GMB
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Health and Safety
Department

Hazards Associated with night shift working

This News Service attempts to concentrate on the hazards and risks associated with night work, the employer's legal duties and the steps that can be taken to eliminate, or applying management controls measures in reducing the risks. The move to 24-hour, 7-day continuous operations in many industries and organisations, the globalisation of the economy and the significant increase of information technology, has meant that shift work is increasing throughout the UK and European Union.

A growing body of evidence suggests that this move away from the generic or model 9-to-5 jobs, particularly if it involves night work, is taking a toll on workers' health, safety and welfare, which is a significant contributory factor in disrupting family and social life. Employers and individuals need to be aware of the adverse effects that working at night has upon performance and alertness and how to best manage and counteract them.

There is considerable variation in the patterns of shift work which involve night work, for example:

- Rotating three-shift working (the day is divided into three working periods morning, afternoon and night, and usually, but not always, involves a number of mornings, followed by the same number of afternoons, followed by an equal number of nights);
- Permanent night shifts; and
- Sometimes nights/days.

In effect there are two main types of shift work. Employees either work a non-fluctuating shift, like 11pm to 7am, or rotate between the three different shifts. There are large variations in the operation of rotating systems. These can vary in the speed and direction with which the shifts rotate the start and finish times of each shift, and the number and placement of days off.

Night shift work is carried out in a diverse range of industries and organisations, for example:

- Essential services, such as electricity, gas, water, sewerage supply and maintenance post and telecommunications, police, custodial services, customs and removal of refuse;
- Health services, such as hospitals, ambulances, doctors, nurses, Care home employees and home care employees, cleaners and technicians;
- Production industries with continuous processes;
- Hospitality industries, Service industries, such as security;
- The media;
- 24-hour supermarkets and their distribution centres and drivers; and
- Call centres with global coverage.

EMPLOYERS' LEGAL DUTIES - The Health and Safety at Work, etc Act 1974 places a *"duty of care"* on employers to ensure, so far as is reasonably practicable, the health and safety at work of all their employees who may be affected by their actions, including those who are not directly employed, for example agency workers and members of the public. This duty extends to the provision of systems of work and will include provisions for shift work.

The Management of Health and Safety at Work Regulations (MHSWR) 1999 require every employer to make a suitable and sufficient assessment of the risks to the health and safety to which his employees and others, who may be affected by their actions, are exposed whilst they are at work. This should enable the identification of the preventative and protective measures that need to be taken to ensure their health and safety.

There is good evidence that night shift work, can result in impaired health and safety, clearly an assessment of the risks from night shift work is required. This should identify steps to minimize the adverse effects of the shift work (and should give special consideration of the risks to new and expectant mothers).

The Regulations also require the provision of information on the risks identified by the assessment together with details of the preventive and protective measures. Health and safety training is required for new workers and when a new system of work is introduced or there is to be a change in a system of work already in use. Employers must provide employees with health surveillance appropriate to the risks identified by the assessment.

The Working Time Regulations 1998 (WTR) (as amended), which provide entitlements for workers as regards their working time, which contain specific provisions for night workers. The normal working hours of a night worker should not exceed an average of eight hours in any 24-hour time span during a 17-week period – (default reference period advised at adoption, if either party could not agree a reference period).

"Night" is a period of at least seven hours which includes the period from midnight to 5am, and can be determined by a relevant agreement (for example, 10pm–5am or 12pm–7am). In the absence of such an agreement it will be 11pm to 6am. A night worker is any worker whose daily working time includes at least three hours of night-time on the majority of the days they work and sufficiently often that it can be said they work these hours as a normal course.

A worker can be said to work at night *"as a normal course"* if they do so on a regular basis, for example as part of a rotating shift pattern that results in them working regularly during night-time. Young workers (e.g. workers who are above the minimum school leaving age but under eighteen) should not ordinarily work at night, although there are certain exceptions.

However, under the WTR the employer must offer night workers a health assessment at no cost to the worker before they start working nights and on a regular basis while they are working nights.

In many cases it will be appropriate to do this once a year, though employers can offer a health assessment more than once a year if they feel it is necessary. Workers do not have to take health assessment, but the employer must offer the opportunity of doing so.

