

# **White Paper: Nurse Scheduling and Fatigue in the Acute Care 24 Hour Setting**

**Prepared at the request of  
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For Wisconsin Organization of Nurse Executives**

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## **White Paper: Nurse Scheduling and Fatigue in the Acute Care 24 Hour Setting**

The nursing profession, which many consider vital to patient safety and care in the hospital, is examining the relationship between hours spent at the bedside without sufficient rest to the quality of care provided. Currently nurses in acute care facilities work long hours and overtime ranging from a few hours to full shifts; they do so either by choice or as a condition of employment. Missing breaks and lunches during these long stretches of work occurs regularly (Rogers, Hwang & Scott, 2004a; Scott, Rogers, Hwang & Zhange, 2006; Trinkoff, Geiger-Brown, Lispcomb & Mutaneer, 2006). Long work hours can and often do result in poorer patient outcomes (IOM, 2004).

A number of social phenomena are associated with nurses working long hours. Patients in acute care facilities must be cared for by nurses around the clock. Hospitalized patients are more acutely ill than at any other time in history requiring lower nurse to patient ratio. A nursing shortage has been well documented, leaving vacant nursing positions unfilled. Fewer persons are entering nursing and often leave at a younger age than other professions. Health care costs continue to increase and systems are continually challenged to manage budgets, including management of nursing budgets (Honor Society of Nursing, 2001). Other professions have set limits on the number of hours that are worked in a twenty-four hour period without rest. The medical profession restricts the length of their time residents may remain on duty (IOM, 2004). This change has had an impact on other professionals, namely attending physicians and nurses, further heightening the critical need for nurses to function safely and productively.

Researchers consistently identify a relationship between hours worked, nurse fatigue, and errors; with error rates doubling at 12 hours of work and tripling at 16 hours (IOM, 2004; Rogers, Hwang, Scott, Aiken, & Dinges, 2004b). Fatigue is often characterized by a decreased ability to complete work and a subjective complaint of feeling tired. Inadequate rest, sleep loss, and shift work schedules often contribute to fatigue (IOM, 2004). Fatigue has been reported to produce slowed reaction time, omission errors, impaired problem-solving abilities and attention lapses (Van-Griever & Meijman, 1987). Furthermore, fatigue may diminish productivity and lead to errors and accidents (IOM).

Numerous factors potentially affect work schedules and fatigue. Among these factors are staffing schedules, number of full and part-time personnel on unit, lifestyle decisions nurses make related to family and sleep, use of agency nurses, patient acuity, type of unit (intensive care unit, specialty unit, general unit), teaching or community hospital, personal preferences for shift worked and management support for staffing schedules. Recommendations to combat fatigue and decrease the potential for errors have been proposed by the Institute of Medicine (IOM) in "Keeping Patients Safe: Transforming the Work Environment of Nurses". The IOM states that "...to reduce error-producing fatigue, state regulatory bodies should prohibit nursing staff from providing patient care in any combination of scheduled shifts, mandatory overtime, or voluntary overtime in excess of 12 hours in any given 24 hour period and in excess of 60 hours per 7 day period" (2004, p. 237).

In general, studies of nursing work schedules have been researched using descriptive or correlation designs resulting in conclusions that are associational rather than causative. Across these studies (see Evidence Tables I & II) there is agreement that working over 12 hours, working overtime, and inadequate rest (i.e. less than 8 hours in between shifts) are associated with higher error rates. This IOM recommendation, related to limiting number of hours worked per week is based on writing of Jha, Duncan, and Bates and a 2002 descriptive study of American Nurses Association nurses (Rogers et al., 2004b). This conclusion was drawn based on how other safety industries have responded to work fatigue and the above mentioned study. In this study, Rogers and colleagues (2004b) did find that working greater than 40 hours per week increased errors, but did not delineate what type of shifts were worked to equal greater than 40 hours (i.e. four twelve-hour shifts, four sixteen-hour shifts, etc.). No other studies were found in which number of hours worked per week was evaluated in nurses. There is some suggestion that longer work hours are particularly fatiguing for nurses over 40 years old or nurses working the night shift (Kunert, King & Kolkhorst, 2007; Muecke, 2005). There is some evidence that persons working 12 hours rather than 8 hours with longer rest periods (i.e., greater number of days off between tours of duty) actually experienced less fatigue (Gillespie & Curzio, 1996).

Implementation of the IOM recommendation would limit the capacity for health care systems to generate and test alternative methods of scheduling nurse work. Upon examination the recommendation to limit nursing to a 60 hour work week has been inadequately validated by research at this point. Many hospitals have been able to develop creative staffing solutions aimed at improving staffing and attending to the preference of nurses. Models such as 4/40 (four ten-hour shifts), 7/70 (seven ten-hour shifts) and three twelve-hour shifts per week, have demonstrated their ability to maintain optimal patient outcomes and high nurse retention rates (Froedtert Hospital, 2006). These scheduling models have thus far not been researched in relation to fatigue in nurses.

The increased risk of error associated with fatigue has necessitated the development of recommendations based on evidence in order to decrease fatigue in relation to nurse scheduling. Based on the evidence available, recommendations were synthesized from the literature. Please note that “on call” nursing was not included in this synthesis and could be a focus for future study.

## **Synthesis of Evidence with Recommendations for Practice and Future Research**

### **Problem**

- As many as 40% of nurses reported working overtime (Rogers et al., 2004b).
- Over two-thirds of nurses reported working more than 12 hours in one day (Scott et al., 2006).
- Fourteen percent of nurses worked 16 or more hours at least once over a four-week period (Rogers et al., 2004b).
- Almost two-thirds of nurses reported working overtime 10 or more times during a four-week period (Rogers et al., 2004b).
- Nurses reported having a break or meal period free of patient care responsibilities less than half of the shifts worked (Rogers et al., 2004a).
- Twenty percent of nurses reported falling asleep once during their work shift (Scott et al., 2006).
- Chance of error increases with prolonged work shifts (IOM, 2004).

### **Definitions**

- “Direct patient care encompasses activities carried out in the presence of the patient and family, such as performing a physical exam and other assessments of the patient, administering medications, and performing treatments and procedures” (IOM, 2004, p. 36).
- Fatigue is a protective response, an indicator of an individual’s response to physical and psychological demands. It is an awareness of a decreased capacity of activity (physical and/or mental) attributed to an imbalance in the availability, utilization and or restoration of the resources an individual needs to perform activity (Ruggiero, 2003).
- Chronic fatigue is a general tiredness and lack of energy irrespective of sleep quantity or hard work (Ruggeiro, 2003).

### **Scientific Merit**

- A number of primary studies reviewed included nurses’ work schedules, measures of nurse responses to the work schedule or patient outcomes. A number of review articles were located. See evidence tables for detailed information.
- One study (Smith-Coggins, 2006) used an experimental design. All others studies used descriptive (including qualitative) or correlational designs hence evidence is weak as it is associational, not causative.
- Samples were drawn from acute care facilities. Sample size varied widely ranging from 6 to 2273 (5 studies with samples under 100; four under 200; 6 under 400; 2 greater than 1100). Consistent with the profession, the samples were primarily females. All samples except Scott (2006) were convenience samples.
- The most common work schedules included in the studies were 8, 10, or 12 hours; but also included 9 or 11 hour shifts (Josten, Ng-A-Tham & Theiry, 2003). Some studies explored differences between shifts (morning, evening, and night) (Dorrian et al., 2006; Kunert et al, 2007; Ruggiero, 2003). In the review of literature, overtime was evaluated and ranged from less than ten minutes past the end of ones shift to working a complete extra shift (Rogers et al., 2004b; Scott et al., 2006; Trinkoff et al., 2006).

