

Shift work, health, the working time regulations and health assessments

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Shift work and night work in particular have been associated with sleep difficulties, general malaise, fatigue, peptic ulceration, ischaemic heart disease, cigarette smoking and adverse pregnancy outcome. The medical conditions previously regarded as making individuals unsuitable for shift work show wide ranging patho-physiological activity and there is no published evidence for any such condition to be regarded an absolute reason to exclude an individual from shift work. The fulfilment of the legal obligations of the Working Time Regulations 1998 is neither prescribed nor constrained in any way. It is advisable therefore to build on existing health procedures where they are in effect. Periodic health questionnaires can offer health professionals an opportunity to detect any disorder likely to be aggravated by shift work or by a combination of shift work, job demands and workplace conditions. A further purpose of the questionnaire is the assessment of ability to undertake shift work duties. However, health questionnaires are neither sensitive nor specific enough to be used to select applicants or employees for shift work, since they do not consistently predict tolerance of shift work or subsequent health problems. Whether employers should offer anything more than a simple questionnaire will depend on the culture of the company and accessibility of health services. Screening programmes affect many people relative to the few who benefit and with existing knowledge, periodic general health examinations performed in asymptomatic subjects have limited predictive or preventive value.

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INTRODUCTION

This paper reviews the recent biomedical literature in relation to shift work and health and outlines the health requirements of the Working Time Regulations 1998 to provide a rational evidence-based foundation for assessing the health risks and providing a possible approach to fulfilling legal requirements.

The suprachiasmatic nuclei of the hypothalamus¹ control circadian rhythmicity of physiological, biochemical and psychological parameters. Shift work alters the normal circadian rhythmicity giving rise to concerns regarding health and well-being. Of the working population in developed countries, 20–30% perform shift work^{2–4} and it has been stated that around 20% of recruited workers leave shift work, mainly for social reasons.⁵ Shift work has become more commonplace^{6,7} due to business

demands, competition and technological change.⁸ Whereas some people are temperamentally intolerant of any type of shift work, other workers' tolerance of shift work depends on various factors that affect work–home life balance. There is evidence that acceptance of shift work is associated with motivation,⁹ employee involvement in shift design¹⁰ and individual control over the shift pattern worked.¹¹

SHIFT WORK AND HEALTH

The following sections summarize briefly the conclusions of the two UK Health & Safety Executive commissioned critical and authoritative reviews of shift work and health^{5,12} and bring these up to date in light of subsequent research. Whereas previous reviews examined closely the effects of shift work on health, they did not treat the effect of pre-existing health problems on shift work in a similar fashion. There have been many subsequent studies of the effects of shift work on health, but

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the effects of pre-existing medical conditions on ability to perform shift work remain under-researched. In the following sections the previous reviews are updated by original research that has been published from 1991, following the most recent UK Health and Safety Executive commissioned review. Any studies that were published in 1990 yet not cited in previous reviews are also included. A literature search used *Medline* and *EMBase* to identify original studies published in peer reviewed scientific journals. The objectives of this review were to determine those health conditions associated with shift work previously, those new health effects reported subsequently and to examine and update the evidence for any proposed health effects.

EFFECTS OF WORK ON HEALTH

Mortality and morbidity

It is just over 20 years since the first scientific and critical review of shift work health effects concluded that there was no evidence of increased mortality in shift workers.⁵ There remain few studies of overall mortality in shift workers. However, morbidity studies using sickness absence records show that shift work has no adverse effect upon overall morbidity.^{13,14} However, there is substantial evidence that specific diseases are more prevalent in shift workers.

Gastro-intestinal disorders

There has long been good epidemiological evidence linking gastric and duodenal ulcers with shift work.⁵ Subsequent reviews confirmed this association and cited possible reasons as alcohol intake, caffeine and smoking (though consistent patterns had not been demonstrated), altered eating habits and disruption of circadian rhythm of gastric acidity.^{12,15} Later studies explored these potential contributing factors. Five studies confirm that smoking is more prevalent among shift workers^{16,17,19-21} The evidence that shift workers consume more alcohol^{19,22} and caffeine remains equivocal.^{23,24}

That the association between shift work and gastric and duodenal ulcers is well-established probably explains the relative paucity of new research. One major study of 1.8 million subjects demonstrated an increased standardized hospitalization ratio (SHR) for gastric ulcer as shown in Table 1.

