Chapter 8

Case Study: Registered Nurses and Resident Physicians

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Case Study: Registered Nurses and Resident Physicians

Health care is a 24-hour-a-day business. People get sick and need care around the clock, and hospitals must be staffed with health care professionals ready to meet those needs. This means that some health care employees, such as nurses and residents,[1] must work at night, on weekends, and on holidays. Extended duty hours and circadian rhythm disruption play a major role in the training of residents. Historically, that training has been marked by long, intensive hours over several years. Some residents have worked more than 130 hours per week in shifts of 12 to 60 hours, with every other night on call (58). The resulting sleep deprivation is a major source of stress in residency (23). Likewise, many nurses must work nondaytime shifts and endure the resulting circadian rhythm disruption for the duration of their professional lives.

Although the issues discussed in this case study affect some portion of virtually every group working in hospitals (e.g., laboratory and x-ray technicians, pharmacists, transport teams, chaplains, social workers, runners, admitting clerks, housekeepers), the focus here will be limited to nurses and residents. This case study examines the effects of shift work on the health and well-being of nurses and the quality of care they deliver and how the structure of resident training programs may result in sleep deprivation that can affect the health and well-being of residents and their patients.

SHIFT WORK IN NURSING

Jane Doe . . . worked as a registered nurse (R.N.) at a hospital on the West Coast. She had been working all night and was in the 12th hour of a 12-hour shift. She was under time pressure to complete her work She was disconnecting a patient's I.V. and had to dispose of a used I.V. needle. In the process, she was accidentally stuck by the needle, which turned out to contain HIV-infected blood. Jane Doe seroconverted and is now HIV-positive. The fact that she was tired at the end of a 12-hour shift, that the hospital was understaffed, and that the hospital did not have proper containers accessible to dispose of sharp needles all combined to create a hazardous working condition, with tragic results (88).

A nurse at a Northeastern hospital was on restricted duty due to a heart condition but eventually was required to work 18 hours straight. She was on medication and increased the dosage to help cover the demands of her work situation. She became ill, and her case, along with 14 others, was submitted to labor arbitration (105). The case was settled just prior to the arbitration hearing (98).

A malpractice case was filed against a nurse in the Northeast because a patient died during the nurse's second continuous 8-hour shift (105).

Registered Nurses: An Overview

Anecdotes such as these are easy to find, but the contribution work hours may play in them is difficult to document. Several explanations for this seem plausible. First, statistics on the relationship between hours of work and adverse events for nurses are not tallied by the U.S. Department of Labor, and there is no statutory requirement that unions or employers collect such data. As illustrated by the case of Jane Doe, extended duty hours may be only one of several factors contributing to an incident, and a nurse may therefore not interpret an incident as related to shift work. Even if nurses do believe that shift work is causing problems, they may find it difficult to prevail when they file grievances over shift work issues unless these issues are covered in their collective bargaining agreements. Nonunion nurses often work at facilities without formal grievance procedures and, thus may have less opportunity to pursue shift work concerns through a structured complaint process (89).

A number of unions representing nurses, including the American Nurses Association, Service Employees International Union, American Federation of State, County and Municipal Employees, and the Federation of Nurses and Health Professionals (a division of the American Federation of Teachers), bargain over shift assignments, length of time between shifts, shift of choice, split shifts, and shift

[1]For the purposes of this chapter, a resident is any postgraduate medical trainee, including interns, in both medical and surgical specialties. Residents are also referred to as house officers or house staff.

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rotations for nurses. In the words of one union employee, however:

> . . . our success at limiting shift work through the collective bargaining process has been modest at best. We attribute this in part to the lack of any legal or regulatory framework on shift work and extended hours. It is very difficult to persuade employers to adopt measures that exceed existing legal requirements. In addition, in many of these industries, shift work and night work are unavoidable. In these cases, we attempt to give the employees more of a choice and more control over their hours of work (88).

Some nurses must work extended hours as a condition of their employment, while others welcome the opportunity to mass their hours. Both situations may present challenges to the well-being of nurses, their families, and their patients. This section reviews research on shift work in nursing and the consequences of shift work for family and social life, health, and work performance of nurses.

R.N.s are the largest health care profession.[2] According to a recent survey, there were 2,033,032 R.N.s licensed to practice in the United States in 1988, of whom 1,627,035 (80 percent) were employed in nursing positions (67). Nursing is predominantly a woman's profession; in 1988, only 3 percent of registered nurses were men. In addition, 71 percent of R.N.s were married, and 54 percent had at least one child living at home. One-half of all R.N.s in 1988 were under age 40, and 63 percent were under age 45. Thus the majority of nurses have families or are in their childbearing years, sociodemographic factors that bear on shift work.

Of those employed in nursing in 1988,68 percent were working full-time and 32 percent were working part-time. Hospitals traditionally have been the principal employer of R.N.s. In 1988, 68 percent of employed registered nurses worked in hospitals, and no other single type of employment setting accounted for more than 8 percent of employed nurses. Nursing homes and other long-term care facilities employed only 7 percent of R.N.s in 1988. Ninety percent of R.N.s employed in hospitals in 1988 worked in non-Federal, short-term care hospitals, 6 percent worked in Federal Government hospitals, and 4 percent worked in non-Federal, long-term care hospitals. Among R.N.s working in hospitals in March 1988, 2.7 percent (or 30,358 nurses) were working through a temporary employment service (67).

Prevalence

No national survey of R.N.s provides estimates of the prevalence of shift work or the number of years the typical R.N. spends in shift work during her or his career. However, since the organizations that employ the vast majority of nurses—hospitals, nursing homes, and other extended care facilities—require 24-hour operations, it is likely that a sizable proportion of R.N.s are engaged in shift work. Moreover, many nurses also work overtime, since they draw time-and-a-half pay for overtime (62). Data from one survey show that among 764 responding community hospitals, an average of71 percent of R.N.s were reported to work some nondaytime hours, and an average of 33 percent of R.N.s worked some combination of day, evening, and night shifts, including rotating all three shifts; furthermore, only 7 percent of R.N.s had every weekend off (l).

Another survey reported that 46 percent of R.N.s employed in nursing homes in 1985 worked nonstandard hours, and 9 percent worked rotating shifts (107). The smaller proportion of R.N.s on rotating shifts in nursing homes compared with hospitals could be attributed to the fact that nursing home R.N.s are more likely to be in supervisory positions than in staff positions.

Estimates for the total U.S. labor force suggest that shift work is more prevalent among nurses than women workers in general (see ch. 4). Data collected in 1985 on wage and salary workers age 16 and over revealed that 13 percent of full-time women workers and 43 percent of part-time women workers were involved in some type of shift work. Among full-time workers in health assessment and treatment occupations (the category that includes R.N.s), 31.3 percent were in some type of shift work. Rotating shifts were the most frequent kind of shift work in these occupations. (Ch. 4 gives a more thorough discussion of the extent of shift work in the labor force.)

[2] This report pertains to registered nurses. Nursing personnel in the U.S. health care industry include @s&d nurses, licensed practical-vocational nurses, and unlicensed ancillary personnel, including nursing aides. It is estimated that these three occupations included over 3 million persons employed in health care in 1984 (108).

Photo credit: Joint Commission on the Accreditation of Healthcare Organizations

Nurses tend to patients within view of the nursing station.

Patterns

Traditionally, hospitals and nursing homes have operated on three 8-hour shifts (day, evening, and night shifts), with nurses typically working five 8-hour shifts per week on either a freed or rotating basis, including weekend work.[3] Shifts typically overlap for one-half hour, in order that nurses leaving the unit can communicate with those arriving regarding patient status or anticipated admissions. The pattern of activity in hospitals varies by time of day, so the tasks and workloads of nurses can vary by shift. Night shifts are generally considered to be slower and to require a smaller complement of nurses, since most patients are asleep and fewer procedures take place at night. A possible exception might be the emergency room, where activity can be frenetic during the night shift. On the other hand, night nurses are expected to be able to manage emergencies when other services are not readily available.

Shift patterns (e.g., timing and length of shifts, patterns of rotation), the method of shift assignment (the degree to which nurses can control their assignments by bidding on preferred shifts or trading shifts), and compensation for shift work (e.g., higher hourly wages for undesirable shifts) are determined by the employing organization and vary widely. In some decentralized organizations, these policies are determined at the unit level. Some aspects of shift work, such as requirements regarding rotation, mandatory overtime, or pay differentials, become issues in collective bargaining by nurses, although only 20 percent of hospitals report having organized collective bargaining for R.N.s (predominantly through State nurses' associations) (l).

Typically, nursing coordinators or nursing managers have authority over shift assignments for staff nurses and resolve scheduling conflicts. Assignments to undesirable shifts (e.g., night or weekend work or rotating shifts as opposed to fixed shifts) are often an inverse function of seniority. Some nursing

[3] In nursing, the day shift typically refers to the 8-hour shift occurring during daytime hours (e.g., 7 a.m. to 3:30 p.m.), as contrasted with evening (e.g., 3 p.m. to 11:30 p.m.) and night shifts (e.g., 11 p.m. to 7:30 a.m.). In this chapter, nurses who work fixed day shifts are *not* regarded as shift workers.

administrators reward seniority with more desirable shifts as a retention strategy (61).

Six distinct hospital scheduling alternatives appear to exist, although some are used in very few hospitals. The models are:

- the traditional five 8-hour shifts per week, including rotation within a l-week cycle;
- the "Baylor Plan," consisting of two or three 12-hour shifts for separate weekend staff, with the regular staff working traditional 8-hour shifts;
- ''4 to 40,' consisting of four 10-hour shifts per week;
- "7-on, 7-off," consisting of seven 10-hour shifts on alternative weeks;
- " 12-hour shifts," consisting of three 12-hour shifts one week, four 12-hour shifts the next; and
- ''customized schedules," involving choice of various shift lengths (47).