There is good evidence to show that night work can result in impaired health, safety and welfare for the individual and causes the disruption of family and social life. In the short term, working shifts can cause:

- Changes in natural body rhythms, sleep disturbances;
- Increased physical and mental fatigue, stress and irritability;
- Disturbed eating patterns and poor diet;
- Use of alcohol and drugs to overcome the effects of shift work;
- Psychosomatic troubles, difficulties in family and social contacts;
- Concentration difficulties, errors and accidents.

The adverse effects of night work stems from the conflict between man's evolution as a diurnal species and the requirement to work at night. Life on earth has evolved in an environment subject to regular changes in the light/dark cycle. As a result, during the process of evolution, virtually all living organisms have developed a *"body clock"* that allows them to respond and anticipate environmental changes. Humans have approximately 24-hour "circadian" rhythms that occur in almost all physiological processes.

This internal *"biological clock"* helps control the sleep/wake cycle and, consequently, mental performance and alertness. It also controls a host of biological processes such as hormone production, immunological factors, blood pressure, core body temperature, cardiovascular parameters, response to certain medications, and mood and anxiety.

The problem with night shifts is that they coincide with the time of day when the biological drive for sleepiness is high and performance is low. For the night shift worker, the activity at night will be out of phase with the circadian body temperature and other coupled rhythms. In addition, because individual biological rhythms react to a time shift at different rates, each time the work schedule rotates, for a period of time after the time shift, the circadian system will be in a desynchronised state.

Some people can adjust to working a new shift, as long as the change is permanent. Such workers can get used to sleeping during daylight, and their circadian rhythm can adjust to the body's new sleep-wake routine. It is possible for the shift in circadian rhythm for permanent night shift work, to remain constant once the body has adapted, but although possible, recent research has indicated that only a small minority of *"permanent"* night workers show evidence of good adjustment.

For the majority of permanent night staff, their shift schedule may result in some partial adjustment over the span of nights worked, followed by readjustment to normal on rest days. For those shift workers who move between shifts, particularly the three-shift system, the change of shifts intensifies the severity of circadian disturbance, although a slow rotation schedule will aid circadian adaptation. This continual disruption of circadian rhythms is thought to underlie many of the problems associated with shift work.

The most obvious deviation from normal life for night workers is having to stay awake during the night and having to sleep during the day. Night workers typically get less sleep than their day-working counterparts (indeed, regular night work is associated with chronic sleep deprivation). Individuals have difficulty in falling asleep and remaining asleep because they are at odds with their body clock, and their sleep length is 15–20% that of day and afternoon workers, averaging 4–6 hours compared to 6–9 hours respectively.

In addition to being shorter than night sleep, day sleep is of a poor quality due to disruptions by frequent awakenings and deviations from the normal sleep pattern. In general, this will result in performance deficits, including increased variability in performance, slowed physical and mental reaction time, increased errors, decreased vigilance, impaired memory, and reduced motivation and laxity. Employees, who work night shifts, run an increased risk of being involved in a *sleep-induced road traffic accident*.

Sleep difficulties are also associated with increased chronic fatigue, anxiety, nervousness and depression, any or all of which frequently demand medical intervention. These consequences may be aggravated by working hours that are in excess of the normal 35–40 hours per week.

Gastrointestinal disorders are the most prevalent health complaints associated with night work. Up to 75% of night workers, compared to around 10% of day workers, complain of irregular bowel movements and constipation, heartburn, gas, and appetite disturbances. In many cases, these complaints eventually develop into chronic diseases, such as chronic gastritis and peptic ulcers.

There are probably several causes for gastrointestinal disorders in shift workers, including dietary and lifestyle factors as well as circadian disruption. In addition to eating at unusual times, the lack of eating facilities during the night shift may be responsible for a change in diet. Night workers' meal times are in conflict with the circadian rhythms of their digestive system.

Recently it has been found that the factors contributing to the formation of peptic ulcer disease include:

- Sleep loss and disruption;
- Psycho-social stress;
- Meal skipping and changes in the digestive system cycle.

It is generally accepted that cardiovascular disorders are caused by shift work; (40% greater risk than day workers). As a group, shift workers demonstrate increased cardiovascular risk factors for example, gastrointestinal symptoms, sleeping dysfunction, smoking, and poor working conditions found in many industrial environments.

