



Guiding Principles in Determining Appropriate Nurse Staffing: Standards of Practice for Acute Care in the State of Wisconsin

January 2005

(Literature Summary Updated September 2005)

as defined by the
***Wisconsin Organization of
Nurse Executives***

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The Call to Action:

The nursing profession is comprised of the largest group of clinicians participating in the delivery of health care in this country. Numbering about 2.8 million, nurses account for about 54% of all health care workers (Committee on the Work Environment for Nurses and Patient Safety, 2003). Nursing is practiced in virtually every setting in which health care is delivered, from the home, to hospitals, clinics, nursing homes and hospices, to name a number of the most common. Though nursing care has been, or will be, experienced by everyone at some stage of life, it is ironic that the work of the profession is poorly understood by those who are recipients of its services, colleagues in other clinical disciplines and those who administer health care organizations.

Nursing has not been able to clearly communicate the nature of its work to its publics. It has also been less than effective in assuming ownership of all of the accountabilities that comprise any clinical profession including defining practice, managing quality, assuring competence, generating and validating the knowledge base of the discipline and managing the resources essential to the work. The result has been detrimental to the care of patients across the country in many settings, but nowhere more acutely than in hospitals. Over the past 20 years, the pressure of declining reimbursement to hospitals has resulted in decisions related to nurse staffing that have created unworkable, and sometimes unsafe, practice environments. Nurses, disenchanted with practice environments that no longer support excellence, and may even pose risks to patient safety, have left those settings. This has contributed to the development of the current nursing crisis (Committee on the Work Environment for Nurses and Patient Safety, 2003; Dang, Johantgen, Pronovost, Jenckes, & Bass, 2002; Weinberg, 2000, 2003).

Nurses are knowledge workers (Arbon, 2004; Colley, 2003; Tishelman, Bernhardson, Blomberg, Bøjesson, Franklin, Johansson, Leveälahti, Sahlberg-Blom, & Ternestedt, 2004; Wainwright, 2003). While much of what nurses do in the form of tasks is observable, such as administering medication, teaching a patient, or changing a dressing on a wound, the essence of nursing practice is not. Nurses, in caring for patients, are engaged in a continuous process of interpreting a broad array of objective and subjective information. The information is gathered through a variety of means including observation, physical examination, conversing with the patient and/or family and review of diagnostic test results. Nurses interpret and assign meaning to the information by drawing on a vast knowledge base from the physical and social sciences, liberal arts, practice wisdom and intuition (Benner, 1984; Benner, Hooper-Kyriakidis, Stannard, 1999). They make judgments about the significance of the information and

decisions concerning appropriate intervention. Continuous evaluation of practice interventions for desired effects rounds out what has come to be known as “nursing process”.

Effective nursing practice is dependent upon the nurse’s ability to know the patient’s “story”, including pertinent history, co-morbidities, present illness and any compounding variables that might impact his/her interpretation of the patient situation. Subtle changes in a patient which may precede a significant change in condition can only be noted if the nurse has the opportunity to remain in adequate contact with the patient. Research has demonstrated that the expert nurse can often intuitively detect deterioration in a patient’s condition before there are any objective findings to support that conclusion. (Benner, 1984; Benner, Tanner, Chesla, Dreyfus, Dreyfus & Rubin, 1996; Benner, Hooper-Kyriakidis, Stannard, 1999). Recent studies have shown that an assignment of too great a number of patients to a nurse may result in “failure to rescue”, that is, impending signs of patient deterioration are missed because of inadequate opportunity to observe the patient first hand (Aiken, Clarke, Sloane, Sochalski & Silber, 2002; Clarke, 2004; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002a, 2002b).

The Wisconsin Organization of Nurse Executives, as the professional organization of nurses charged with the management of nursing resources in health care organizations, has determined that the development of an evidence-based position paper to promulgate the guiding principles for determining appropriate nurse staffing is an urgent priority. These guiding principles are intended to be used as the standard of practice by all acute care organizations in which nurses practice in Wisconsin. They have been developed in collaboration with, and are endorsed by, the Wisconsin Nurses Association.

Literature Summary

Purpose

The purpose of this summary is to provide an overview of the research/evidence base which has clarified the relationship between nurse staffing and adverse events. Such adverse events may be experienced by patients and/or nurses-as-employees. The literature summary is presented in tabular format adapted from the Evidence Grading System developed by the Institute for Clinical Systems Improvement (Greer, Mosser, Logan & Halaas, 2000).

Search Strategy

Literature to be included in this summary were limited to those which: 1) were published 1998¹ through August 2005, 2) were conducted in the United States, and 3) include some measure of nurse staffing. Medline, CINAHL, and HealthSTAR electronic databases were searched using the key words:

- Nurse staffing
- Nurse-patient ratio
- Staff mix
- RN mix
- Patient Safety
- Patient Outcomes
- Nurse Safety
- Quality of Care
- Quality of Nursing Care
- Nursing Outcomes
- Nurse-sensitive Outcomes

Additional articles were identified from hand searches of reference lists of retrieved articles. After the abstract of identified articles were reviewed for relevance, 23 published works remained for inclusion in this summary. For this summary the published works were organized into the following categories: 1) Report of Primary Research, 2) Research Review/Evidence Summary and 3) Topic Discussion/Commentary.

¹ Prior to 1998 studies were marked by data limitations and/or significant design issues, resulting in minimal to no evidence base for the effects of structural measures such as staffing levels and staffing mix. Although studies from 1998 to present continue to have data limitations inherent to the reliance on administrative data sources for clinical outcomes data, progress has been made towards development of more standardized nurse staffing measures & data sets.

Nurse Staffing Literature Summary

Author/Year	Design	Population/ Sample Size	Primary Outcome Measure(s)	Conclusions/ Comments
Report of Primary Research				
Aiken, L.H., Clarke, S.P. & Sloane, D.M. (2000). Hospital restructuring: Does it adversely affect care and outcomes? <u>Journal of Nursing Administration, 30</u> (10), 457-65.	Multi-site, cross-sectional analysis designed to assess the effects of organizational changes in hospitals related to restructuring; the time period is 1986-1998. Purpose of the research is to study the relationship between nurse staffing and patient outcomes. Data sources: 1996 Chief Nurse Executive (CNE) survey; 646 respondents AHA annual surveys HCFA (CMS) CMI data 1998 nurse surveys with 2000+ respondents from 22 hospitals Data set developed from pooled data drawn from AHA staffing data and HCFA mortality data	646 CNEs 2000+ RNs	Patient mortality rates	Findings: Nurse staffing variation is a major driver for variation in patient outcomes. Excess mortality is inversely related to nurse staffing. RN surveys RNs report deteriorating nurse practice environments; less likely than in the past to have: <ul style="list-style-type: none"> • Enough RNs • Sufficient support services • Supervisors viewed as supportive of nursing • An influential CNE CNE surveys 57% reported work re-design/re-engineering initiatives at their hospitals within the past 5 years, including: <ul style="list-style-type: none"> • Personnel reductions • Cross-training • Skill mix reductions • Management positions eliminated AHA data <ul style="list-style-type: none"> • # RN FTE increased in relation to hospital census; however, intensity of resource requirement increased at the same or higher rate • Nursing personnel comprised the only category of hospital employees that decreased in representation related to adjusted patient days for the time period 1981 – 1993; decreased by 7.3% Conclusions: Authors noted that there is a deficient knowledge/research base regarding the relationship between nurse staffing and patient outcomes. Despite this, a frequent restructuring initiative is to decrease nurse staffing. They call for re-engineering initiatives to be evaluated in terms of capacity to promote the delivery of care that is affordable and effective. In addition, the authors note that restructuring, in general, has “hurt caregiving” and has not produced compensatory positive outcomes.