Traditional 8-hour shifts continue to predominate in nursing. Community hospitals report that nearly 79 percent of R.N.s, on average, work 8-hour shifts, 17 percent work 12-hour shifts, and 4 percent work other types of shifts, including partial shifts of 4 to 6 hours (l). Although a number of experiments with hospital shift lengths and patterns have been reported, these appear to affect a relatively small proportion of R.N.s. For example, one hospital in North Carolina has reported a 12-hour shift system in which nurses work seven 12-hour days in succession, followed by 7 days off (40). Urban hospitals appear to be more innovative with regard to shift issues because they face greater competition for nursing staff (61). At Johns Hopkins Hospital, a professional practice model, in which the nurses agree to provide 24-hour coverage of their unit in exchange for self-management and annual salaries, has been in place on some nursing units since 1981. The model permits nurses to design their own shift systems and to make and monitor their own shift assignments (27).

Differentials in pay for shift work are used widely by U.S. hospitals. In a 1988 survey, over 97 percent of hospitals reported paying more to full-time and part-time R.N.s for evening and night shifts (l). However, only 41 percent of hospitals reported paying more for weekend shifts (l). In 1987, the average hourly differential paid for the evening shift by U.S. hospitals was $0.79, for the night shift $1.02 (5). Nonfinancial compensation for shift work (e.g., extra days off or child care) is rare. The effectiveness of pay differentials in attracting nurses to undesirable shifts is unknown. Box 8-A discusses shift work schedules for nurses in Great Britain.

Box 8-A—Impact of Shift Work on Nursing in Great Britain

A recent study for the British Department of Health entailed a survey of the shift schedules in effect in large (400+ beds) general hospitals in England and Wales. Over 50 percent of all such hospitals supplied details of their shift schedules. Only a small minority of hospitals (less than 20 percent) had a regular shift schedule, The majority of hospitals (65 percent) claimed to have a flexible system in which the individual nurses' requests were taken into account when drawing up the duty rosters. The remainder had an irregular system in which no account was taken of nurses' requests.

Despite these differences, timing and duration of shifts were remarkably consistent among hospitals. Approximately 80 percent of the early morning shifts started between 7:30 a.m. and 8 a.m. and lasted for 8 to 8.5 hours. The starting time, but not the duration, of the late afternoon shift was slightly more variable. Ninety percent started between 12:30 p.m. and 2 p.m. Similarly, most night shifts started between 8:30 p.m. and 9:30 p.m. and lasted between 10 and 12 hours. Perhaps more important, while new schedules involved more than two or three successive early or late shifts, spans of seven or eight successive night shifts were not uncommon, These data contrast with U.S. patterns, presumably reflecting national differences.

SOURCES: Office of Technology Assessment, 1991; based on S. Folkard, Department of psychology, University of Sheffield, Sheffield, United Kingdom, personal communication, January 1991.

Evidence of Dissatisfaction With Shift Work

A number of polls and research studies conducted during the last decade provided evidence that shift work, or the nurse's perceived lack of control over scheduling, was associated with job dissatisfaction and turnover. However, few prospective studies of job satisfaction have distinguished between the effects of shift work and other job, organizational, or personal attributes. Results of a **1981** Texas survey of 3,500 nurses suggested that work overload and shift work issues were intermingled and that, in general, nurses desired greater control over work assignments and scheduling (1 13). (The job condi-

tion eliciting the most dissatisfaction, however, was salaries.)

In one 1987 poll, 1,643 nurses were asked what caused them the greatest dissatisfaction with their jobs:

- 76 percent of nurses responding said increased work hours;
- 51 percent of nurses responding said increased shift rotation; and
- 43 percent of nurses responding said increased weekend work due to the current nursing shortage.

In addition, 65 percent of nurses responding said that a minimum of every other weekend off was most important in evaluating their present jobs, and 53 percent reported that a permanent shift assignment was most important. (Salary and benefits were ranked equal in importance with a permanent shift assignment) (30).

A l-year prospective study of nursing job satisfaction and turnover asked R.N.s in two large university-affiliated hospitals to report their satisfaction with scheduling of work hours. Overall, nurses were dissatisfied with their scheduling (114). In one hospital, working rotating shifts, as opposed to fried shifts, was found to lower nurses' perceptions of their control over the work environment. Lower perceived control, in turn, was the strongest predictor of job dissatisfaction. In the second hospital, shift work had no significant impact on perceived control (115).

A study of job satisfaction of R.N.s in five short-term acute care hospitals measured satisfaction at two points, 8 months apart. Assignment to the day shift was associated with higher job satisfaction (12). A study of 146 nursing units in 17 hospitals examined unit-level determinants of turnover rates. Greater shift rotation among R.N.s in a unit was seen as an indicator of less staff cohesiveness, which was predicted to produce higher rates of turnover. In fact, extent of shift rotation was found to be a marginally significant predictor of turnover rates (2).

Only one randomized trial of different shift patterns in nursing has been reported. In a 788-bed tertiary-care hospital (i.e., a hospital that provides highly intensive, sophisticated care for medical conditions that are difficult to manage in a community hospital), 12 randomly selected medical-surgical units staffed by both R.N.s and licensed practical nurses (L.P.N.s) were assigned at random to one of four schedules:

- fixed shifts;
- computer-assisted scheduling in which nurses' shift preferences were considered;
- select-a-plan, in which unit nurses designed their own scheduling system, typically combining 8- and 12-hour shifts; and
- a control group.

Descriptions of job attitudes were obtained from ***98*** percent of nurses before and after the shift assignments, but the length of the followup period is unspecified. The results did not indicate substantial variations by schedule in R.N.s' job attitudes or turnover at followup (20).

A number of commissions and task forces in recent years have recommended that health service organizations address the issue of shift work. A 1981 study of nursing and nursing education noted flexible scheduling as a strategy to increase nursing labor supply to hospitals and nursing homes (48). A 1983 report recommended that flexible scheduling be developed as a component of models for organizational change in nursing (68). A study of magnet hospitals found that flexible scheduling and elimination of rotating shifts were among the four most important factors promoting recruitment and retention of nursing staff (3).

A consensus appears to have developed regarding the need to provide shift work alternatives for nurses and to increase nurses' involvement in scheduling decisions. A 1988 report cited work scheduling as a major source of stress among hospital R.N.s (108). Most recently, the authors of a study of 421 hospitals and over 15,000 nurses in six urban areas recommended that hospitals offer varied and flexible schedules as a means of responding to the work preferences of nurses and resolving the current nursing shortage (91).

Consequences of Shift Work in Nursing

While there is a body of research that addresses the consequences of shift work on the health, well-being, and performance of workers in a variety of industries, these industries employ mostly men; relatively little research has been conducted specifically on women shift workers (24). As a result, it is difficult to generalize about nurses from existing studies. (The consequences of

Photo credit: Harvard Community Health Plan

Patient getting his blood pressure checked by a nurse.

shift work are discussed more fully in ch. 5.) In nursing, type of shift is often confounded by age, because younger, less experienced nurses tend to be assigned to rotating shifts. This discussion of consequences focuses on studies in which nurses have been subjects, but it will allude occasionally to studies of other women shift workers or to the absence of information about women shift workers.

Work Performance

Studies of the work performance of shift workers have generally focused on lost productive time as a consequence of health problems (e.g., absenteeism due to illness or use of health services) and on errors and injuries as a consequence of fatigue or disrupted circadian rhythms. A few studies of nurses have reported results for sick days, use of health services, self- or supervisor-reported performance levels, and various indicators of quality of patient care.

Sick Days and Use of Health Services—A 1977 study of the health consequences of shift work conducted by the Stanford Research Institute for the National Institute for Occupational Safety and Health (NIOSH) used employee records to study sick days and clinic visits by nurses on four shifts. (The number of sick days alone is not a reliable indicator of health problems, since sick days are limited by personnel policies.) Nurses on a rotating schedule tended to take more sick days than nurses on fixed shifts, and rotating nurses tended to have more serious reasons for taking sick days (e.g., acute respiratory infection, upper gastrointestinal tract distress). With regard to clinic visits, rotating nurses attended workplace clinics during work hours more frequently than fixed shift nurses and for a wider array of complaints (103), indicating that rotating nurses lose more time from work (due to both sick days and clinic visits) and could be less productive on the job.

Job Performance Ratings-A few studies of the effects of shift work on the job performance of individual nurses have used self-reports of performance or the reports of supervisors. The NIOSH study found that nurses on fixed afternoon-evening and rotating shifts reported lower levels of satisfaction with their work performance than did freed night and day shift nurses (103). Another study found that nurses on rotating shifts received lower job performance ratings by their supervisors, compared to nurses on freed shifts (49).

In a recent study of job performance and job-related stress among 482 R.N.s in five hospitals in the Southeastern United States, self-reported job performance was examined in relation to type of shift worked. On overall job performance, nurses on rotating shifts reported the lowest performance level, followed by freed afternoon nurses, freed night nurses, and freed day nurses. The investigators found that only one of a number of dimensions studied was significantly associated with shift: for performance with regard to professional development, rotating and freed afternoon nurses scored themselves lower than fixed day and freed night nurses. There were no significant differences by shift for leadership, teaching-collaboration, planning-evaluation, or interpersonal relations-communications. Rotating nurses also reported the highest levels of job-related stress. These relationships held when anticipated turnover, position level, and length of time on the present shift schedule were controlled (21).