- Although fatigue and error were the most commonly measured, outcomes were numerous and included driving drowsiness, sleep patterns, patient satisfaction, communication, depression, anxiety, and health complaints.
- Measurement instruments consisted primarily of self-report via logbooks or verbal report (Dorrian et al., 2006). Measures also included neurobehavioral performance simulated testing (Dorrian, Lamond, & Dawson, 2000); measures of brain waves polysomnography (Smith Coggins et al., 2006); review of medical records (Gillespie & Curzio, 1996); personnel records (e.g., absenteeism) (Gillespie & Curzio, 1996); and psychometric instruments (Ruggiero, 2003).
- Common threats to the internal validity of the studies included selection bias, low response rates (20%) (Josten et al., 2003), and use of measurement tools without established reliability and validity.
- Potentially confounding factors not studied included staffing adequacy (acuity of patients and nurse-to-patient ratios), additional professional commitments, full-time vs. part-time, critical versus acute care units, personal preference, and use of agency staffing.

### **Findings**

- Evidence was weak but consistent in that working more than 12 hours in a single day was associated with errors (Montgomery, 2007; Rogers et al., 2004b; Scott et al., 2006). The IOM (2004) reports error rate doubles after 12 hours.
- Again, evidence is weak, but consistent overtime is associated with errors (Montgomery, 2007; Rogers et al., 2004; Scott et al., 2006). However, no evidence that the reason (mandatory vs. voluntary) for overtime makes a difference (Rogers et al., 2004b).
- One descriptive article reported that the risks of nurses making an error were increased when they worked greater than 40 hours per week (Rogers et al., 2004b). However, there was no delineation as to what type of shifts were worked to exceed 40 hours.
- The only other study referring to impact of number of hours worked per week was a recommendation for truck drivers (Jha et al., 2001; IOM, 2004).
- In a state of the science article Knauth (1993) recommended at least two successive days off if 5 to 7 days are worked consecutively.
- There was weak and limited evidence that night nurses reported increased fatigue and nurses over the age of 40 reported more fatigue when working longer hours (Kunert et al., 2007; Muecke, 2005).
- There was weak and limited evidence that recovery time between shifts decreases fatigue, a factor affecting rotation and alternative scheduling systems (Hughes, 2004; IOM, 2004; Meucke, 2005). One study found that increasing shift length while increasing recovery time resulted in less fatigue (Josten et al., 2003); a recommendation supported by Knauth (1993)
- Scheduling naps was the only intervention tested and was associated with both positive and negative outcomes (Smith-Coggins et al., 2006).
- The 60 hour work week limit suggested by the IOM has been inadequately validated by research, specifically in relation to nurse scheduling (see Evidence Tables I & II).

### **Recommendations for Future Research Based on Gaps in the Evidence**

1. Recommend support of state and national organizations to fund studies related to work schedule, nurse fatigue, and patient outcomes.
2. Evaluate the impact of time-off between shifts and recovery time needed to minimize fatigue.
3. Evaluate the impact of personal preference of work schedule related to fatigue and errors.
4. Study the combination of work schedule and staffing on patient safety and nurse fatigue.
5. Evaluate the cumulative effect of hours per day worked with hours per week worked.

### **Summary of Recommendation for Practice Based on Synthesis of the Evidence**

1. **Limit scheduled shifts to 12 hours or less in a 24 hour period** (Caruso, Hitchcock, Dick, Russo, & Schmit, 2004; Gillespie & Curzio, 1996; IOM, 2004; Montgomery, 2007; Rogers et al., 2004b; Scott et al., 2006; Trinkoff et al., 2006).
2. **Increase awareness that fatigue varies across shifts and consider this when developing staffing schedules** (Dorrian et al., 2006; Ruggiero, 2003).
3. **Strongly recommend adequate rest to be obtained between shifts (i.e. 10 hours after an 8-hour shift and 12 hours after a 12-hour shift)** (Gillespie & Curzio, 1996; Hughes, 2004; Knauth, 1993).
4. **Encourage staff to schedule time for breaks and meals. Management must put a structure in place that allows this to occur** (Rogers et al., 2004a; Hughes, 2004).
5. **Avoid shift rotation. If necessary to rotate shifts, facilitate shifts with forward rotations (morning to night)** (Dean et al., 2006; Hughes, 2004; Knauth, 1993; Muecke, 2005).
6. **Educate nurses about proper sleep hygiene** (Dean et al., 2006).
7. **Educate staff on personal responsibility to not work when too fatigued** (Department of Government Affairs, 2007; Hughes, 2005).
8. **Encourage state and national funding agencies to support study of innovative work schedules.**

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## Determination of Focus

### Focus of Document

Acute care nurses work schedules and nurse fatigue in relation to patient safety

### PICO Question

Question guiding selection and critique of literature resulting in recommendations for practice.

**P**opulation: Acute care staff nurses

**I**ntervention: Nurse scheduling (hours worked per day/hours worked per week/shift work/rotation/overtime)

**C**omparison Groups: Comparison across different types of nurse scheduling (e.g, 8 hours, 10 hours, 12 hours, 16 hours)

**O**utcomes: Nurse Fatigue

### Search Strategy

Medline and CINAHL electronic databases were searched utilizing the PICO question. Additional articles were identified from hand searches of reference lists of already retrieved articles. The abstracts of the articles were reviewed for relevance and the works that remained were included in three tabular summaries. They include Nurse Scheduling and Fatigue, Nurse Scheduling and Fatigue: Review Articles, and Nurse Scheduling (see Table III). The works are organized alphabetically.

**\*\***Special thanks to the Froedtert Hospital Clinical Nurse Specialists including Stephenie Cerns MSN, RN, CNS-BC; Annette Garcia MSN, RN; Melissa Paulson Conger MS, RN; Susan Palmer MSN, RN, CNS; Jeri Smith MSN, RN, ANP-BC, CNS-BC; and Kathleen Sweeney MSN, RN, CNS-BC for their assistance in reviewing critiques of articles utilized for the evidence tables.