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<p>Aiken, L.H., Clarke, S.P., Sloane, D.M. (2002). Hospital staffing, organization, and quality of care: Cross-national findings. <u>International Journal for Quality in Health Care</u>, 14(1), 5-13.</p>	<p>Multi-site, cross-sectional survey with nurses as informants Designed to test which organizational features affect patient and nurse outcomes</p>	<p>10,319 nurses working on medical and surgical units in 303 hospitals across 5 jurisdictions in 4 nations (US, Canada, England & Scotland)</p>	<p>Nurse satisfaction and burnout Nurse reports of quality of hospital care</p>	<p>Findings: Nurses in worst-staffed hospitals (based on nurse report) were 1.3 times as likely as those in the best-staffed to rate quality of care on their units as fair or poor Nurses in hospitals with lowest levels of support for nursing care (based on nurse report) were over two times more likely than nurses in hospitals with highest levels of support for nursing care to rate the quality of care on their units as fair or poor.</p> <p>Conclusions: The authors note that multi-national results point to understanding that fundamental changes to the organization of hospitals, the work of nursing, and the nursing workforce will be required to respond to contemporary challenges</p> <ul style="list-style-type: none"> • Models for organizing care that are not based in evidence may be part of the problem, not the solution • Renew attention to the clinical mission of hospitals • Increase managerial engagement/partnership with clinical nursing • Increase understanding of the role(s) nurses play in optimal patient outcomes <p>In addition, practice environments that do not support the work of professional nurses may undermine the benefits that accrue from excellent staffing</p>
<p>Aiken, L.H., Clarke, S.P., Sloane, D.M., Sochalski, J. & Silber, J.H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. <u>Journal of the American Medical Association</u>, 288(16), 1987-93.</p>	<p>Multi-site, cross-sectional analysis of linked nurse, patient and organizational data</p> <p>Context for discussion is nursing shortage and mandated patient-to-nurse ratios</p> <p>Nurses are the informants about hospital staffing and organizational characteristics Patient outcomes information drawn from hospital discharge abstracts</p>	<p>10,184 staff nurse survey respondents 232,342 general, orthopedic, and vascular surgery patients 168 nonfederal adult general hospitals</p>	<p>Nurse job dissatisfaction Burnout Nurse-rated quality of care</p>	<p>Findings: At the hospital level, a high patient-to-nurse ratio is associated with:</p> <ul style="list-style-type: none"> • Higher risk-adjusted 30 day mortality <ul style="list-style-type: none"> ◦ 7% increase in likelihood of dying within 30 days for each additional patient per nurse • Higher failure-to-rescue rates <ul style="list-style-type: none"> ◦ 7% increase in odds of failure-to-rescue for each additional patient per nurse • Nursing staff more likely to report burnout <ul style="list-style-type: none"> ◦ 23% increase in odds of reporting burnout • Nursing staff more likely to report job dissatisfaction <ul style="list-style-type: none"> ◦ 15% increase in odds of reporting job dissatisfaction

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	Administrative databases used to determine hospital characteristics for control variables (size, teaching status, technology)			
Armstrong, R.A. (2004). <u>Mandated staffing ratios: Effect on nurse work satisfaction, anticipated turnover, and nurse retention in an acute care hospital</u> . UMI Dissertation Services. (UMI Number 3136243).	Survey of inpatient California nurses pre- and post-implementation of mandated minimum nurse-to-patient ratios Pre-implementation survey was administered in December 2003 Post-implementation survey was administered in May 2004.	101 nurses from one acute care California hospital participated in the pre-implementation survey and 96 nurses from the same hospital participated in the post-implementation survey	Nurse overall work satisfaction Anticipated turnover Nurse retention	The implementation of mandatory minimum nurse-to-patient ratios did not have a statistically significant effect on work satisfaction and anticipated turnover in the acute care California hospital MANOVA indicated overall work satisfaction and task satisfaction was related to assigned nursing unit
Blegen, M.A., Goode, C.J. & Reed, L. (1998). Nurse staffing and patient outcomes. <u>Nursing Research</u> , 47(1), 43-50.	Single site, cross-sectional analysis of linked nurse, patient and organizational data Level of analysis is the nursing unit; study designed to describe the relationship among total hours of nursing care, RN skill mix, and adverse patient outcomes. Nursing acuity system data used to control for patient severity	21,783 discharges/ 198,962 patient days 42 inpatient units of 880 bed hospital 1074 total nursing FTE with 832 RN FTE	Medication errors Patient falls Skin breakdown Patient & family initiated complaints Infections Deaths	Findings: Higher RN staff mix inversely related to medication errors, pressure injury rate, and patient/family complaints (statistically significant) Higher RN staff mix inversely related to UTI and respiratory infection (not statistically significant; effect present up to 87.5% RN staff mix) Total hours of nursing care not associated with better outcomes Total hours of nursing care associated with higher rates of pressure injury, patient/family complaints, and mortality Note: Total hours of care also associated with acuity so this finding must be interpreted very carefully Key finding: Higher RN staff mix is associated with better patient outcomes
Blegen, M., & Vaughn, T. (1998). A multi-site study of nurse staffing and	Multi-site, cross-sectional analysis of the relationship	39 nursing units in 11 hospitals • 24 med-surg	Medication Administration Errors (MAE)	Findings: • Richer staff mix (higher RN proportion) was associated with ○ Lower MAE rates per 10,000 doses administered

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<p>patient occurrences. <u>Nursing Economics</u>, 16, 196-203.</p>	<p>between nurse staffing and patient outcomes Nurse staffing variables are: Total hours of nursing care Proportion of total hours of nursing care delivered by Registered Nurses Type of Unit (Med-Surg, ICU, OB, Skilled Care) and Hospital-wide CMI were used to account for acuity</p>	<ul style="list-style-type: none"> • 8 intensive care • 4 maternal-child • 3 skilled nursing 	<p>Falls Cardiopulmonary Arrest</p>	<ul style="list-style-type: none"> ○ Lower number of falls per 1000 patient days • There was a nonlinear relationship between staff mix and MAE <ul style="list-style-type: none"> ○ Staff mix > 85% RN was associated with higher MAE • Units in hospitals with higher acuity had <ul style="list-style-type: none"> • Lower MAE • Lower cardiopulmonary arrest rates • ICUs had <ul style="list-style-type: none"> • Lower MAE • Higher cardiopulmonary arrest rates <p>Conclusions: The authors call for further research:</p> <ul style="list-style-type: none"> • Explicate the non-linear relationship between RN proportion > 85% and higher MAE • Build a systematic knowledge/ research base regarding the relationship between nurse staffing variables and patient outcomes • Recommend standardized indicators • Use patient outcomes variables that demonstrate a positive effect of quality nursing care, rather than available data based on reported adverse outcomes of care <p>The authors note that decisions about nurse staffing should be based on nursing effectiveness research</p>
<p>Bolton, L.B., Aydin, C.E., Donaldson, N., Brown, D.S., Nelson, M.S. & Harms, D. (2003). Nursing staffing and patient perceptions of nursing care. <u>Journal of Nursing Administration</u>, 33(11), 607-14.</p>	<p>Prospective, cross-sectional study designed to explore the relationship between nurse staffing and patient perceptions of nursing care.</p> <p>Data from 40 hospitals using standardized tools with demonstrated reliability and validity.</p> <p>Nurse Staffing was assessed using the California Nursing Outcomes Coalition (CalNOC) Patients' Evaluation</p>	<p>40 California hospitals</p>	<p>Patient perceptions of care</p>	<p>Findings: Wide variation in patient perceptions of care and in staffing across organizations There was one statistically significant relationship among the nurse staffing and the indicators for patient perceptions of care; that relationship was between total nursing hours per patient day and patients' assessment of respect for patient's values, preferences, and expressed need.</p> <p>Hospitals with 4-5 total hours of care per patient day had similar problem scores to those with over 10 hours of care per patient day. Also found no threshold above or below which patient perceptions of care changed significantly. The authors conclude that nurse staffing is only one of several variables that influence patient perceptions of care. The authors call for nurse staffing research using unit and patient level data.</p>

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	of Performance in California (PEP-C) was used to assess patient perceptions of care.			
<p>Cho, S., Ketefian, S., Barkauskas, V.H. & Smith, D.G. (2003). The effects of nurse staffing on adverse events, morbidity, mortality and medical costs. <u>Nursing Research</u>, 52(2), 71-9.</p>	<p>Cross-sectional study designed to examine the effects of nurse staffing, hospital characteristics, and patient characteristics on the incidence of patient adverse events, morbidity, mortality and medical costs.</p>	<p>232 acute care hospitals in California 124,204 patients from the following diagnosis groups: Craniotomy Cardiac valve procedures Coronary bypass Major CV procedures Amputation for circulatory disorders Rectal resection Major small & large bowel procedures Stomach, esophageal & duodenal procedures Pancreas, liver & shunt procedures Major joint & limb reattachment Hip & femur procedures</p> <p>Data was drawn from existing databases</p> <p>Hospital Financial Data from the California Office of Statewide Health Planning and Development (OSHDP)</p>	<p>Incidence of: Adverse events</p> <ul style="list-style-type: none"> • Fall/injury • Pressure ulcer • ADE • Pneumonia • UTI • Wound infection • Sepsis <p>Morbidity Mortality Medical costs</p>	<p>Findings: An increase of 1 hour per day worked by RN was associated with an 8.9% decrease in the odds of developing pneumonia A 10% increase in RN proportion of staff mix was associated with a 9.5% decrease in the odds of developing pneumonia A greater # of nursing hours per patient day was associated with a higher probability of developing pressure ulcers</p> <p>Hospital characteristics had minimal influence on patient outcomes</p> <p>Each adverse event was associated with a statistically significant prolonged length of stay and increased medical costs</p> <p>Patients who developed pneumonia, wound infections, and sepsis were more likely to die during hospitalization</p> <p>Conclusions: The author notes the recognized difficulty related to nurse staffing measurement issues An area for future research will be to test the ability of administrative and coding data for the assessment of patient outcomes, especially those conceptualized as nurse sensitive.</p>