Quality of Patient Care—Very little research has been conducted on the relationship between shift work and quality of patient care by nurses. The few studies that have addressed the effects of shift work on quality have been small-scale evaluations of shift work demonstration projects.

In nursing studies in general, quality of care is typically measured in terms of the nursing care process rather than patient outcomes. Process meas-

ures of quality usually take place at the unit level and involve chart audits, in which raters examine nursing care plans to determine whether specific procedures have been recorded. An alternative method is direct observation of nursing procedures, in which a rater assesses performance along a number of dimensions. Other indicators of quality include incident reports (medication errors, accidents, or injuries) and patient satisfaction. One should remember, however, that quality of care as defined by provider and quality of care as defined by patient may not be the same (15).

Research to date implies two mechanisms by which shift patterns might affect quality of nursing care. First, shift work patterns that are more compatible with circadian rhythms would be expected to result in less fatigue and increased alertness on the job. Second, shift work patterns that are more satisfying to nurses would be expected to result in greater nurse retention, unit cohesiveness, and continuity of care across shifts.

A 4-month trial of the 4 to 40 workweek (four 10-hour days per week) in a pediatrics unit employing both R.N.s and L.P.N.s was conducted in Seattle, Washington. The new scheduling system, compared to the traditional 8-hour, 5-day shift system, was expected to improve quality of care, defined in terms of intershift continuity of care. Process measures of nursing care quality revealed little change from the traditional system. Staff reports of quality, however, did show improvement (50).

In another program, a 12-hour shift system was introduced on an intensive care unit and evaluated over a 6-month period. The impact of the 12-hour shift, compared to the traditional 8-hour shift pattern, was measured with regard to nurses' job satisfaction, interpersonal relations in the work environment, nurses' health status, nurses' fatigue and alertness, and quality of patient care. No significant differences were found between types of shift for alertness (reaction times) or fatigue, although in the 12-hour shift system reaction time was faster for day shift than for night shift nurses. Using retrospective analysis, the investigators found no significant difference between the quality of nursing care at the time studied and that during a corresponding period of the previous year. Data from incident reports showed no change in the rate of incidents with the switch to 12-hour shifts (29).

In a pilot study of 12-hour shifts in a surgical intensive care unit, quality of patient care prior to implementation of 12-hour shifts was compared to quality of care 1 year later. Some increase in subjective feelings of fatigue and decreased accuracy on performance tests was reported, but evidence from chart audits revealed no significant changes, and nurses perceived that their performance improved (63).

One small study compared 10 R.N.s working 8-hour shifts with 10 R.N.s working 12-hour shifts in the intensive care units of two Midwestern hospitals. The Quality Patient Care Scale (QUALPACS) was administered by an observer to provide concurrent ratings of patient care provided by each nurse. Only one of five behavior categories rated by the QUALPACS demonstrated a statistically significant difference between 8- and 12-hour shift workers, although nurses on 12-hour shifts scored lower than nurses on 8-hour shifts on all of the dimensions. Since most of the 12-hour nurses volunteered comments about the fatigue they experienced, the investigators interpreted these results as indicating potential problems with quality of care on 12-hour shifts (69).

It is not known how extended workdays and compressed workweeks affect patients' satisfaction with nursing care. Conceivably, patients could react differently to various shift schedules, depending on the availability of their primary care nurse. One study reports anecdotal evidence of patient satisfaction with a 12-hour shift system in which nurses worked 7 consecutive 12-hour days followed by 7 days off (40). However, patients who do not see their primary nurse for days at a time may experience this as discontinuity in their care.

Health

As discussed in chapter 5, shift work can affect health. Disruption of circadian rhythms because of shift work could have differing effects on men and women due to hormonal differences between the sexes. Differences between men's and women's circadian rhythms and adjustment of these rhythms to shift work have been studied, but no definitive conclusions have been drawn (8). Congressional interest in research on women's health, as exemplified by the Women's Health Equity Act of 1991, supports the theory that the results of research on male subjects cannot be assumed to apply to women.

Table 8-1 lists recent studies of health outcomes of shift work in nursing. The key findings are discussed below. Research has demonstrated that nurses working night and rotating shifts suffer more sleep disturbances than other nurses and may be at higher risk for various other health problems (89).

Sleep Disturbances—Deficits in the quantity or quality of sleep are associated with physical or emotional disorders and with problems in alertness and performance that can produce injuries on the job. All but one of the studies summarized in table 8-1 measured quantity or quality of sleep as a function of nurses' shift work. Outcomes studied included amount of sleep, sleep stages and rapid eye movement (REM) sleep, interruptions of sleep, and subjective fatigue. A frequent focus has been the adaptation of sleep patterns to different amounts of night work. In general, nurses working rotating shifts and night shifts involving only a few nights on duty had more sleep disturbances than other nurses, although few studies compared nurses on a variety of shifts or controlled for such variables as age, shift work history, and family circumstances. None of the studies examined the effects of chronic sleep disruption on nurses' health or work performance.

Several of the studies made a distinction between part-time and full-time night nurses (e.g., those working only 2 nights a week or 2 nights in succession compared to those working more than 2 nights a week or in succession) in an effort to study short-term compared to long-term sleep adjustment to shift work. These studies found that full-time night nurses were better adjusted than part-time night nurses in terms of quantity and quality of sleep (34,64,65). Such adjustment was attributed in part to greater commitment to night work among full-time night nurses, as well as to greater compatibility of family situations with night work and day sleep among these nurses (e.g., no children at home).

The dual issues of a selection effect (i.e., nurses selecting shift work based on compatibility with lifestyle) and family roles as mediating variables in adjustment to night work were noted in most of the studies. For women night shift workers more than for men, family responsibilities (e.g., child care, carpooling, housework) during nonworking hours take precedence over the need to compensate for lost sleep (39). Duration of sleep was found to be greater among unmarried subjects than among married subjects with children (39). Nurses' lifestyles, not just their shift patterns, determine sleep patterns (39). Another study found that fatigue in nurses working nights (in a sample of nurses who worked various shifts at irregular intervals) appeared to be due to social factors (number of children, age, and being married or living with a partner) (45). Greater number of children also decreased the amount of sleep achieved by nurses after work on the night shift.

The NIOSH study mentioned earlier (103) found that nurses on fixed night shifts and on rotating shifts generally reported more problems with sleep, as compared with nurses on fixed day or fixed afternoon or evening shifts. These included subjective reports on the overall adequacy of sleep, trouble falling asleep, awakening during sleep and falling asleep after awakening, waking up feeling tired, and feeling tired during work. Although nurses on all four types of shifts reported desiring the same amount of sleep, nurses on fixed night shifts reported getting the least sleep. Further, rotating shift nurses, compared with those on fixed shifts, showed significantly higher incidence of fatigue and inadequate sleep patterns when the effects of age and marital status were controlled (103).

Digestive Disorders—The NIOSH study reported data on nutritional intake, appetite, and digestive problems among nurses by type of shift. Nurses on fixed afternoon or evening shifts reported better appetites than nurses on other shifts. Night shift nurses reported needing fewer meals in a 24-hour period than other nurses, and day shift nurses reported needing the most. Rotating shift nurses reported more snacking. Day nurses reported the most meals eaten with family or fiends.

Rotating and day nurses reported significantly more bloating or feeling full; rotating and afternoon nurses reported more gastritis; and rotating nurses had higher incidence of trouble digesting food. Rotating shift nurses showed a significantly higher incidence of digestive trouble than other nurses, when age and marital status were controlled (103).

In another study, nurses working three or more consecutive nights exhibited greater adjustment in their meal times during a period of 12 consecutive days than nurses working single nights or only 2 nights in succession. Nurses working more nights

Table 8-I-Studies of Health Consequences of Shift Work in Nursing

study	Sample	Shifts compared	Major findings
Bryden and Holdstock, 1973	12 nursing students in 1 hospital in South Africa (all female)	Day shift, night shift in same nurses	Daytime sleep was shorter than night sleep and had more interruptions. REM* sleep occurred sooner in day sleep than in night sleep.
Felton, 1976	39 nurses in Hawaii (all female)	Night shift, postnight duty in same nurses	Peak body temperature; excretion of sodium, potassium, and creatinine in the urine; and osmolality (concentrations of these substances in the urine) occurred later in the day in nurses on night duty. After returning to day shift, nurses' urinary sodium, creatinine, and osmolality cycles returned to baseline pattern, but temperature and potassium did not after 10 days of followup. Fewer hours of sleep and poorer quality of sleep reported while on night duty.
Folkhard et al., 1978	30 nurses in 1 hospital in England (all female)	Early and late day shifts, permanent nightshirt (full-time, 4 nights/week; part-time, 2 nights/week)	Circadian rhythms (oral temperature, subjective alertness and well-being) of full-time night nurses showed greater adjustment than those of part-time nurses, both on first night shift and in adjustment from first to second nights. Part-timers reported less sleep and less "calmness" on waking.
Gadbois, 1981	898 nurses and nursing auxiliaries in 61 hospitals in France (all female)	Fixed night work only (varied number of nights on duty)	Self-reported sleep duration was shorter, and sleep interruptions more frequent, for married women with children than for unmarried women. Mothers with young children went to bed later in the day.
Harma et al., 1988	128 nurses and nursing aides in 1 hospital in Finland (all female)	Irregular rotating shifts only (combinations of day, evening, night shifts in 3-week cycles)	Neuroticism and morningness were found to increase shift-cycle fatigue, and greater maximal oxygen consumption decreased it. Morningness, older age, and having children decreased sleep duration after night shift. Shift work experience and morningness decreased sleep quality after night work, and oxygen consumption increased it. Gastrointestinal symptoms were increased by neuroticism, marriage, and older age. Neurovegetative symptoms were increased by marriage and neuroticism. Musculoskeletal symptoms were increased,by marriage, neuroticism, and physical activity and were decreased by oxygen consumption and muscle strength.
Hildebrandt and Stratmann, 1979	6 nurses in Germany	7-to 18-day period of night work compared with 10-day recovery period in same nurses	Three "evening type" nurses reacted to night work with flattening of circadian amplitude (temperature and heart rate) and greater tolerance. Three "morning type" nurses developed increased amplitude, higher amounts of subjective complaints (e.g., headache, nervousness, irritation), greater compensation for lost sleep, and lower subjective vigilance.
Infante-Rivard et al., 1989	418 nurses and nursing aides in 1 hospital in Canada (all female)	Fixed day, fixed evening (within both groups, comparisons between those with and without prior night work)	Prevalence of 9 sleep disorder symptoms ranged from 6 percent to 53 percent. Evening workers were at higher risk of not being alert and receptive at rising and at lower risk of early morning awakening. Prior night work was associated with day tiredness and quantity of sleep.