Two studies explored new potential areas. One small study demonstrated more prolonged periods of low intra-gastric pH in shift workers *vs.* healthy controls.²⁶ Food intake raised pH in both groups, emphasizing the

importance of dietary advice in ulcer prevention. This latter point is particularly important since food intake is redistributed according to shift pattern, with reduced intake during the night shift.²⁷ Another study associated shift work with increased positive serology to *Helicobacter pylori*, although not with ulcer or non-ulcer dyspepsia.²⁸ However, positive serology to *Helicobacter pylori* is common, occurring in 27-42% of those of working age^{29,30} and further studies are required to determine whether this association is significant.

Metabolism and nutrition

Previous reviews have not focused on metabolism and nutrition other than to speculate on body mass as a possible contributor to ischaemic heart disease and irregular meal times as a possible contributor to peptic ulceration.¹² Since then, studies have examined body mass, nutritional parameters and metabolism. On balance, shift work probably does not affect body mass and studies of dietary intake are supportive of this. Two studies demonstrated no effect on body mass index,^{23,31} whilst one study reported obesity in night workers³² and another reported marginally raised body mass index in shift workers.³³ Studies of dietary intake in different shift patterns,³⁴ stage of shift cycle²⁷ and between day workers and shift workers,^{22,23} show no difference in 24 hour dietary or nutritional parameters. There are inconsistent findings in relation to serum triglyceride. Serum triglyceride was elevated in shift workers in one study,²² in night workers in another³⁵ but a third study found no association.²³ Such different observations may be due to circadian rhythms and redistribution of food. Four studies confirm that there is no association between shift work and serum cholesterol when controlled for weight.^{22,23,36,37}

Cardiovascular disorders

No excess cardiovascular morbidity was demonstrated at the time of the first critical review,⁵ although there had been few good epidemiological studies. Later reviews concluded that although early studies failed to demonstrate an association, more recent and better designed studies did link shift work with cardiovascular disease.^{12,15} The relative risk for ischaemic heart disease in shift workers was accepted as being around 1.4. Five recent studies confirmed an association between shift work and ischaemic heart disease,^{21,36,38-40} whereas only one did not.⁴¹ In the latter, the authors noted that workers with poor cardiovascular health may be under represented among shift workers due to health selection out of shift work. The relative risk of ischaemic heart disease in shift workers lies between 1.3 to 1.7 when adjusted for other risk factors.^{21,36,38} The risk is increased by the presence of other risk factors. The relative risk for 'shift work + obesity' is 2.3 and for 'shift work + smoking' is 2.7.⁴⁰ Previous evidence suggests that ischaemic heart disease increases progressively with the number of years spent shift working.¹² In subsequent studies, one small study found no such association,⁴¹

Table 1. Standardized hospitalization ratio (SHR) for gastric ulcer in different shift workers²⁵

Work schedule	SHR
Any type of non-day work	130
24-hour rosters	147
Late evening work	236

Table 2. Standardized hospitalization ratio (SHR) for ischaemic heart disease in different shift workers³⁸

Work schedule	SHR
24-hour rosters	174
Frequent night and early morning work	193
Late evening work	216
Other types of irregular work	172

whereas a much larger study did.³⁹ The relative risk of ischaemic heart disease increases with age²¹ and with more time spent working at night. The SHR for ischaemic heart disease is shown in Table 2.

Whereas previously it was thought that the increased risk may be attributable to increases in body mass, blood pressure, smoking, stress or serum lipids,¹² there is now a significant body of evidence to confirm an increased risk of ischaemic heart disease in shift workers that is independent of other cardiovascular risk factors. Nonetheless, shift workers compound this independent risk by exercising less^{17,18} and smoking more.

