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Occupational distress raises the risk of alcohol use, binge-eating, sleep problems and ill health: cross-sectional study of UK medical doctors

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Abstract

Objectives. This study aims to assess the prevalence of health problems (e.g. sleep problems, binge-eating, substance use, and ill health) among UK doctors and to investigate whether doctors suffering from occupational distress have an increased risk of these health problems.

Design. This study reports the analysis of data collected at the baseline stage of a randomised controlled trial (protocol #NCT02838290).

Setting. Doctors were invited from medical Royal Colleges, the British Medical Association's research panel members, and a random selection of NHS trusts across various UK regions.

Participants: 417 UK doctors with an equivalent split of gender (48% males) and seniority (49% consultants).

Main Outcomes and Measures: Outcomes were sleep problems (e.g. insomnia), substance use (e.g. binge-drinking), ill health (e.g. backache) and binge-eating (e.g. uncontrollable eating). Predictor variables were occupational distress (psychiatric morbidity, burnout, job effort, work-life imbalance, coping with stress through self-blame or substances) and work factors (working in a hospital and years practicing medicine).

Results: 44% of doctors binge-drank and 5% met the criteria for alcohol dependence; 24-29% experienced negative emotions after overeating and 8% had a binge-eating disorder; 20-61% had some type of sleep problems and 12% had severe/moderate insomnia; 69% had fatigue and 19-29% experienced other types of ill health problems. The results show that occupational distress and job factors increases the odds of doctors using substances, having sleep problems, frequent symptoms of ill health, and binge-eating. For example, burnout increased the risk of all types of sleep problems, e.g. difficulty falling/staying asleep, insomnia (OR$\geq$1.344; p $\leq$ 0.036).

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Conclusion. Early recognition of occupational distress can prevent health problems, such as insomnia, binge-eating, substance use, ill health symptoms, among UK doctors. Even taking into consideration whether or not a doctor works in a hospital, the risk of health problems still rises when doctors have signs of occupational distress.

Strengths and limitations of this study

- This is the first study exploring a wide range of health problems among UK doctors and examining work-related risk factors;

- The study was piloted - doctors were consulted before the study started;

- This is a cross-sectional study and therefore it is not possible to conclude on causation;

- It was not possible to calculate the response rate as it was not clear if all trusts and royal colleges who agreed to take part in this study actually distributed the invitation and to how many doctors.

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Introduction

Doctors experience higher levels of occupational distress than the general population [1] but little is known about the impact on the health of doctors. Little is known about whether occupational distress raises the risk of doctors using alcohol or drugs, as has been observed in the general population,[2] or presenting with symptoms of ill health such as daily or frequent headaches, backache, or insomnia. This study contributes new evidence to the literature by evaluating the health consequences of occupational distress for doctors. Occupational distress may be described as a syndrome comprising of burnout, job effort-reward imbalance, work-life imbalance, stress, depression, psychiatric morbidity, maladaptive coping strategies and other symptoms.[3,4] Although doctors are generally healthier than the general population,[5] they suffer higher levels of occupational distress than the average worker in the general population [1] making it useful to investigate the impact of different types of occupational distress on the relative risk of three dimensions of doctors' health: (a) behaviours that have an impact on doctors' health such as substance use and binge-eating; (b) trouble falling or staying asleep, and insomnia; and (c) daily or weekly symptoms of ill health such as headaches, backache, or fatigue. The other innovation of the current study is that, whereas many previous studies have sampled US doctors [6] or individual specialties such as oncology [4] and surgery,[7] this study sheds new light on the impact of occupational distress on health problems among UK doctors.

Does occupational distress increase the risk of doctors using alcohol or drugs?

Workers experiencing occupational distress are more likely to regularly drink alcohol, binge-drink or use drugs as a method of coping.[2,8] Doctors, on average, report equivalent or lower rates of alcohol abuse than the general population [5] but daily alcohol consumption or binge-drinking that does not meet the threshold for defining alcoholism is still problematic,[9,10] and symptomatic of psychological distress. In the US, 10% of doctors drink alcohol daily and 8% report severe alcohol or drug misuse or dependence at some point in their lives.[6] Prescription drug abuse is particularly problematic because doctors are up to 5 times more likely to use prescription drugs than the general population due to easier access or familiarity with prescription drugs, e.g. 24% of US doctors use benzodiazepine and 40% use minor opiates.[6] There are many reasons why doctors drink alcohol or use drugs – not all of which are to do with

being distressed – therefore research is needed to clarify if doctors use alcohol/drugs as a way of coping with occupational distress. The coping function of alcohol/drug use among doctors, as with the general population, is plausible because alcohol and prescription drugs such as benzodiazepine and opiates have psychoactive properties. Occupational distress is known to predict alcohol misuse in the general population [2] but little is known about whether, for example, doctors with high levels of burnout are at greater risk of using prescription drugs or alcohol, and whether other types of occupational distress (e.g. work-life imbalance, psychiatric morbidity, negative coping strategies) have similar effects. Little is also known about the impact of other job factors on the risk of doctors engaging in substance use such as working in a hospital versus practising medicine in the community.

Does occupational distress increase the risk of doctors' binge-eating?

Like alcohol or drug use, binge-eating is more prevalent among workers experiencing occupational distress [11] but, unlike substance use, little is known about binge-eating rates and risk factors among doctors. Binge-eating can be defined as eating a larger amount of food than most people in one sitting and finding oneself unable to control ones eating.[12] Binge-eating, like alcohol or drug use, is a common method of coping with psychological distress because eating offers an initial sense of comfort.[13,14] That is, however, followed by feelings of shame or guilt, thus exacerbating distress.[14] This is one of the first studies to assess the prevalence of binge-eating among UK doctors and to offer insights into whether doctors who binge-eat experience unpleasant emotions after binging. This study will also offer new insights into the impact of different types of occupational distress (e.g. burnout or work-life imbalance) which, together with analysing alcohol or drug abuse by doctors, will reveal the consequences of occupational distress for doctors' health-related behaviours.

Does occupational distress increase the risk of doctors having trouble sleeping or insomnia?

There have been calls for research into the connection between sleep disturbances and doctors' health [15] but most previous studies have focused on sleep deprivation rather than sleep disturbances that have a psychological aetiology e.g. trouble falling/staying asleep due to worry or insomnia. Sleep deprivation can be defined as the lack of the opportunity to sleep, or more simply as sleeping too few hours each day. Sleep deprivation is associated with

depression,[16,17] burnout,[18] suicide risk,[17] relationship difficulties [17] and immunity or cardiovascular health problems [19] among doctors but sleep deprivation in itself is not necessarily a sign of psychological distress. Doctors who work long shifts [20] or lack block-scheduled shifts [21] sleep too few hours because they have no choice. Therefore, rather than measuring sleep deprivation, this study measured types of sleep disturbance with a psychological aetiology such as trouble falling asleep, waking up prematurely because of worrying about work, and insomnia. It is plausible that the risk of these types of sleep disturbance is higher among doctors suffering from work-life imbalance, psychiatric morbidity, and other types of occupational distress such as coping with problems at work by blaming oneself or using substances. This study will evaluate whether UK doctors suffering from occupational distress have an increased risk of sleep disturbances and insomnia.

Does occupational distress increase the risk of doctors presenting with ill health?

There is some research about the physical health of doctors in some specialties (e.g. oncology)[4] but research is needed to assess whether occupational distress predicts the risk of doctors suffering from daily or frequent headaches, gastrointestinal problems, and other physical symptoms. Physical health has a complex range of causes (e.g. health behaviours, genetics and infections) but people who are distressed are more susceptible to infections because psychological distress weakens the immune system.[22] The important question, therefore, is the relative risk of ill health symptoms, comparing doctors with and without occupational distress. We recognise that the physical health of doctors is shaped by a complex range of factors – only one of which is occupational distress – because working in a clinical environment can pose some risk to physical health.[23] This study is one of the first to shed light on the impact of occupational distress on ill health symptoms among UK doctors.

Study aims

This study aims to assess whether doctors suffering from occupational distress have an increased risk of (i) using alcohol or drugs; (ii) binge-eating; (iii) having sleep problems or insomnia; and (iv) presenting with daily or frequent symptoms of ill health such as headaches, nausea, and fatigue. This study will extend previous literature about occupational distress in medicine, which has focused on burnout and psychiatric morbidity,[3] by measuring and defining occupational distress in additional ways, e.g. work-life imbalance, job effort, coping with stress through self-

blame or through substance use, drawing on previous literature highlighting the multiple dimensions of occupational distress.[4] This study will also provide new insight into the prevalence of alcohol/drug use, binge-eating, sleep problems and symptoms of ill health among UK doctors, extending previous research about doctors from other countries or individual specialties.[4,7]

Method

Patient and public involvement statement

Before the main study 15 doctors took part in a pilot study. Using online software (*Qualtrics*) the pilot study sought doctors' feedback about the relevance and clarity of questionnaires about occupational distress and health. The questionnaires were valid, reliable and selected from previous literature but it was important to utilise feedback from doctors about whether the types of occupational distress and health/health-related behaviours to be measured were relevant to doctors, and whether the instructions were clear. Doctors who answered open ended questions in the pilot study gave generally positive feedback. Feedback from the doctors resulted in some minor amendments to the wording of demographic questions, questionnaire instructions and the number of questionnaires was reduced to eliminate similar measures.

Study design

The research reported in this article is an analysis of data collected at the baseline stage of a randomised controlled trial (protocol #NCT02838290) of the effect of an occupational health intervention on doctors' levels of occupational distress, health and health-related behaviours. The trial took place from July to November 2016. Due to the complexity of the trial this paper reports analysis of only the baseline data.

Participants and study size

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Any medical doctor currently working in the UK was eligible for inclusion in the baseline data analysis. Doctors learnt about the study through invitations sent on our behalf by 9 medical Royal Colleges, the British Medical Association's research panel members, and a random selection of 9 NHS trusts. Doctors took part in this study online on a platform using *Qualtrics* software.

Measures

Outcome measures: Doctors completed a variety of questionnaires (see protocol #NCT02838290). For the purpose of this article, the analysis focused on doctors' health, sleep and health-related behaviours as outcome measures:

1. *Alcohol and drug use*: Alcohol dependence was assessed with the Patient Health Questionnaire [24] and the frequency and quantity of alcohol use was assessed with 3 items from the Alcohol Use Disorder Identification Scale (AUDIT).[25] Two items from the Brief COPE questionnaire [26] evaluated doctors' tendency to use alcohol or drugs as a stress coping strategy. Drug use was assessed using a list devised from the Commonly Abused Drugs Charts [27] and the UK drug misuse declaration.[28] It consisted of 22 illicit and legal drugs as well as over the counter medications.