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		(hospital characteristics, nurse staffing data, and financial information) State Inpatient Databases (SID) California – 1987 released by AHRQ (patient data)		
Clarke, S.P., Rockett, J.L., Sloane, D.M. & Aiken, L.H. (2002). Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. <u>American Journal of Infection Control</u> , 30(4), 207-16.	Cross-sectional study designed to assess the relationship between nurse & hospital characteristics (organizational climate – support for nursing practice, average nursing experience), protective equipment, and the likelihood of needlestick injuries and near misses Nurses reported the # of patients cared for on last shift worked	2287 medical-surgical nurses from 22 US hospitals	Likelihood of sustaining a needlestick injury or near miss	Findings: Poor organizational settings and high workload were associated with a 50% to 2 fold increase in the likelihood of sustaining a needlestick or near miss The presence of safer needle systems were associated with a 20-30% lower risk of sustaining a needlestick or near miss Conclusion: Nurse staffing and organizational climate are key determinants of nurse needlestick injury/near miss
Dang, D., Johantgen, M.E., Pronovost, P.J., Jenckes, M.W. & Bass, E.B. (2002). Postoperative complications: Does intensive care unit staff nursing make a difference? <u>Heart & Lung</u> , 31(3), 219-28.	Multi-site, retrospective review; data for analysis consists of hospital (nonfederal, acute care) discharge data linked to ICU characteristics Data sources: Uniform Health Discharge Data Set	2606 patients from 38 Maryland hospital ICUs who underwent abdominal aortic surgery for the time period January 1994 through December 1996.	Incidence of complications <ul style="list-style-type: none"> • Cardiac • Respiratory • Other <ul style="list-style-type: none"> ○ ARF ○ Septicemia ○ Platelet transfusion ○ Any other 	Findings: Nurse staffing intensity was significantly associated with Cardiac, Respiratory, and Other complications 13% of patients experienced cardiac complications 30% of patients experienced respiratory complications 8% of patients experienced other complications There was an increased likelihood of respiratory complications for patients cared for in ICUs with low vs. high intensity nurse staffing (Odds Ratio 2.33/CI 1.5-3.6)

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	<p>maintained by the Maryland Health Services Cost Review Commission</p> <p>Survey of physician ICU directors who were ask to complete the survey in collaboration with ICU nurse managers was source of nurse staffing data</p> <p>Study designed to explicate the relationship between ICU nurse staffing and the likelihood of experiencing a complication for patients having abdominal aortic surgery</p>			<p>There was an increased likelihood of cardiac complications for patients cared for in ICUs with medium vs. high-intensity nurse staffing (Odds Ratio 1.78./cU 1,16-2.72)</p> <p>There was an increased likelihood of other complications for patients cared for in ICUs with medium vs. high-intensity nurse staffing (Odds Ratio 1.74/ CI 1.15-2.63)</p> <p>Conclusion: studies using more robust and sensitive measures sensitive to nursing care should be conducted.</p> <p>Study limitations include: physician respondents as main source of nurse staffing data, retrospective design with secondary data analysis limited robustness of outcomes measures studied, and recognized limitations with the use of administrative data to assess clinical effectiveness.</p>
<p>Kovner, C. & Gergen, P. (1998). Nurse staffing levels and adverse events following surgery in U.S. hospitals. <u>Image: Journal of Nursing Scholarship</u>, 30, 315-21.</p>	<p>Cross-sectional, descriptive</p> <p>1993 discharge data (Nationwide Inpatient Sample from AHCPH) from a 20% stratified probability sample of US community hospitals were used to determine adverse events</p> <p>Hospital level data were matched to AHA data on hospital characteristics, including nurse staffing level.</p> <p>Purpose is to</p>	<p>Patient level data for patients age 18 and over from 589 acute care hospitals from 10 states</p>	<p>Incidence of adverse events conceptualized as nurse sensitive and non-nurse sensitive.</p> <p>Nurse-sensitive outcomes:</p> <ul style="list-style-type: none"> • Venous thrombosis (VT) or pulmonary embolism (PE) after major surgery • VT or PE after invasive vascular procedure • UTI after major surgery • Pneumonia after major surgery • Pneumonia after invasive vascular procedure 	<p>Findings:</p> <p>There was a significant inverse relationship between nurse staffing and 3 out of the 5 adverse events that were conceptualized as nurse-sensitive</p> <ul style="list-style-type: none"> • UTI after major surgery (clinically meaningful) • Pneumonia after major surgery • VT after major surgery (clinically meaningful) <p>There was a significant inverse relationship between nurse staffing and 1 of the 4 adverse events that were conceptualized as non-nurse sensitive</p> <ul style="list-style-type: none"> • Pulmonary compromise after major surgery <p>The relationships described above are not independent in that an increase in nurse staffing was related to a decrease in UTI, pneumonia, VT and pulmonary compromise after surgery.</p> <p>Conclusions:</p> <p>The authors note that the relationship between nurse staffing and adverse patient events must be considered during redesign initiatives involving the clinical nursing workforce. They also note the implications for policy makers in terms of hospital regulation.</p>

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	<p>examine the relationship between nurse staffing and adverse events believed to be sensitive to nursing care. Hospital characteristics were controlled for.</p> <p>Nurse staffing was measured as the number of RN FTEs working per adjusted patient day.</p>		<p>Non-nurse sensitive outcomes:</p> <ul style="list-style-type: none"> • Pulmonary compromise after major surgery • AMI after major surgery • GI bleed/ulceration after major surgery • Mechanical complications related to device, implant or grant <p>• For the purposes of this analysis, those determined to be at risk for the adverse event prior to the surgery/procedure were excluded from the analysis</p>	
<p>Kovner, C., Jones, C., Zhan, C., Gergen, P.J. & Basu, J. (2002). Nurse staffing and post-surgical adverse events: An analysis of administrative data from a sample of U.S. hospitals, 1990-1996. <u>Health Services Research</u>,37(3), 611-29.</p>	<p>Cross-sectional, descriptive</p> <p>This study extends the analysis of Kovner & Gergen, 1998.</p> <p>1990-1996 discharge data (Nationwide Inpatient Sample from AHCPH) from a 20% stratified probability sample of US community hospitals were used to determine adverse events</p> <p>Hospital level data were matched to AHA data on hospital characteristics,</p>	<p>Patient level data for patients age 18 and over from 530-570 (# varies by year within the study time period) acute care hospitals from 13 states</p>	<p>Incidence of adverse events conceptualized as sensitive to nurse staffing levels:</p> <p>VT/PE Pulmonary compromise after surgery UTI Pneumonia</p>	<p>Findings: RN hours per adjusted patient day, after all other variables were controlled for, were inversely related to all adverse events The relationship was statistically significant only for pneumonia</p> <p>LPN hours per adjusted patient day did not show a significant relationship to any of the adverse events</p> <p>Conclusions: This study adds to knowledge base regarding the relationship between nurse staffing and patient outcomes, but is limited by the use of administrative data for determining quality indicators as well as analysis at the hospital level. In addition, the metric for RN staffing is drawn from paid hours, rather than direct care hours. Finally, the metric includes managerial as well as clinical RNs. Ongoing research is called for using increasingly accurate and consistent measures of acuity and quality. The nurse staffing level that produces patient care that is of high quality and cost-effective has not been determined.</p>