**Evidence Table I: Summary of the Literature--Original Research  
Nurse Scheduling and Fatigue**

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Dean, G. E., Scott, L.D., &amp; Rogers, A.E. (2006). Infants at risk: fatigue jeopardizes quality care. <i>Advances in Neonatal Care</i>, 6(3), 120-126.</p>	<p>Pilot Study  Case Studies  6 nurses were randomly selected from a larger prospective study.</p>	<p>6 NICU nurses</p>	<p>Relationship between fatigue and error.</p> <ol style="list-style-type: none"> <li>1. Adverse drug events</li> <li>2. Circadian rhythms</li> <li>3. Critical incidents</li> <li>4. Fatigue</li> <li>5. Medication errors</li> <li>6. Sleep deprivation</li> </ol>	<p><b>Outcome(s)/Results:</b> Total of 6 errors reported during a 28-day period; 3 procedural and 3 medication administration errors.</p> <p>Procedural Errors:</p> <ol style="list-style-type: none"> <li>1. Patient received tube feeding too early; instead of every 8 hours, it was given every 4 hours.</li> <li>2. Found an intravenous rate that was too high; would have given patient an increase in total fluids.</li> <li>3. Intravenous infiltrated; too many visitors, could not get in there to check on site.</li> </ol> <p>Medication Errors:</p> <ol style="list-style-type: none"> <li>1. Morphine dose to be given was drawn up at twice the ordered dose because RN forgot to dilute the medication.</li> <li>2. Gave medication at a 6-hour interval instead of the 8-hour interval ordered.</li> <li>3. Stopped RN (recent graduate) from administering a medication through an arterial line.</li> </ol> <p>Logbooks recorded hours worked, time of day worked, overtime, days off, sleep/wake patterns, errors and near errors. These logbooks suggested that fatigue may have been a contributing factor to at least 2 of the 6 errors reported.</p> <p>Provided case studies which reinforce the concept that NICU nurses need to be alert enough to provide safe care for their patients, as well as alert enough to detect and correct the errors made by others.</p>	<p>Recommendations: “What Nurses Can Do”</p> <ul style="list-style-type: none"> <li>• Employing good sleep habits</li> <li>• Minimizing shift rotations and excessive work hours</li> <li>• Using strategic naps can reduce the adverse effects of fatigue that could potentially put patients, especially the most vulnerable ones, at risk.</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Dorrian, J., Lamond, N., &amp; Dawson, D. (2000). The ability to self-monitor performance when fatigued. <i>Journal of Sleep Research</i>, 9, 137-144.</p>		<p>18 participants</p> <ul style="list-style-type: none"> <li>• Ages 19-26</li> </ul> <p>Exclusion Criteria</p> <ul style="list-style-type: none"> <li>• Current health problems and/or a history of psychiatric or sleep disorders</li> <li>• Smokers</li> <li>• Those taking medications known to affect sleep or performance</li> </ul>	<p>What was measured</p> <ul style="list-style-type: none"> <li>• Neurobehavioral performance using four tests from a standardized computer battery               <ol style="list-style-type: none"> <li>1. Grammatical reasoning (accuracy and response latency)</li> <li>2. Vigilance (accuracy and response latency)</li> <li>3. Simple sensory comparison and tracking</li> </ol> </li> <li>• Tasks were presented in random order</li> <li>• Subjects received no feedback during the study</li> <li>• Pre and post-tests self-rating alertness level and speed and accuracy of their performance based on a linear visual acuity scale</li> </ul>	<ul style="list-style-type: none"> <li>• Planned comparison analysis indicated that scores on four of the six performance measures decreased significantly as hours of wakefulness increased.</li> <li>• Predicted performance scores for all six measures of performance decreased significantly</li> <li>• Analysis revealed moderate correlations between predicted and actual performance for the four parameters affected by fatigue</li> <li>• Moderate to high correlations were found between all six performance parameters and their respective post-test self ratings</li> <li>• Moderate to high correlations were found between predicted performance and alertness</li> </ul>	<ul style="list-style-type: none"> <li>• As fatigue levels increase, subjects globally assess performance decrements</li> <li>• Subjective alertness may in part mediate an individual's global assessment of performance.</li> <li>• Fatigue had a detrimental effect on neurobehavioral performance.</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Dorrian, J., Lamond, N., Van Den Heuvel, C., Pincombe, J., Rogers, A., &amp; Dawson, D. (2006). A Pilot Study of the Safety Implications of Australian Nurses' Sleep and Work Hours.</p>	<p>Pilot study</p> <p>GHQ-General Health Questionnaire completed by participants to gather info about health problems, particularly sleep disorders.</p>	<ul style="list-style-type: none"> <li>• 23 Full-time RNs</li> <li>• 20 Female/3 Male</li> <li>• Ages 22-57</li> <li>• Rotating shifts</li> </ul>	<p>Demographic information and a general health questionnaire were completed on each subject at the beginning of the study. Each subject was given a log book in which they were to log information daily for 28 days. The information logged included:</p> <ul style="list-style-type: none"> <li>• Work hours</li> <li>• Sleep length and quality (including time, quality, level of alertness before and after sleep, time to fall asleep, frequent arousals, caffeine intake and use of sleep aids)</li> <li>• Fatigue/Sleepiness/ Stress (rated fatigue, stress, physical and mental exhaustion on a five point scale)</li> <li>• Errors (frequency, type and severity of nursing errors, near errors and observed errors of another caregiver-time and narratives of each error were recorded)</li> </ul>	<p>Actual worked hours</p> <ul style="list-style-type: none"> <li>• ≤ 8 hours 17.3%, 8-9 hours 58.1%, 9-10 hours 13.2%, &gt;10 hours 11.4%</li> <li>• Max shift =13 hours</li> <li>• AM shift=50.9%, PM shift=27.5%, Noc shift=21.6%</li> <li>• Trouble falling asleep=26.8%</li> <li>• Frequent arousals=34%</li> <li>• Woke too early=31%</li> <li>• Increased sleep disruption=25.9% (12.5% due to work related concerns)</li> <li>• 14 of 23 used a sleep aid for a total of 68 times (17.3% of days) <ul style="list-style-type: none"> <li>○ prescription=62.7%</li> <li>○ alcohol=26.9%</li> <li>○ non-prescription=7.6%</li> </ul> </li> <li>• RNs reported struggling to remain awake during 36% of shifts</li> <li>• RNs reported moderate to high levels of: <ul style="list-style-type: none"> <li>○ Stress=23%</li> <li>○ Physical exhaustion=40%</li> <li>○ Mental exhaustion=36%</li> </ul> </li> <li>• RNs reported extreme drowsiness while driving or cycling home 11.5% of time (45 occasions), 3 reported near accidents</li> <li>• Caffeine consumption increased on workdays</li> <li>• Total sleep duration was significantly shorter on work days than days off</li> <li>• Total sleep was significantly shorter on workdays when an error or near error occurred</li> <li>• 20 errors, 13 near errors and 22 observed orders were reported</li> <li>• Shift schedules are associated with reductions in sleep</li> <li>• On average had 1.5 hours less sleep on workdays compared to days off.</li> <li>• Sleep was reduced for the morning and night shifts, relative to evening shifts</li> </ul>	<ul style="list-style-type: none"> <li>• Decreased sleep may lead to the increased likelihood of making an error and the decreased likelihood of catching someone else's error.</li> <li>• Findings suggest that in this population, it is the schedule per se, as opposed to overtime that is responsible for sleep loss.</li> <li>• Further investigation into the effects of sleep loss in nursing may be necessary for patient safety from an individual RN perspective and from a health care team perspective.</li> </ul> <p>Limitations</p> <ul style="list-style-type: none"> <li>• Small number of participants working in only one Australian hospital.</li> <li>• Small number of days in which data was collected.</li> <li>• Data obtained by self-report which can be criticized for a lack of reliability.</li> <li>• Pilot study.</li> <li>• Not generalizable.</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Gillespie, A., &amp; Curzio, J. (1996). A comparison of a 12-hour and eight-hour shift system. <i>Nursing Times</i>, 96(39), 36-39.</p>	<p>Descriptive</p> <p>Comparison of a 12-hour shift with traditional shift</p> <p>Staff Questionnaires, interviews and patient interviews, documentation review and analysis of a number of organizational issues.</p>	<p>4 medical wards- two working 12-hour shifts and two working traditional shifts</p> <p>103 staff</p> <p>Overall response was 48.5%:</p> <ul style="list-style-type: none"> <li>• 61% from 12-hour wards</li> <li>• 34.6% from 8-hour wards</li> </ul> <p>Scotland</p>	<ol style="list-style-type: none"> <li>1. Effectiveness of handovers</li> <li>2. General communication between nurses</li> <li>3. Level of personal tiredness</li> <li>4. Possible cause of tiredness</li> <li>5. Documentation Completion</li> <li>6. Patient's level of satisfaction, knowledge of their named nurse and the amount of information they received about care.</li> <li>7. Basic staffing levels</li> <li>8. Absenteeism</li> <li>9. Number, type and time of accidents</li> </ol>	<p><b>Outcomes(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. No significant differences between the shift patterns.</li> <li>2. Less fatigue was reported by those working the 12-hour shift</li> <li>3. Documentation was more complete on the 12-hour shift wards.</li> <li>4. Length of time available for the handovers was identified as a problematic area.</li> </ol> <p>Of the 12-hour shifts, 70% reported that time spent in direct patient care increased and 61% identified more opportunity for patient contact.</p> <p>Of the 8-hour shifts, less than half described the opportunity for patient contact to be an advantage of this shift, yet 76% stated they had enough time for direct patient care.