Night shift work can also result in increased blood pressure and heart rate, cholesterol, and alterations in glucose and lipid metabolism, all of which may be a factor in the development of heart disease. There is accumulating evidence of an increased incidence of symptoms of nervous disorders amongst shift workers, developing into mental illness.

Chronic fatigue may possibly lead to reduced stress tolerance, irritability and depression. One study reported a reduction in the average onset period for mental illness in shift workers. Such disorders and resulting illnesses often lead to problems with social and family relationships.

Menstrual disorders - It is not surprising, given that night shift work disrupts periodic or cyclic functions, such as sleep and digestion, that some studies report a link between shift work and disruption of the menstrual cycle. These effects include irregularities in cycle length or pattern, increased spontaneous abortions, and lower rates of pregnancies and deliveries. Shift work has also been associated with premature delivery and lower birth weights.

However, some studies have noted those female shift workers' reports of subjective health alertness, and sleep difficulties improved after the age of 50, whereas the opposite was true for males.

Other illnesses - certain health conditions, such as asthma, diabetes, epilepsy and depression, may be made worse by shift work. Working irregular hours depresses the immune system and makes the body more vulnerable to disease. Women who work night shifts could be at greater risk of breast cancer, but the evidence is as yet not clear-cut.

Drug and alcohol use - studies indicate that, compared to day workers, certain groups of shift workers use more alcohol, caffeine and nicotine, possibly to help them stay awake. Other study results show that some groups of night workers report using more over-the-counter and prescription sleeping pills than day workers.

Using alcohol or medicines to help sleep simply makes the problems worse. They do not help the body clock to adjust to the new time pattern, the sleep they induce is of a different quality to natural sleep and many find that it is not as refreshing. Taking medication long term is not a good idea.

Social and family stress - shift workers usually have less time to spend with their family and friends. They are often at work when regular social activities are scheduled and at home when others are at work, and consequently may spend less of their time off involved in social or recreational activities. Night work, evening work, and irregular schedules often make it difficult for shift workers to fulfil parenting and social responsibilities — working the second shift (late afternoon/evening) is usually the most disruptive for family relationships.

Fatigue may also prevent shift workers from enjoying such activities. Shift workers who are parents, frequently experience additional stress from childcare responsibilities and may have shorter and more frequently interrupted day time sleep periods — they report greater tiredness than other groups of shift workers. Irritability and generalized fatigue can compromise marital relationships. There are higher divorce rates reported for shift workers than for day workers.

Accidents and injuries - shift work can lead to sleepiness and decreased performance, alertness, perception and decision-making ability. A large body of research shows that rotating shifts and sleep loss lead to mistakes, dips in attention, delayed reactions, accidents in the workplace, road accidents, reduced productivity, and difficulties in communication.

Industrial injuries show some clear trends associated with features of shift systems. The risk of injuries is some 30% higher on the night shift than on the morning shift, and, surprisingly, is highest at about midnight after which it decreases until the end of the shift.

There is a substantial rise of about 45% in the risk of injuries over a span of four successive night shifts, and the risk also increases over prolonged duty periods — it is doubled in the eleventh hour on duty compared to the average for the first eight hours.

Aggravation of medical disorders - due to circadian rhythms in metabolic parameters, the effectiveness of many medications varies with the time of day the medication is taken. Irregular work schedules may interfere with its effectiveness, also workers with irregular schedules lack consistent routines, making it difficult to remember to take medications.

RISK ASSESSMENT - risk assessments for shift work need to identify the hazards and assess both the risks from the process and the risks from shift work, together with the risks (particularly the increased risk of accidents) arising from fatigue and the mismatch of circadian rhythm with the work. Techniques that can be used to identify hazards include:

- Investigating employee complaints, examining accident and sickness records;

- Conducting employee surveys, environmental and medical monitoring;
- Assessing expert reports, Reviewing scientific and medical literature; and
- Incident, injury and illness investigation.

These factors need to be considered when assessing the risks posed by the hazards associated with shift work include the:

- Type of work and the equipment being used and the workload of employees;
- Personal needs and work experience of employees;
- Special circumstances on the site and shift pattern.

Work which is physically or mentally demanding, monotonous or requires high vigilance can lead to fatigue which will be worsened by night work. The Health and Safety Executive (HSE) has published a report called Validation and Development of a Method for Assessing the Risks Arising from Mental Fatigue. Where shift work involves working alone at night, and if the workers may be vulnerable to violence from customers, residents and inmates, a risk assessment covering these risks should be carried out.