Blood pressure

Few reviews discussed blood pressure beyond speculating that it may contribute to cardiovascular disease in shift workers.¹² Studies were few and investigated different groups and outcome measurements.¹⁵ On balance, recent studies present no evidence of any association between shift work and hypertension.¹³ Blood pressure is higher in the working phase irrespective of time of day,⁴²⁻⁴⁴ since the circadian rhythm tends to depend on the sleep wake cycle more than endogenous rhythm, although individuals differ.⁴⁵ Circadian, individual and situational variability in blood pressure, varying shift patterns and lack of methodological standardization result in studies producing varied results. Small studies have investigated shift pattern⁴⁶ and years on shift⁴⁷ but these studies have methodological problems such as small study size and no conclusions can be drawn. A larger study revealed higher blood pressure in subjects working 2×8 shift patterns.³⁵ It is difficult to accept that one type of shift pattern should contribute to elevated blood pressure. In two studies where blood pressure differences were observed between different shift patterns, there were noticeable differences in work activity and stress.^{48,49} These factors were more likely to explain the differences in blood pressure rather than shift pattern *per se*.

Smoking

Limited data in previous reviews suggested that shift workers were more likely to smoke than the general worker population. Five recent studies confirm an association between shift work and smoking.^{16,17,19-21} The excess prevalence of active smokers among shift workers as compared with day workers is between 6%¹⁶ and 8-11%.²¹ Night shifts longer than 8 hours¹⁹ and low work site social support⁴⁹ are also associated with increased smoking.

Mental health

There are three discrete areas of interest regarding the mental health effects of shift work: (1) minor medico-social complaints; (2) sleep disturbance and (3) psychoneurotic disorders.

General malaise, fatigue and minor medico-social complaints are established consequences of shift work.^{5,12} Subsequent studies have confirmed the association with minor medico-social complaints.^{50,51} Organizational factors including the lack of supervisor social support,⁵² longer shifts^{13,53} and shift pattern⁵⁴ are as important as shift work *per se* in contributing to general malaise and fatigue.

Sleep disturbances and the effects of ageing among shift workers are known.^{5,12} Five recent studies confirm sleep disturbances including frequent insomnia, frequent use of hypnotics, sleep deprivation and daytime sleepiness.⁵³⁻⁵⁷ The effects of ageing include reduced melatonin levels,⁵⁸ increased alertness earlier in the day or 'morningness',⁵⁹ reduced sleep length,^{59,60} problems adjusting to shift work⁶¹ and increased use of hypnotics/tranquillisers.⁵⁶ Studies of gender effects show inconsistent results,^{62,63} or no effect.⁶⁴ There is no consistent evidence regarding coffee consumption,^{23,24} there being much individual variation as confirmed by a study which observed that only some workers used caffeine at the start of a night shift to maintain alertness.⁶⁵

There have been few good studies of psychoneurotic disorders among shift workers and no increased morbidity has been reported previously.^{5,12} Workforce characterization differences, variability in shift patterns and lack of standardization of methodology and outcome measurements (*e.g.*, using different questionnaires) account for varying outcomes in studies. Few recent studies associate shift work with the onset of mental disorder⁶⁶ and the use of anti-depressants,⁵⁷ while other studies report no effect on mental health.^{18,50} Furthermore, studies using depression scales demonstrate no difference in depression between day workers and shift workers.^{67,68}

On balance, aspects of shift work contribute to minor symptoms of psycho-social disturbance and sleep disorders, but the balance of evidence is that there is no increased risk of psychoneurotic disorders.

Reproductive health

Only in a more recent review has it been regarded prudent to consider poorly designed rotating shift work to be a risk factor in pregnancy.¹⁵ Pre-term birth, low birth weight and spontaneous abortion are associated with shift work.^{15,69} More recent studies implicate working hours as a factor in menstrual cycle disturbance⁷⁰ and subfecundity.^{71,72} A further study demonstrated increased risk of subfecundity associated with long working hours, but not with shift work.⁷³ New studies confirm a link between shift work and adverse pregnancy outcome with adjusted odds ratios in shift workers of 2.1 for low birth weight and 2.0 for pre-term birth.⁷⁴ Two studies associate shift work with pregnancy loss that is greater than the norm when more time is spent working

late evening and at night.^{75,76} Pre-eclampsia has also been reported to be increased twofold in shift workers.⁷⁷

EFFECTS OF HEALTH ON WORK

The medical conditions that have been associated with intolerance of shift work are all relatively common disorders. Each of these disorders shows wide ranging patho-physiological and symptomatic activity between and within individuals. No published evidence supports the consideration of any medical condition as an absolute reason for exclusion from shift work. Each employee or job applicant therefore merits individual assessment of fitness for work.