</p> <p>Reported by the 12-hours shifts:</p> <ol style="list-style-type: none"> <li>1. Adequate time off between shifts</li> <li>2. More days off; able to plan ahead</li> <li>3. No 10-day stretches</li> </ol> <p>Dramatic reduction in tiredness</p> <p>Reported by the 8-hour shifts:</p> <ol style="list-style-type: none"> <li>1. Less time to rest between shifts</li> <li>2. Fewer days off</li> <li>3. Worked too many days in a row</li> </ol> <p>Tiredness due to number of consecutive shifts worked.</p> <p>Patients reported similar positive responses regardless of shift pattern, but 12 hour shift had more positive responses.</p> <p>Disadvantage staff perceived was number of staff lent out to other wards. Staff in 12 hour wards borrowed fewer staff than those in 8-hour and did not lend out staff.</p>	<p>Results indicate that a 12-hour shift system compares favorably with a traditional shift system.</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Josten, E.J.C., Ng-A-Tham, J.E.E., &amp; Theiry, H. (2003). The effects of extended workdays on fatigue, health, performance and satisfaction in nursing. <i>Journal of Advanced Nursing</i>, 44(6), 643-652.</p>	<p>Questionnaire sent by internal and external mail designed to measure the variables of interest</p>	<p>134 nurses from three nursing homes in the Netherlands</p>	<p>8-hour shift vs. 9-hour shift</p> <p>What was measured:</p> <ol style="list-style-type: none"> <li>1. Fatigue</li> <li>2. Health</li> <li>3. Performance</li> <li>4. Satisfaction with free time</li> <li>5. Satisfaction with different shift types</li> </ol> <p>Full-time workers in health care have a 36-hour week. 9-hour shifts give them a four day work week.</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Nurses who worked 9-hour as compared to nurses who worked 8-hour shifts were on average: <ul style="list-style-type: none"> <li>• More fatigued</li> <li>• Had more health complaints</li> <li>• Were less satisfied with their working hours and free time</li> <li>• Slightly poorer performers</li> </ul> </li> <li>2. 70-80% of the 8- and 9-hour nurses preferred to work a maximum of 8 hours during morning/early and afternoon/late shifts</li> </ol> <p>Lengthening night shift, when workload much lower, was not problematic. High workload makes extended shifts more fatiguing.</p>	<p>The 9-hour shift seemed to combine the negative aspects of the 12-hour shift with the negative aspects of the 8-hour shift. The authors suggest that the 9-hour shift had more negative effects than the 12-hour shift because:</p> <ol style="list-style-type: none"> <li>1. Nurses could not choose what shift length they worked</li> <li>2. Many worked part-time</li> <li>3. They already had many days off</li> </ol> <p>Nurses prefer 8-hour or 12-hour shifts over 9-hour shifts</p> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• 73% of the nurses worked part time prior to this study</li> <li>• 8-hour group's response rate was only 20%</li> </ul> <p>Factor that moderates effects is employee choice: if no choice, negative effects on all aspects.</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Kunert, K., King, M.L., &amp; Kolkhorst, F.W. (2007). Fatigue and sleep quality in nurses. <i>Journal of Psychosocial Nursing</i>, 45(8), 31-37.</p>	<p>Descriptive Design</p>	<p>Convenience 90 night-shift nurses  100 day-shift nurses  Local Hospital in Southern California</p>	<p>What was measured: 1. Fatigue 2. Sleep quality</p> <p>BFI-Brief Fatigue Inventory</p> <p>PSQI-Pittsburgh Sleep Quality Index)</p> <p>Instruments have proven reliability and validity</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Night shift nurses perceived higher levels of fatigue than day shift nurses</li> <li>2. Night shift nurses had poorer sleep quality than day shift nurses</li> <li>3. Nurses with 20 or more years of experience reported greater fatigue and lower global sleep quality scores than did nurses with 20 or fewer years of experience</li> <li>4. No significant difference in perceived levels of fatigue between night-shift and day-shift nurses with 9 or fewer years of experience</li> <li>5. Married and divorced night-shift nurses reported greater fatigue than did single night-shift nurses</li> <li>6. For night-shift nurses, sleep medication use and daytime dysfunction were predictors of fatigue</li> <li>7. For day-shift workers, subjective sleep quality, sleep medication use and sleep efficiency were predictors of fatigue</li> <li>8. Nurses on all shifts should be encouraged to take regular breaks.</li> </ol>	<p>Because fatigue has been implicated in previous studies as a factor in patient care errors, these findings suggest that poorer sleep quality and greater feelings of fatigue in night-shift nurses may lead to more mistakes in patient care.</p> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• Convenience sample</li> <li>• Slightly more than half of the nurses in this study reported that they worked 3 to 10 hours overtime per week</li> <li>• 52% reported they work shifts longer than 12 hours at least once or twice per week</li> <li>• Little known about physical and emotional health and/or ethnicity or socioeconomic status of sample</li> <li>• Would have been helpful to break study down by age to look at differences in fatigue and sleep quality.</li> </ul> <p>Implications: Studies are needed to determine interventions that decrease fatigue and improve sleep quality for shift-work nurses</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Rogers, A.E., Hwang, W., &amp; Scott, L. (2004a). The effects of work breaks on staff nurse performance. <i>JONA</i>, 34(11), 512-519.</p>	<p>Correlational</p> <p>Self-reported data</p> <p>To determine if skipping breaks and meal periods increases the risk of errors.</p> <p>Goals:</p> <ol style="list-style-type: none"> <li>1. To describe the prevalence of skipping breaks and meal periods among American Staff Nurses.</li> <li>2. Determine if this practice has an adverse effect on patient safety.</li> </ol>	<p>393 nurses</p> <p>ANA members</p> <p>All subjects were paid</p> <p>5,211 shifts examined</p> <p>All subjects worked full time (&gt;36 hours) as hospital, unit-based staff nurses</p>	<p>Completed log books for 28 days with information about:</p> <ol style="list-style-type: none"> <li>1. Work hours (scheduled/actual)</li> <li>2. Error</li> <li>3. Episodes of drowsiness</li> <li>4. Actual sleep on duty</li> <li>5. Breaks and meal periods</li> <li>6. Overtime</li> <li>7. Days off</li> <li>8. Sleep/wake patterns</li> </ol> <p>Participants were asked:</p> <ol style="list-style-type: none"> <li>1. If they were able to take a break</li> <li>2. Total duration of breaks taken during the shift</li> <li>3. If they were relieved of patient care responsibilities during their meals and/or break periods</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Nurses reported having breaks or meal period free of patient care less than half of the shifts worked</li> <li>2. No differences in the risk of errors reported by nurses who had a break free of patient care compared to those unable to take a break.</li> </ol> <p>Although nearly 40% of the shifts exceeded 12 hours, nurses working longer shifts were no more likely to be able to take a break than nurses working an 8 or 10 hour shift.</p> <p>A logistical regression model did indicate a 10% decrease in risk of making at least 1 error when nurses had an additional 10 minutes for their break and meal periods.</p> <p>The lack of breaks and/or meal periods did not increase the risk of errors.</p>	<p>Although skipping breaks and/or meal periods was not associated with a higher risk of error, there are other compelling reasons for nurses to take breaks.</p> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• 40% return rate</li> <li>• Error not defined</li> <li>• Self-reporting</li> <li>• Convenience sample (ANA members)</li> <li>• Small # of hospital nurses and may not be representative of work practices/schedule of other U.S. hospitals</li> <li>• Full-time employees only</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Rogers, A.E., Hwang, W., Scott, L.D., Aiken, L.H., &amp; Dinges, D.F. (2004b). The working hours of hospital staff nurses and patient safety. <i>Health Affairs</i>, 23(4), 202-212.</p>	<p>Log books containing information about the hours RNs worked</p> <p>Descriptive</p> <p>Goals: 1. To quantify hospital staff nurse work hours and work patterns. 2. Determine whether extended staff nurse work hours contribute to errors and near errors.</p>	<p>393 hospital staff nurses, all members of the ANA</p> <p>92% women 79% Caucasian</p> <p>Only 26% reported less than ten years' experience</p> <p>All worked full-time</p> <p>(40% of original group that was sent logbook)</p>	<p>What was measured: Logbook recorded:</p> <ol style="list-style-type: none"> <li>1. Hours worked (both scheduled and actual)</li> <li>2. Time of day worked</li> <li>3. Overtime</li> <li>4. Days off</li> <li>5. Sleep/wake patterns</li> <li>6. Errors</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Participants worked longer than scheduled.</li> <li>2. 40% of the 5,317 work shifts logged exceeded twelve hours.</li> <li>3. 14% reported working 16 or more consecutive hours at least once during the 4-week period.</li> <li>4. Almost 2/3 worked overtime ten or more times during the 4-week period.</li> <li>5. 1/3 reported working overtime each day during the 4-week period.</li> <li>6. 1/4 worked more than 50 hours per week for 2 or more weeks during the 4-week period.</li> <li>7. 199 errors and 213 near errors reported during the data-gathering period.</li> <li>8. The risks of making an error were significantly increased when: <ol style="list-style-type: none"> <li>a. Work shifts were longer than twelve hours</li> <li>b. Nurses worked overtime</li> <li>c. They worked more than 40 hours per week</li> </ol> </li> <li>9. Confirms that the work schedules of hospital staff nurses are unpredictably prolonged.</li> </ol>	<p>Work duration, overtime, and number of hours worked per week had significant effects on errors.