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	<p>including nurse staffing level.</p> <p>Purpose is to examine the relationship between nurse staffing and adverse events believed to be sensitive to nursing care. Hospital characteristics were controlled for.</p> <p>Nurse staffing was measured as the number of RN FTEs working per adjusted patient day. Medicare CMI for each study year, proportion of patients with Medicare as principal payer, and source of admission were included to adjust for acuity.</p>			
<p>Lichtig, L, Knauf, R. & Milholland, D. (1999). Some impacts of nursing on acute care hospital outcomes, <u>Journal of Nursing Administration</u>, 29, 25-33.</p>	<p>Cross-sectional analysis of publicly available data from acute care hospitals in New York (N=229) and California (N = 462)</p> <p>Purpose is to determine the relationship between nurse staffing and nursing-sensitive patient outcomes</p> <p>New York 1992 & 1994 Institutional Cost</p>	<p>All acute care hospitals in New York (N=229) and California (N = 462)</p> <p>New York Uniform Hospital Discharge Data Set includes information for approximately 2.5 million patients annually</p> <p>California Uniform Hospital Discharge Data Set includes information for</p>	<p>Adverse patient outcomes:</p> <ul style="list-style-type: none"> • Pressure ulcers • Pneumonia • UTI • Postoperative infections <p>Length of Stay (LOS)</p> <p>Analyzed at the hospital level and state level.</p>	<p>Findings:</p> <p>Richer nursing hours per NIW and higher nursing skill mix were associated with reduced LOS across all data sets (2 states, 2 time periods each)</p> <p>Richer RN skill mix was associated with lower pressure injury rates</p> <ul style="list-style-type: none"> • Each additional percentage point of RN personnel was associated with a reduction in pressure injury rate between 0.79% and 1.77%. <p>There was no consistent relationship between the staffing variables and pneumonia.</p> <p>There was not a consistent relationship between the staffing variables and post-operative infection</p> <ul style="list-style-type: none"> • In California a significant reduction in post-op infection was associated with richer RN staffing • In New York, the relationship was not significant

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	<p>Reports were source of data about total patient days, total FTE by cost center, total nurse FTEs by skill level (RN, LPN, CNA)</p> <p>California 1992 & 1994 Annual Hospital Disclosure Reports were the source of data about cost center, paid hours for RNs, LVNs and aides/orderlies, and total patient days.</p> <p>For New York and California, patient data source was the Uniform Hospital Discharge Data Set minus items that could be used to identify individual patients.</p> <p>Nursing Intensity Weights (NIW), reflecting the relative amount of nursing services required for typical patients within a DRG, were used to adjust for acuity</p>	<p>approximately 3.5 million patients annually</p>		<p>In 3 of the 4 data sets there was a significant relationship between nursing skill mix and UTI</p> <ul style="list-style-type: none"> • Each additional percentage point of RN personnel was associated with a UTI rate that was close to 0.66% lower. <p>Conclusions: The availability of standardized administrative data sets present the opportunity to measure nursing-sensitive outcomes in relationship to staffing variables and other hospital characteristics</p>
<p>McCue, M., Mark, B.A. & Harless, D.W. (2003). Nurse staffing, quality, and financial performance. <u>Journal of Health Care Finance</u>, 29(4), 54-76.</p>	<p>Dependent Variables Financial Performance</p> <ul style="list-style-type: none"> • operating margin • operating expense 	<p>422 acute care hospitals Data sources: American Hospital Association Annual Survey Centers for</p>	<p>Change in financial Performance</p>	<p>Findings</p> <ul style="list-style-type: none"> • Increasing Registered Nurse staffing was associated with an increase in operating costs; the increase was statistically significant • There was no statistically significant effect on profit margin associated with Registered Nurse staffing • Higher levels of non-nurse staffing was associated with higher operating costs and lower profits • Changes in quality of care did not have a statistically significant effect

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	<p>Independent Variables</p> <p>Hospital Output</p> <ul style="list-style-type: none"> • Inpatient Days • Discharges • Outpatient Visits <p>Input price</p> <p>Hospital Characteristics</p> <ul style="list-style-type: none"> • Case mix index • Payer mix • Nonprofit ownership • For-profit ownership • Location • System affiliation <p>Market Characteristics</p> <ul style="list-style-type: none"> • HSA hospital use • Herfindahl index • Number of HMOs • HMO penetration <p>Population characteristics</p> <ul style="list-style-type: none"> • Unemployment rate • Per capita income • Percent over age 65 <p>Staffing</p> <ul style="list-style-type: none"> • RN FTEs • LPN FTEs • Non-nurse FTEs <p>Quality Measures</p>	<p>Medicare and Medicaid Services</p> <ul style="list-style-type: none"> • minimum cost & capital file • provider of services file • case mix index file • Online Survey Certification & Reporting files • HCUP files 		<p>on operating costs and margin</p> <p>Conclusions</p> <p>The authors note that, at a minimum, their findings should lead to questioning the understanding that cuts in RN staffing will be associated with increased profitability. They suggest that this study provides a baseline analysis (prior to Medicare Payment Reform - Balanced Budget Act) for studies assessing the impact of nurse staffing and quality of care on financial performance.</p>

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<p>Mark, B.A., Salyer, J. & Harless, D. (2002). Factors influencing perceptions of staffing adequacy. <u>Journal of Nursing Administration</u>, 32(5), 234-42.</p>	<ul style="list-style-type: none"> • Mortality <p>Independent variables</p> <p>Hospital characteristics</p> <ul style="list-style-type: none"> • Case mix index • Technological complexity • Teaching status • Hospital volatility of admissions <p>Nursing Unit characteristics</p> <ul style="list-style-type: none"> • Total nursing staff • Skill mix • Nursing work load • Education • Unit admission volatility <p>Availability of support services</p> <p>Nurse characteristics</p> <ul style="list-style-type: none"> • Experience • Age <p>Patient characteristics</p> <ul style="list-style-type: none"> • Age <p>Dependent variable</p> <p>Perceptions of adequacy of staffing</p> <ul style="list-style-type: none"> • Staff nurse responses to global single item indicator • 5 point Likert scale ranging from "very much above average" 	<p>136 general medical-surgical units in 68 randomly selected nonfederal, not for profit hospitals in the Southeastern United States, Texas, and the District of Columbia.</p>	<p>Staff nurse perception of staffing adequacy</p>	<p>Findings:</p> <ul style="list-style-type: none"> • Larger unit size was associated with perceptions of less adequate nurse staffing • Optimal unit size may be fewer than 27 beds • Additional factors <ul style="list-style-type: none"> ▪ Architectural/spatial design ▪ Occupancy rates ▪ Implementation of computerized information systems ▪ Ergonomics, human factors, & engineering components • Higher levels of patient was associated with perceptions of less adequate nurse staffing • Being an admissions "grower" was positively associated with perceptions of adequate nurse staffing <p>Authors note that operationalization of workload is based on notion of production efficiency</p> <ul style="list-style-type: none"> ▪ Does not account for complexity of patient at the level of the nursing unit ▪ Patient days, a key measure of workload, is derived from midnight census which most likely underestimates nursing workload.

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	to "very much below average."			
Mark, B.A., Salyer, J. & Wan, T.T.H. (2003). Professional nursing practice: Impact on organizational and patient outcomes. <u>Journal of Nursing Administration</u> , 33(4), 224-34.	Independent variables Hospital characteristics <ul style="list-style-type: none"> • Technological complexity • Case mix index • Teaching status • Volatility of admissions • Hospital size Nursing unit characteristics <ul style="list-style-type: none"> • Experience • Skill mix • Unit size • Availability of support services • Patient technology Organizational structure <ul style="list-style-type: none"> • Decentralization • Autonomy • Collaboration with physicians Dependent variables Organizational outcomes <ul style="list-style-type: none"> • Nurses' work satisfaction • Nursing turnover • Average patient length of stay Patient outcomes <ul style="list-style-type: none"> • Patient satisfaction • Reported medication errors 	1682 RNs and 1326 patients on 124 general medical-surgical nursing units in 64 acute care hospitals in the Southeast United States	Organizational outcomes <ul style="list-style-type: none"> • Nurse work satisfaction • Nursing turnover • Average LOS Patient Outcomes <ul style="list-style-type: none"> • Patient satisfaction • Reported medication errors • Reported patient falls 	Findings: <ul style="list-style-type: none"> • Significant relationship between professional nursing practice and nurses' work satisfaction at both the hospital and unit level • At the unit level, higher levels of professional practice associated with lower nursing turnover • Consistent availability of support services was a significant predictor of professional nursing practice • Richer skill mix associated with higher patient satisfaction • Skill mix not associated with <ul style="list-style-type: none"> ○ Nursing satisfaction ○ Medication errors ○ Patient falls Note: Data collection for the ORNA-2 Project began in 2004. the ORNA-2 Project will continue to study the relationship between RN staffing