2. *Binge-eating habits*: These were measured using the binge-eating disorder items from the Eating Disorder Diagnostic Scale (as a scale and separate items).[29]

3. *Sleep disturbances and insomnia*: Insomnia was measured with the Insomnia Severity Index,[30] an instrument with high reliability 0.891. Sleep problems were items derived from the Effort-Reward scale [31] and Insomnia Severity Index.[30]

4. *Ill health symptoms*: The Physical Symptom Inventory [32] comprising 12 items was used to assess the frequency with which doctors experience various symptoms.

Predictor measures: The predictor variables and measuring instruments captured different types of occupational distress and job factors:

1. *Psychiatric morbidity:* This was measured using the General Health Questionnaire-12 [33] with a high internal reliability of 0.927 in our study.

2. *Burnout*: Emotional exhaustion from the Maslach Burnout Inventory [34] was assessed in this study and had high internal reliability, α=0.905. Emotional exhaustion was selected because previous research shows that it is the best predictor of stress-related health among the three dimensions.[35]

3. *Job effort:* The Job Effort scale from the Effort-Reward scale [31] measured time pressure, interruptions and demands at work (Cronbach α= 0.770).

4. *Work-life imbalance:* This was measured using the Work-Family Conflict scale [36] (Cronbach α=0.934).

5. *Maladaptive coping strategies:* Two scales form the Brief COPE questionnaire [26] were used: coping through substance use (Cronbach α=0.872), and coping through self-blame (Cronbach α=0.783).

6. *Work experience:* years working in medicine.

7. *Work place* type: doctors indicated whether they work in a hospital or other setting.

More information about the measures is presented in Table 1.

Statistical methods

Outcome variables were re-coded into binary variables (symptom present or absent, see Table 1). Logistic regression tested the impact of predictors on the odds of the outcomes using SPSS v21 software.

Results

In total, 417 UK doctors participated. The mean age was 47.23 years (SD=10.97), and there was an equivalent split of gender (48% males, 52% females) and seniority (49% consultants, 51% other). 32.7% of doctors had psychiatric morbidity and 55.3% had a type of burnout called emotional exhaustion. The descriptive statistics (mean scores and standard deviations) of predicting factors (efforts, maladaptive coping strategies, and work-life imbalance) are presented in Table 1. Table 1 also shows the level of alcohol/drug use, binge-eating, sleep disturbances,

and ill health symptoms among doctors and Tables 2-5 present results from logistic regressions predicting thee health problems.

[Insert Table 1]

How many doctors use alcohol or drugs? Table 1 shows that 53% of doctors drank alcohol ≥2 times a week, 27% consumed ≥3 drinks on a typical day of drinking and 44% binge-drank by consuming 6+ drinks on one occasion. 5% of doctors met the criteria for alcohol dependence: most doctors did not report significant impairments in their occupational or other functioning as a result of drinking alcohol. In terms of drug use, 44% of doctors used some type of drugs; 3% of doctors used prescription opioids, 2% used benzodiazepines, 5% used sleep medication, 5% smoked tobacco, 7% used herbal or homeopathic remedies and 35% used over-the-counter medicines. Illegal drug use was rare: only 1 doctor reported cocaine use and 1 doctor used amyl nitrite. No doctor reported using amphetamines, anabolic steroids, cannabis, ecstasy, heroin, ketamine, khat, LSD, magic mushrooms, mephedrone, methadone, methamphetamine or tranquillizers.

Are distressed doctors more likely to use alcohol/drugs? Coping with stress was the reason given by many doctors for drinking alcohol or taking drugs, with 34% saying that they used substances in order to feel better, and 22% used substances to help them get through stressful events. Table 2 shows logistic regression results analysing the effects of occupational distress and job factors on alcohol and drug use by doctors. The model significance testing shows that the predictors significantly explained variance in doctors using substances to help them get through something (6%), drinking alcohol frequently (38%) and large amounts (12%), binge-drinking (28%), and being alcohol dependent (28%). The predictors did not explain variance in drug use and doctors using substances to feel better (p>0.05). Doctors who coped with stress by using substances had a higher risk of frequent alcohol use, binge-drinking, alcohol dependence and drug use (p≤0.022). The results summarised in Table 2 also show that having more experience working in medicine raised the risk of a doctor drinking alcohol frequently (OR=1.036; p=0.002) but lowered the risk of binge-drinking (OR=0.970; p=0.007). Doctors who worked in a hospital were more likely to drink high amounts of alcohol on a typical day of drinking and to binge-drink

(OR≥1.672; p≤0.044). Doctors who react to stress by blaming themselves are more likely to use substances to get through something (OR=1.374; p=0.039). Burnout, work-life imbalance and job effort were not significant unique predictors of substance use although the combined models were significant. This implies that occupational distress should be considered as a syndrome when understanding its effects on substance abuse. The exception was psychiatric morbidity which had a significant unique effect of decreasing the risk of doctors drinking alcohol 2-3 times or more a week (OR=0.478; p=0.019).

[Insert Table 2]

How many doctors binge-eat? Table 1 shows that 35% of doctors ate a large amount of food when they were not physically hungry, 31% ate until they felt uncomfortably full, 24-29% of doctors experienced negative emotions after overeating, like embarrassment, disgust, depression or guilt. We found that 8% of doctors had a binge-eating disorder.

Are distressed doctors more likely to binge-eat? Table 3 shows that all models tested were statistically significant and the predictors explained 8.1-17.1% of variance in binge-eating (p<0.05). Types of occupational distress that, individually, significantly predicted binge-eating were: self-blaming, work-life imbalance, and burnout. More experienced doctors were less likely to feel disgusted with themselves after binge-eating (OR=0.966; p=0.009), as were doctors who work in hospitals (OR=0.453; p=0.008). Job effort lowered the risk of a binge-eating disorder (OR=0.179; p<0.001). Psychiatric morbidity, by itself, did not predict binge-eating, and nor did coping with stress through substance use (p>0.05).

[Insert Table 3]

How many doctors have sleep problems? Table 1 shows that 22% of doctors had difficulty falling asleep, 35% difficulty staying asleep, 44% were dissatisfied with their sleep pattern, 20% were worried or distressed about a current sleep problem, and 35% of doctors' sleep problems interfered with daily functioning. Thinking about work contributed to sleep problems; 61% of doctors thought about work when they went to bed and 49% had trouble sleeping if they

postponed something they were supposed to do that day. The Insomnia Severity Index [30] showed that 12% of doctors had severe/moderate insomnia.

Are distressed doctors more likely to have sleep problems? Logistic regression models predicting seven signs of sleep problems and insomnia are presented in Table 4. All models were statistically significant explaining from 23.4% to 39.1% of variance, showing that occupational distress and job factors significantly predicted sleep problems and insomnia among doctors. This supports the view of occupational distress as a syndrome that increases sleep problems. There were also several unique effects, showing that certain types of occupational distress can, even in isolation, predict sleep problems. Table 4 shows, for instance, that doctors with psychiatric morbidity were more likely to have difficulty falling/staying asleep, think about work when they went to bed, find that sleep problems interfered with their daily functioning, and insomnia (OR≥2.117; p≤0.026), and burnout increased the risk of all 7 sleep problems (OR≥1.344; p≤0.036). Other significant unique predictors of sleep problems among doctors were: maladaptive coping with stress, work-life imbalance, and working in a hospital (p≤0.030). Therefore, unlike alcohol/drug use which required a syndrome approach to occupational distress, the risk of sleep problems or insomnia existed even if doctors were suffering just burnout or one other type of distress with significant unique effects in Table 4.

[Insert Table 4]

How many doctors suffer from daily or frequent ill health? 69% of doctors had fatigue and between 19% and 29% frequently experienced other type of ill health problems, e.g. upset stomach, backache and headaches. Only 8% or fewer doctors reported frequent (daily/weekly) non-menstrual stomach cramps, constipation, appetite loss and dizziness therefore these symptoms were not analysed using logistic regression.

Are distressed doctors more likely to have daily or frequent ill health? Table 5 shows the logistic regression results that the odds of doctors suffering from frequent ill health are raised by occupational distress together with years practising medicine and working in a hospital. The predictors explained 8-35.2% of variance in doctors presenting with fatigue, upset stomach or

nausea, headaches, acid/indigestion/heartburn, eye strain, diarrhoea, and ringing in the ears . The effects on back pain were non-significant (p=0.083). Several types of occupational distress had significant unique effects, meaning that they individually predicted doctors' health: psychiatric morbidity, burnout, coping with stress by blaming oneself, job effort, and work-life imbalance. For instance, burnout raised the odds of doctors suffering from fatigue (OR=1.804; p<0.001); job effort raised the odds of headaches (OR=1.905; p=0.030); work-life imbalance raised the odds of diarrhoea (OR=1.717; p=0.005); and psychiatric morbidity raised the odds of doctors suffering from fatigue, upset stomach or nausea, headaches, acid/indigestion/heartburn, and eye strain (OR≥1.930; p≤0.017). Working in a hospital did not, by itself, predict doctors' presentation of ill health symptoms, and nor did using alcohol or drugs to cope with stress (p>0.05). More years of experience in medicine decreased the odds of doctors having fatigue, upset stomach or nausea and headaches (OR≥0.963; p≤0.024), but more experienced doctors had increased odds of ear ringing (OR=1.050; p=0.002).