Table 8-l-Studies of Health Consequences of Shift Work in Nursing-Continued

Study	Sample	Shifts compared	Major findings
Kuchinski, 1989	146 R.N.s[b] in 1 hospital in Cincinnati (all female)	Fixed shifts, rotating shifts	No differences by shift were found in menstrual interval, duration of flow, amount of flow, dysmenorrhea, intermenstrual bleeding, or secondary amenorrhea.
LeClerc et al., 1988	824 nurses in 10 hospitals in France	Permanent day, permanent night, rotating without night, rotating with <5 nights/month, rotating with 5+ nights/month	For 38 health variables, including symptoms and health services utilization, type of shift had poor explanatory power.
Matsumoto, 1978	5 nurses in 1 hospital in Japan	Day shift, night shift in same nurses	Time in bed and total sleeping time were lower in daytime than nighttime sleep. Number of awakenings was greater in day sleep. Daytime sleep differed qualitatively from night sleep in appearance of REM and non-REM sleep.
Minors and Waterhouse, 1983	26 nurses	Single nights, paired nights, nights in blocks of 3+	Nurses working single nights maintained a conventional diurnal routine. Nurses working a number of consecutive nights showed changes in routine, including afternoon napping and different meal times.
Minors and Waterhouse, 1985	14volunteernurses in 1 hospital in England (11 female)	Short-term night shift (1 to 3 successive nights), long-term night shift (3 successive nights)	Nurses working 3 successive nights were better adjusted to nocturnal activity and diurnal sleep, as reflected in amount of sleep, afternoon naps, and fewer subjective complaints.
Tasto et al., 1978; Smith et al., 1979	1,219 full-time nonsupervisory R.N.s and L. P.N.s[c] in 12 U.S. hospitals (1,195 female)	Fixed day, fixed afternoon/evening, fixed night, rotating	Nurses who rotate shifts took more sick days than nurses on fixed shifts, suffered more injuries, and reported more digestive trouble, leg and foot cramps, colds, nervousness and shaky feelings, fatigue and exhaustion, use of stimulants, use of beer and liquor, tension or anxiety, depression or dejection, confusion or bewilderment, neuroticism, sleep disturbances, and problems adjusting work schedules and family life.
Verhagen et al., 1987	167 nurses in 6 hospitals in Belgium (all female)	Permanent night (full-time and part-time), 2-shift rotation with some nights	Rotating nurses reported more health complaints. Permanent nurses slept less than rotating nurses.
Webb, 1983	19 nurses age 50 to 60 in 3 hospitals in Florida compared with forty 50- to 60-year-old female university employees with no history of shift work	Current night shift with 10 years of rotating shift experience; nurses not on current shift work but extensive night or rotating shift experience; nurses not on current night shift and limited prior shift experience	Little evidence of enduring effect of night shift experience on sleep patterns. Some evidence of moderately changed REM sleep.

[a]REM, rapid eye movement.
[b]R.N., registered nurse.
%.P.N., licensed practical nurse.

SOURCE: Office of Technology Assessment, 1991.

tended to have their evening meal around midnight, indicating a commitment and long-term adaptation to night shift work (64).

Being married increased the reported incidence of gastrointestinal symptoms (poor appetite, gaseous distention, heartburn, constipation, and diarrhea), nervous and psychological symptoms (nervousness and tautness, headache, nightmares, giddiness and nausea, palpitation or irregular heartbeat, hand sweating, pricking or numbness of body parts, decrease in libido), and musculoskeletal symptoms (back symptoms, neck, shoulder or hip symptoms, knee or ankle symptoms) (45).

Psychological and Nervous Symptoms—Psy-chological variables may be interpreted as outcomes of shift work or as outcomes of mediating variables. The NIOSH study used the Profile of Mood States (POMS) to measure psychological state and the Eysenck Personality Inventory (EPI) to assess personality traits. Psychological state changes over time, while personality trait is more or less constant (25,54). On the POMS subscales:

- nurses on a rotating shift reported significantly higher tension and anxiety than afternoon-evening and night workers;
- rotating nurses reported significantly more depression and dejection than day or night workers;
- rotating nurses reported significantly less vigor and more fatigue than nurses on all other shifts; and
- rotating nurses reported significantly more confusion and bewilderment than nurses on all other shifts.

On the EPI, nurses on a rotating shift were significantly more anxious and irritable than nurses on other shifts. Interestingly, day shift nurses scored lower on sociability than afternoon-evening and night nurses (103).

Anxiety, irritability, and nervousness increase shift-cycle fatigue in nurses and contribute to a higher reported incidence of gastrointestinal, nervous, psychological, and musculoskeletal symptoms, regardless of shift (45). A measure of morningness (preferring daytime activity) as opposed to eveningness (preferring nighttime activity) was also predictive:

- morningness decreased reported fatigue in morning shift nurses and increased it in evening shift nurses; and
- morningness also decreased the duration and quality of sleep after night shift work (45) (see ch. 5).

The relationship between specific psychological symptoms and degree of social interaction, which may be reduced by shift work, is not known.

Menstrual Dysfunction-Few studies have examined the relationship between shift work and reproductive health in nurses, although environmental and occupational conditions can contribute to menstrual dysfunction (51). The NIOSH study included some indicators of menstrual dysfunction and found that nurses on fixed day shifts reported more irregular menstrual periods than other nurses and that nurses on all types of freed shifts reported more menstrual cramps than did rotating nurses. Night and rotating nurses, however, reported spending more time lying down due to menstrual cramps, and rotating nurses reported more tension, nervousness, weakness, and sickness at menstruation, as well as longer periods, than did nurses on other types of shifts (103).

In a recent study of the menstrual characteristics of 146 R.N.s age 20 to 40 in a university hospital, 43 percent of the nurses studied worked fixed shifts and 57 percent worked rotating shifts. No significant differences between these two groups of nurses were found for self-reported length of the menstrual period, duration of flow, amount of flow, dysmenorrhea, intermenstrual bleeding, or secondary amenorrhea (55).

Substance Use and Abuse-Only the NIOSH study has reported differences in nurses' substance use by type of shift:

- rotating nurses, compared with nurses on freed shifts, were more likely to use stimulants;
- rotating and afternoon shift nurses drank more beer;
- rotating nurses drank more alcohol of all kinds;
- rotating and day shift nurses were more likely to drink on workdays; and
- night nurses were more likely to drink before going to work.

The information obtained on quantity of alcohol consumed was limited, and no conclusions can be drawn regarding alcohol dependency. Similarly, it is

not possible to determine from the reported data whether drinking on workdays occurs during or outside of work hours or whether drinking on workdays causes problems in performance (103). It also is not possible to determine whether people who drink more prefer different shifts (25,54).

Injuries—Fatigue and impaired cognitive and psychomotor function during shift work can result in injuries. As mentioned in chapter 5, laboratory studies have shown that speed, reaction time, and accuracy decline after evening hours, suggesting that more accidents and injuries are likely to occur at night (33). Only the NIOSH study and a reanalysis of those data (97) have reported injuries by type of shift worked by nurses. Rotating shift workers suffered more injuries than fixed shift workers. Injury rate was not influenced by age, length of employment, or marital status. Furthermore, cuts, bruises, and punctures (mainly to fingers) were the most frequent category of injury on all shifts, and rotating nurses had significantly more such injuries than nurses on freed shifts (97).

Family and Social Life

The NIOSH study provides some information about the effects of shift work on the family and social life of nurses. Questionnaires were administered to 1,219 fill-time, nonsupervisory R.N.s and L. P.N.s in 12 U.S. hospitals; 98 percent of the nurses were female, the average age was 32.9 years, and 45 percent were married. The sample was fairly evenly distributed across four work schedules: fried day shift, freed afternoon or evening shift, fixed night shift, and rotating shift (generally, rotation occurred between two shifts only) (103).

Results showed that the greatest disruption of family and social life occurred for nurses on rotating shifts. Regarding degree of satisfaction with the amount of time spent with their spouses, rotating and night shift nurses were most dissatisfied. Night shift nurses reported the most interference with sexual activities, whereas nurses on rotating shifts reported the most complaints from spouses regarding their work schedules. As for amount of time spent with children, nurses on rotating shifts were the least satisfied, although afternoon and evening shift nurses reported that they assumed the least responsibility for child rearing and disciplining. Finally, rotating and afternoon shift nurses were least satisfied with the time available for personal activities, sports, and social activities (103).