Diabetes mellitus

The overall prevalence of insulin-dependent diabetes mellitus in the UK is around 3.5 per 1,000 persons.⁷⁸ The prevalence of diagnosed and undiagnosed non-insulin dependent diabetes mellitus (NIDDM) is around 2–4%.^{79–81} Although diabetics are more likely to report shift work problems,⁸² there is no reason why a diabetic on insulin and with a responsible attitude towards their employment should not do shift work.^{78,83} Sensible and well-motivated diabetics should be capable of manipulating their insulin dosage, especially if they monitor their blood glucose levels and use multiple insulin techniques. Indeed, studies have shown that insulin treated diabetics who work shifts have similar control to non-insulin treated diabetics^{83,84} and that diabetic control is similar whether working days or shifts.⁸⁴ Changes in lifestyle, diet and medication can minimize the adverse effects of shift work;⁸⁵ however, short shift cycles may present difficulties with control. Diabetic employees should be encouraged to have regular reviews with their general practitioner and/or specialist.

Peptic ulceration

The prevalence of peptic ulcer disease is around 6% in adult males. Environmental factors such as current smoking, high stress levels and regular analgesic use appear to be better predictors of peptic ulcer disease than family history.⁸⁶ Previous advice was to counsel those with peptic ulceration against shift work.^{5,12} There is no published corroborative evidence for such advice and revolutionary advances in the treatment of peptic ulceration since the initial review, *i.e.*, H₂ antagonists, proton pump inhibitors and *Helicobacter pylori* eradication treatment make such advice insupportable. Peptic ulceration is not a reason to exclude an individual from performing shift work in light of modern drug therapy.⁸⁷

Epilepsy

The prevalence of active epilepsy is around 5–10 per 1,000 persons, the major type being tonic-clonic seizures.^{88,89} In nocturnal epilepsy, seizures are common just prior to waking and there is no firm evidence of

change in seizure frequency with shift work. Indeed many people with well-controlled epilepsy work rotating shift work without problems. However, sleep deprivation is a precipitant of seizures for some individuals⁸⁸ and such individuals should be monitored more closely. Previous advice that epileptics should be selected out of⁵ or counselled against shift work¹² cannot be defended in light of the lack of evidence of significant risk and modern law, *i.e.*, Disability Discrimination Act 1995.

Asthma

Asthma affects about 5% of the adult population. Respiratory physiology demonstrates a circadian rhythm with a morning dip around 4.00–5.00 am.^{90–92} There is greater diurnal variability of peak expiratory flow rate in asthmatics,⁹³ which becomes more exaggerated with increasing age.⁹⁴ A few asthmatics may have difficulty adapting to rapidly changing shifts, but in general, shift work should not be a problem because circadian rhythms depend on sleeping patterns rather than time of day.⁹⁵ Indeed, sleep deprivation can improve peak expiratory flow rate in nocturnal asthmatics.⁹⁶ It is possible to determine whether changes in work schedule affect an individual's degree of symptoms. Circadian variation in lung function can be demonstrated easily and reliably by serial peak expiratory flow rate measurements,^{97,98} increased diurnal variation reflecting worsened control and increased airways reactivity.^{99–102} Responses to manipulations of drug or dosage can be monitored similarly¹⁰³ and may assist assessment of compatibility of drug and shift pattern.

Ischaemic heart disease

Five per cent of the population have known coronary heart disease¹⁰⁴ and around 25% of men are at increased risk of ischaemic heart disease.¹⁰⁵ Whether employees who suffer from angina can tolerate shift work will depend on whether aggravating factors are present in their work activities. Factors such as emotional stress, physical activity and exposure to the cold as well as occupying safety critical positions will guide the occupational physician with regard to the advice that is given to the employee and management. For employees who are fit to return to work after sickness absence, if individuals have tolerated shift work before developing symptomatic heart disease, then returning to the same job may be the least stressful option, if social support is provided by familiar colleagues.¹⁰⁶

Psychoneurotic disorders

The incidence of depressive disorders is around 1–2 per 1,000 for men and three times this figure for women.¹⁰⁷ Circadian mood variation occurs in healthy subjects¹⁰⁸ and is exaggerated in depressive disorders. Although sleep problems are a feature of depression, sleep deprivation improves mood in about 60% of patients with major depressive disorder. The improvement is transient and relapses can be prevented by bringing forward the time

of going to sleep, then gradually shifting back to the normal sleep time.¹⁰⁹⁻¹¹¹ Whether such observations in controlled clinical studies are relevant in the workplace and to shift patterns in particular is unknown. Drowsiness is no longer an inevitable consequence of treatment now that drugs other than tricyclic antidepressants are available. Whatever drug is used, careful supervision is needed until the employee is stabilized on an effective and suitable treatment regime.