CONTROLS - shift work should be controlled in the same way as work hazards, i.e. based on a hierarchy of controls. If possible, the hazard should be eliminated, if this is not possible, other ways of organising work should be found that reduce the need for shift work. Shift schedules that are based on ergonomic and medical recommendations should be adopted.

Some individuals cope far better with night work than others, but the use of personality tests to predict who will, or will not, successfully tolerate shift work has met with only limited success. The measures currently available are clearly insufficient to successfully select tolerant individuals with any accuracy.

The HSE recommend a *"best practice"* management approach towards minimising the impact of shift work, which includes:

- Careful planning of shift rostering taking into account knowledge of the effects of biological rhythms;
- Education of shift workers on sleep routines, nutrition, exercise and the effects on family and social life;
- Environmental design changes, especially those aspects which can improve alertness such as temperature, lighting and comfort levels;
- Providing medical advice for shift workers, especially for those with existing medical conditions; and
- Consultation *in good time* with safety representatives in accordance with the Safety Representatives and Safety Committee Regulations 1977 – Regulation 4A.

Shift design - no clear-cut conclusions have been reached as to which night-shift systems are least harmful. The European Foundation for the Improvement of Living and Working Conditions advocate the following tentative proposals, which are as follows:

- Minimise permanent nights, work only 2–4 shifts in succession on permanent nights;
- Avoid short intervals between two shifts, with at least 24 hours, and preferably 48 hours, between sets of night shifts, some weekends should be completely free;
- Avoid compressed working periods (i.e. of eight or more continuous working days), relate the length of the shift to the task to be performed, consideration should be given in making the night shift shorter than the other shifts;
- Forward rotation (mornings, then afternoons, then nights) is preferred for continuous shifts, make regular rotas;
- Allow some opportunity for swapping shifts and changing handover times and allow a return to regular day work without penalty, especially for older workers;
- Avoid short-term rota changes for operational reasons, consulting with safety reps in good on any changes in shift patterns;
- Employers should involve shift workers in designing shift schedules; and
- Employee education and instruction.

Shift workers should be advised on how to cope on a personal level with the demands of the job, including advice on dealing with sleep problems, guidelines on eating, on shift work, rules for physical fitness and for maintaining social contact. Basically, the advice is to follow as conventional, regular and moderate a lifestyle as the circumstances allow.

In particular, the employee should be given information on the following:

- How to recognise the symptoms of poor health that may be related to shift work;
- How to control shift-work hazards and the workplace factors that can be used (e.g. by using organisational controls, shift scheduling and workplace design);
- How to ensure that sleep is good quality sleep (by protecting sleep periods in maintaining regular rest and wake routines, avoiding exercising for two hours before going to bed, keeping light out of the bedroom, disconnecting the phone, ensuring a quiet sleeping area and not taking alcohol or sleeping pills to aid sleep;
- Eating nutritious meals, keeping a regular meal routine and selecting meals rich in carbohydrates, rather than heavy, fatty, high protein meals, before bedtime;
- Ensuring that family and friends understand the potential harmful consequences of shift work;
- Adjusting family and social life to spend sufficient time with family and friends;
- Maintaining physical fitness;
- Learning strategies for remaining alert while on the job, for example by not getting too comfortable or too warm;
- Work and workplace design;

Workplace design can be used to improve conditions for shift workers by:

- Reducing night traffic, noise and distractions;
- Keeping work and traffic areas brightly lit, and reducing glare and reflective surfaces;
- Maximising health and safety controls, for example by providing good ventilation, temperature control, machine guarding and limiting exposure to harmful chemical and biological substances;