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	<ul style="list-style-type: none"> Reported patient falls 			adequacy, the practice of professional nursing, and patient and organizational outcomes (Mark, 2003).
<p>Mark, B., Harless, D.W., MuCue, M. & Xu, Yihua (2004). A longitudinal examination of hospital registered nurse staffing and quality of care. <u>Health Services Research</u>,39(2), 279-300.</p>	<p>Longitudinal, non-experimental analysis of secondary data from the years 1990-1995 to examine the relationships between nurse staffing and quality of care.</p>	<p>422 acute care hospitals Data sources: American Hospital Association <ul style="list-style-type: none"> Nurse staffing Hospital characteristics InterStudy & Area Resource Files <ul style="list-style-type: none"> Market characteristics Centers for Medicare and Medicaid Services <ul style="list-style-type: none"> Financial performance Healthcare Cost & Utilization Project <ul style="list-style-type: none"> In-hospital mortality Risk-adjusted complication ratios for pressure injury, pneumonia & urinary tract infection </p>	<ul style="list-style-type: none"> Risk-adjusted observed/expected mortality Risk-adjusted observed/expected pneumonias Risk-adjusted observed/expected decubitus Risk-adjusted/expected urinary tract infection 	<p>Findings</p> <ul style="list-style-type: none"> There was a marginal, but diminishing, effect on reducing mortality associated with increasing Registered Nurse staffing There was no consistent effect on the rates of pressure injury, pneumonia, or urinary tract infection Selected hospital characteristics, market characteristics, and financial performance had other independent effects on the outcomes of interest <p>Conclusion The findings of this analysis provide only limited support for the understanding that enhancing RN staffing will provide <i>unconditional</i> (emphasis in the original research report) improvement in quality of care.</p>
<p>Needleman, J., Buerhaus, P., Mattke, S., Stewart, M. & Zelevinsky, K. (2002). Nurse-staffing levels and the quality of care in hospitals. <u>The New England Journal of Medicine</u>, 346(22), 1715-22.</p>	<p>Cross-sectional 1997 administrative data (discharge abstracts) from 799 hospitals in 11 states was used to analyze the relationship between amount of care provided by hospital nurses and patient outcomes.</p> <p>Measures of nurse</p>	<p>5,075,969 medical patient records 1,104,659 surgical patient records</p>	<p>Adverse outcomes</p> <ul style="list-style-type: none"> UTI Pressure ulcer Hospital-acquired pneumonia Shock or cardiac arrest UGI bleeding Hospital-acquired sepsis DVT CNS complications In-hospital death Failure to rescue 	<p>Findings: For medical patients richer RN staffing (higher percentage of hours of care provided by RNs and/or higher absolute number of hours of care per day provided by RNs) was associated with:</p> <ul style="list-style-type: none"> Shorter LOS Lower rates of <ul style="list-style-type: none"> UTI UGI bleeding Pneumonia Shock or cardiac arrest Failure to rescue <p>For surgical patients richer RN staffing (higher percentage of hours of care provided by RNs and/or higher absolute number of hours of care per day provided by RNs) was associated with:</p>

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	staffing were determined from a variety of hospital reported sources		<ul style="list-style-type: none"> • Wound infection • Pulmonary failure • Metabolic derangement <p>The last three outcome indicators were assessed for surgical patients only.</p> <p>Length of Stay</p>	<ul style="list-style-type: none"> • Lower rates of <ul style="list-style-type: none"> ○ UTI ○ Failure to rescue <p>There was no association between richer RN staffing and in-hospital death</p> <p>There was no association between increased staffing by LPNs or CNAs and the rate of adverse outcomes.</p> <p>Conclusion: Better care for hospitalized patients is achieved when a higher proportion of hours of nursing care are delivered by RNs and when a higher number of hours of care per day are delivered by RNs</p>
<p>Person, S. D., Allison, J.J., Kiefe, C.I., Weaver, M.T., Williams, O.D., Centor, R.M. & Weissman, N.W. (2004). Nurse staffing and mortality for Medicare patients with acute myocardial infarction. <i>Medical Care</i>, 42(1), 4-12.</p>	Retrospective, correlational design with review of medical records and hospital staffing data	<p>118,940 Medicare patients with Acute Myocardial Infarction</p> <p>American Hospital Association data</p> <p>Cooperative Cardiovascular Project data</p>	In-hospital mortality	<p>After extensive multivariate adjustment for patient and hospital characteristics there is a:</p> <ul style="list-style-type: none"> ▪ Mortality advantage for patients treated in hospitals with high RN staffing <ul style="list-style-type: none"> ○ Lowest mortality associated with RN staffing in top quartile ○ Highest mortality associated with RN staffing in lowest quartile ▪ Mortality disadvantage for patients treated in hospitals with high LPN staffing <ul style="list-style-type: none"> ○ Highest mortality associated with LPN staffing in top quartile ○ Lowest mortality associated with LPN staffing in lowest quartile <p>Hypotheses:</p> <ul style="list-style-type: none"> ○ Those aspects of care that are most relevant to patient well-being are delivered by RNs skilled in delivering those aspects of care ○ The delivery of standardized assessments and orders is a critical RN function ○ RNs alert physicians to complications of Acute Myocardial Infarction ○ In general, higher RN staffing is associated with greater organizational resources, which in turn are associated with better patient outcomes
<p>Potter, P., Barr, N., McSweeney, M. & Sledge, J. (2003). Identifying nurse staffing and patient outcome relationships: A guide for change in care delivery. <i>Nursing</i></p>	Prospective, single-site, correlational design with inpatient units as the analytic units Staffing and patient acuity data were	3418 patients	<p>Fall Index Medication Errors Index Patient self report data (VAS):</p> <ul style="list-style-type: none"> ◆ Pain ◆ Distress ◆ Anxiety 	<p>Findings: Higher percentages of hours of nursing care provided by RNs was associated with:</p> <ul style="list-style-type: none"> • lower level of pain reported by patients • better patient perception of self-care ability • better patient perception of health status • greater post-discharge patient satisfaction

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<u>Economics</u> , 21(4), 158-166.	<p>correlated with outcomes of interest</p> <p>Study was designed to:</p> <ul style="list-style-type: none"> ◆ begin to develop a database of outcome measures that reflect trends in nursing practice and nurse staffing ◆ develop a baseline of current practice to be used to assess the effectiveness of changes in nurse staffing and nursing care delivery 		<ul style="list-style-type: none"> ◆ Quality of preceding night's sleep ◆ 4 self-care measures 	<p>Greater total number of hours of nursing care delivered by all personnel was associated with:</p> <ul style="list-style-type: none"> • decreased patient distress • less problems with symptom management • fewer falls • patient more likely to be able to manage self-care <p>Percentage of RN hours was found to predict 2 post-discharge patient satisfaction indicators:</p> <ul style="list-style-type: none"> • communication • discharge process <p>Average hours of nursing care per patient day was significantly related to:</p> <ul style="list-style-type: none"> • symptom distress (VAS) • willingness to self-care • index of self-care • fall index • symptom management (approached significance) <p>Conclusion: The development of outcome measures that accurately reflect nursing practice can be used to assess the impact of reorganization initiatives and to benchmark for improvement. Nurse-sensitive outcomes act as "barometers" for assessing the adequacy of staffing practices.</p>
Rothberg, M.B., Abraham, I., Lindenauer, P.K., & Rose, D.N. (2005). Improving nurse-to-patient staffing ratios as a cost-effective safety intervention. <u>Medical Care</u> , 43(8), 785-91.	Cost-effectiveness analysis from the institutional perspective; 2003 dollars; comparing nurse-to-patient (PTN) ratios from 8:1 to 4:1	General medical and surgical patients; data were drawn from multiple sources including 2003 Bureau of Labor Statistics, a state database, and previously published studies	Cost per life saved	<p>Base Case Analysis</p> <ul style="list-style-type: none"> • 8:1 PTN ratio least expensive, but associated with highest patient mortality • Mortality decreased and costs increased as PTN ratio declined from 8:1 to 4:1 • Incremental cost-effectiveness did not exceed \$136,000 per life saved <p>Sensitivity Analysis</p> <ul style="list-style-type: none"> • The analytic model was most sensitive to PTN effects on mortality • Incremental cost-effectiveness of 4:1 PTN ratio did not exceed \$449,000 per life saved <p>Conclusion In terms of cost-effectiveness, PTN ratios of 4:1 are in the range of commonly accepted patient safety interventions</p>
Sochalski, J. (2004). Is more better?: The relationship between nurse staffing and the quality of	Secondary analysis of data obtained from survey research conducted in	Informants were 80,500 RN licensed to practice in the state of	Inpatient hospital staff nurses' assessments of the quality of nursing care	Nurses' assessment of quality of care are significantly associated with: <ul style="list-style-type: none"> ▪ Nurse-to-patient ratio ▪ Reported rates of unfinished care for patients (process of care indicator)