Chronic fatigue syndrome

Chronic fatigue syndrome is a complex condition, the manifestation of which is most likely influenced by pathophysiological, psychological and social factors. Management of individual cases is also likely to be complex, particularly where working shifts is not by choice. Whether an employee who has chronic fatigue syndrome can manage to work shifts will depend on the perceived severity of symptoms and response to management of the condition. In general, however, long working hours and rapidly rotating shift patterns are inadvisable or at least require careful medical supervision until recovery is complete and sustained.¹¹² Consideration of fitness for work should be based on the individual case history and job analysis to identify other work stressors such as strenuous physical or mental activity.

Pregnancy

Some women remain perfectly healthy during pregnancy and many will experience a wide range and degree of minor symptoms that affect quality of life. Where pregnancy affects sleep and energy levels, motivation for shift work is likely to be affected. Symptoms should be defined along with any relationship to work. The most important role that the occupational physician has to play is to ensure that the work that is undertaken does not present any adverse risk to the pregnancy. Activity levels, working hours and shift pattern should be assessed throughout pregnancy and particularly in the third trimester. In some cases, medical complications of pregnancy may require work restrictions.⁶⁹

Medication

Drugs that cause drowsiness or affect performance may add to the tiredness and impaired performance that is associated with shift work. The absorption, elimination and pharmacological effect of some drugs is dependent on circadian rhythms, *e.g.*, amitriptyline levels are higher after a morning dose than an evening one. Likewise steroid treatment is best given in the morning after the diurnal peak of ACTH. However the relevance of medication regimes to shift work is not known.¹¹³ Circadian rhythm is affected by the sleep wake cycle and those working rotating shifts may require manipulation of dosage schedule or change of medication. This may be an issue in control of conditions such as hypertension, asthma, epilepsy and diabetes. Obviously, manipulation of medication is the responsibility of the employee's general practitioner or hospital specialist. It is important that

there is clear two-way communication of any issues to ensure that the employee receives the drug regime that is suited personally to the individual and the shift pattern worked.

There is much interest in melatonin for the treatment of rhythm disorders that occur in shift work.¹¹⁴⁻¹¹⁶ Melatonin is a neurohormone produced by the pineal gland mainly at night.¹¹⁷ The hormone appears to have a direct hypnotic effect as well as producing circadian phase shifts.^{58,118} Although not licensed as a drug, melatonin is widely available in some countries and in products that are not always of pharmaceutical quality.¹¹⁵ The optimal dose of melatonin is not known and most studies have produced blood levels higher than physiological blood levels.¹¹⁹ Three recent studies have shown no significant clinical benefit from administering melatonin to shift workers.¹²⁰⁻¹²² Melatonin has not undergone the usual clinical trials and safety data is needed before melatonin can be recommended for long term use.^{118,123-125}

LEGAL

The European Union Working Time Directive lays down minimum health and safety requirements for the organization of working time. It is implemented in the UK as the Working Time Regulations 1998 (SI 1998/1833) and became effective on 1 October 1998.

In the UK, the Regulations apply to any worker whose daily working time includes at least three hours of night time which is further qualified by one of three conditions, *viz*:

- on the majority of their working days;
- on a proportion of the days they work, an issue subject to agreement between employer and employees and
- sufficiently frequently that they may be said to work such hours as a normal course.

The latter situation arises when, for example, a worker is on a regular rotating shift pattern as opposed to a situation in which they may provide cover for someone else on an infrequent or *ad hoc* basis. This definition might be seen to extend the Directive but this is not so. The scope of application is equivalent to that set out in Article 2 of the Directive. The Regulations merely give a basis for agreeing definitions of the scope locally, thus maintaining maximum flexibility.

The Regulations also enact the requirements of Article 9 of the Directive, which is the requirement to provide free health assessments. The description 'free' is almost a throw back to some of the earlier Factories Acts legislation which required medical examinations which were without cost and did not incur loss of earnings for the employee.