- Avoiding isolating workers (communicate regularly with employees working alone);
- Providing food preparation areas if a cafeteria is not available (e.g. a fridge and a microwave oven) and rest facilities (some exercise facilities could be provided);
- If shift work has to be carried out the task should be designed to minimise adverse effects, for example as follows;
- Avoid the scheduling of hazardous jobs at night and those involving intense and continuous mental attention and effort, monotonous operations in dimly lit environments, and/or complex work procedures;
- Limit where possible, intense physical labour and intense, continuous, mentally demanding tasks to no more than eight or nine hours;
- Rapidly rotate shifts for jobs involving intense mental effort (8-hour shifts are better than 12-hour shifts for such jobs;
- Limit shift work to essential jobs;
- Use slowly rotating or permanent shifts for work involving sustained eye-hand co-ordination and intensive physical effort. This provides a greater chance for workers to adjust and remain alert. Experts recommend maintaining this shift schedule for at least three or four weeks;
- Organise workloads so that the toughest and most dangerous tasks are completed early in the shift, with less demanding tasks scheduled for late in the shift;
- Adjust the workload during the shift to prevent boredom;
- Ensure that supervision is effective, particularly when accidents are more likely, e.g. between 2:00am and 5:30am when performance is at its lowest;
- Ensure that shift workers have access to adequate meal facilities, night-shift meals should be light, nutritious and easy to digest;
- Allow adequate meal and rest breaks, for example two short breaks and a meal break for each night shift;
- Arrange safe travel to and from work at unusual hours; and
- Monitor workers for changes in their performance, and check for health complaints.

HEALTH ASSESSMENT - In order to fulfil the requirements of the WTR for the provision of health assessments for night workers, the employer will have to decide how to conduct the health assessment, how often to offer the opportunity for a re-assessment, and what and how records should be kept.

The purpose of health assessments is to determine whether a worker is fit to carry out the night work to which they have been assigned. Workplace hazards are unlikely to change at night, but risks arising from night work may be greater due to the effects of the circadian rhythm, tiredness due to sleep disorders and also certain medical conditions. In practice, only a few workers are permanently unfit to work at night. There are, however, a number of medical conditions that may be made worse by night work.

These include:

- Diabetes (particularly where treatment with insulin is required on a strict timetable);
- Some heart and circulatory disorders (particularly for work that requires severe exertion or physical stamina);
- Gastrointestinal disorders (particularly ulcers and conditions where the timing of a meal is important);
- Medical conditions affecting sleep;
- Severe nervous disorders (in particular chronic anxiety and depression);
- Pregnancy (particularly if there is a known risk of miscarriage, i.e. in the first three months of pregnancy)
- Some chronic chest disorders where night-time symptoms may be troublesome
- Other medical conditions that require regular medication on a strict timetable (i.e. epilepsy).

Young workers should not ordinarily work at night, but there are certain exceptions. In the case of these exceptions, special consideration should be given to the suitability for night work of young workers particularly taking into account their physique, maturity and experience. The WTR do not prescribe procedures for carrying out health assessments. There are numerous options by which the employer can fulfil this requirement.

As a minimum, employers can use a screening questionnaire specifically devised for their circumstances, or arrange a health assessment by a health professional.

Screening questionnaires - these should be compiled with the guidance of a qualified health professional, such as a nurse or doctor who understands how night working might affect health. The questionnaire should explain its purpose and take into account the type of work that will be done and ask whether the worker suffers from any medical conditions, such as those listed earlier in this article, and which might affect their fitness to work at night.

People trained to interpret the information should screen the responses to the questionnaires to identify workers with conditions that may be affected by night work. Where the responses raise any doubt about any worker's fitness to work at night, that individual should be examined by a suitable health care professional to ascertain whether they are fit to carry out the night work in question.

Assessments by health professionals - the employer can use a variety of health professionals to carry out health assessments. They can use their own occupational health service, or they can arrange for employees to see their own GP, a local occupational health service or a local GP practice.

Frequency - under the WTR the worker is entitled to the opportunity of a free health assessment at regular intervals, but the WTR does not define how frequent this should be, presumably because this will vary between individuals dependent on their health and age and on the nature and duration of the night work. The employer should be guided by the opinion of the health professional.

Records - employers need to keep adequate records that show they have complied with their duty to provide health assessment. These records must be kept for two years.

Conclusion - night shift work has adverse effects, as illustrated in a recent survey Stepping Stones, Careers of Nurses in 2003, which found that rigid shift systems were a likely reason for nurses leaving their jobs.

A junior sister said "It's not just the constant changing from earlies to lates to nights and the tiredness and trouble concentrating on things that it brings, it's the sense that you are out of step with everyone else". Clearly there is a strong case for optimising the design of the system to minimise such adverse effects.