</p> <p>Both error and near errors are more likely to occur when hospital staff nurses work 12 or more hours.</p> <p>Limitations:</p> <ol style="list-style-type: none"> <li>1. Convenience Sample (ANA members).</li> <li>2. Self reporting</li> <li>3. Not representative</li> <li>4. Low response rate</li> <li>5. Full-time employees only</li> </ol>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Ruggiero, J.S. (2003). Correlates of fatigue in critical care nurses. <i>Research in Nursing &amp; Health, 26</i>, 434-442.</p>	<p>Descriptive</p> <p>Purpose was to examine shift-related differences in chronic fatigue and the contributions of sleep quality, anxiety, and depression to chronic fatigue among a group of female critical care nurses</p>	<p>Random nationwide sample</p> <p>142 critical care nurses</p> <p>Member of the AACN</p> <p>Full-time workers providing direct patient care in a critical care work setting</p>	<ol style="list-style-type: none"> <li>1. Chronic shift-worker fatigue (SSICFS-Standard Shiftwork Index Chronic Fatigue Scale)</li> <li>2. Global sleep quality (PSQI-Pittsburgh sleep quality index)</li> <li>3. Depression (BDI-II-Beck depression inventory-II)</li> <li>4. Anxiety (BAI-Beck anxiety inventory)</li> <li>5. Demographic data</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <ul style="list-style-type: none"> <li>• 23% of sample met criteria for clinical depression.</li> <li>• Day and night shift nurses did not differ in their reports of chronic fatigue.</li> <li>• Night nurses reported more depression and poorer sleep quality when compared to day shift nurses.</li> </ul> <p>The majority of the nurses worked night shifts and 83% worked 12-13 hour shifts. Minimal differences were found between 8 and 12-hr shift workers in fatigue, sleep, and psychological disturbances.</p>	<p>The findings of this study indicate that sleep disturbances and depression are common in critical care nurses, and regardless of shift assignment, these factors are related to chronic fatigue. These findings suggest the need for studies of strategies to promote sleep and improve mood in critical care nurses.</p> <p>Limitations:</p> <ol style="list-style-type: none"> <li>6. Convenience sample</li> <li>7. Nurses pulled from AACN membership</li> <li>8. Full-time employees only</li> <li>9. Females only</li> <li>10. Majority were night shift workers</li> </ol>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Scott, L.D., Rogers, A.E., Hwang, W., &amp; Zhang, Y. (2006). Effects of critical care nurses' work hours on vigilance and patients' safety. <i>American Journal of Critical Care Nurses</i>, 15(1), 30-37.</p>	<p>Descriptive, exploratory study</p>	<p>Random Sample</p> <p>All members of the American Association of Critical-Care Nurses</p> <p>Sent out to 5261 nurses</p> <p>1148 nurses responded that were eligible</p> <p>502 provided data for study-43.7% response rate</p>	<ol style="list-style-type: none"> <li>1. Hours worked</li> <li>2. Time of day worked</li> <li>3. Overtime hours</li> <li>4. Days off</li> <li>5. Sleep-wake pattern</li> </ol> <p>What was measured:</p> <ol style="list-style-type: none"> <li>1. The occurrence or no occurrence of an error during the work shift</li> <li>2. The occurrence or no occurrence of an error that was intercepted (a near error) during the work shift</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. 502 respondents consistently worked longer than scheduled and for extended periods.</li> <li>2. Longer work duration increased the risks of errors and near errors and decreased nurses' vigilance</li> </ol> <p>Although 44% of the work shifts were scheduled for 12 hours or more, 67% actually exceeded 12 consecutive hours.</p> <p>For 86% of the shifts, the nurses worked longer than scheduled. On average worked almost an hour beyond scheduled shift.</p> <p>Almost 2/3 of the nurses reported struggling to stay awake at work at least once during the study period, and 20% reported falling asleep at least once during their work shift.</p> <p>Nurses who worked more than 12.5 consecutive hours were more likely to struggle to stay awake at work</p> <p>The risk of falling asleep at work almost doubled when shifts exceeded 8 hours and increased more when shifts exceeded 12 or more hours.</p> <p>More than 1/4 reported making at least 1 error and more than 1/3 reported at least 1 near error.</p> <p>Majority of errors (56.5%) and near errors (28.2%) involved medication administration.</p>	<p>The findings of this study support the Institute of Medicine recommendations to minimize the use of 12-hour shifts and to limit nurses' work hours to no more than 12 consecutive hours during a 24-hour period.</p> <p>Recommend minimizing the use of 12-hour shifts or at least limiting nurses' work hours to no more than 12 consecutive hours during a 24-hour period.</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Smith-Coggins, R., Howard, S.K., Mac, D.T., Wang, C., Kwan, S., Rosekind, M.R., Sowb, Y., Balise, R., Levis, J., &amp; Gaba, D.M. (2006). Improving alertness and performance in emergency department physicians and nurses: The use of planned naps. <i>Annals of Emergency Medicine</i>, 48(5), 596-604.</p>	<p>Randomized Controlled Intervention Trial</p>	<p>49 physicians and nurses</p> <p>3 consecutive night shifts (12 hours)</p> <p>Academic emergency department</p> <p>Control Group=no nap</p> <p>Intervention group=40-minute nap opportunity at 3:00AM</p> <p>ED had 38,802 patient visits during the recruitment period. 38.2% of visits occurring between 7:30PM and 7:30AM</p>	<ol style="list-style-type: none"> <li>1. Psychomotor vigilance task (visual reaction time)</li> <li>2. Probe recall memory task</li> <li>3. CathSim intravenous insertion virtual reality simulation</li> <li>4. Profile mood status</li> <li>5. Karolinska sleepiness scale</li> </ol> <p>Administered before, during and after night shifts</p> <ol style="list-style-type: none"> <li>6. A 40-minute driving simulation was administered at 8:00AM and videotaped for behavioral signs of : <ul style="list-style-type: none"> <li>• Sleepiness</li> <li>• Driving accuracy</li> </ul> </li> </ol> <p>Polysomnographic data measured during the nap period</p> <p>Sleep/wake diary</p> <p>Subjects wore a risk activity monitor</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. 90% of nap subjects were able to sleep for an average of 24.8 minutes</li> <li>2. At 7:30 AM, the nap group: <ul style="list-style-type: none"> <li>• Had fewer performance lapses</li> <li>• Reported more vigor</li> <li>• Less fatigue</li> <li>• Less sleepiness</li> </ul> </li> <li>3. Nap group tended to: <ul style="list-style-type: none"> <li>• More quickly complete the intravenous insertion</li> <li>• Exhibit less dangerous driving</li> <li>• Display fewer behavioral signs of sleepiness during the driving simulation</li> </ul> </li> <li>4. Immediately after the nap the nap group scored more poorly on Probed Memory Recall</li> </ol> <p>A 3:00AM nap improved:</p> <ol style="list-style-type: none"> <li>1. Performance</li> <li>2. Subjective report</li> </ol> <p>When compared to a no-nap condition.</p> <p>However, immediately after the nap, memory temporarily worsened.</p> <p>The nap group did not perform better than the no-nap group during a simulated drive home after the night shift.</p> <p>No subject spent any time in REM sleep.</p>	<p>Integrating a nap into a night work schedule can produce some performance improvements. Recommends a wake-up period after the nap to address sleep inertia.</p> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• Driving simulator lacked noises from real environment</li> <li>• Drivers knew there was no real danger in the simulator</li> <li>• Banned caffeine, usual caffeine habits not evaluated</li> <li>• Self-Report</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Trinkoff, A., Geiger-Brown, J., Brady, B., Lipscomb, J., &amp; Muntaner, C. (2006). How long and how much are nurses now working? <i>AJN</i>, 106(4), 60-72.</p>	<p>Quantitative survey obtained as part of a longitudinal study funded by the National Institute of Occupational and Safety and Health.</p>	<p>2,273 RNs  Two States</p>	<p>Demographics Primary job Data on:</p> <ol style="list-style-type: none"> <li>1. Off-shifts</li> <li>2. Overtimes</li> <li>3. Breaks</li> <li>4. On-call requirements</li> <li>5. Time off between shifts</li> <li>6. How often worked more than 13 hours per day and on scheduled days off and vacation days</li> <li>7. Outside work activities</li> <li>8. Commuting time</li> <li>9. Non-nursing activities</li> <li>10. Hours worked <ul style="list-style-type: none"> <li>• Day</li> <li>• Week</li> <li>• Days per week</li> <li>• Weekends/Month</li> </ul> </li> </ol> <p>Mandatory OT/On-Call</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. More than 1/4 reported working 12 or more hours per day</li> <li>2. 1/3 of the sample worked more than 40 hours per week</li> <li>3. More than 1/3 worked six or more days in a row at least once in the preceding six months</li> <li>4. Nearly 1/4 rotated shifts</li> <li>5. Almost 1/4 with more than on job worked 50 or more hours per week, and they were more likely to work many days consecutively, without sufficient rest between shifts, and during scheduled time off.</li> <li>6. Single parents were as likely to work 13-15 hours per day, 50-60 hours per week and many days consecutively.</li> <li>7. 17% of all nurses work mandatory overtime</li> <li>8. Nearly 40% of the total sample and more than 40% of hospital staff nurses had jobs with on-call requirements</li> </ol>	<p>The proportion of nurses who reported working schedules that exceed the recommendations of the Institute of Medicine should raise industry-wide concerns about fatigue and health risks to nurses as well as the safety of patients in their care.</p> <p>Recommend encouragement of adequate staffing by promoting optimal working conditions that appeal to employees and create loyalty and stability in the workforce.</p>