Author/Year	Design	Population/ Sample Size	Primary Outcome Measure(s)	Conclusions/ Comments
<p>nursing care in hospitals. <u>Medical Care</u>, 42(2suppl), 11-67 – 11-73.</p>	<p>February 1999</p> <p>Assessed RN assessments of quality of nursing care correlated with workload and processes of care indicators</p>	<p>Pennsylvania</p>		<ul style="list-style-type: none"> ▪ Reported frequency of patient safety problems (process of care indicator) <p>Process of care indicators have more pronounced impact on nurses' assessment of quality of care than does workload</p>
<p>Sovie, M.D. & Jawad, A.F. (2001). Hospital restructuring and its impact on outcomes. <u>Journal of Nursing Administration</u>, 31(12), 588-600.</p>	<p>Cross-sectional study designed to explicate the effects of organizational restructuring on patient outcomes.</p> <p>Data were collected, validated & supplied by the hospitals</p> <p>Each hospital identified 1 adult medical unit and 1 surgical unit as study units.</p> <p>Structure, process, and outcome variables were collected for the 1997 and 1998 fiscal years.</p> <p>Structural variables included:</p> <ul style="list-style-type: none"> • FTEs for each category of nursing staff • Skill mix • Hours worked per patient day • Labor costs per discharge <p>Process variables:</p> <ul style="list-style-type: none"> • 77 item 	<p>29 university teaching hospitals collected uniform data about organizational structures, processes and outcomes</p>	<p>Selected outcomes:</p> <ul style="list-style-type: none"> • Fall rate • Nosocomial pressure injury rate • UTI rate • Patient satisfaction 	<p>Findings:</p> <p>Fall rates were inversely related to the number of RN hours worked per patient day</p> <p>Pain management satisfaction is positively associated with the number of RN hours worked per patient day.</p> <p>Patient satisfaction is positively associated with increased numbers of RNs providing care.</p> <p>Conclusions:</p> <p>While the analysis confirms that RN hours per patient day and total hours for all staff are important measures, the findings do not support specific ratios or hours by category of staff. Further research into the structural staffing variables is recommended.</p>

Author/Year	Design	Population/ Sample Size	Primary Outcome Measure(s)	Conclusions/ Comments
	<p>Management Practices & Organizational Processes Questionnaire</p> <ul style="list-style-type: none"> • 4 item subscale on autonomy & decision-making from the Quality of Employment Survey <p>Outcomes variables as noted. The patient satisfaction measure included satisfaction with pain management, education, attention to needs/promptness of staff, nursing & the hospital, and preparation for discharge</p>			
<p>Tallier, P.C. (2003). <u>Nurse staffing ratios and patient outcomes</u>. UMI Dissertation Services. (UMI Number: 3091301).</p>	<p>Retrospective medical record review for patient data</p> <p>Survey research for nurse satisfaction data – data collection period was 10/1/2000 through 3/31/2001</p> <p>Purpose was to measure the relationship among structure (staff mix and Nursing Care Hours per Patient Day) indicators and process and outcomes indicators</p>	<p>Convenience sample of adult inpatient admissions to a single acute care, inner-city community hospital</p>	<p><u>Process Indicators</u> Maintenance of skin integrity Nurse staff satisfaction</p> <p><u>Outcomes Indicators</u> Nosocomial Urinary Tract Infection Patient satisfaction with nursing care</p>	<p>Findings:</p> <ul style="list-style-type: none"> ▪ Significant relationships among nosocomial pressure injuries, nosocomial urinary tract infections, nurse satisfaction, patient satisfaction and Nursing Care Hours per Patient Day were not identified ▪ Significant negative correlations between urinary tract infection and the number of RNs were identified ▪ Significant positive relationships between patient satisfaction and the number of RNs and LPNs were identified <p>Conclusion:</p> <ul style="list-style-type: none"> ▪ Adequate numbers of nurse staff and appropriate skill mix are important considerations when making staffing decisions

Author/Year	Design	Population/ Sample Size	Primary Outcome Measure(s)	Conclusions/ Comments
<p>Unruh, L. (2003). Licensed nurse staffing and adverse events in hospitals. <u>Medical Care</u>, 41(1), 142-52.</p>	<p>Descriptive analysis of secondary cross-sectional data for the purpose of examining the relationship between licensed nursing staff(RN & LPN) and adverse patient events in hospitalized patients for the time period 1991 – 1997.</p> <p>Data on nursing personnel and hospital characteristics was supplied by the Pennsylvania Department of Health</p> <p>Patient-level data was obtained from the Pennsylvania Health Care Cost Containment Council.</p>	<p>211 hospitals for each of 7 years</p>	<p>Incidence of:</p> <ul style="list-style-type: none"> • Atelectasis • Pressure ulcer • Falls • Pneumonia • Postoperative/Post treatment infection • UTI 	<p>Findings:</p> <p>The workload for licensed nurses increased for only 2 short periods during the study time.</p> <p>The intensity of patient care increased almost throughout the entire time.</p> <p>The skill mix declined during the study period.</p> <p>Hospitals with higher numbers of licensed nurses had significantly lower incidences of atelectasis, pressure injury, falls and UTI</p> <p>Lower rates of pressure injury and pneumonia were associated with a greater proportion of licensed nurses to total nursing staff.</p> <p>Hospitals with higher numbers of licenses nurses had higher rates of pneumonia (statistically significant)</p> <p>Conclusion:</p> <p>Adequate nurse staffing is an important policy issue for US hospitals. Flexible staffing systems, instead of static ratios, are recommended to assure care that is adequate and cost-efficient</p> <p>Health care organizations should take steps to increase the supply of nurses by making hospital employment more attractive to non-active nurses as well as those considering entry into the profession.</p> <p>Improvements in working conditions, especially remedying understaffing, are cited as a strategy for accomplishing this.</p>

Research Review/Evidence Summary				
<p>Agency for Healthcare Research and Quality (2004). Hospital nurse staffing and quality of care. <u>Research in Action</u>, 14, 1-9.</p>	<p>Evidence Summary</p>	<p>n/a</p>	<p>n/a</p>	<p>This evidence summary provides a summary of research, funded by AHRQ & other sources, addressing the relationship between nurse staffing and adverse patient outcomes that are conceptualized as nurse sensitive. Adverse patient outcomes conceptualized as nurse sensitive include:</p> <ul style="list-style-type: none"> • Urinary tract infection (UTI) • Pneumonia • Shock • Upper gastrointestinal (UGI) bleeding • Longer hospital stays • Failure to rescue • 30-day mortality <p>The introduction provides an overview of factors that contribute to the current nursing shortage.</p> <p>Findings:</p> <ul style="list-style-type: none"> ◆ Lower nurse staffing levels were found to be associated with a variety of adverse outcomes including pneumonia, UGI bleeding, shock/cardiac arrest, UTI, failure to rescue, lung collapse, falls, pressure injury, thrombosis after major surgery, pulmonary compromise after surgery, longer hospital stays, and 30-day mortality. The authors recommend that nurse sensitive adverse outcomes be viewed as indicators rather than measures of the impact of nurse staffing on patient outcomes. ◆ More accurate and consistent measures of the impact of nurse staffing on patient outcomes are required before research can indicate appropriate minimal staffing ratios at the unit or hospital level.
<p>Committee on the Work Environment for Nurses and Patient Safety (2003). <u>Keeping patients safe: Transforming the work environment of nurses</u>. Washington, DC: The National Academies Press.</p>	<p>Evidence Summary</p>	<p>n/a</p>	<p>n/a</p>	<p>This evidence summary addresses multiple aspects of the practice/work environment for nurses across various care setting and within the context of patient safety. This report builds on the prior two Institute of Medicine patient safety reports.² Recommendations that relate specifically to nurse staffing in acute care hospitals are:</p> <p><u>Recommendation 5-2:</u> Health care organizations (HCO) should employ nurse staffing practices that identify needed nurse staffing for each patient care unit per shift</p> <ul style="list-style-type: none"> • Incorporate census methodologies that are more robust than midnight census • Involve direct care nursing staff in determining and evaluating

² Kohn, L.T., Corrigan, J.M. & Donaldson, M.S. (Eds.). (2000). To err is human: Building a safer health system. Washington, DC: National Academy Press.
 Committee on Quality of Health Care in American (2001). Crossing the quality chasm: A new health system for the 21st century. Washington, DC: National Academy Press.