The Regulations also enact the Young Workers' Directive which provides for free health assessments for young

people aged 16–18 years who work between the hours of 2200 to 0600. This gives a clearer definition of the requirement but appears again to be reminiscent of earlier paternalistic approaches to so-called vulnerable groups of workers.

The health assessment must be provided on assignment and at regular intervals thereafter. Supporting guidance suggests annually as a rule of thumb but there is little justification for this frequency. Both the Regulations and guidance remain unclear or at least equivocal, about the process, content, frequency and, indeed, grounds for transferring workers from night/shift work. It is this that has prompted us to write this review.

The purpose of the health assessment is to determine fitness for night duty. That decision making will be helped by the risk assessments made under the Management of Health and Safety at Work Regulations 1992. What is not clear is under what circumstances is it permissible to decide that an employee is no longer fit to continue night/shift work. We believe that it is essential that such criteria are decided early on in the implementation of these Regulations and are established on the basis of the evidence outlined above. Given that consideration will have been given to the issue, we believe that most established criteria will at least be defensible provided they are linked to both medical evidence and workplace situation. If they are to be relied upon, then it is essential that these are established early.

Removal from night or shift work requires certification by a doctor that the employee is suffering from health problems connected with their work at night or on shift. It is sufficient that the problems are related to work patterns, not necessarily consequential. The situation is not simply academic since these cases will also interact with the Discrimination Act 1995.

When an employee develops a condition that places him or her under the protection of the Disability Discrimination Act 1995, employers will be under a legal obligation to make reasonable adjustments to the employee's working conditions. This might include changes to worker's hours. The outcome of this process of reasonable adjustment should redress any disadvantage arising from the development of a disability and the requirement to undertake night/shift work. In essence, therefore, it is an attempt to retain the individual in the workforce.

Lastly, the Working Time Regulations may become important in future litigation surrounding personal injury. We have seen an increase in the number of claims based on occupational stress as a cause of personal injury. These Regulations are now explicit about workload in terms of time and though not yet applying to certain groups such as junior hospital doctors, may nonetheless be able to facilitate further litigation as previously in *Johnstone vs. Bloomsbury Health Authority* [1989].

The remainder of this paper will outline some issues in the frequency and content of the health assessments required by the Regulations.

HEALTH ASSESSMENTS

Health assessments offer health professionals an opportunity to detect any disorder likely to be aggravated by shift work or by a combination of shift work, job demands and workplace conditions. Detection may be at an early or pre-symptomatic stage and thus intervention might arrest progression of the disease. High risk lifestyles — smoking, excessive alcohol, unhealthy diet and lack of exercise — that affect the health risks of shift work can also be detected, creating the opportunity for lifestyle counselling. Under these Regulations an additional purpose of the assessment is the determination of ability to undertake shift work duties.

There is no prescribed procedure within the Regulations for conducting the health assessment that has to be offered to night workers. A screening questionnaire should be a sensitive and efficient method of performing the required health assessment. However, health questionnaires are neither sensitive nor specific enough to be used to select applicants or employees for shift work. Circadian questionnaires do not consistently predict tolerance of shift work^{126,127} nor do individual differences in neuroticism, morningness, *etc.* predict subsequent health problems.¹²⁸

The health questionnaire should examine mental health as well as physical health. Mental health problems are the second most common cause of reported work-related ill-health after musculoskeletal disorders. Furthermore, emotional health problems are reported to be a more important cause of disability in adults of working age than all physical health problems put together.¹²⁹ However, there is insufficient evidence to recommend for or against the routine use of standardized depression questionnaires to screen asymptomatic subjects.¹³⁰ Properly constructed questionnaires detect with reasonable accuracy excessive alcohol intake¹³¹ and cardiovascular risk by exploring personal and family history of coronary heart disease, stroke, diabetes, smoking, alcohol use and exercise history.¹⁰⁵ Questionnaires¹⁰⁵ especially when combined with body mass index¹³² or waist:hip ratio^{132,133} are strong predictors for risk of ischaemic heart disease. Waist:hip ratio may be a better predictor of the sequelae of adult obesity than body mass index.¹³⁰