EXTENDED DUTY HOURS AND GRADUATE MEDICAL EDUCATION PROGRAMS

> "Shifts" implies that there is a preset beginning and end to your work hours, however long they may be. We do not work shifts. We just work, When the work is done we can go. If that's 36 hours later, so be it. During my internship year, I routinely spent 120 hours a week in the hospital. These hours were largely devoted to menial, nonmedical tasks called scut work, a catch-all term for patient-care-related work that does not require a medical degree (i.e., inserting I.V.s, doing blood cultures, transporting patients, or scheduling tests) (31).

> I entered medical school with lofty aspirations of selfless dedication to the sick, a life of joyful altruism. Like many of my colleagues, I saw these worthy aspirations transformed into cynicism under the pressure of sleepless call nights in a pediatrics internship. My love for children became a loathing. As an intern in 1984, I worked over 135 hours a week taking short call (until 10 p.m.) one night, long call (40 hours) the next night, and 8 hours off the next night. I felt that sleep deprivation dangerously impaired my judgment, giving me the sensation of a sleep-walking nightmare. I remembered the story of the resident in our program a few years before I came who had been so impaired by her sleep deprivation that she fell asleep at the wheel after returning from a 40- to 45-hour shift. She is now quadriplegic and will never be able to practice medicine again (62).

> I was on call for the hospital trauma and code teams eight times during a 14-week chaplaincy internship. Like the medical staff, I worked 28- to 31-hour shifts, with the most intense work during nights of little or no sleep. Like them, I alternated between adrenalin-charged highs when an ambulance or helicopter arrived and crushingly weary lows when patients died or were transferred. I counted on the calm, alert time in between to do my best work. Yet that period shrank as the shift progressed. My mind slowed after 2 a.m., and my empathy tumbled. Medical staff seemed to react the same way. Sometimes tempers frayed as the night wore on, and we all cut corners. No one was a very cheery friend for a couple of days after a night on call (117).

Graduate medical education, or residency, is formal medical education beyond the M.D. degree. This training incorporates substantial clinical expe-

rience and prepares the residents for practice in recognized medical or surgical specialties. Residents who complete this training become eligible to take the appropriate board certification examination. Resident training programs began at the Johns Hopkins School of Medicine roughly 100 years ago. In those early days, residents, as the title implies, were expected to live at the hospital, were on permanent call, and were discouraged from marrying (83,100). The first-year trainee was called an intern; now, that year is often referred to as postgraduate year one, PGY1. The training period was lengthened to include additional years-junior resident (PGY2), senior resident (PGY3), and chief resident (PGY4).[4] Some specialties have a fifth year of residency (PGY5), and others, such as neurosurgery, require 7 years. The typical resident has changed since the early days of resident training. Today the resident is older, more likely to be a woman, and more likely to have a family or other commitments outside the hospital (59).

Although extended hours for resident training date back to the early 1900s, when residents lived on hospital grounds and were on permanent call, in more recent times some residents have rotated the night shift every other night in addition to their daily duties (100). In 1975, when the Committee of Interns and Residents, a union, struck New York City's hospitals, many programs revised this requirement and allowed an on-call schedule of every third night (100). According to the Association of American Medical Colleges (AAMC):

> . . . the resident benefits by being exposed to patients throughout the course of their illnesses. This allows observation of both the natural history of the illness and the impact of the medical intervention. To experience all of the learning opportunities, the resident would have to be on duty 7 days a week, 24 hours a day. Clearly, such a schedule is unrealistic and does not recognize the possible adverse impacts of fatigue or the resident's commitments to other activities and interests. Therefore, assignment schedules for residents must be balanced between competing objectives and constraints (82).

Long hours are a necessary part of resident training. They enable residents to follow the progression of a disease and to provide continuity of care. This has been the custom and practice in postgraduate medical education for nearly 100 years. However, questions and concerns have been raised about the work schedules that have traditionally been used in resident training. It has been argued that the progression of a disease can no longer be learned in a hospital setting, since patients remain in hospitals for much shorter periods of time than they did 20 or 30 years ago (10). In addition, some maintain that long hours are a bow to tradition and an initiation into the profession-a rite of passage—that all would-be doctors must endure (6,100,1 12). Supporters of extended hours for residents argue that labels such as "rite of passage" are irresponsible and destructive (95). Four additional points have been identified to support the current system of extended duty hours with night call hours:

- sleep-depriving night call is a valid learning experience;
- individual idiosyncrasies, not night hours and sleep deprivation, make night call a negative experience;
- night call does not cause permanent distortion of personal and professional sensitivities; and
- quality of care is not compromised by sleep-deprived physicians (7).

It has been noted that due to the many recent advances in medical knowledge and technology, the practice of medicine is not what it was 100 years ago, when the concept of residency was created. Patients today come into the hospital sicker, and there are many more drugs and technologies available to treat them. In fact, the medical problems of patients are more severe today than they were even a few years ago (106). Prior to modern advances in medical technology and pharmacology, physicians were very limited in what they could do for patients. Physicians did their best to make patients comfortable and relieve suffering, but few diseases could be cured. There were no intensive care units, only a handful of antibiotics, and patients were admitted for observation (a practice not routinely performed today because of insurance regulations and reimbursement schedules) (16). Today, both the intensity of medical treatment and the pressure from patients for a positive outcome are higher.

[4]Not all PGY4s are chief residents. This term refers t. the resident who devises the schedule and resigns call. Only in medicine and pediatrics, and perhaps psychiatry, is the PGY4 automatically chief. In other specialties, such as pathology and surgery, usually one of the PGY5s is made chief. The other PGY5s are called senior residents.

According to one chief resident:

> In reality, a resident does not sit at the bedside and watch the progression of a disease process. After admitting a patient, the resident scurries about, drawing blood on another patient, checking lab values, or admitting the next patient. Therefore, long hours for residents provide a cheap source of labor and less real teaching benefit, with very little continuity. Furthermore, once residency finishes, rarely does a physician spend the whole night at the bedside of a patient, ready to pounce on the next development of disease. In fact, many physicians alternate call schedules with other physicians or members of their group. Very often the person who ''covers' for a physician has never seen the patient before and only has a short description of the patient and the current medical problems. What happens to continuity of care in this situation? (17).

In addition, in some diseases, such as cancer, a period of weeks, months, or years is necessary to follow disease progression in patients (117). There is also the position that it is not the resident but the R.N. who is constantly at the patient's bedside; a resident may check on a patient frequently during a shift but usually does not spend more than a few minutes with the patient (101).

One legal expert rejects the notion that injuries may result because doctors are fatigued by long shifts of duty and maintains that, despite being on duty for long stretches at a time, doctors are able to sleep during slack periods (71). A chief resident argues that, although there may be times when there is a lull in the admissions process, it is during such lulls that the resident tries to catchup on all his or her other work (I.V.s, drawing blood, assessing other sick patients on the floor, etc.) (17). A resident on call at night is often responsible for the care of 40 to 60 patients, and in some busy inner-city hospitals, first-year residents may have as many as 15 new admissions each night (17). One senior resident points out that in many programs if a resident is caught sleeping during slack hours, he or she is reprimanded (62). Further, sleeping during slack periods does not take into account the likelihood that such sleep may be short, unpredictable, and repeatedly interrupted. Prior to the implementation of the new regulations of hours of work in New York, it had been reported that first-year residents averaged 2.6 hours of sleep per day (44).

Libby Zion Case

An incident that recently caused the public to focus on the issue of residents' hours was the death of a patient, Libby Zion, in a New York hospital. In 1984, Libby Zion, an 18-year-old woman, was admitted to New York Hospital-Cornell University Medical Center through the emergency room and died a few hours later. Her father, an attorney and a former reporter for the New *York Times,* charged that his daughter had received substandard care at the hands of residents. Zion was treated by an intern and a junior resident. Both of them had been on duty for some 18 hours prior to her admission.

During the 8 hours between her admission and her death, Zion was not examined by an emergency room attending physician (a physician who has completed all phases of the medical education process and whose job is teaching interns and residents), because none was on duty. Telephone discussions were held with her private attending physician, although he did not examine her in person. Further, it is argued that the intern and resident who were on duty failed to provide adequate monitoring of the patient and prescribed medications that were contraindicated in light of Zion's history of drug and medication use.

Grand Jury Findings

A grand jury convened to examine the circumstances surrounding Libby Zion's death determined that there were five contributing factors. Four factors involved supervision and treatment (85). In addition, the grand jury concluded that the number of hours that interns and residents are required to work is counterproductive to providing quality medical care (85). While this practice may be cost-effective for hospitals, providing them with a cheap source of labor, the corresponding cost is a diminished quality of health care (85). Physicians must be in full command of their mental faculties in order to provide proper care for patients and to continue the learning process (85). The grand jury investigation found that major medical decisions made by inexperienced physicians acting alone and unsupervised can result in medical mistakes, sometimes with fatal consequences. The likelihood that such mistakes will occur is increased by the long hours that interns and residents must work (85). Moreover, the wee hours of the morning are when the attending physician coverage is routinely sparse.

Hence, not only are residents tired and sleep-deprived, but they often have no senior person available for a second opinion or backup (10,31). In addition, physicians who are sleep-deprived and overworked cannot make a commitment to continuity of care (9). Accordingly, the grand jury proposed that regulations be promulgated to limit consecutive working hours for interns and residents. The grand jury failed to hand down any criminal indictments concerning Libby Zion's treatment and subsequent death, but it severely criticized the graduate medical education system in New York and made five recommendations to improve the system. Concerning resident work hours, the grand jury recommended that the State department of health promulgate regulations to limit consecutive working hours for interns and junior residents in teaching hospitals.

In response to the grand jury and other public and political pressures, the New York State Department of Health convened an Ad Hoc Advisory Committee on Emergency Services, which issued 19 recommendations to the health department (73). Three of these related to residents' hours:

- a 12-hour limit was to be placed on emergency room shifts;
- residents in acute care specialties not on emergency room services should work no more than 80 hours per week averaged over a 4-week period and should not be scheduled to work as a matter of course for more than 24 consecutive hours, with one 24-hour period of nonworking time per week; and
- no moonlighting would be allowed.