[Insert Table 5]

Discussion

Prevalence of occupational distress and health problems among UK doctors

This study shows the prevalence of occupational distress and health problems such as ill health symptoms, and health-related problems (e.g. substance use) among UK doctors. The results replicate recent systematic reviews about the prevalence of burnout and psychiatric morbidity,[3] finding that 32.7% of UK doctors have psychiatric morbidity and 55.3% a type of burnout called emotional exhaustion, while providing new evidence about the prevalence of types of problems that were unrepresented in previous literature. The results showed that 11% of doctors have insomnia; 20-61% experience various sleep problems; 5% are alcohol dependent; 27-53% drink in a hazardous way; 69% had fatigue; 4-33% experience other physical complaints; 8% have a binge-eating disorder; and 24-35% have binge-eating symptoms. Drug use was rare among doctors (3% used opioids; 2%benzodiazepines) suggesting that the proportion of doctors getting drug treatment for anxiety is lower than the proportion of doctors with anxiety (14.7%).[37]

Compared to the general population more doctors have psychiatric morbidity (55.3% compared 19%),[1] burnt out (32.7% compared to 24.8%),[38] and have physical complaints such as back pain (e.g. 34% compared to 8-28% in the general population).[39] However, fewer doctors are alcohol dependent (5%) compared to the general population whereby 13.9-29.1% have alcohol use disorder.[40]

Occupational distress increases the odds of health problems among UK doctors

The results show that occupational distress increases the odds of doctors using substances, having sleep problems, frequent symptoms of ill health, and binge-eating. Even taking into consideration whether or not a doctor works in a hospital, the risk of ill health still rises when doctors have signs of occupational distress such as burnout. Previous research showed that distress,[2,41] coping strategies [42–44] and job factors [45–50] are associated with ill health problems. This study replicates previous findings while demonstrating the generalisability of the effects to a wider range of health issues among UK doctors from various specialties:

> *Alcohol/drug use:* Distressed doctors are more likely to use alcohol, with 22-34% of
> doctors reporting that they use substances to feel better or help them get through stressful
> events. Doctors who cope with stress by using substances have a higher risk of frequent
> alcohol use, binge-drinking, alcohol dependence and drug use. Doctors who react to stress
> by blaming themselves are more likely to use substances to get through something. Having
> more experience working in medicine makes a doctor more likely to drink alcohol
> frequently but lowers the likelihood of binge-drinking. Doctors who work in a hospital are
> more likely to drink high amounts of alcohol on a typical day of drinking and to binge-
> drink. In understanding the effects of occupational distress on alcohol or drug use, the
> results showed the usefulness of assessing the combined effects of different types of
> occupational distress, but that, except for psychiatric morbidity, burnout, work-life
> imbalance and job effort do not individually predict alcohol or drug use. This suggests that
> occupational distress is best understood as a syndrome when understanding its effect on
> alcohol use. These findings extend previous studies which demonstrate that such
> occupational stress factors as burnout, depression and psychiatric morbidity, individually

predict alcohol defences/abuse.[7,51] The results also show that – for UK doctors – occupational distress as a syndrome has no significant effect on drug use. Only doctors who cite substance use as their strategy for coping with stress are significantly more likely to use drugs – and most of these are prescription or over-the-counter drugs.

Binge-eating: The risks of doctors' binge-eating and experiencing negative emotions after over-eating are raised by occupational distress e.g. burnout, coping with stress by blaming oneself, and work-life imbalance. This aligns with previous studies describing binge-eating as a method of coping with stress offering an initial sense of comfort.[13,14] More experienced doctors and doctors who work in hospitals are less likely to have unpleasant emotions after binge-eating and job effort lowers the risk of a doctor suffering from a binge-eating disorder. Psychiatric morbidity, by itself, did not predict binge-eating, and nor did coping with stress through substance use.

Sleep problems: Occupational distress and job factors significantly predict sleep problems and insomnia among doctors, supporting the view of occupational distress as a syndrome that increases sleep problems, whilst also revealing that certain types of occupational distress can also, individually, predict sleep problems or insomnia among doctors. Previous research show that physicians with high burnout, for example, are more likely to experience sleep related problems.[52] This study extends our understanding of the risk factors and shows that burnout, psychiatric morbidity, maladaptive coping strategies, work-life imbalance, and working in a hospital increase the risk of sleep problems. This means that the risk of sleep problems or insomnia exists even if doctors are suffering from just one of these types of occupational distress. The sleep problems include trouble falling/staying sleep, worrying about work when trying to sleep, and finding that sleep problems interfere with daily functioning.

Daily or frequent ill health: Occupational distress increases the odds of doctors suffering from fatigue, upset stomach or nausea, headaches, acid/indigestion or heartburn, eye strain, diarrhoea, and ringing in the ears but not back pain. Psychiatric morbidity, burnout, coping with stress by blaming oneself, job effort, and work-life imbalance each, as individual

predictors, also raise the odds of doctors suffering from frequent ill health. These findings extend previous studies which investigate how doctors' work conditions link to their ill health [23] by showing that occupational distress also increases the risk of ill health problems. Doctors who work in a hospital do not have increased odds of ill health symptoms, and nor do doctors who use substances to cope with stress. More experienced doctors have lower odds of fatigue, upset stomach or nausea and headaches, but are at a greater risk of suffering from ringing ears.

Strengths and weaknesses of the study and future research

This study is the first to explore the impact of occupational distress and work factors on the risk of health problems (sleep problems, substance use, ill health and binge-eating) among UK doctors from various specialties. It was not possible, however, to calculate the response rate for this study as it was not clear if all trusts and royal colleges who agreed to take part in this study actually distributed the invitation and to how many doctors. This study is a part of the bigger study which used "a gold standard" design and was piloted by consulting doctors. The weakness of this study, however, is not using a longitudinal design which would let us to conclude on causation between occupational distress and health problems – but this would be difficult to do because occupational distress is often a continually occurring phenomenon with seldom a clear starting point. We encourage future research about work factors not measured in the current study, for example, how the risk of gastrointestinal problems among doctors changes with patient caseload or infection exposure and how the risk of ringing ears changes with exposure to repeated equipment noise in hospitals.

The meaning of the study: possible explanations and implications for clinicians and policymakers

We recommend that occupational health services for doctors recognise (1) the prevalence of occupational distress among doctors; (2) that occupational distress increases the risk of health problem among doctors; and (3) the need to provide early interventions for doctors suffering from signs of occupational distress to prevent them from adopting negative health behaviours such as binge-drinking or eating, and to prevent doctors from suffering the long-term health effects of sleep disturbances and frequent ill health.

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Ethics approval and consent to participate

The BEI School Ethics Committee at Birkbeck, University of London, approved the study in May 2016. Participants voluntarily consented to take part in this study.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AM and CK participated in the conception and design of the study. AM collected and analysed data. AM and CK were involved in the interpretation of the data and preparation of this article. Both authors read and approved the final manuscript.

Data sharing

No additional data available

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Table

Table 1. Description of measures

Item	N	No of Items	% of doctors with present symptom/ M(SD)	Recoding (if applicable)	Measure	Measure/Original Scoring
Sleep problems						
Difficulty falling asleep	390	1	22%		The Insomnia Severity Index	0 (scores showing no insomnia) to 4 (showing severe insomnia)
Difficulty staying asleep	390	1	35%			
Sleep problems interfere with daily functioning	389	1	35%	0,1 – Symptom absent 2,3,4 - Symptom present		
Worried or distressed about a current sleep problem	390	1	20%			
Dissatisfied with sleep pattern	390	1	44%	0,1,2 – Symptom absent *(2 is included as it means "unsure")* 3,4 - Symptom present		
Think about work when they go to bed	417	1	61%		Effort-Reward scale	1 (strongly disagree) to 4 (strongly agree)
Trouble sleeping if they postpone tasks	416	1	49%	0,1 – Symptom absent 2,3 - Symptom present		
Insomnia	390	7	11%	≤14 – Symptom absent *(no, subthreshold insomnia)* ≥15 – Symptom present *(moderate, severe insomnia)*	The Insomnia Severity Index	0 (scores showing no insomnia) to 4 (showing severe insomnia)

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Substance use

Substance use in order to feel better	392	1	34%		The Brief COPE	
Substance use in order to get through something	393	1	22%	1 – Symptom absent 2, 3, 4 - Symptom present		1 (I usually don't do this) to 4 (I usually do this a lot)
Frequency of drinking alcohol	386	1	53%	1,2,3 – not drinking or drinking less than 2-3 times a week 4,5 - drinking 2-3 times a week or more often	AUDIT	1 (never/1-2) to 5 (daily/more than 10)
Quantity of drinks on typical day of drinking	362	1	27%	1 – drinking 1,2 drinks 2, 3, 4, 5 – drinking 3 or more drinks		
Drink 6 or more drinks on one occasion	373	1	44%	1 – never 2, 3, 4, 5 – binge-drinking		
Alcohol dependence	377	5	5%	Substance abuse was identified if any of the items were answered "*yes*"	The Patient Health Questionnaire	0 (no) and 1 (yes)
Drug use	380	22	44%	Drug use was identified if any of the items were answered "*yes*"	Commonly Abused Drugs	0 (no) and 1 (yes)

24

Physical symptoms

Fatigue	390	1	69%			
Upset stomach or nausea	390	1	19%			
Backache	390	1	33%			
Headaches	390	1	27%			
Acid indigestion or heartburn	390	1	23%			
Eye strain	390	1	29%	1,2 – Symptom absent		
Diarrhoea	390	1	12%	3,4,5 - Symptom present	The Physical Symptom Inventory	1 (not at all) to 5 (every day)
Ringing in the ears	390	1	13%			
Stomach cramps	389	1	8%			
Constipation	390	1	4%			
Loss of appetite	390	1	7%			
Dizziness	390	1	8%			

Eating problems

Eating large amounts of food when not physically hungry	316	1	35%			
Eat until feeling uncomfortably full	316	1	31%	n/a	The Binge Eating Scale	0 (no) and 1 (yes)
Eat alone because they feel embarrassed	315	1	24%			
Feel disgusted with themselves,	316	1	28%			

depressed or very guilty after overeating						
Feel upset about their uncontrollable eating or weight gain	316	1	29%			
Binge eating	316	9	8%	Please see [29] details for coding	The Binge Eating Scale	8 questions - 0 (no) and 1 (yes); 1 question – 0 to 7 days

Predictor variables

Burnout: Emotional exhaustion	406	8	55% (M = 3.16; SD = 1.34)	Recoded for prevalence: <27 – Symptom absent ≥27 – Symptom present	Maslach Burnout Inventory	0 (never) to 6 (every day)
Psychiatric morbidity	393	12	33% (M = 2.19; SD = 0.55)	Recoded for prevalence: 0,1 into 0 and 2,3 into 2; & < 4 – Symptom absent ≥4 – Symptom present	General Health Questionnaire-12	0 (better than usual/not at all) to 3 (much less than usual/much less capable)
Effort scale	415	3	M = 3.3 (SD = 0.6)	n/a	Short Version of Effort-Reward scale	1 (strongly disagree) to 4 (strongly agree)
Work-family Imbalance	416	5	M = 5.26 (SD = 1.38)	n/a	Work-Family Conflict scale	0 (strongly disagree) to 6 (strongly agree)

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Coping: Substance use	392	2	M = 2.33 (SD = 0.88)	n/a		
Coping: Self-blame	393	2	M = 1.37 (SD = 0.61)		The Brief COPE	1 (I usually don't do this) to 4 (I usually do this a lot)