				<p>methods used to determine appropriate staffing for each shift</p> <ul style="list-style-type: none"> • Provide for "elasticity" within each shifts scheduling to accommodate unpredicted variations in volume and acuity; avoid use of external agencies to provide this elasticity. • Empower nursing staff to regulate unit work flow • Involve direct care nursing staff in identifying causes of nursing staff turnover and in developing approaches to improving nursing staff retention <p><u>Recommendation 5-3:</u> HCOs should perform ongoing evaluation of the effectiveness of their nurse staffing methods, levels, and effects on patient safety</p> <p><u>Recommendation 5-4:</u> DHHS should implement a nationwide, publicly accessible system for collecting and managing valid and reliable staffing and turnover data from HCOs; this data should be publicly reported</p>
<p>Heinz, D. (2004). Hospital nurse staffing and patient outcomes: A review of current literature. <u>Dimensions of Critical Care Nursing</u>, 23(1), 44-50.</p>	<p>Review of Literature/ Non-systematic Purpose is to provide an overview of current literature that addressed the relationship between nurse staffing and patient outcomes and to present recommendations for nursing practice.</p>	n/a	n/a	<p>The author summarizes 16 nurse staffing research studies between 1998 and 2002) and concludes: Much of the research investigating the relationship between nurse staffing and patient outcomes use mortality, length of stay, and patient complications as the outcomes of interest; these indicators do not reflect nursing care alone. Some studies have the whole hospital as the unit of analysis, while others use the patient care unit as the unit of analysis; some are limited to a single hospital, while others may include an entire geographical area. In general, across the studies there is a lack of clear operational definitions for outcomes thought to be sensitive to nursing care, a lack of consistent definitions for nurse staffing, and inconsistent definitions for health care workers considered as nurse staffing. Finally, most of this research is based in administrative data obtained retrospectively; this results in limitations in study design. Critical care nurses do play a significant role in patient outcomes and should conduct research designed to identify nurse sensitive outcomes with clear operational definitions. Nurse staffing is associated with patient outcomes.</p> <p>Recommendations for nursing practice are: Enhance nurse staffing through recruitment and retention activities.</p>
<p>Lang, T.A., Hodge, M., Olson, V., Romano, P.S. & Kravitz, R.L. (2004). Nurse-Patient Ratios: A systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. <u>Journal of Nursing</u></p>	<p>Systematic review of nurse staffing literature for the purpose of determining whether the research literature demonstrates support for</p>	n/a	n/a	<p>The authors systematically reviewed 43 articles published between 1980 and 2003. Conclusions:</p> <ul style="list-style-type: none"> • The literature reviewed does not provide support for setting specific nurse-patient ratios • Minimum nurse-patient ratios are not adequate to assure quality of nursing care • The evidence <u>probably</u> supports the following relationships between nurse staffing and patient outcomes

<p>Administration, 34(7/8), 326-37.</p>	<p>developing and promulgating requirements for specific nurse-patient ratios in acute care setting.</p> <p>In addition, the authors assessed the evidence for associations between staffing levels and differences in patient outcomes, nurse-as-employee outcomes and hospital outcomes.</p> <p>43 articles published between 1980 and 2003 were reviewed.</p>			<ul style="list-style-type: none"> ○ Richer nurse staffing and lower rates of failure to rescue, in surgical patients ○ Richer nurse staffing and lower mortality rates ○ Richer nurse staffing and lower length of stay, for medical patients ● There is limited evidence for an association between richer nurse staffing and <ul style="list-style-type: none"> ○ Lower nurse burnout rates ○ Lower needlestick injury rates ● The evidence is equivocal about the relationship between nurse staffing and the incidence of <ul style="list-style-type: none"> ○ Pneumonia ○ UTI ● The evidence does not support a relationship between nurse staffing and the incidence of <ul style="list-style-type: none"> ○ Pressure injury ○ Patient falls ○ Nosocomial infections ○ Additional patient outcomes ○ Documentation ● In general, the literature does not use positive outcomes to assess nursing quality. Positive outcomes of nursing care in relation to nurse staffing should be studied.
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Topic Discussion/Commentary				
<p>Clarke, S.P. (2003). Balancing staffing and safety. <u>Nursing Management</u>, 34(6), 44-8.</p>	<p>Topic Discussion/Commentary</p>	<p>n/a</p>	<p>n/a</p>	<p>This article offers an overview of:</p> <ul style="list-style-type: none"> • The issues involved in studying the relationships between nurse staffing and patient outcomes (methods) • Nurse staffing research (findings) • Practice and policy implications • Nurse staffing research limitations <p>In order to study the impact of staffing on patient outcomes, detailed information about outcomes must be gathered across like patient care situations. Less detailed Hospital-wide information is often readily available from administrative databases, while gathering data at the unit level remains costly and logistically difficult. Disadvantages of administrative databases include:</p> <ul style="list-style-type: none"> • It is difficult to separate nurses in indirect roles, or those practicing in non-acute roles, from nurses in direct acute patient care positions • Discharge databases are developed primarily to support reimbursement, and not to provide a "logical connection" to nursing care • A third issue had to do with risk adjustment and the ability to use administrative databases to determine patient characteristics and conditions that were present at the time of admission <p>Another source of outcomes information at the hospital and unit level is the incident/occurrence system; it is recognized that use of this data may lead to underestimations of the adverse outcome occurrence.</p> <p>The author's prior research demonstrates that outcomes sensitive to RN staffing include:</p> <ul style="list-style-type: none"> • Medication errors • Patient falls • Postoperative infections and other complications in medical and surgical patients • LOS • Mortality • Mortality following complications <p>The author notes that while limitations exist in the measures used to study the relationship between nurse staffing and patient outcomes, the finding across the studies are consistent. The implication of the limitations of individual measures does mean that front line managers may not be able to directly apply results of a particular study to their unit, but the fundamental finding that better RN staffing is associated with better patient outcomes must be factored into decision-making.</p> <p>In addition:</p>

				<ul style="list-style-type: none"> • Staffing levels provide a context for nursing practice, as well as the most direct constraint • The existing research base cannot inform the manager about particular staffing levels for specific situations or patient populations • The existing research base cannot inform the manager about the ideal skill mix • Given the limitations in our research/knowledge base, clinical nurses and their managers are in the best position to determine staffing adequacy <p>Directions for ongoing research:</p> <ul style="list-style-type: none"> • Research exploring the impact of characteristics of the practice environment, other than staffing, on patient safety <ul style="list-style-type: none"> ○ Decision-making models ○ Interdisciplinary/ Interdepartmental Collaboration • How to enhance patient safety through modifications of the workload of novice nurses • Research-based staffing guidelines developed through the analysis of staffing and outcomes data pooled from hospitals using similar workload metrics
Clarke, S.P. (2004). Failure to rescue: Lessons from missed opportunities in care. <u>Nursing Inquiry</u> , 11(2), 67-71.	Topic Discussion/ Commentary	n/a	n/a	<ul style="list-style-type: none"> • This article explores the concept of failure-to-rescue with implications for clinical nurses, managerial nurses, and nurse researchers • Nurse staffing levels are one of the organizational characteristics that are linked to the phenomenon of failure-to-rescue with implications for managerial nurses. <ul style="list-style-type: none"> ○ Failure-to-rescue rates reflect the degree of resource investment at the organizational level in professional nursing practice ○ Failure-to-Rescue rates may reflect an organizational culture and the extent to which professional nurses understand that they have the authority to act in the best interests of patient safety • Related to adequacy of staffing and failure-to-rescue is the loss of expertise and “clinical memory” when experienced nurses leave the organization. The author notes that retention of tenured staff must be a priority for managerial nurses & their organizations.
Coffman, J.M., Seago, J.A. & Spetz, J. (2002). Minimum nurse-to-patient ratios in acute care hospitals in California. <u>Health Affairs</u> , 21(5), 53-64.	Topic Discussion/ Commentary	n/a	n/a	<p>The authors offer an economic policy analysis of the implications of mandated minimum nurse-to-patient ratios. They suggest that mandatory minimum staffing ratios have the potential to:</p> <ul style="list-style-type: none"> ▪ cause hospitals to hire more LPNs/LVNs in order to comply with licensed nurse ratios ▪ divert organizational resources away from development of organizational cultures that promote involvement of direct care RNs in organizational decision-making ▪ divert organizational resources away from other factors that impact quality of care