The commissioner of health promulgated regulations in 1988 modifying the overall organization and operations of hospitals and staffs, including supervision of residents and their hours:

- as of October 1, 1988, the emergency room shift for both house staff and attending physicians should not exceed 12 hours (there are certain exceptions if the hospital meets certain criteria); and
- as of July 1, 1989, the scheduled workweek for other house staff in designated acute care specialties should not exceed an average of 80 hours over a 4-week period. No scheduled shift should exceed 24 consecutive hours. On-duty assignments should be separated by at least 8 hours, with one 24-hour nonworking period per week.[5]

Photo credit: George *Washington University Media ICenter*

Surgery is the specialty with the most demanding hours.

The cost of implementing these new regulations was determined to be $226 million by the New York Health Department, an increase of about 3 percent in its annual budget. The hospitals asked for additional funding. Approximately $65 million is needed for additional ancillary support —phlebotomists (technicians who withdraw blood from patients' veins), housekeepers, intravenous teams, messengers, and transport teams. It has been reported that this ancillary support work can take up as much as 50 percent of a resident's work hours (31). In some teaching hospitals, 70 to 80 percent of a resident's working hours at night have been found to be devoted to such work (4). To replace work hours lost from resident physicians, $80 million is

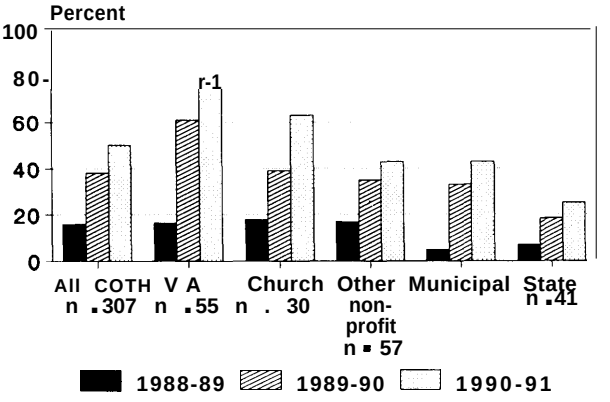
[5]There were special guidelines for surgery.

needed for additional residents, nurses, attending physicians, and physician assistants. The balance is to cover the costs of new supervision requirements, which are also part of the new regulations. It is estimated that the cost will be $3.1 billion over the next 10 years and $5.7 billion over the next 15 years. This cost was to be distributed between the State and other third-party payers. Medicare (the Federal program for the aged and disabled) was not obligated to pay its proportional share of the cost (99). The health commissioner allocated Medicare costs to all other payers controlled by the State—Medicaid, Blue Cross, and the commercial payers (99). Blue Cross subsequently filed a successful suit to avoid payment of the Medicare costs apportioned to it (72). The commercial payers, and the State's Medicaid program, also refused to pay the Medicare share apportioned to them, leaving the system $50 to $60 million short (99).

Although the intent of the regulations was to limit residents' work hours, the wording of the regulations is that no resident should be *scheduled* to work more than 12 hours in the emergency room or *scheduled* to work more than 80 hours in a 4-week period (10). It has been reported that some hospitals in New York have not fully implemented the new regulations, and some residents are still working hours in violation of them (38). Not enough time has elapsed to determine whether the regulations will have any effect on the number of malpractice incidents in New York, since a malpractice action may be filed several years after the alleged incident, and the regulations have been in effect for only 2 years. No broad-based analysis of the effect of the preexisting working hours on successful malpractice claims or quality of care was ever done (99).

While there have been some legislative and regulatory efforts involving the work hours of residents throughout the country, there have been no mandated or involuntarily enforced changes in any State other than New York (99). Massachusetts' teaching hospitals have undertaken a voluntary effort to change the working conditions of residents in that State (99). Table 8-2 discusses the current status of residents' work hours in some States. Box 8-B discusses limitations on residents' hours in Great Britain. Box 8-C explains reductions in residents' hours in New Zealand. And figure 8-1 shows the percentage of American hospitals, by ownership, that have implemented policies which set a maximum number of resident work hours.

Figure 8-l—Prevalence of Hospitals With Policies on Residents' H-ours



Percent of Council on Teaching Hospitals (COTH) with hours for house staff, by ownership, 1988-91.

SOURCES: **"Council on Teaching Hospitals Survey Shows Increase in Stipends, Prevalence in Housestaff Hours Policies,"** ***Association of American Medical Colleges Weekly Report,*** **Oct. 19, 1990, p. 1; S. Zimmerman, "VA Leads COTH Hospitals in Resident Hours Policies,"** ***COTHReport24:5, 1990.***

Current Status of Graduate Medical Education Programs

As of January 1,1990, there were 6,591 accredited resident training programs in the United States in 24 major specialties and 38 subspecialties (94). Of the approximately 85,330 residents in training programs, nearly 40 percent were in training for internal medicine, family practice, or pediatrics (94).

Regulation of Residents' Hours

Regulation of residents' hours has traditionally been under the control of the Accreditation Council for Graduate Medical Education (ACGME), which has five member organizations:

- American Board of Medical Specialties;
- American Hospital Association;
- American Medical Association;
- Association of American Medical Colleges; and
- Council of Medical Specialty Societies.

Each member organization appoints four representatives to ACGME, and the Council also has a resident representative, a public representative, and a nonvoting representative of the Federal Government. ACGME sets standards and procedures for accreditation that

Table 8-2—State Legislative Action Regarding Residents' Work Hours

California: The legislature is vigorously debating whether to control hours by legislation or through voluntary restrictions enforced by the medical schools themselves. An hours bill, calling for an 80-hour workweek with 2 days off every 2 weeks and no more than 1 day in 3 on call, was defeated in the Senate in 1990 but will be considered by the Assembly Ways and Means Committee in January 1992.

Connecticut: A bill was introduced in March 1988 but it did not get out of committee. A new version was introduced in 1991.

Hawaii: There has been no active bill in 3 years. A bill was introduced in 1988 but will not be reintroduced since the sponsor now believes that ACGME guidelines will be sufficient to control residents' hours.

Illinois: A bill was introduced in 1988 that would have required the Department of Public Health to examine residents' working conditions, but the Illinois Hospital Association lobbied strongly against it. The sponsor of the bill is considering reintroducing it in a future session.

Iowa: There are no plans to introduce legislation in this area, but in 1988 a preliminary request for a draft bill on residents' working conditions was made to the legislative service bureau.

Massachusetts: For the first time in 3 years, the legislature does not plan to consider a bill in this area. Legislators say they are optimistic about proposed regulations by the State's medical centers themselves.

Michigan: There are plans to reintroduce a bill that died in 1990. The State's hospital association contends that such legislation is not necessary, since all but three teaching hospitals already have policies on this issue.

Minnesota: The legislature has no active bill, but the topic is being overseen by two senators, one of whom may reintroduce an earlier bill if not satisfied with residents' working conditions.

Missouri: The legislature is not considering a bill during the 1991 term. A 1988 bill regarding residents' hours and working renditions died in committee.

Nevada: The University of Nevada School of Medicine at Reno, the State's only academic medical center, has executed its own hours limitations on residents.

New Jersey: The legislature has never considered a bill regarding residents' hours. The State health department discussed possible guidelines several years ago but never implemented changes.

New York: It is still the only State that has implemented rules regarding residents' hours and supervision. New York passed its law administratively in 1989, while the legislature merely passed a bill for its funding. During 1990 the State began to enforce the rules.

Pennsylvania: For the first time in 3 years, no legislator has plans to introduce a bill on this issue. No reason for this change was given.

SOURCES: Office of Technology Assessment, 1991; based on L. Page, "Resident Hours Legislation Has Slowed Down," *American Medical News,* Mar. 11, 1991, pp. 49-52.

Box 8-B—Limitations on Residents' Hours in Great Britain

In an effort to end the potential dangers posed by overworked resident physicians, the English minister for health recently announced that the Ministerial Group on Junior Doctors' Hours has developed an agreement to reduce the maximum workweek for resident physicians to 72 hours. The Ministerial Group includes representatives of the United Kingdom's health departments, National Health Service management, consultant physicians, resident physicians, and medical colleges.

The agreement calls for a short-term goal of 83 hours of work per week and a long-term goal of 72 hours of work per week for all residents, especially those in the most overworked positions. In the first step of the agreement's enactment, the government will fund the creation of an additional 200 consultant and 50 staff grade positions during 1991 and 1992. Next, the agreement will be translated into practical measures to be carried out on the local level. It calls for the immediate formation of regional committees to analyze local problems and suggest solutions.

The agreement strongly supports various types of shift work, especially in busy areas, and lists several methods for change. These include the sharing of duties by residents, additional coverage in the busiest posts, and a reorganization of work schedules to allow for more part-time doctors and time off after night duty. Examining how to maximize the use of other staff, such as nurses and midwives, will also be important.

This announcement came 2 days before the English Court of Appeal refused to dismiss a claim by a doctor who sued the Bloomsburg Health Authority for damages caused by the health authority's requirement that he work at least 88 hours a week. The doctor claimed that these hours were unbearable and that they deprived him of necessary sleep to the point of posing a danger to his own health and that of his patients.

SOURCES: Office of Technology Assessment, 1991; J. Burkhart, "England Imposes 72-Hour Limit on Residents," *Journal of the American Medical Association* 265:2742, 1991.