Table 2. Logistic regression predicting substance use problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)
Substance use in order to feel better	B	-2.239	0.304	0.162	0.096	-0.083	0.092	n/a	0.011	0.053
	SE	0.844	0.258	0.123	0.237	0.100	0.135	n/a	0.010	0.231
	OR	0.107	1.355	1.175	1.101	0.921	1.097	n/a	1.011	1.054
	p	0.008	0.239	0.190	0.685	0.411	0.493	n/a	0.278	0.819
	Model	$X^2(7)=10.96$; p=0.140; $R^2=0.04$								
Substance use in order to get through something	B	-3.034	0.423	0.085	0.202	-0.179	**0.318**	n/a	0.002	0.005
	SE	0.963	0.289	0.142	0.274	0.113	**0.154**	n/a	0.012	0.266
	OR	0.048	1.527	1.089	1.224	.836	**1.374**	n/a	1.002	1.005
	p	0.002	0.143	0.551	0.461	0.113	**0.039**	n/a	0.859	0.986
	Model	$X^2(7)=14.76$; p=0.039; $R^2=0.059$								
Drinking alcohol 2-3 times a week or more often	B	-2.297	**-0.739**	0.203	-0.360	0.086	-0.183	**2.936**	**0.035**	0.013
	SE	1.001	**0.316**	0.141	0.256	0.114	0.155	**0.393**	**0.011**	0.257
	OR	0.101	**0.478**	1.226	0.698	1.090	0.833	**18.836**	**1.036**	1.013
	p	0.022	**0.019**	0.148	0.160	0.449	0.237	**<0.001**	**0.002**	0.960
	Model	$X^2(8)=123.03$; p<0.001; $R^2=0.379$								
Drink more than 3 drinks typically	B	-2.593	-0.222	-0.041	0.185	-0.004	-0.083	**0.955**	0.002	**0.594**
	SE	0.975	0.314	0.141	0.281	0.119	0.161	**0.206**	0.012	**0.276**
	OR	0.075	0.801	0.772	1.203	0.996	0.920	**2.599**	1.002	**1.812**

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)
	p	0.008	0.480	0.960	0.511	0.971	0.604	**<0.001**	0.885	**0.031**
	Model	$X^2(8)=29.10$; $p<0.001$; $R^2=0.118$								
Drink 6 or more drinks on one occasion	B	-0.341	-0.481	0.038	-0.440	0.148	-0.190	**1.849**	**-0.030**	**0.514**
	SE	0.942	0.308	0.135	0.260	0.113	0.151	**0.267**	**0.011**	**0.255**
	OR	0.711	0.618	1.039	0.644	1.159	0.827	**6.355**	**0.970**	**1.672**
	p	0.717	0.118	0.777	0.090	0.191	0.209	**<0.001**	**0.007**	**0.044**
	Model	$X^2(8)=83.18$; $p<0.001$; $R^2=0.279$								
Alcohol dependence	B	-3.171	-0.047	0.037	-0.855	0.162	-0.091	**1.819**	-0.041	0.095
	SE	1.781	0.581	0.286	0.623	0.269	0.350	**0.359**	0.028	0.616
	OR	0.042	0.955	1.037	0.425	1.176	0.913	**6.165**	0.960	1.100
	p	0.075	0.936	0.898	0.170	0.548	0.795	**<0.001**	0.153	0.877
	Model	$X^2(8)=34.648$; $p<0.001$; $R^2=0.280$								
Drug use	B	-1.732	-0.084	0.073	0.192	0.067	0.068	**0.425**	-0.011	-0.047
	SE	0.830	0.256	0.120	0.228	0.099	0.133	**0.186**	0.010	0.226
	OR	0.177	0.92	1.076	1.211	1.069	1.070	**1.530**	0.989	0.954
	p	0.037	0.744	0.541	0.400	0.501	0.608	**0.022**	0.287	0.835
	Model	$X^2(8)=13.935$; $p=0.083$; $R^2=0.051$								

Note. n/a – scale is not included in the analysis because predictor is a part of it. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 3. Logistic regression predicting substance binge-eating problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Eating large amounts of food when not physically hungry	B	-1.831	0.344	0.127	-0.403	0.176	**0.410**	-0.094	-0.022	-0.040
	SE	0.935	0.290	0.142	0.275	0.124	**0.156**	0.208	0.011	0.271
	OR	0.160	1.410	1.136	0.669	1.193	**1.507**	0.910	0.978	0.961
	p	0.050	0.236	0.370	0.143	0.156	**0.009**	0.652	0.052	0.883
	Model	$X^2(8)=29.537$; p<0.001; R^2=0.127								
Eat until feeling uncomfortably full	B	-2.229	0.064	0.132	-0.186	**0.271**	0.297	-0.117	-0.018	-0.342
	SE	0.972	0.294	0.144	0.278	**0.131**	0.159	0.214	0.012	0.275
	OR	0.108	1.066	1.141	0.831	**1.311**	1.346	0.890	0.982	0.710
	p	0.022	0.828	0.359	0.504	**0.038**	0.062	0.585	0.121	0.212
	Model	$X^2(8)=22.420$; p=0.004; R^2=0.100								
Eat alone because they feel embarrassed	B	-3.111	0.233	0.213	-0.139	0.112	0.378	0.089	-0.015	-0.386
	SE	1.068	0.314	0.158	0.307	0.139	0.175	0.220	0.013	0.300
	OR	0.045	1.262	1.237	0.870	1.119	1.46	1.093	0.985	0.680
	p	0.004	0.458	0.178	0.650	0.418	0.031	0.686	0.255	0.199
	Model	$X^2(8)=21.890$; p=0.005; R^2=0.105								
Feel disgusted	B	-2.237	0.079	**0.321**	-0.313	0.208	0.335	0.154	**-0.034**	**-0.791**

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
with themselves, depressed or very guilty after overeating	SE	1.036	0.310	**0.155**	0.299	0.138	0.172	0.218	**0.013**	**0.298**
	OR	0.107	1.082	**1.378**	0.731	1.231	1.398	1.166	**0.966**	**0.453**
	p	0.031	0.799	**0.038**	0.295	0.132	0.052	0.481	**0.009**	**0.008**
	Model	$X^2(8)=38.029$; $p<0.001$; $R^2=0.171$								
Feel upset about their uncontrollable eating or weight gain	B	-2.367	-0.187	**0.324**	-0.234	0.206	**0.337**	0.021	-0.015	-0.200
	SE	0.998	0.302	**0.150**	0.287	0.133	**0.164**	0.212	0.012	0.282
	OR	0.094	0.830	**1.383**	0.792	1.228	**1.400**	1.021	0.986	0.819
	p	0.018	0.537	**0.030**	0.416	0.121	**0.040**	0.922	0.231	0.478
	Model	$X^2(8)=23.374$; $p=0.003$; $R^2=0.106$								
Binge eating	B	-1.064	-0.343	**0.610**	**-1.678**	0.250	0.473	0.220	-0.014	0.224
	SE	1.395	0.445	**0.237**	**0.443**	0.219	0.253	0.309	0.019	0.444
	OR	0.345	0.710	**1.841**	**0.187**	1.284	1.606	1.246	0.986	1.251
	p	0.446	0.440	**0.010**	**<0.001**	0.253	0.062	0.477	0.458	0.614
	Model	$X^2(8)=27.089$; $p=0.001$; $R^2=0.163$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 4. Logistic regression predicting sleep problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Difficulty falling asleep	B	-5.019	**0.906**	**0.393**	-0.303	0.107	-0.039	**0.617**	-0.022	**0.669**
	SE	1.098	**0.304**	**0.158**	0.313	0.139	0.171	**0.210**	0.013	**0.308**
	OR	0.007	**2.474**	**1.482**	0.738	1.113	0.962	**1.854**	0.979	**1.953**
	p	<0.001	**0.003**	**0.013**	0.333	0.443	0.822	**0.003**	0.103	**0.030**
	Model	$X^2(8)=65.69$; p<0.001; $R^2 = 0.249$								
Difficulty staying asleep	B	-5.593	**0.829**	**0.468**	-0.022	0.038	0.155	**0.443**	0.014	0.275
	SE	1.014	**0.286**	**0.137**	0.267	0.114	0.148	**0.202**	0.012	0.257
	OR	0.004	**2.291**	**1.596**	0.978	1.039	1.168	**1.557**	1.014	1.317
	p	<0.001	**0.004**	**0.001**	0.933	0.741	0.296	**0.028**	0.233	0.285
	Model	$X^2(8)=79.09$; p<0.001; $R^2 =0.264$								
Dissatisfied with sleep pattern	B	-3.678	**0.962**	0.536	-0.142	-0.050	-0.006	0.280	-0.014	0.438
	SE	0.937	**0.292**	0.134	0.256	0.108	0.143	0.200	0.011	0.250
	OR	0.025	**2.617**	1.710	0.868	0.642	0.994	1.324	0.986	1.549
	p	<0.001	**0.001**	**<0.001**	0.579	0.951	0.966	0.160	0.200	0.080
	Model	$X^2(8)=85.18$; p<0.001; $R^2 =0.274$								
Sleep problems interfere with	B	-5.352	**1.047**	**0.492**	-0.303	0.058	**0.347**	**0.485**	-0.016	0.483
	SE	1.040	**0.299**	**0.144**	0.283	0.120	**0.153**	**0.208**	0.012	0.272

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
daily functioning	OR	0.005	**2.848**	**1.6360**	0.739	1.059	**1.414**	**1.625**	0.984	1.621
	p	<0.001	**<0.001**	**0.001**	0.284	0.631	**0.023**	**0.019**	0.187	0.075
	Model	$X^2(8)=102.74$; $p<0.001$; $R^2=0.333$								
Worried or distressed about a current sleep problem	B	-6.003	**1.342**	**0.570**	-0.414	0.014	0.267	-0.033	0-.013	**0.776**
	SE	1.202	**0.321**	**0.171**	0.340	0.146	0.179	0.232	0.014	**0.331**
	OR	0.002	**3.826**	**1.768**	0.661	1.014	1.306	0.968	0.987	**2.172**
	p	<0.001	**<0.001**	**0.001**	0.224	0.924	0.136	0.888	0.362	**0.019**
	Model	$X^2(8)=86.58$; $p<0.001$; $R^2=0.327$								
Think about work when they go to bed	B	-6.476	**0.750**	**0.295**	0.214	**0.456**	**0.616**	-0.053	-0.010	0.399
	SE	1.091	**0.337**	**0.141**	0.263	**0.116**	**0.160**	0.227	0.012	0.263
	OR	0.002	**2.117**	**1.344**	1.238	**1.577**	**1.851**	0.948	0.990	1.491
	p	<0.001	**0.026**	**0.036**	0.416	**<0.001**	**<0.001**	0.814	0.393	0.128
	Model	$X^2(8)=128.23$; $p<0.001$; $R^2=0.391$								
Trouble sleeping if they postpone tasks	B	-3.377	0.434	**0.337**	-0.273	0.243	**0.460**	0.090	-0.013	0.011
	SE	0.901	0.277	**0.128**	0.247	0.107	**0.140**	0.196	0.011	0.239
	OR	0.034	1.544	**1.401**	0.761	1.275	**1.584**	1.094	0.988	1.011
	p	<0.001	0.117	**0.008**	0.270	0.023	**0.001**	0.648	0.237	0.965
	Model	$X^2(8)=72.32$; $p<0.001$; $R^2=0.234$								