**Evidence Table II: Summary of the Literature--Review Articles  
Nurse Scheduling and Fatigue**

Complete Citation	Review	Outcomes
<p>Caruso, C.C., Hitchcock, E.M., Dick, R.G., Russo, J.M., Schmit, J.M. (2004). <i>Overtime and Extended Work Shifts: Recent Findings on Illnesses, Injuries, and Health Behaviors</i>. National Institute for Occupational Safety and Health. Pub. No. 2004-143</p>	<p><u>Design</u> Integrated review of literature; 52 articles</p> <p><u>Sample</u> Inclusion criteria : extended work shifts, published 1995-2002, peer review publication, published in English. 19 of 52 studies involved health care workers 21 of 52 studies done in US</p> <p><u>Definitions</u> Overtime &gt;40 hours/week Extended Work Shifts &gt;8 hours</p> <p><u>Measures</u></p> <ol style="list-style-type: none"> <li>1. Illness</li> <li>2. Injury</li> <li>3. Health Behaviors (physical activity, smoking, alcohol use, body weight)</li> <li>4. Performance (car crashes, test of cognitive functioning, executive functioning, subjective alertness, cardiovascular fatigue, muscle fatigue)</li> </ol>	<p>General Health: Overtime associated with</p> <ul style="list-style-type: none"> <li>• Poorer perceived general health</li> <li>• Increased injury</li> <li>• More illness</li> <li>• Increased mortality</li> <li>• Preterm birth (suggested 1 study)</li> <li>• Weight gain (2 studies)</li> <li>• Increased alcohol (2 of 3 studies)</li> <li>• Increased smoking (1 of 2 studies)</li> <li>• Poorer neuropsychologic test performance (1 study)</li> </ul> <p>&gt;12 hrs combined with &gt;40 work/wk</p> <ul style="list-style-type: none"> <li>• Decreasing psychophysiological performance on tests</li> <li>• In the 9<sup>th</sup> to 12<sup>th</sup> work hours associated feelings of decreased alertness and increased fatigue, lower cognitive function, decline vigilance, increased injury (4 studies)</li> <li>• increased health complaints (6 studies), slower work pace</li> </ul> <p>8 hrs compared with 12 hours</p> <ul style="list-style-type: none"> <li>• 12 hrs associated with physical fatigue, smoking, or alcohol use (2 studies)</li> </ul> <p>12 hrs and 6:00AM start time</p> <ul style="list-style-type: none"> <li>• Health complaints</li> <li>• Alertness (2 studies)</li> </ul> <p>Research limitations/potential interactions</p> <ul style="list-style-type: none"> <li>• Many studies did not include health care workers and approximately half were done outside the United States in countries with different labor laws.</li> <li>• Inconsistencies in types of work schedules examined across studies: time of day, fixed vs. rotating schedules, speed of rotation, direction of rotation, number of hours per week, number of consecutive days, number of rest days, number of weekends off</li> <li>• Incomplete description of work shifts evaluated in some studies</li> <li>• Inadequate study of shift work, overtime</li> <li>• Not explored; consistency of work pattern, personal preferences, individual control</li> <li>• Little information on women, older workers, or persons with chronic disease</li> <li>• Break, availability of co-workers and support persons not studied</li> </ul>

Complete Citation	Review	Outcomes
<p>Hughes, R. (2004). The Perils of Shift Work: Evening shift, night shift, and rotating shifts: are they for you? <i>AJN</i>, 104(9), 60-63.</p>	<p><u>Focus of review:</u> Reviews the large body of evidence on the effects of shift work on health and work performance.</p> <p>Provides specific recommendations for nurses.</p>	<p>IOM: Recommends state regulatory bodies prohibit nurses from working more than 12 hours in a 24-hour period and more than 60 hours per 7 day period.</p> <p>12-hour shift workers experience fatigue and diminished alertness at the end of the shift. 12-hour shifts reduce the number of nursing hand-offs from one shift to another, during which mistakes are known to occur.</p> <p>For night shift, procedural and medication errors are more likely to occur between 4AM and 8:00AM.</p> <p>Rotating shift workers have an increased risk of sleep problems and an adverse effect on performance and alertness. One study found that the odds of making an error or having a near miss doubled among rotating shift workers.</p> <p>Evidence demonstrates that shifts with a forward rotation (morning to night) can improve conditions for nurses and patients.</p> <p>Recommendations for Nursing:</p> <ol style="list-style-type: none"> <li>1. Exercise</li> <li>2. Eat well</li> <li>3. Get sufficient rest between shifts <ul style="list-style-type: none"> <li>• Take 10 hours off after working 8 hours</li> <li>• Take 12 hours off after working 12 hours</li> <li>• Take 24 hours off when transferring to or from night shift</li> <li>• Take at least 3 days of rest after working four consecutive 12-hour shifts</li> </ul> </li> </ol> <p>Fight fatigue:</p> <ul style="list-style-type: none"> <li>• Avoid caffeine except early in the shift to avoid it interfering with sleep later</li> <li>• Exercise during breaks by walking or taking the stairs</li> <li>• Take short breaks throughout a shift</li> <li>• Take naps during breaks</li> </ul> <p>Work the shift tolerated best:</p> <ul style="list-style-type: none"> <li>• Find the shift that fits your circadian rhythm</li> </ul> <p>Establish support networks:</p> <ul style="list-style-type: none"> <li>• Exchange solutions with colleagues on ways to cope with the problems of shift work</li> <li>• Discuss the effects of your schedule with family and friends</li> <li>• Help co-workers by watching for signs of drowsiness</li> </ul> <p>Control your environment and your activities:</p> <ul style="list-style-type: none"> <li>• Help the body adjust to night hours by working in bright light with nondistracting noise, such as music</li> <li>• Don't leave the most tedious tasks to the end of the shift when most drowsy</li> </ul>