Box 8-C—Reduction of Residents' Hours in New Zealand

In 1985, the New Zealand Resident Medical Officers' Association was successful in reducing residents' hours-from 100 per week to a maximum of 72 hours per week. In April 1988, three doctors who aided in implementing these changes spoke at a convention of the National Federation of Housestaff Organizations in Boston. They explained the reasons for this reduction, how the new hours system is structured, and the results of the decreased hours:

Rationale Behind the Reduced Hours:

- The system as it existed before 1985 produced sleep-deprived doctors who were unfairly paid and open to abuse by hospital administrations.
- Doctors who were the most sleep-deprived tended to work the longest hours and care for the sickest patients.
- Studies showed that two-thirds of residents were working over 72 hours per week and a large number were working over 90 hours per week.
- The ability to learn and the motivation to work were reduced by insufficient sleep,
- Continuity of care is already broken by changes in shifts; therefore, the question becomes one of when it is best to break the continuity, not whether to break it.
- Other professions that take responsibility for human lives and safety (e.g., airline pilots) have regulated their workers through shortened shifts.
- Generally, the night shift is the quietest, and residents' work between midnight and 8 a.m. is focused on new patients and organizing work rather than on continuing work on old patients.
- Quantity of residents' work does not equal quality.
- The benefit of shortened hours to patients greatly outweighs administrative difficulties in implementing different schedules.

Limits on Hours:

- A resident's shift may be no longer than 16 hours, and there must be an 8-hour break before the next scheduled shift can begin.
- Residents may work a maximum of 72 hours per week averaged over no more than 4 weeks.
- Emergency rooms have been targeted as high-pressure areas; thus, a resident's shift there can last no longer than 10 hours, and there must be a 9-hour break before the next shift begins.
- Emergency room residents may work a maximum of 60 hours per week, with a 50-hour-per-week average over 3 months.
- Under normal circumstances, only one shift may be worked per day.
- Adequate handover time must be provided between shifts.
- No resident shall be on duty or on call for more than 12 days without a scheduled rest period of at least 48 hours.
- Exceptions may be made on a case-by-case basis, but in considering extensions of hours, priority must be given to adequacy of rest and sleep for the resident involved.

Results:

- Residents' hours have decreased significantly: a study conducted in Auckland showed approximately 1 percent of residents working 72 hours per week; the average number of hours worked now is 54 per week, a 19 percent decrease.
- Contrary to predictions before the regulations went into effect, few problems with scheduling have arisen.
- Doctors are more awake, alert, and enthusiastic about their jobs.
- Patients have noted improved care, since they are no longer treated by sleep-deprived doctors.
- There is nothing to stop a resident from following a particular patient, but he or she does so without the ongoing responsibility for that patient's care.
- Productivity has increased, especially on the night shift.
- Residents on the night shift are expected to do more, such as keep up patient records, than they were when working longer hours.
- Nurses find the residents easier to work with, especially on the night shift.
- Residents have more time with their families and have time to pursue outside interests.

SOURCES: Office of Technology Assessment, 1991; J. Cooper, J.Mawson, and B. Swinburn, past presidents, New Zealand Resident Medical Officers' Association, excerpts from presentations given at the National Federation of Housestaff Organizations, Boston, MA, April 1988; J. Stoke, Acting Chief Medical Officer, Workforce Development, Department oHealth, Wellington New Zealand, personal communication June 12, 1991.

apply to all training programs for residents. These standards have the force of law, since resident training programs cannot operate without ACGME accreditation (76). Under ACGME rules, resident training programs must be in "substantial compliance' with standards in order for their accreditation to continue.

The American Medical Association (AMA) House of Delegates passed two resolutions in early 1988 regarding conditions in resident training programs, which are monitored by a Residency Review Committee (RRC) in each of the 24 specialties:

- one asking each RRC to develop guidelines for residents' work hours and conditions, taking into account the intensity of the particular service environment; and
- one directing each RRC to develop guidelines regarding standards for achieving clinical competence, with a specific focus on weekly or continuous work hours, adequate time off, an average of no more than every third night on call, and one 24-hour period off every 7 days. (106).

Of the 24 specialty boards, 16 have adopted specific language addressing residents' work hours. The other eight are in areas where there is little night work (e.g., nuclear medicine, physical medicine and rehabilitation, radiation oncology, preventive medicine), thus the issues of extended hours and night call are not as great.

Accreditation Council for Graduate Medical Education

As described above, within the past few years, the ACGME has moved to revise its requirements for programs regarding supervision and hours and has directed the RRCs to introduce new standards on residents' work hours. Responses of the RRCs ranged from specific (emergency medicine mandating no more than 60 hours per week, with 12-hour shifts) to general (thoracic surgery giving the program director responsibility for ensuring reasonable in-house duty hours) to no response (general surgery and psychiatry) (see table 8-3). According to the Association of American Medical Colleges, guidelines vary because of differences in the demands and patient care requirements among specialties (102). For example, the surgical RRCs are unwilling to accept the one 24-hour period free of patient care responsibilities because of a strong belief that surgical residents should see their pre- and postoperative patients every day. On the other hand, residents in pathology have little patient contact and do not require extended hours (41).

The RRC for internal medicine, under the auspices of the ACGME, implemented new rules that took effect in October 1989 (76). Internal medicine residents must observe a maximum workweek of 80 hours averaged over 4 weeks. Residents are also to spend, on average, 1 day a week away from the hospital, and their continuous duty in the emergency room should not exceed 12 hours (76). The rules call for adequate opportunity to rest and sleep when on call for 24 hours or more, and residents should be on call no more than once every third night. In addition, limits were placed on the number of patients assigned to residents.

The American Board of Medical Specialties recently vetoed a proposal to let residents have 1 day off per week and to be on call no more than once every third night (77). Continuity of care was cited as the reason for such action. As a result of this veto, the Council of Medical Specialty Societies (CMSS), one of the other ACGME member organizations, recently failed to take a position on proposed work hours limits for residents. In a panel discussion before the CMSS deadlock vote, an AMA executive vice president argued that universal limits on hours would show Government regulators that the house of medicine was taking care of the problem of resident hours and overwork (78). According to this same AMA executive vice president, the ACGME hopes to adopt language on hours revisions that applies to all specialties, but this probably will not happen in the near future (106).

As a means of informing medical students about the work environment, including the hours requirement, at various residencies, the AMA has instituted a computerized information system called Fellowship in Residency Electronic Interactive Database Access System (FREIDA). Through FREIDA, medical students who are selecting a graduate program can determine the program's:

- average number of hours per week on duty during the first year;
- average number of 24-hour periods per month off duty;
- maximum number of consecutive hours permitted on duty; and
- whether moonlighting is allowed (93).

Table 8-3-Residents' Working Hour Requirements in the Residency Review Committee's Updated Accreditation Guidelines

Specialty	Specific hourly requirements	General guidelines	Hours not addressed
Allergy and immunology		Adequate backup should be provided if workload may create resident fatigue sufficient to jeopardize patient care.	
Anesthesiology	1 full day out of 7 away from hospital; on call no more than every third night; off-duty time should be sufficient to avoid fatigue.		
Dermatology	On average, 1 day/week should be free from hospital duties; no more than once every third night should be spent on call; rest and sleep should be provided when on call for at least 24 hours.		
Emergency medicine	On average, no more than 60 hours/week; at least 1 day/week away from hospital; no more than 12 hours/shift; at least an equivalent amount of time off between duty periods.		
Family practice	Should be adequate resident staff to prevent excessive workloads; suggest the following: on average, 1 day/week away from residency program; on call no more than every third night; ensuring backup available if there is a sudden increase in workload.		
Internal medicine	In no case should resident go off duty until proper care of patient is ensured. No more than 80 hours/week averaged over 4 weeks; on average, 1 day/week out of hospital; on call no more than once every third night and have adequate backup; should be adequate opportunity and facilities to rest when on for 24 hours or more.		
Neurological surgery		Continuity of care is most important; should have adequate backup; scheduling should avoid prolonged and excessive duties on a regular basis.	
Neurology	Should be allowed 1 day/week away from hospital; on call not more than every third night; should be adequate physician coverage.		
Child neurology			X
Nuclear medicine			X
Obstetrics-gynecology	1 day/week away from hospital; on call no more than every third night; adequate backup must be provided.		
Ophthalmology	80 hours/week limit averaged over 4 weeks; 1 day/week away from hospital; on call no more than every third night.		
Orthopedic surgery	On average, an 80-hour/week limit for direct patient care.		

Otolaryngology	Residents should not be required to perform excessively difficult or prolonged duties regularly; they should have the opportunity to spend an average of 1 day/week free of hospital duties; on call no more than every third night, except to maintain continuity of care; adequate opportunity and facilities for rest when on call for 24 hours or more.		
Pathology	On average, 1 day/week free of hospital duties; on call no more than every third night; backup should be provided when patient care responsibilities are heavy.		
Pediatrics	Resident should be on call on an average of every third or fourth night in any year; schedule should have a monthly average of 1 day/week without assigned duties in the program.		
Physical medicine and rehabilitation	No hour limits, but should have 1 day/week free from hospital duties; should be on call no more than once every third night; must recognize patient duties are not discharged at any given time.		
Plastic surgery	1 day/week off; on average, every other night off duty; annual vacation time is additional time off; adequate backup if excessive patient care could lead to resident fatigue or jeopardize patient care; support systems, including counseling to minimize stress and fatigue, should be provided.		
Preventive medicine		Resident hours on duty should be scheduled to avoid excessive stress and fatigue.	
Psychiatry	1 day/week off; on average, on call no more than once every third night; must have adequate backup.		
Radiology (diagnostic, pediatric, neuroradiology)		Residents must not be regularly required to perform excessively prolonged duties; responsibility of program director to ensure reasonable in-hospital duty hours.	
Radiology (nuclear, oncology)	Residents should have 1 day/week off; on call no more than once every third night.		
General surgery			x
Thoracic surgery		Responsibility of program director to ensure reasonable in-house duty hours so residents do not have to perform excessively prolonged periods of duty regularly.	
Urology	On average 1 day/week free of hospital duties; on call no more than every third night; adequate opportunity to rest when on call for 24 hours or more; adequate backup if work volume jeopardizes quality of patient care.		