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Insomnia	B	-8.627	**1.458**	**0.597**	-0.109	0.035	0.346	0.148	-0.025	0.802
	SE	1.600	**0.378**	**0.216**	0.433	0.191	0.226	0.270	0.018	0.417
	OR	<0.001	**4.299**	**1.817**	.897	1.036	1.414	1.160	.975	2.231
	p	<0.001	**<0.001**	**0.006**	0.802	0.854	0.126	0.582	0.162	0.054
	Model	$X^2(8)=78.24$; p<0.001; $R^2=0.360$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 5. Logistic regression predicting ill-health

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Fatigue	B	-3.632	**0.947**	**0.590**	0.127	0.056	0.308	0.083	**-0.029**	-0.130
	SE	1.079	**0.386**	**0.152**	0.267	0.115	0.164	0.247	**0.012**	0.276
	OR	0.026	**2.577**	**1.804**	1.135	1.058	1.360	1.087	**0.972**	0.878
	p	0.001	**0.014**	**<0.001**	0.635	0.623	0.060	0.735	**0.019**	0.637
	Model	$X^2(8)=106.899$; p<0.001; R^2=0.352								
Upset stomach or nausea	B	-3.970	**1.265**	0.094	0.091	-0.011	0.057	-0.200	**-0.038**	-0.059
	SE	1.089	**0.312**	0.157	0.313	0.136	0.173	0.237	**0.014**	0.303
	OR	0.019	**3.544**	1.098	1.095	.989	1.059	0.819	**0.963**	0.942
	p	<0.001	**<0.001**	0.550	0.771	0.936	0.742	0.399	**0.006**	0.845
	Model	$X^2(8)=45.36$; p<0.001; R^2=0.185								
Backache	B	-2.011	0.218	0.176	-0.172	0.161	0.026	-0.070	-0.001	-0.025
	SE	0.863	0.262	0.126	0.244	0.108	0.139	0.190	0.010	0.237
	OR	0.134	1.243	1.193	0.842	1.175	1.026	0.932	0.999	0.975
	p	0.020	0.407	0.161	0.481	0.138	0.854	0.712	0.955	0.917
	Model	$X^2(8)=13.96$; p=0.083; R^2=0.051								
Headaches	B	-6.523	**0.944**	0.272	**0.644**	0.069	0.035	0.132	**-0.029**	0.394
	SE	1.114	**0.293**	0.143	**0.297**	0.125	0.158	0.208	**0.013**	0.280
	OR	0.001	**2.570**	1.313	**1.905**	1.071	1.035	1.141	**0.972**	1.483

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
	p	<0.001	**0.001**	0.057	**0.030**	0.580	0.826	0.527	**0.024**	0.160
	Model	$X^2(8)=75.67$; p<0.001; $R^2=0.267$								
Acid indigestion or heartburn	B	-4.707	**0.826**	0.120	0.323	-0.011	0.007	-0.062	0.007	0.185
	SE	1.030	**0.290**	0.142	0.284	0.119	0.158	0.209	0.012	0.270
	OR	0.009	**2.284**	1.128	1.382	0.989	1.007	0.940	1.007	1.203
	p	<0.001	**0.004**	0.398	0.255	0.928	0.965	0.768	0.549	0.493
	Model	$X^2(8)=27.78$; p=0.001; $R^2=0.109$								
Eye strain	B	-3.929	**0.657**	-0.06	0.496	0.066	-0.027	0.088	-0.012	-0.129
	SE	0.945	**0.275**	0.13	0.259	0.110	0.146	0.194	0.011	0.249
	OR	0.020	**1.930**	0.942	1.641	1.068	0.973	1.092	0.988	0.879
	p	<0.001	**0.017**	0.647	0.056	0.550	0.851	0.650	0.299	0.606
	Model	$X^2(8)= 22.45$; p=0.004; $R^2=0.084$								
Diarrhea	B	-5.574	0.576	-0.155	-0.245	**0.541**	0.212	-0.020	0.002	0.148
	SE	1.317	0.349	0.179	0.363	**0.191**	0.198	0.259	0.015	0.350
	OR	0.004	1.779	0.857	0.783	**1.717**	1.237	0.981	1.002	1.159
	p	<0.001	0.098	0.386	0.501	**0.005**	0.284	0.940	0.877	0.672
	Model	$X^2(8)=21.640$; p=0.006; $R^2=0.106$								
Ringing in the ears	B	-3.318	0.315	0.292	-0.372	-0.018	0.063	-0.155	**0.048**	<0.0001
	SE	1.204	0.358	0.182	0.342	0.144	0.192	0.262	**0.015**	0.316

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		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
	OR	0.036	1.370	1.338	0.689	0.983	1.065	0.857	**1.050**	1.000
	p	0.006	0.379	0.109	0.277	0.903	0.742	0.555	**0.002**	1.000
	Model	$X^2(8)=16.817$; $p=0.032$; $R^2=0.080$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6-7
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	Not explained as was based on requirements for the RCT
Study size	10	Explain how the study size was arrived at	Not explained as was based on requirements for the RCT
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg	9

		numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	9; Table 1
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-12
		(*b*) Report category boundaries when continuous variables were categorized	-
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	13-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Does occupational distress raise the risk of alcohol use, binge-eating, ill health and sleep problems among medical doctors? A UK cross-sectional study

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Manuscripts

1 **Does occupational distress raise the risk of alcohol use, binge-eating, ill health and sleep**

2 **problems among medical doctors? A UK cross-sectional study**

3

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16

1 **Abstract**

2

3 **Objectives.** This study aims to assess the prevalence of health problems (e.g. insomnia,

4 binge-eating, substance use, and ill health) among UK doctors and to investigate whether

5 occupational distress increases the risk of health problems.

6 **Design.** This study reports the analysis of data collected at the baseline stage of a randomised

7 controlled trial (protocol #NCT02838290).

8 **Setting.** Doctors were invited through medical Royal Colleges, the British Medical

9 Association's research panel, and a random selection of NHS trusts across various UK

10 regions.

11 **Participants**: 417 UK doctors with an equivalent split of gender (48% males) and seniority

12 (49% consultants).

13 **Main Outcomes and Measures**: Outcomes were sleep problems (e.g. insomnia),

14 alcohol/drug use (e.g. binge-drinking), ill health (e.g. backache) and binge-eating (e.g.

15 uncontrollable eating). Predictor variables were occupational distress (psychiatric morbidity,

16 burnout, job effort, work-life imbalance, coping with stress through self-blame or substances)

17 and work factors (workplace and years practicing medicine).

18 **Results**: 44% of doctors binge-drank and 5% met the criteria for alcohol dependence; 24-

19 29% experienced negative emotions after overeating and 8% had a binge-eating disorder; 20-

20 61% had some type of sleep problem and 12% had severe/moderate insomnia; 69% had

21 fatigue and 19-29% experienced other types of ill health problems. The results show that

22 occupational distress and job factors increase the odds of doctors using substances, having

23 sleep problems, presenting with frequent symptoms of ill health, and binge-eating. For

24 example, burnout increased the risk of all types of sleep problems, e.g. difficulty

25 falling/staying asleep, insomnia (OR$\geq$1.344; p $\leq$ 0.036). Even taking into consideration

1 whether or not a doctor works in a hospital, the risk of health problems still rises when

2 doctors have signs of occupational distress.

3 **Conclusion**. Early recognition of occupational distress can prevent health problems among

4 UK doctors and in turn an impact on the quality of care by reducing the need for sickness-

5 related absence.

6 **Strengths and limitations of this study**

7

8 - This is the first study to explore a wide range of health problems among UK doctors

9   and to examine work-related risk factors;

10 - The study was piloted by consulting doctors about the method before the study

11   started;

12 - This is a cross-sectional study and therefore it is not possible to draw conclusions

13   about causation;

14 - It was not possible to calculate the response rate because it was not clear if all NHS

15   trusts and Royal Colleges who agreed to invite doctors to take part in this research did

16   send out the invitations, and to how many doctors.

17

Introduction

Distress suffered by doctors has significant consequences for patient care. A recent meta-analysis of 47 studies found that burned-out doctors were more likely to provide poor quality care because of reduced professionalism, and they were more likely to be associated with poor patient satisfaction and incidents that jeopardise patient safety.[1] There is a high prevalence of distress among doctors in the United Kingdom (UK), with a systematic review of 30 studies showing that 17% to 52% of doctors have psychiatric morbidity,[2] higher than the prevalence rate of 19% in the general population,[3] and 31% to 54% of doctors have a type of burnout called emotional exhaustion.[2] Little is known, however, about whether occupational distress raises the risk of health problems (e.g. insomnia, binge-drinking) that might compel doctors to be absent from work or take sick leave resulting in under-staffing and a risk to patient safety.

Occupational distress can be described as a syndrome comprising of burnout, depression, maladaptive coping strategies and other symptoms.[4] The potential implications for risks to patient safety due to sickness-absence makes it useful to investigate the impact of different types of occupational distress on the relative risk of: (a) behaviours that have an impact on doctors' health such as alcohol/drug use and binge-eating; (b) health issues such as sleep disturbances and daily or weekly symptoms of ill health (e.g. headaches or fatigue). This is the first study to examine such a broad spectrum of health consequences among doctors. The other innovation of the current study is that, whereas many previous studies have sampled US doctors [5] or individual specialties such as oncology [6] and surgery,[7] this study sheds new light on the impact of occupational distress on health problems among doctors in the UK.

Does occupational distress increase the risk of doctors using alcohol or drugs?

Workers experiencing occupational distress are more likely to regularly drink alcohol, binge-drink or use drugs as a method of coping.[8,9] Doctors, on average, report equivalent or lower rates of alcohol abuse than the general population [10] but daily alcohol consumption or binge-drinking that does not meet the threshold for diagnosis of alcoholism is still problematic,[11,12] and symptomatic of psychological distress. In the US, 10% of doctors drink alcohol daily and 8% report severe alcohol or drug misuse or dependence at some point in their lives.[5] Prescription drug abuse is particularly problematic because doctors are up to

1 5 times more likely to use prescription drugs than the general population due to easier access

2 or familiarity with prescription drugs, e.g. 24% of US doctors use benzodiazepine and 40%

3 use minor opiates.[5] There are many reasons why doctors use substances – not all of which

4 are to do with being distressed – therefore research is needed to clarify the proportion of

5 doctors who use alcohol/drugs as a way of coping with occupational distress. The coping

6 function of alcohol/drug use among doctors, as with the general population, is plausible

7 because alcohol and many drugs have psychoactive properties, e.g. prescription drugs such as

8 benzodiazepine and opiates; illicit drugs such as LSD. Occupational distress is known to

9 predict alcohol misuse in the general population [8] but little is known about whether, for

10 example, doctors with high levels of burnout are at greater risk of using alcohol or drugs

11 (including prescription or legally purchased drugs), and whether other types of occupational

12 distress (e.g. psychiatric morbidity, negative coping strategies) have similar effects. Little is

13 also known about the impact of other job factors such as work experience on the risk of

14 doctors engaging in substance use.