Complete Citation	Review	Outcomes
<p>IOM, Committee on the Work Environment for Nurses and Patient Safety Board on Health Care Services (2004). <i>Keeping Patients Safe: Transforming the Work Environment of Nurses</i>. Washington, DC: National Academic Press.</p>	<p><u>Focus of review:</u></p> <ul style="list-style-type: none"> <li>• Shift work</li> <li>• Extended work hours</li> <li>• Work performance</li> <li>• Nurse work hours and errors</li> <li>• Description of current work hours of nurses</li> <li>• Fatigue</li> </ul> <p><u>Definition</u> Extended Work Hours &gt;12 with limited opportunity for rest and no opportunity for sleep.</p> <p><u>Limitations</u></p> <ul style="list-style-type: none"> <li>• Regulation on hour of service industries are not always based on evidence.</li> <li>• Studies limited by poor design or outcomes that do not well represent fatigue.</li> <li>• Difference between scheduled and actual worked time</li> </ul> <p>Confounding Factors: A number of factors confound the relationship between work schedule and fatigue including</p> <ul style="list-style-type: none"> <li>• Stressful working conditions</li> <li>• Number of acutely ill patients</li> <li>• Inadequate staffing</li> <li>• Working without breaks</li> <li>• Use of agency nurses</li> <li>• Vacancy rates</li> </ul> <p>Aside from the regulations from service industries (i.e. truckers, aviation) and a descriptive study (Rogers et al., 2004) there is weak evidence supporting limiting nurses to a 60-hour work week.</p>	<p>Recommendations of Committee on the Work Environment for Nurses and Patient Safety, Board on Health Care Services</p> <ul style="list-style-type: none"> <li>• “To reduce error-producing fatigue, state regulatory bodies should prohibit nursing staff from providing patient care in any combination of scheduled shifts, mandatory overtime, or voluntary overtime in excess of 12 hours in any given 24-hour period and in excess of 60 hours per 7-day period. (This recommendation applies to direct patient care...intended to limit amount of time fatigues nurses will have responsibility for direct patient care. ... including clinical supervision) p. 237”</li> <li>• “...responsibility of nurses who work in more than one facility to ensure that their total patient care hours worked do not exceed the patient safety thresholds identified (p. 238)”.</li> </ul> <p>Fatigue Fatigue results from continuous physical or mental activity, inadequate rest, sleep loss, or non-standard work schedule. Fatigue results in slowed reaction time, diminished attention to detail, errors of omission, compromised problems solving, reduced motivation, decreased vigor, and decreased productivity. In nurses’ work environment, fatigue is produced by shift work and extended work environment (p.228).</p> <p><u>Research findings</u> Night Shift</p> <ul style="list-style-type: none"> <li>• Night shift workers have difficulty staying awake (even those who work permanent shift or work 8 hours).</li> <li>• Adequate rest diminishes this effect but clear evidence suggests night workers do not obtain adequate sleep.</li> <li>• Problem increased by shift rotation and speed of shift rotation.</li> </ul> <p>Extended Work Hours (&gt;12 hours)</p> <ul style="list-style-type: none"> <li>• Accident rates increase after 9 consecutive hours, double after 12 hours, triple after 16 hours.</li> <li>• Fatigue greater without day(s) off or short time between shifts</li> <li>• Recovery takes &gt;1 day off with longer periods more beneficial</li> </ul> <p>Safety</p> <ul style="list-style-type: none"> <li>• AHRQ report (Jha, et al, 2001) “Researchers were unable to locate research that could help identify specific numbers of hours worked by health care personnel, including nurses, beyond which patient safety is threatened (p.232).</li> </ul> <p>Overtime</p> <ul style="list-style-type: none"> <li>• No effect on error rate unless shift exceeds 12 hours.</li> </ul> <p>Conclusion</p> <ul style="list-style-type: none"> <li>• Nurses should not work longer than 12 hours without 12 to 16 hours off between shifts. (Appendix C prepared by Ann E. Rogers)</li> </ul>

Complete Citation	Review	Outcomes
<p>Montgomery, V. (2007). Effect of fatigue, workload, and environment on patient safety in the pediatric intensive care unit. <i>Pediatric Critical Care Medicine</i>, 8 (2 Supplement), S11-S16.</p>	<p><u>Focus of review:</u></p> <ul style="list-style-type: none"> <li>Physicians work schedule and performance</li> </ul>	<ul style="list-style-type: none"> <li>Impact of limiting residents' work hours -- No significance difference observed in outcomes measured before and after limitation of resident schedule to 80 hrs/wk.</li> <li>When nurses worked &gt; 12.5 hours, number of errors (including medical errors) increased.</li> <li>Nurses working &gt; 12.5 hours nearly double errors and had more episodes of drowsiness.</li> <li>Work load confounds work hours. Increasing evidence that smaller nurse patient ratios, higher educational levels of nurses, higher proportion of RN care per patient improve patient safety and patient outcomes. Hours worked needs to be studied in combination with workload.</li> </ul>
<p>Muecke, S. (2005). Effects of rotating night shifts: Literature review. <i>Journal of Advanced Nursing</i>, 50(4), 433-439.</p>	<p><u>Focus of review:</u> Examination of literature for a 10-year period using the keywords of shiftwork, rosters, intensive care, fatigue, sleep deprivation and sleep studies</p>	<p>There is a consensus among researchers on the adverse psychological and physiological effects of night rotations on nurses when compared with permanent night shift peers. This is especially true if the nurse is over 40 years of age.</p> <p>Evidence also suggests that the effects of fatigue on nurse performance may negatively affect the quality of patient care.</p> <p>The literature reinforces previous concerns about the adverse relationship between fatigue and performance in the work place.</p> <p>Optimal standards for patient care may be difficult to achieve for more mature nurses, who may suffer from sleep deprivation and health problems associated with rotating night shifts.</p>

