? J Nurs Adm. 1990;20(3):31-37 (Urden Ld, Roode JL: Work Sampling: a decision-making tool for determining resources and work redesign. Journal of Nursing Administration, Volume 27(9), September 1997, pp 34-41.)

⁴⁹ Minyard K, Wall J, Turner R: RNs may cost less than you think. J Nurs Adm. 1986;16(5):28-34. (Urden Ld, Roode JL: Work Sampling: a decision-making tool for determining resources and work redesign. Journal of Nursing Administration, Volume 27(9), September 1997, pp 34-41.)