15 *Does occupational distress increase the risk of doctors' binge-eating?*

16 Like alcohol or drug use, binge-eating is more prevalent among workers experiencing

17 occupational distress [13] but, unlike substance use, little is known about binge-eating rates

18 among doctors and risk factors. Binge-eating can be defined as eating a larger amount of food

19 than most people eat in one sitting and finding oneself unable to control ones eating.[14]

20 Binge-eating, like alcohol or drug use, is a common method of coping with psychological

21 distress because eating offers an initial sense of comfort.[15,16] The initial comfort is,

22 however, followed by feelings of shame or guilt, thus exacerbating distress.[16] This is one

23 of the first studies to assess the prevalence of binge-eating among UK doctors and to offer

24 insights into whether doctors who binge-eat experience unpleasant emotions after binging.

25 This study will also offer new insights into the impact of different types of occupational

26 distress (e.g. work-life imbalance) which, together with analysing substance abuse by

27 doctors, will reveal the consequences of occupational distress for doctors' health-related

28 behaviours.

29 *Does occupational distress increase the risk of doctors having sleep disturbances?*

30 There have been calls for research into the connection between sleep problems and doctors'

31 health [17] but most previous studies have focused on sleep deprivation rather than sleep

32 disturbances that have a psychological aetiology, e.g. trouble falling/staying asleep due to

1 worry. Sleep deprivation can be defined as the lack of the opportunity to sleep, or more

2 simply as sleeping too few hours each day. Sleep deprivation is associated with

3 depression,[18,19] burnout,[20] suicide risk,[19] and immunity or cardiovascular health

4 problems [21] among doctors but sleep deprivation in itself is not necessarily a sign of

5 psychological distress. Doctors who work long shifts [22] or lack block-scheduled shifts [23]

6 sleep too few hours because they have no choice. Therefore, rather than measuring sleep

7 deprivation, this study measured types of sleep disturbance with a psychological aetiology

8 such as trouble falling asleep, waking up prematurely because of worrying about work, and

9 insomnia. It is plausible that the risk of these types of sleep disturbance is higher among

10 doctors suffering from work-life imbalance, psychiatric morbidity, and other types of

11 occupational distress. This study will evaluate whether UK doctors suffering from

12 occupational distress have an increased risk of sleep disturbances.

13 *Does occupational distress increase the risk of doctors presenting with ill health?*

14 There is some research about the physical health of doctors in some specialties (e.g.

15 oncology)[6] but research is needed to assess whether occupational distress predicts the risk

16 of doctors from various specialties suffering from daily or frequent headaches,

17 gastrointestinal problems, and other physical symptoms. Physical health has a complex range

18 of causes (e.g. health behaviours, genetics and infections) but people who are distressed are

19 more susceptible to infections because psychological distress weakens the immune

20 system.[24] The important question, therefore, is the relative risk of ill health symptoms,

21 comparing doctors with and without occupational distress. We recognise that the physical

22 health of doctors is shaped by a complex range of factors – only one of which is occupational

23 distress – because working in a clinical environment can pose some risk to physical

24 health.[25] This study is one of the first to shed light on the impact of occupational distress

25 on ill health symptoms among UK doctors.

26 *Study aims*

27 This study aims to assess whether doctors suffering from occupational distress have an

28 increased risk of (i) using alcohol or drugs (illicit, non-illicit); (ii) binge-eating; (iii) having

29 sleep disturbances; and (iv) presenting with physical health symptoms. This study will extend

30 previous literature about occupational distress in medicine, which has focused on burnout and

31 psychiatric morbidity,[2] by measuring and defining occupational distress in additional ways,

32 e.g. work-life imbalance, job effort, coping with stress through self-blame or through

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3   1   substance use, drawing on previous literature highlighting the multiple dimensions of
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5   2   occupational distress.[6] This study will also provide new insights into the prevalence of
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7   3   alcohol/drug use, binge-eating, sleep and ill health problems among UK doctors, extending
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9   4   previous research about doctors from other countries or individual specialties.[6,7]
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11   5
12   6   **Method**
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16   8   *Patient and public involvement statement*
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18   9   All questionnaires were valid, reliable measures selected from previous literature but it was
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20   10   important to consult doctors about whether the types of occupational distress and health
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22   11   problems to be measured were relevant to doctors, and whether the instructions were clear.
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24   12   We thus consulted 15 doctors before the main study, using online software (*Qualtrics*). The
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26   13   pilot study sought the doctors' feedback (through open ended questions) about the relevance
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28   14   and clarity of the questionnaires. Doctors gave generally positive feedback. Some minor
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30   15   amendments included revising the wording of demographic questions, questionnaire
31   16   instructions and reducing the number of questionnaires to eliminate similar measures.
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35   18   *Study design*
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37   19   The research reported in this article is an analysis of data collected at the baseline stage of a
38   20   randomised controlled trial (protocol #NCT02838290) of the effect of an intervention on
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40   21   doctors' levels of occupational distress and health problems. The trial took place from July to
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42   22   November 2016. Due to the complexity of the trial this paper reports a cross-sectional
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44   23   analysis of the baseline data.
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48   25   *Participants and study size*
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50   26   Doctors took part in this study online (*Qualtrics*). They learnt about the study through
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52   27   medical Royal Colleges, NHS trusts, and the British Medical Association (BMA). To prevent
53   28   selection bias based on specialty, we invited all Royal Colleges from which 9 agreed to
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55   29   distribute information about the research to their members. To prevent selection bias due to
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57   30   an NHS trust's reputation we randomly selected 25% NHS trusts. From the ones possible to
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59   31   reach, 9 distributed invitations to this study. The third source of data was the BMA's research
60   32   panel. The majority of UK medical doctors are members of the BMA and any of them can
     33   join the BMA's research panel; therefore, this panel represented a broad spectrum of doctors.
     34   All medical doctors working in the UK were included in the baseline data analysis.

1 *Measures*

2 *Outcome measures:* Doctors completed a variety of questionnaires assessing health problems.

3 In some cases, we analysed responses to individual items in addition to the average of whole

4 questionnaires because this offered richer insights into the prevalence of certain types of

5 substance misuse (e.g. binge-drinking), different symptoms of ill health (e.g. backache),

6 different signs of binge-eating (e.g. uncontrollable eating) and sleep disturbances (e.g. trouble

7 falling asleep). This also enabled a better understanding of what aspects of health problems

8 are predicted by occupational distress.

9   1. *Alcohol and drug use*: Alcohol dependence was assessed with the Patient Health

10   Questionnaire [26] and the alcohol use habits with 3 items from the Alcohol Use

11   Disorder Identification Scale (AUDIT).[27] Two items from the Brief COPE

12   questionnaire [28] evaluated doctors' tendency to use substances as a stress coping

13   strategy. Drug use list of 22 illicit and legal drugs was devised from the Commonly

14   Abused Drugs Charts [29] and the UK drug misuse declaration.[30]

15   2. *Binge-eating habits*: These were measured using the binge-eating disorder items from

16   the Eating Disorder Diagnostic Scale (as a scale and separate items).[31]

17   3. *Sleep disturbances*: Insomnia was measured with the Insomnia Severity Index (ISI;

18   Cronbach α=0.891).[32] Sleep problems were items derived from the Effort-Reward

19   scale [33] and ISI.[32]

20   4. *Ill health symptoms*: The Physical Symptom Inventory [34] comprising 12 items was

21   used to assess the frequency with which doctors experienced various symptoms.

22

23 *Predictor measures:* The predictor variables and measuring instruments captured different

24 types of occupational distress and job factors:

25

26   1. *Psychiatric morbidity:* This was measured using the General Health Questionnaire-12

27   (GHQ-12; Cronbach α=0.927).[35] This measure of psychiatric morbidity was chosen

28   instead of others (e.g. Patient Health Questionnaire) because GHQ-12 was previously

29   extensively used to examine working populations (e.g.[3]), including doctors (e.g.[6]).

30   2. *Burnout*: Emotional exhaustion from the Maslach Burnout Inventory (MBI) [36] was

31   assessed in this study (Cronbach α=0.905). Emotional exhaustion was selected

32   because previous research shows that it is the best predictor of stress-related health

33   among the three dimensions.[37]

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1   3. *Job effort:* The Job Effort scale from the Effort-Reward scale [33] measured time

2   pressure, interruptions and demands at work (Cronbach α=0.770).

3   4. *Work-life imbalance:* This was measured using the Work-Family Conflict scale [38]

4   (Cronbach α=0.934).

5   5. *Maladaptive coping strategies:* Two scales from the Brief COPE questionnaire [28]

6   were used: coping through substance use (Cronbach α=0.872), and coping through

7   self-blame (Cronbach α=0.783).

8   6. *Work experience:* years working in medicine.

9   7. *Work place type:* doctors indicated whether they work in a hospital or other setting.

10

11   More information about the measures is presented in Table 1.

12

13   [Insert Table 1]

14

15   *Statistical methods*

16   Outcome variables were re-coded into binary variables in order to distinguish between the

17   presence and absence of a health problem and to identify factors that raise the risk of the

18   symptom being present. The cut-off points where possible were identified from the literature

19   (see citations within Table 1). For sleep problems, we determined the cut-off points based on

20   the guidance for the ISI.[32] For each item doctors reporting moderate or severe sleep

21   problems were noted as having the symptom present, and reporting no/mild sleep problems

22   were noted as having the symptom absent. Doctors' responses about using substances to cope

23   with stress were dichotomised as either not doing so, or using substances a little bit, to a

24   medium extent or a lot. Frequency of drinking was divided into drinking alcohol less than 2-3

25   times a week and more than 2-3 times a week. Ill health symptoms were recoded such that the

26   presence of each symptom meant experiencing once/twice per week or more often. See Table

27   1 for more details. Logistic regression tested the impact of predictors on the odds of the

28   outcomes using SPSS v21 software.

29

30   **Results**

31

32   In total, 417 UK doctors participated. The mean age was 47.23 years (SD=10.97), and there

33   was an equivalent split of gender (48% males) and seniority (49% consultants). We compared

34   demographic characteristics of doctors in this study to doctors on the List of Registered

1 Medical Practitioners (LRPM)[39,40] and the comparison showed that the current sample

2 largely mirrors the demographics of UK medical doctors in terms of the proportion of doctors

3 by gender, age, grade and specialty, except that there was a higher representation of

4 consultants and public health doctors than the proportions within the LRPM (Table 2).

5

6 Table 1 shows the prevalence and descriptive statistics of different types of occupational

7 distress; for example, 32.7% of doctors had psychiatric morbidity and 55.3% were

8 emotionally exhausted.