SOURCE: Office of Technology Assessment, 1991.

It has been pointed out by one resident that some specialties, such as pediatrics, dermatology, radiology, and obstetrics-gynecology, are attracting more women. These women, as part of the old guard and as new recruits, are insisting on changes to make the current system more manageable (31). Some programs are beginning to implement a system known as night float to assist residents with hours coverage (74,104). Night float can take several forms, but basically the house staff on call will admit patients until 10 p.m., for example, and then leave the hospital when their workups are completed. At 10 p.m. the night float team comes on duty (they have been off duty all day) and covers admissions and calls until the next morning, when duties will again be turned over to the house staff. This arrangement can also be used for a day float system. It has been reported that not all programs have the funds to implement this type of system (74).

Effects of Extended Duty Hours on Residents

Research on sleep deprivation began as early as 1896 (79). In 1961 a researcher concluded that interns had little time for sleep and spent only a small proportion of their time on direct patient care (81). Ten years later, another study reported similar findings regarding the daytime activities of interns in California (42). A more recent study observed internal medicine interns and residents for 5 nights at three teaching hospitals. It determined that:

- the interns and residents admitted between three and eight patients each night;
- each house officer received 16 to 25 calls per night:
- up to 12 percent of their time was spent doing procedures such as inserting I.V. catheters or drawing blood specimens, most of which could have been done by nonphysicians;
- from 87 to 175 minutes of on-call time were spent in direct patient evaluation;
- the mean time spent on each new patient evaluation ranged from 17 to 31 minutes;
- the mean time before the evaluation was interrupted ranged from 7 to 11 minutes;
- 66 to 187 minutes per night were spent documenting new patient evaluations in the hospital record;
- the average sleep time ranged from 122 to 273 minutes; and
- the mean time before sleep was interrupted ranged from 40 to 86 minutes.

While no finding was made as to whether these house officers were sleep-deprived because of their work schedules, the researchers concluded that house officers:

- . spend relatively little time in direct patient contact;
- . spend considerable time charting; and
- are frequently interrupted while working and trying to sleep (59).

The results of studies examining the effects of extended hours on residents' performance are equivocal. One study noted deficits in grammatical reasoning in a group of five physicians after sleep deprivation (84). These researchers found that in another 15 subjects deprived of sleep, the ability to compensate for fatigue led to improved performance on a more complicated reading test; however, additional time was needed to maintain accuracy and complete the test. They concluded that physicians can compensate for the effects of sleep loss in the performance of both simple and complex psychomotor and cognitive functions (84). In another study, 33 surgical residents were given a comprehensive psychometric test battery (87). Results showed no differences in performance between sleep-deprived and rested residents.

A recent study of the effects of sleep deprivation on the performance of residents assigned to three services (trauma, vascular, and cardiothoracic) of a major teaching hospital failed to support the idea that sleep deprivation impairs cognitive and motor performance of residents (26). Results of this study indicated that sleep deprivation did not affect performance, as measured by a series of five psychomotor tests of visual and auditory attention, reasoning ability, spatial visualization ability, and fine motor coordination. Moreover, analysis of the correlation between certain sleep parameters (total sleep and longest period of uninterrupted sleep) and performance on each component of the psychometric test battery identified changes in performance on some tests but only insignificant effects due to sleep loss (26). The results of this study are controversial and have been challenged on the basis of the measures and experimental design used (13,14,18, 19,32,43,60,66,75,80,90,96,1 10).

Other studies have found decrements in some measures of performance. For example, a study in England found decreased mathematical abilities among sleep-deprived residents (57). Other studies

Photo credit: George Washington University Medical Center

Being able to confer with other residents and attending physicians is a critical part of graduate medical education.

involving sleep-deprived interns have found increased errors in reading electrocardiograms (EKGs) and increased time required to complete the task (36,37,11 1). In one of these studies, a mood scale was administered simultaneously, and results indicated that the rested interns felt more elation, social affection, egotism, and vigor and less fatigue and sadness than sleep-deprived interns (11 1). In another study, rested and fatigued anesthesiology residents showed a difference in response time to abnormalities appearing on a simulated monitor (28), while a study of sleep-deprived and rested interns assessing speed of information processing, decisionmaking, recent memory, and mood showed that the sleep-deprived interns had less ability to retain information, longer response latencies, and greater mood disturbances, including hostility, than the rested interns (46).

Family and Personal Consequences

There are a great number of stresses associated with graduate medical education, and working long duty hours is one of them. Cultivating and maintaining a healthy relationship with a spouse or significant other can be difficult when a resident is constantly tired. Recognizing that sleep deprivation can be a stressor, one study detected no relationship between gender and stress among internal medicine residents (56), while a separate study found that women residents reported more stress than men residents but were more likely to mobilize external support to cope with it (11).

Divorce and broken relationships often result from the stresses of residency (23). One survey of family practice residents determined that 41 percent believed their performance was impaired because of

marital problems (70). Another survey found that 17 percent of residents felt that their current relationships were in jeopardy because of job stresses (53).

The outcome of pregnancy during residency for 1,293 residents and 1,494 wives of residents who served as controls was the subject of a recent study (52). It was determined that there were no significant differences in the proportion of pregnancies ending in miscarriage, ectopic gestations, and stillbirths. The rate of voluntary termination of pregnancy among women residents was three times higher than among the wives. The women residents reported working twice as many hours per week as the wives (in some residents' cases more than 100 hours per week), with pregnant residents averaging 6 to 7 on-call nights per month. Premature labor requiring bed rest or hospitalization was nearly twice as common among the residents as among the wives, as was preeclampsia or eclampsia. However, placental abruption was less likely to occur in residents. The study concluded that there were no significant differences in pregnancy outcome between women residents and wives of male residents.

It has been alleged that sleep deprivation is the cause of numerous automobile accidents among house staff (22,92). Anxiety and depression are common among residents (23), and several studies have documented incidents of significant depression (53,86,109). Women house staff may be at greater risk of depression than men (35), in part because residents who are mothers may have primary responsibility for child rearing when they are not on duty at the hospital. Drug dependency and alcohol dependency are also prevalent in the medical profession (116). Many hospitals are implementing programs to help ''impaired physicians' cope with stress.

While many stressors may combine to affect a resident's home life, it is unclear that extended duty hours in themselves are responsible for negative consequences. No studies have focused solely on the impact of extended duty hours on home life.

SUMMARY AND CONCLUSIONS

Both nursing and resident training are characterized by shift work. Information about shift work in nursing is limited by the absence of national data on nurses' shift prevalence and career experience with shift work; few studies of the short- or long-term consequences of shift work for nurses' family and social life, health, and work performance; and few studies of the impact of various schedules on the quality of patient care. These limitations are due in part to a general lack of research attention to shift work. However, available data may also reflect prevailing assumptions about the effectiveness of pay differentials in solving shift-specific staffing problems and about the ease with which resigning nurses can be replaced, at least until recently, by a steady stream of new graduates who will be willing to work shifts early in their careers. Increased demand for R.N.s could prompt more health care administrators to examine shift work policies and to experiment with alternatives as a means of improving recruitment and retention of nurses.

While more research is needed on the short- and long-term effects of shift work on a range of nurses' health outcomes and on work performance, some adverse effects of shift work have been established. The findings of the NIOSH study associate rotating shift work with more digestive problems, more tension and stress, and a higher rate of injury. While the NIOSH study was an important examination of a number of health consequences of shift work in a large sample of R.N.s, it was cross-sectional, relied primarily on self-reported symptoms, and contained few measures of other job attributes that could be confounded with type of shift worked (e.g., workload, degree of control over work-related decisions, method of shift assignment).

Furthermore, working conditions of hospital nurses have changed since the NIOSH study was conducted in 1977. Hospital nurses today are coping with decreased lengths of patient stay and increased severity of illness as a result of prospective reimbursement of hospitals. These factors may exacerbate work stress and health problems in general, independent of shift work, or they may interact with shift work to produce extremely high stress levels among those nurses working undesirable shifts and confronting patients who require more intensive nursing care. These factors may also offset any positive effects of alternative shift schedules as a recruitment or retention strategy. More research is needed on various shift work issues, including the impact of changes in the health care system on workload, shift work, job stress, and related issues.

Graduate medical education as a training process subjects young doctors-in-training to many stresses,

one of which is long hours. This has been the case for many generations of doctors. Some have begun to question the wisdom of this system, arguing that with advances in medical technology doctors have many more treatment decisions to make, and the sleep deprivation and fatigue that result from long hours can reduce the resident's ability to make timely and appropriate decisions. The Libby Zion case demonstrated how long hours may contribute to errors in patient care. This case focused attention on the issue of extended duty hours for house staff. New York has responded with limitations on scheduling of house staff hours. The ACGME has also established guidelines for reduction of residents' hours. The problem that has yet to be resolved is how these new changes will be funded in a health care economy that is financially strapped.

There have been a number of studies on extended duty hours and sleep deprivation in medical residency, but results are inconclusive. Proponents of revision argue that, despite study conclusions, it is difficult to function at maximurn proficiency when one is sleep-deprived and fatigued. Almost no research has been done to determine the effect that extended duty hours have on the personal lives of residents.

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