				<ul style="list-style-type: none"> ▪ perversely incentivize organizations with richer RN staffing levels to reduce their staffing levels to mandated levels ▪ lead to hospital bed closure ▪ cause some hospitals to reduce spending for support personnel such as unlicensed caregivers, housekeepers, transporters, and others. ▪ discourage innovations in the utilization of other types of health care workers by hospitals ▪ discourage investments in technology and facilities that have the potential to improve health care quality for patients and quality of work life for nurses
Norrish, B.R. & Rundall, T.G. (2001). Hospital restructuring and the work of registered nurses. <u>The Milbank Quarterly</u> , 79(1), 55-79.	Topic Discussion/ Commentary	n/a	n/a	<p>This article examines the impact that hospital restructuring has had on the work of Registered Nurses. The authors believe that it is important to explicate this effect because alterations in work roles, workload, and control over work impact the satisfaction of the RN workforce and are key variables through which the effects of restructuring upon patient outcomes are mediated.</p> <p>Impact of restructuring on work roles Return to team nursing with a resultant decrease in the emphasis on the nurse-patient relationship</p> <p>Impact of restructuring on workload Difficult to assess due to:</p> <ul style="list-style-type: none"> • methodological constraints on accurate estimates of patient care staffing requirements • new categories of caregivers in the staff mix • complex dynamics of inpatient unit staffing <ul style="list-style-type: none"> ○ census volatility ○ competency of the nursing staff ○ mandated staffing practices <p>Impact of restructuring on control of nursing work Professional autonomy, participation, and shared decision making are vulnerable when an organization restructures; professional control of the work may be subordinated to the organizational bureaucracy</p> <ul style="list-style-type: none"> • restructuring initiatives may “bypass” the governance structure • decreased money budgeted for governance activities • may prompt the organization to move to organization-wide shared governance/shared decision making models <p>The authors conclude that state regulation of nurse staffing ratios may neither enhance patient outcomes nor improve the working conditions of nurses. The complexity of determining the ever fluctuating demand for nursing care makes it very difficult to assure safe and effective clinical care across multiple organizations using a regulatory approach. The authors recommend that 3 strategies be used when initiating hospital restructuring:</p> <ul style="list-style-type: none"> • use effective change management principles

				<ul style="list-style-type: none"> • build trust between nursing staff and management • assess the patient impact of planned changes and put the assessment in writing in the form of a Patient Impact Statement
Seago, J.A. (2002). The California experiment: Alternatives for minimum nurse-to-patient ratios. <u>Journal of Nursing Administration</u> , 32(1), 48-58.	Topic Discussion/ Commentary	n/a	n/a	<p>The context for this article is California Assembly Bill 394 which established minimum nurse staffing levels for acute care hospitals. The author's review of the literature is designed to respond to 5 questions:</p> <ul style="list-style-type: none"> • why nurse patient ratios are at the forefront of the California health care agenda • what is expert opinion about mandated staffing ratios • how are states other than California, as well as other institutions, approaching the issue of staffing ratios • what is the relationship between nurse staffing and patient outcomes • what is the relationship between nurse staffing and nursing staff outcomes <p>In terms of nurse staffing and patient outcomes, the author notes the paucity of evidence supporting an "ideal" nurse-patient ratio. The positive association between richer nurse staffing and positive patient outcomes is noted.</p> <p>In terms of nurse staffing and nursing staff outcomes, higher nurse-to-patient ratios are associated with a safer work environment for nurses. There is a relationship between high workload and nurse burnout and reduced job satisfaction. This research base is limited.</p> <p>Conclusions: There is no support in the literature for determining/setting optimal nurse-patient ratios for diverse patient populations.</p>

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Guiding Principles for Determining Appropriate Nurse Staffing

Position Statement:

Appropriate nurse staffing in any health care setting can only be achieved through a decision making process in which nurses themselves evaluate and respond to the drivers of patient care intensity. This evaluation and response must be made in light of the nursing organization's capacity to provide professional services. The components of appropriate staffing include the hours of nursing care and the appropriate mix of professional and non-professional providers.

Guiding Principles:

1. Authority and accountability for all nurse staffing decisions within the organization must rest with the nurse executive who will work in direct collaboration with the clinical direct care professionals in each specialty. Expertise in nursing is a foundation of appropriate staffing decisions.
2. An effective system of appropriate staffing strives to match patient care requirements with nursing care resources each shift, each day. Patient care needs must determine the level of staffing. Efforts to adjust for a day of higher than normal care requirements by arbitrarily restricting staffing to less than adequate levels at some point in the future are inappropriate.
3. The daily determination of appropriate staffing requires objective information concerning patient care needs, skills of available staff, and budgeted resources, coupled with expert clinical judgment about the specific patient care requirements on any particular day. Appropriate staffing requires mechanisms to increase staffing in response to greater care requirements and to decrease staffing in response to reduced care requirements. Further required is a collaborative approach to managing patient flow within the organization when the demand for patient admissions exceeds the available nursing resources.
4. The professional standards, developed by the nationally recognized specialty nursing associations to address appropriate staffing, must be considered in developing staffing plans within organizations.
5. Clinical nurses recognize that prerequisites to providing a meaningful voice in determining appropriate staffing include an awareness of the fiscal realities of the current health care environment, and a willingness to play an active role in assuring the efficient and effective use of resources through the pursuit of improved approaches to patient care.
6. The continuous pursuit of evidence-based best practices is an obligation of the profession. Benchmarking with other organizations must be an ongoing endeavor in determining appropriate staffing. To be meaningful, benchmarking must be a comprehensive process that includes comparisons of the Key Drivers of Intensity of Patient Care Requirements and of the Key Drivers of the Capacity of the Nursing Organization to Provide Patient Care. Comparisons of single variables, such as "hours of care", without the broader organizational context, are not useful.

7. Ongoing evaluation of outcomes is also a necessary element in insuring the provision of quality care. At a minimum, this should include collection and analysis of data related to nurse sensitive outcomes such as length of stay and rates for urinary tract infection, pressure injury, post-operative infections, and pneumonia (ANA, 2000) and their correlation with other patient care trends. In addition, the impact of quality of work-life on quality of care delivered must be evaluated.

Key Drivers of Intensity of Patient Care Requirements:

1. The acuity, complexity and case mix of the patient situation are the primary determinants of patient care requirements.
2. There is a direct relationship between the length of stay in the acute setting and the intensity of care requirements. For every day the length of stay is decreased, nursing workload is increased by greater than 27% (The Advisory Board, 2002).
3. Intensity of patient care is increased by admission, discharge and transfer activity. The greater the number of admissions, discharges and transfers in a given day, the greater the intensity. Midnight census does not accurately reflect nursing workload.

Key Drivers of the Capacity of the Nursing Organization to Provide Patient Care:

1. The experience/expertise of the nurse directly influences individual capacity to provide patient care. Generally, the greater the expertise of the nurse, the greater the capacity to manage, both in terms of the number and complexity of patients.
2. The support systems available to nurses in the practice setting directly impact the capacity to provide professional services within the organization. Nurses whose work is supported by effective housekeeping, pharmacy, food and supply systems, as examples, have a greater capacity to provide professional services than those who are forced to spend time compensating for inadequate support.
3. The effectiveness of the system of care, particularly documentation and other non-direct care requirements, directly impacts the capacity of the nursing organization to provide professional services. Cumbersome systems that pull nurses away from the patient detract from the capacity to provide patient care.
4. The geography and unit design in which nurses practice influence the capacity to provide professional services. The ability to readily visualize and access patients enhances capacity. The demand for larger and more private patient care spaces (essential to meeting the expectations of today's active consumer,) detracts from the capacity of the nursing organization to provide professional services.

Closing Statement:

This document has been created by The Wisconsin Organization of Nurse Executives as a service to our patients, in recognition of our obligations and commitment to them, and as a service to our organizations as they struggle with a changing reality. We have created a comprehensive tool to be utilized by nurses, in partnership with their organizations, throughout the state. The accountabilities for decision making and key relevant considerations are clearly described. Our positions reflect the best available evidence of the scientific community.³

³ These principles compliment the work of an American Nurses Association Expert Panel convened in 1999 (American Nurses Association, 1999). The ANA Congress on Nursing Practice and Economics plans to release an update to the 1999 *Principles for Nurse Staffing* in 2005.

Acknowledgments:

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The W-ONE wishes to express our gratitude to the Clinical Nurse Specialist team⁴ of St. Marys Hospital Medical Center in Madison, Wisconsin, for their thorough review and synopsis of the relevant professional literature on appropriate nurse staffing levels.

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