9

10 [Insert Table 2]

11

12 *How many doctors use alcohol or drugs?* Table 1 shows that 53% of doctors drank alcohol

13 ≥2 times a week, 27% consumed ≥3 drinks on a typical day of drinking and 44% binge-drank

14 by consuming 6+ drinks on one occasion. 5% of doctors met the criteria for alcohol

15 dependence but the rest of doctors did not report significant impairments in their occupational

16 or other functioning as a result of drinking alcohol. In terms of illicit/non-illicit drug use,

17 44% of doctors used some type of drugs but almost all were non-illicit drugs: 3% of doctors

18 used prescription opioids, 2% used benzodiazepines, 5% used sleep medication, 5% smoked

19 tobacco, 7% used herbal or homeopathic remedies and 35% used over-the-counter medicines.

20 Illegal drug use was rare: only 1 doctor reported cocaine use and 1 doctor used amyl nitrite.

21 No doctor reported using amphetamines, anabolic steroids, cannabis, ecstasy, heroin,

22 ketamine, khat, LSD, magic mushrooms, mephedrone, methadone, methamphetamine or

23 tranquillizers.

24

25 *Are distressed doctors more likely to use alcohol/drugs?* Coping with stress was the reason

26 given by many doctors for drinking alcohol or taking drugs, with 34% saying that they used

27 substances in order to feel better, and 22% used substances to help them get through stressful

28 events. Table 3 shows logistic regression results analysing the effects of occupational distress

29 and job factors on alcohol and drug use. The model significance testing shows that the

30 predictors significantly explained variance in doctors using substances to help them get

31 through something (6%), drinking alcohol frequently (38%) and large amounts (12%), binge-

32 drinking (28%), and being alcohol dependent (28%). The predictors did not explain variance

33 in drug use and doctors using substances to feel better (p>0.05). Doctors who coped with

34 stress by using substances had a higher risk of frequent alcohol use, binge-drinking, alcohol

1   2   3   4   5   6   7   8   9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36   37   38   39   40   41   42   43   44   45   46   47   48   49   50   51   52   53   54   55   56   57   58   59   60

1   dependence and drug use (p≤0.022). The results also show that having more experience

2   working in medicine raised the risk of a doctor drinking alcohol frequently (OR=1.036;

3   p=0.002) but lowered the risk of binge-drinking (OR=0.970; p=0.007). Doctors who worked

4   in a hospital were more likely to drink high amounts of alcohol on a typical day of drinking

5   and to binge-drink (OR≥1.672; p≤0.044). Doctors who reacted to stress by blaming

6   themselves were more likely to use substances to get through something (OR=1.374;

7   p=0.039). Burnout, work-life imbalance and job effort were not significant unique predictors

8   of substance use although the combined models were significant. The exception was

9   psychiatric morbidity which had a significant unique effect of decreasing the risk of doctors

10 drinking alcohol frequently (OR=0.478; p=0.019).

11

12 [Insert Table 3]

13

14 *How many doctors binge-eat?* Table 1 shows that 35% of doctors ate a large amount of food

15 when they were not physically hungry, 31% ate until they felt uncomfortably full, and 24-

16 29% of doctors experienced negative emotions after overeating such as embarrassment,

17 disgust, depression or guilt. We found that 8% of doctors had a binge-eating disorder.

18

19 *Are distressed doctors more likely to binge-eat?* Table 4 shows that all models tested were

20 statistically significant and the predictors explained 8.1-17.1% of variance in binge-eating

21 habits (p<0.05). Types of occupational distress that, individually, significantly predicted

22 binge-eating habits were: self-blaming, work-life imbalance, and burnout. More experienced

23 doctors were less likely to feel disgusted with themselves after binge-eating (OR=0.966;

24 p=0.009), as were doctors who worked in hospitals (OR=0.453; p=0.008). Job effort lowered

25 the risk of a binge-eating disorder (OR=0.179; p<0.001). Psychiatric morbidity, by itself, did

26 not predict binge-eating, and nor did coping with stress through substance use (p>0.05).

27

28 [Insert Table 4]

29

30 *How many doctors have sleep disturbances?* Table 1 shows that 22% of doctors had

31 difficulty falling asleep, 35% difficulty staying asleep, 44% were dissatisfied with their sleep

32 pattern, 20% were worried or distressed about a current sleep problem, and 35% of doctors'

33 sleep problems interfered with daily functioning. Thinking about work contributed to sleep

34 problems; 61% of doctors thought about work when they went to bed and 49% had trouble

1 sleeping if they postponed something they were supposed to do that day. The ISI [32] showed

2 that 12% of doctors had severe/moderate insomnia.

3

4 *Are distressed doctors more likely to have sleep disturbances?* Logistic regression models

5 predicting 7 signs of sleep problems and insomnia are presented in Table 5. All models were

6 statistically significant explaining from 23.4% to 39.1% of variance, showing that

7 occupational distress and job factors significantly predicted sleep disturbances among

8 doctors. Doctors with psychiatric morbidity were more likely to have insomnia, difficulty

9 falling/staying asleep, think about work when they went to bed, find that sleep problems

10 interfered with their daily functioning (OR≥2.117; p≤0.026), and burnout increased the risk

11 of all 7 sleep disturbances (OR≥1.344; p≤0.036). Other significant unique predictors of sleep

12 problems among doctors were: maladaptive coping with stress, work-life imbalance, and

13 working in a hospital (p≤0.030).

14

15 [Insert Table 5]

16

17 *How many doctors suffer from daily or frequent ill health?* 69% of doctors had fatigue and

18 between 19% and 29% frequently experienced other type of ill health problems, e.g. upset

19 stomach, backache and headaches. Only 8% or fewer doctors reported frequent

20 (daily/weekly) non-menstrual stomach cramps, constipation, appetite loss and dizziness,

21 therefore these symptoms were not analysed using logistic regression.

22

23 *Are distressed doctors more likely to have daily or frequent ill health?* Table 6 shows the

24 logistic regression results that the odds of doctors suffering from frequent ill health are raised

25 by occupational distress together with years practising medicine and working in a hospital.

26 The predictors explained 8-35.2% of variance in doctors presenting with ill health symptoms;

27 only the effects on back pain were non-significant (p=0.083). Several types of occupational

28 distress had significant unique effects, meaning that they individually predicted doctors'

29 health. For instance, burnout raised the odds of doctors suffering from fatigue (OR=1.804;

30 p<0.001); job effort raised the odds of headaches (OR=1.905; p=0.030); work-life imbalance

31 raised the odds of diarrhoea (OR=1.717; p=0.005); and psychiatric morbidity raised the odds

32 of doctors suffering from fatigue, upset stomach or nausea, headaches,

33 acid/indigestion/heartburn, and eye strain (OR≥1.930; p≤0.017). Working in a hospital did

34 not, by itself, predict doctors' presentation of ill health symptoms, and nor did using

1   substances to cope with stress (p>0.05). More years of experience in medicine decreased the

2   odds of doctors having fatigue, upset stomach or nausea and headaches (OR≥0.963;

3   p≤0.024), but more experienced doctors had increased odds of ear ringing (OR=1.050;

4   p=0.002).

5

6   [Insert Table 6]

7

8   **Discussion**

9

10   *Prevalence of occupational distress and health problems among UK doctors*

11   This study shows the prevalence of occupational distress and health problems such as ill

12   health symptoms, and health-related problems (e.g. substance use) among UK doctors. The

13   results replicate a recent systematic review about the prevalence of burnout and psychiatric

14   morbidity [2] by finding that 32.7% of UK doctors have psychiatric morbidity and 55.3% a

15   type of burnout called emotional exhaustion while providing new evidence about the

16   prevalence of types of problems that were unrepresented in previous literature. The results

17   showed that 11% of doctors have insomnia; 20-61% experience various sleep problems; 5%

18   are alcohol dependent; 27-53% drink in a hazardous way; 69% have fatigue; 4-33%

19   experience other physical complaints; 8% have a binge-eating disorder; and 24-35%

20   experience binge-eating symptoms. 44% of doctors use some type of drugs, but mostly over-

21   the-counter medications (35%). Prescription drug use was rare (3% use opioids and 2% use

22   benzodiazepines), suggesting that the proportion of doctors getting drug treatment for anxiety

23   is lower than the proportion of doctors with anxiety (14.7%).[41] Compared to the general

24   population more doctors have psychiatric morbidity (32.7% compared 19%),[3] burnout

25   (55.3% compared to 24.8%),[42] and more doctors have physical complaints such as back

26   pain (e.g. 34% compared to 8-28% in the general population).[43] However, fewer doctors

27   have insomnia (11%) or are alcohol dependent (5%) compared to the general population

28   whereby 37% have insomnia and 13.9-29.1% have alcohol use disorder.[44] The results from

29   this study also revealed a higher prevalence of burnout than the National Trainee Survey

30   (NTS) which reported that 23.8% of medical trainees have burnout [45] but this could be

31   because the current study had a high representation of consultants (49%). The current study

32   supports the recent BMA annual survey reporting that 61% of doctors feel that their stress

33   levels have increased over the last year [46] by showing that a similar proportion of doctors

34   (55.3%) have a type of burnout called emotional exhaustion.

1   *Occupational distress increases the odds of health problems among UK doctors*

2   The results show that occupational distress increases the odds of doctors using substances,

3   having sleep disturbances, frequent symptoms of ill health, and binge-eating. Even taking

4   into consideration whether or not a doctor works in a hospital, the risk of health problems still

5   rises when doctors have signs of occupational distress such as burnout. Previous research

6   showed that distress,[8,47] coping strategies [48–50] and job factors [51–56] are associated

7   with health problems. This study replicates previous findings while demonstrating the

8   generalisability of the effects to a wider range of health issues among UK doctors from

9   various specialties:

10

11   *Alcohol/drug use:* Distressed doctors are more likely to use alcohol, with 22-34% of

12   doctors reporting that they use substances to feel better or help them get through

13   stressful events. Doctors who cope with stress by using substances have a higher risk of

14   alcohol dependence, binge-drinking, drinking larger amounts of alcohol, and a higher

15   risk to a great extent of using alcohol more frequently. Doctors who react to stress by

16   blaming themselves are more likely to use substances to get through something. Having

17   more experience working in medicine makes a doctor more likely to drink alcohol

18   frequently but lowers the likelihood of binge-drinking. Doctors who work in a hospital

19   are more likely to drink high amounts of alcohol on a typical day of drinking and to

20   binge-drink. In understanding the effects of occupational distress on alcohol or drug

21   use, the results showed the usefulness of assessing the combined effects of different

22   types of occupational distress, but that, except for psychiatric morbidity, burnout, work-

23   life imbalance and job effort do not individually predict alcohol use. This suggests that

24   occupational distress is best understood as a syndrome when understanding its effect on

25   alcohol use. These findings extend previous studies which show that burnout,

26   depression and psychiatric morbidity individually predict using alcohol

27   dependence/abuse.[7,57] The results also show that – for UK doctors – occupational

28   distress as a syndrome has no significant effect on legal or illegal drug use. Only

29   doctors who cite substance use as a strategy that they use to cope with stress are

30   significantly more likely to use drugs – and most of these are prescription or over-the-

31   counter drugs.