**Evidence Table III: Summary of the Literature-Nurse Scheduling**

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Aiken, L.H., Clarke, S.P., &amp; Sloane, D.M. (2002). Hospital staffing, organization, and quality of care: Cross-national findings. <i>International Journal for Quality in Health Care</i>, 14(1), 5-13.</p>	<p>Multi-site cross-sectional survey</p>	<p>10, 319 nurses Med-Surg units 303 hospitals 5 jurisdictions in 4 Nations</p>	<p>Independent Variables 1. Nursing Staffing 2. Organizational Support</p> <p>What was measured: 1. Nurse job dissatisfaction 2. Burnout 3. Nurse-rated quality of care in hospital</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Dissatisfaction, burnout and concerns about quality of care were common</li> <li>2. Organizational/managerial support for nursing had a pronounced effect on nurse dissatisfaction and burnout</li> <li>3. Organizational support for nursing and nurse staffing were directly, and independently, related to nurse-assessed quality of care</li> <li>4. Multivariate results imply that nursing reports of low quality of care were three times as likely in hospitals with low staffing and support for nurses as in hospitals with high staffing and support</li> </ol>	<p>Adequate nurse staffing and organizational/managerial support for nursing are key to improving the quality of patient care, to diminish nurse job dissatisfaction and burnout and, ultimately, to improving nurse retention.</p> <p>Practice environments that do not support the work of nurses have the potential to undermine any benefits that result from optimal staffing.</p> <p>Limitation: 1. Self-report</p>
<p>Aiken, L.H., Clarke, S. P., Sloane, D.M., Sochalski, J., &amp; Silber, J.H. (2002). Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. <i>JAMA</i>, 288(16), 1987-1993.</p>	<p>Cross-sectional analysis of linked data</p> <p>Multi-site</p> <p>Nurses completed a survey</p> <p>Patient outcomes were retrieved from discharge abstracts</p>	<p>10,184 staff nurses</p> <p>232,342 patients from general, orthopedic and vascular units</p> <p>168 non-federal adult hospitals</p>	<p>What was measured: 1. Risk-adjusted patient mortality 2. Failure to rescue within 30 days of admission 3. Nurse-reported job dissatisfaction and job-related burnout</p>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. Each additional patient per nurse was associated with a: <ul style="list-style-type: none"> <li>• 7% increase in the likelihood of dying within 30 days of admission</li> <li>• 7% increase in the odds of failure to rescue</li> <li>• 23% increase in the odds of burnout</li> <li>• 15% increase in the odds of job dissatisfaction</li> </ul> </li> </ol>	<p>In hospitals with high patient-to-nurse ratios, surgical patients experience higher risk-adjusted 30-day mortality and failure to rescue rates, and nurses are more likely to experience burnout and job dissatisfaction.</p> <p>Limitations:</p> <ul style="list-style-type: none"> <li>• Limited analysis to general and orthopedic surgery, eliminating vascular patients due to higher mortality rates.</li> </ul>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Clarke, S.P., Rockett, J. L., Sloane, D.M., &amp; Aiken, L.H. (2002). Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. <i>American Journal of Infection Control</i>, 30(4), 207-216.</p>	<p>Survey, mail  Cross-sectional study  Assessed the relationship between nurses and hospital characteristics, protective equipment, and likelihood of a needlestick injury/incident</p>	<p>2,287 medical-surgical nurses  22 U.S. Hospitals</p>	<p>What was measured: 1. Staffing and organizational climate 2. Patient and nurse outcomes, including needlestick injuries</p>	<p><b>Outcome(s)/Results:</b> 1. Poor organizational climate and high workloads were associated with 50% to 2-fold increases in the likelihood of a needlestick and near-misses to hospital nurses 2. Capless-valve secondary intravenous set systems and use of any type of protective equipment for IV starts or blood draws were associated with 20-30% lowered risks of both event types</p>	<p>Nurse staffing and organizational climate are key determinants of needlestick risk and must be considered with the adoption of safety equipment to effectively reduce sharps injuries  Limitations: 1. Hospitals picked related reputation/status (Magnet).</p>
<p>Halm, M., Peterson, M., Kandels, M., Sabo, J., Blalock, M., Braden, R., Gryczman, A., Krisko-Hagel, K., Larson, D., Lemay, D., Strom, L., &amp; Topham, D. (2005). Hospital nurse staffing and patient mortality, emotional exhaustion, and job dissatisfaction. <i>Clinical Nurse Specialist</i>, 19(5), 241-251.</p>	<p>Cross-sectional analysis of patients and nurses  Research Questions: 1. What is the relationship between nurse-to-patient ratio and the patient outcomes of 30-day mortality rate and failure-to-rescue. 2. What is the relationship between clinical specialty and nurse outcomes of job satisfaction and job-related emotional exhaustion</p>	<p>2,709 general, orthopedic, and vascular surgery patients  140 staff nurses at a large Midwestern institution</p>	<p>What was measured: 1. Mortality 2. Failure-to-rescue 3. Emotional exhaustion 4. Job dissatisfaction  Staffing Level</p>	<p><b>Outcome(s)/Results:</b> 1. Staffing was not a significant predictor of mortality or failure to rescue 2. Clinical specialty did not predict emotional exhaustion or job dissatisfaction  Age of nurse and length of service were factors that increased job dissatisfaction.  Not: this was a unionized hospital with fixed nurse/patient ratios that were enforced.</p>	<p>These findings reinforce adequate staffing ratios at the studied institution.  Recommend development of nurse retention programs. Urge the use of focus groups conducted with staff RNs to determine what is most important to them in terms of job satisfaction.</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Laschinger, H.K.S., &amp; Leiter, M.P. (2006). The impact of nursing work environments on patient safety outcomes. <i>JONA</i>, 36(5), 259-267.</p>	<p>Cross-sectional  Anonymous Questionnaire</p>	<p>Hospital-based nurses in Canada  Subset of a larger study  N=8,597</p>	<p>Measures of:  <ol style="list-style-type: none"> <li>1. Work life</li> <li>2. Burnout (Maslach Burnout Inventory Human Service Scale)</li> <li>3. Report of frequency of adverse patient events</li> </ol> <p>Utilizes the Nursing Worklife Model as a theoretical framework</p> <p>The 5 work-life factors are:  <ol style="list-style-type: none"> <li>1. Effective nursing leadership</li> <li>2. Staff participation in organizational affairs</li> <li>3. Adequate staffing for quality care</li> <li>4. Support for a nursing model of patient care</li> <li>5. Effective nurse/physician relationships</li> </ol> </p> </p>	<p><b>Outcome(s)/Results:</b>  <ol style="list-style-type: none"> <li>1. Nursing leadership played a key role in the quality of worklife regarding policy involvement, staffing levels, support for a nursing model of care (vs medical), and nurse/physician relationships.</li> <li>2. Staffing adequacy directly affected emotional exhaustion, and use of a nursing model of care had a direct impact on nurses' personal accomplishment.</li> </ol> <p>Both directly affected patient safety outcomes.</p> </p>	<p>The results suggest that patient safety outcomes are related to the quality of the nursing practice work environment and nursing leadership's role in changing the work environment to decrease nurse burnout.</p> <p>The link between adequate staffing and adverse events corroborates previous findings that linked nurse/patient staffing ratios to inpatient mortality.</p> <p>When the hospital supported a nursing model of care, nurses felt a greater sense of personal accomplishment in their work, which in turn translated into more positive nurse-sensitive patient outcomes.</p> <p>The results of this study suggest that the characteristics of professional nursing work environments play an important role in the quality of nurses' worklife and patient safety outcomes.</p>

Complete Citation	Research Design	Population/Sample Size	Variables	Primary Outcome(s)	Conclusions/Comment
<p>Seago, J.A., Williamson, A., &amp; Atwood, C. (2006). Longitudinal analyses of nurse staffing and patient outcomes: More about failure to rescue. <i>JONA</i>, 36(1), 13-20.</p>	<p>Secondary analyses of data viewed retrospectively.</p> <p>Longitudinal repeated-measures design to estimate the relationships between nurse staffing and the outcomes studied.</p>	<p>3 adult medical-surgical nursing units in a university teaching hospital across 4 years.</p> <p>Data collected from incident reports.</p>	<p>Objectives of this study were to :</p> <ol style="list-style-type: none"> <li>1. Compare the relationships between nurse staffing and positive patient outcomes</li> <li>2. Explore the use of 2 new failure-to-rescue rates as outcomes, specifically failure-to-rescue from medication errors and from decubitus ulcers</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <ol style="list-style-type: none"> <li>1. All patient satisfaction measures increased as total hours of care per patient day increased</li> <li>2. As the skill mix became richer (more RN hours/total hours) there was a higher satisfaction with pain management and physical care requests.</li> <li>3. An increase in failure-to-rescue from medication error as the non-RN hours of care per patient day increased</li> <li>4. An increase in failure-to-rescue from decubitus ulcers as patient severity increased</li> </ol>	<p>It is necessary to vary staffing hours and mix depending on which positive patient outcome or outcomes a facility wishes to achieve.</p>
<p>Vahey, D.C., Aiken, L.H., Sloane, D.M., Clarke, S.P., &amp; Vargas, D. (2004). Nurse burnout and patient satisfaction. <i>Medical Care</i>, 42(2), II-57-II66.</p>	<p>Cross-sectional survey</p>	<p>820 nurses</p> <p>621 patients</p> <p>40 units in 20 urban hospitals</p> <p>AIDS patients (from 1991...terminal illness at that time and fear from nurses)</p> <p>Data used was collected in 1991.</p>	<p>Nurse surveys measured:</p> <ol style="list-style-type: none"> <li>1. Measures of practice from the revised Nursing Work Index</li> <li>2. Nurse outcomes measured by the Maslach Burnout Inventory</li> <li>3. Intentions to leave</li> </ol> <p>Patients were interviewed:</p> <ol style="list-style-type: none"> <li>1. About satisfactions with nursing care using the La Monica-Oberst Patient Satisfaction Scale</li> </ol>	<p><b>Outcome(s)/Results:</b></p> <p>Patients cared for on units that nurses characterized as having adequate staff, good administrative support for nursing care, and good relations between doctors and nurses were more than twice as likely as other patients to report high satisfaction with their care, and their nurses reported significantly lower burnout.</p> <p>The overall level of nurse burnout on hospital units also affected patient satisfaction</p>	<p>Improvements in nurses' work environments in hospitals have the potential to simultaneously reduce nurses' high levels of job burnout and risk of turnover and increase patients' satisfaction with their care.</p>

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