SCREENING TESTS

Whether anything more than a simple questionnaire is offered as part of the health assessment for night workers depends on the culture of the company, existing plans, policies and benefits, the presence of other risks and access to occupational health services. It is not the aim of this paper to review screening tests, but it is worth summarizing current opinion, in light of the interest generated by new legislation. Screening programmes affect many people relative to the few who benefit¹³⁴ and with existing knowledge, periodic health examinations performed in asymptomatic subjects and without clearly defined objectives have limited prophylactic value.^{135,136}

Of commonly performed procedures, most advocacy groups only recommend blood pressure measurements every two years and weight measurements every four years. Laboratory and other tests are not generally advised for asymptomatic adults. Such tests as cholesterol, urinary glucose,^{79,137,138} blood glucose,^{81,139–141} serum GGT,¹³⁰ resting ECG^{130,142} and exercise ECG^{130,143,144} are not of sufficient predictive value to be suitable for mass screening. Furthermore, recent studies show little clinical benefit from mass screening for hypercholesterolaemia^{145,146} and there is no evidence of reduced complications after earlier intervention in asymptomatic non-insulin dependent diabetes.^{147,148} Screening for heart disease¹⁰⁴ and diabetes^{138,148–150} should be based on screening for risk factors rather than for the disease with laboratory testing targeted at high risk groups. Cholesterol tests should be targeted at those with symptoms of heart disease, asymptomatic men 35–65 years old, women 45–65 years old or younger people who might benefit from treatment for high cholesterol.^{130,151} Fasting blood glucose may be offered every five years to those over 40 years of age or every three years if there is a risk factor for diabetes.¹⁵² However, there is insufficient evidence to recommend for or against routine screening for diabetes mellitus in asymptomatic adults.¹³⁰ It is only appropriate to consider exercise ECGs in persons with multiple risk factors or in employees engaged in occupations that demand considerable physical exertion or which impact on public safety.

HEALTH QUESTIONNAIRE

Examples of health questionnaires for use with shift workers or all employees are available.^{153,154} The style of individual company health questionnaires will depend on the company and any existing health questionnaire used for other screening or surveillance. Questions must be appropriate and must explore the health issues associated with night work. Many of these symptoms occur as minor everyday complaints and it is better to phrase questions to obtain positive responses only for problematic symptomatology or to use visual or numerical scales to quantify the perceived severity. The health questionnaire should include core questions in relation to:

- Personal data: name, date of birth, marital status, dependent children;
- Job details: shift pattern worked, department, hazards (physical, chemical, etc.);
- Social history: smoking, alcohol, exercise, diet;
- Family history: diabetes, gastric or duodenal ulcer, heart attack or angina;
- General health: health state compared with others of same age, use of medication, persisting fatigue, tiredness not disappearing after time off to rest;
- Cardiovascular: shortness of breath, chest pain or ache;
- Gastrointestinal: indigestion, abdominal pain, heartburn, unexplained weight change;
- Psychological: do you feel stress, do you feel sad, do you feel irritable, how satisfied are you with life, how

satisfied are you with work, difficulty sleeping, regular use of sleeping tablets and

- Reproductive: are your periods regular.

HEALTH INFORMATION FOR SHIFT WORKERS

Information for managers and employees with respect to shift work is readily available, including on the World Wide Web.¹⁵⁵ Employers have a duty to provide employees with comprehensible and relevant information in accordance with the Management of Health and Safety at Work Regulations 1992. Occupational health practitioners can help employers discharge this responsibility by ensuring that information is readily available for employees. Information provided to employees should include:

- the potential health and social effects of shift work;
- arrangements for providing health assessments;
- how to seek advice for any relevant health complaints pertinent to work;
- coping skills;
- how to protect sleep;
- lifestyle advice with regard to smoking, diet, alcohol and exercise;
- advice regarding caffeine in drinks and
- advice in relation to prescription and over-the-counter sleeping tablets and melatonin.

CONCLUSIONS

The fulfilment of the legal obligations of the Working Time Regulations is neither prescribed nor constrained in any way. It is advisable therefore to build on existing health procedures where they are in effect. For the purposes of equitable implementation, it is necessary to determine the grounds for exclusion from shift work before the scheme is implemented. As a minimum, a suitably designed questionnaire should be used. This however, should never be the sole basis for exclusion, which should also be based on clinical reports and an assessment. The evidence suggests that the annual frequency for the health assessment suggested in the supporting guidance cannot be sustained. A two-year frequency appears to satisfy the evidence and cost considerations.

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