32

33   *Binge-eating:* The risks of doctors binge-eating and experiencing negative emotions

34   after over-eating are raised by occupational distress, e.g. burnout, coping with stress by

blaming oneself, and work-life imbalance. This supports previous studies showing that binge-eating is a method of coping with stress that offers people an initial sense of comfort.[15,16] Doctors who have longer experience working in medicine, and doctors who work in hospitals, are less likely to have unpleasant emotions after binge-eating, suggesting that community-based doctors are more at risk of finding that binge-eating makes them feel worse, rather than better. The amount of effort that a doctor puts into their job lowers the risk of their suffering from a binge-eating disorder. Psychiatric morbidity, by itself, did not predict binge-eating, and nor did coping with stress through substance use.

Sleep disturbances: Occupational distress and job factors significantly predict sleep problems and insomnia among doctors, supporting the view of occupational distress as a syndrome, whilst also revealing that certain types of occupational distress can also, individually, predict sleep disturbances. Previous research show that physicians with high burnout, for example, are more likely to experience sleep related problems.[58] This study extends our understanding of the risk factors and shows that burnout, psychiatric morbidity, maladaptive coping strategies, work-life imbalance, and working in a hospital increase the risk of sleep disturbances. This means that the risk of sleep problems or insomnia exists even if doctors are suffering from just one of these types of occupational distress which is in particularly noticeable with the increase in psychiatric morbidity. The sleep problems include trouble falling/staying sleep, worrying about work when trying to sleep, and finding that sleep problems interfere with daily functioning.

Daily or frequent ill health: Occupational distress increases the odds of doctors suffering from fatigue, upset stomach or nausea, headaches, acid/indigestion or heartburn, eye strain, diarrhoea, and ringing in the ears but not back pain. Psychiatric morbidity, burnout, coping with stress by blaming oneself, job effort, and work-life imbalance each, as individual predictors, also raise the odds of doctors suffering from frequent ill health. These findings extend previous studies which investigate how the working conditions experienced by doctors relate to ill health [25] by showing that occupational distress, especially psychiatric morbidity, increases the risk of physical health problems. Doctors who work in a hospital do not have increased odds of ill health symptoms, and nor do doctors who use substances to cope with stress. More

1 experienced doctors have lower odds of fatigue, upset stomach or nausea and

2 headaches, but are at a greater risk of suffering from ringing ears.

3

4 *Strengths and weaknesses of the study and future research*

5 This study is the first to explore the impact of occupational distress and work factors on the

6 risk of health problems among UK doctors from various specialties. An additional strength of

7 this study is that it is part of a bigger study using "a gold standard" design (a randomised

8 controlled trial) and it was piloted by consulting doctors to ensure that the types of

9 occupational distress and health problems measured were relevant. A weakness of this study

10 is a cross-sectional analysis. We need future experimental research to test causation between

11 occupational distress and health problems using a longitudinal design. We also encourage

12 future research to measure hypotheses not possible to test within the current study, e.g.

13 whether the risk of gastrointestinal problems among doctors rises with patient caseload or

14 infection exposure.

15

16 It was not possible to calculate the response rate because it was not clear whether all NHS

17 trusts and medical Royal Colleges who agreed to take part in this study actually distributed

18 the invitation and to how many doctors. Future research should explore whether our findings

19 replicate in a larger sample because the current sample size is relatively small, in comparison

20 to the whole population of UK medical doctors. We are also mindful that some participants

21 might not have been comfortable answering some sensitive questions (e.g. about illicit drug

22 or alcohol use) but the risk of response bias was mitigated by allowing doctors to complete

23 confidential self-reported questionnaires. This is a recognised methods of measuring health

24 and health-related behaviours (e.g. alcohol intake [59]).

25

26 *The meaning of the study: possible implications for clinicians and policymakers*

27 Occupational distress among doctors has a detrimental effect on the quality of care and

28 patient safety.[1] This study has revealed that occupational distress also increases the risk of

29 doctors suffering from health problems. The impact of occupational distress on ill health

30 could increase levels of sickness-absence among doctors, thus reducing patient safety because

31 of under-staffing. Likewise, the impact of occupational distress on substance use and sleep

32 problems could mean that distress indirectly impairs doctors' fitness to practice, judgement or

33 decision-making because of being intoxicated, hung-over or having disturbed sleep.

34 Therefore, we recommend that doctors' mentors, supervisors, peers and occupational health

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1 support services recognise and act upon (1) the prevalence of occupational distress and health

2 problems among doctors; (2) the possibility that occupational distress raises the risk of

3 several health problems; and (3) the need to provide early interventions that prevent doctors

4 who are experiencing occupational distress from suffering the long-term health effects of

5 sleep disturbances, frequent symptoms of ill health, and adopting negative health behaviours,

6 such as binge-drinking or eating in order to cope.

7

8 *Acknowledgements*

9 We are extremely grateful to all the doctors who kindly agreed to take part in this study and

10 the organisations who helped us to reach their doctors.

11

12 *Ethical approval and consent to participate*

13 The BEI School Ethics Committee at Birkbeck, University of London, approved the study in

14 May 2016. Participants voluntarily consented to take part in this study.

15

16 *Competing interests*

17 The authors declare that they have no competing interests.

18

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20 Not applicable

21

22 *Authors' contributions*

23 AM and CK participated in the conception and design of the study. AM collected and

24 analysed data. AM and CK were involved in the interpretation of the data and preparation of

25 this article. Both authors read and approved the final manuscript.

26

27 *Data sharing*

28 No additional data available

29

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Table

Table 1. Description of measures

Item	N	No of Items	% of doctors with present symptom/ M(SD)	Recoding (if applicable)	Measure	Measure/Original Scoring
Sleep disturbances						
Difficulty falling asleep	390	1	22%			
Difficulty staying asleep	390	1	35%			
Sleep problems interfere with daily functioning	389	1	35%	0,1 – Symptom absent; 2,3,4 - Symptom present	ISI	0 (scores showing no insomnia) to 4 (showing severe insomnia)
Worried or distressed about a current sleep problem	390	1	20%			
Dissatisfied with sleep pattern	390	1	44%	0,1,2 – Symptom absent *(2 is included as it means "unsure");* 3,4 - Symptom present		
Think about work when they go to bed	417	1	61%	0,1 – Symptom absent; 2,3 - Symptom present	Effort-Reward scale	1 (strongly disagree) to 4 (strongly agree)
Trouble sleeping if they postpone tasks	416	1	49%			
Insomnia	390	7	11%	≤14 – Symptom absent *(no, subthreshold insomnia);*≥15 – Symptom present *(moderate, severe insomnia)*[32]	ISI	7 items; 0 (scores showing no insomnia) to 4 (showing severe insomnia)

Substance use

Substance use in order to feel better	392	1	34%	1 – Symptom absent; 2, 3, 4 - Symptom present	The Brief COPE	1 (I usually don't do this) to 4 (I usually do this a lot)
Substance use in order to get through something	393	1	22%			
Frequency of drinking alcohol	386	1	53%	1,2,3 – not drinking or drinking less than 2-3 times a week; 4,5 - drinking 2-3 times a week or more often	AUDIT	1 (never/1-2) to 5 (daily/more than 10)
Quantity of drinks on typical day of drinking	362	1	27%	1 – drinking 1,2 drinks; 2, 3, 4, 5 – drinking 3 or more drinks		
Drink 6 or more drinks on one occasion	373	1	44%	1 – never; 2, 3, 4, 5 – binge-drinking		
Alcohol dependence	377	5	5%	Substance abuse was identified if any of the items were answered "*yes*" [26]	The Patient Health Questionnaire	0 (no) and 1 (yes)
Drug use	380	22	44%	Drug use was identified if any of the items were answered "*yes*"	Commonly Abused Drugs	22 items; 0 (no) and 1 (yes)

Physical symptoms

Fatigue	390	1	69%	1,2 – Symptom absent; 3,4,5 - Symptom present	The Physical Symptom Inventory	1 (not at all) to 5 (every day)
Upset stomach or nausea	390	1	19%			
Backache	390	1	33%			

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Headaches	390	1	27%			
Acid indigestion or heartburn	390	1	23%			
Eye strain	390	1	29%			
Diarrhoea	390	1	12%			
Ringing in the ears	390	1	13%			
Stomach cramps	389	1	8%			
Constipation	390	1	4%			
Loss of appetite	390	1	7%			
Dizziness	390	1	8%			

Eating problems

Eating large amounts of food when not physically hungry	316	1	35%			
Eat until feeling uncomfortably full	316	1	31%			
Eat alone because they feel embarrassed	315	1	24%		The Binge Eating Scale	
Feel disgusted with themselves, depressed or very guilty after overeating	316	1	28%	n/a		0 (no) and 1 (yes)
Feel upset about their uncontrollable eating or weight gain	316	1	29%			
Binge eating	316	9	8%	Please see [31] details for coding	The Binge Eating Scale	8 items - 0 (no) and 1 (yes); 1 question – 0 to 7 days

Predictor variables

Burnout: Emotional exhaustion	406	8	55% (M = 3.16; SD = 1.34)	Recoded for prevalence: <27 – Symptom absent; ≥27 – Symptom present [36]	MBI	9 items; 0 (never) to 6 (every day)
Psychiatric morbidity	393	12	33% (M = 2.19; SD = 0.55)	Recoded for prevalence: 0,1 into 0 and 2,3 into 2; & < 4 – Symptom absent; ≥4 – Symptom present [35]	GHQ-12	12 items; 0 (better than usual/not at all) to 3 (much less than usual/much less capable)
Effort scale	415	3	M = 3.3 (SD = 0.6)	n/a	Effort-Reward scale	3 items; 1 (strongly disagree) to 4 (strongly agree)
Work-family Imbalance	416	5	M = 5.26 (SD = 1.38)	n/a	Work-Family Conflict scale	5 items; 0 (strongly disagree) to 6 (strongly agree)
Coping: Substance use	392	2	M = 2.33 (SD = 0.88)	n/a	The Brief COPE	2 items; 1 (I usually don't do this) to 4 (I usually do this a lot)
Coping: Self-blame	393	2	M = 1.37 (SD = 0.61)	n/a		

Table 2. Participants' sociodemographic characteristics

Sociodemographic characteristics		%(n) or M(SD)	LRMP
Gender (Male)		48% (199)	54.5%
Age		47.23 (10.97)	
	Under 30	7% (28)	13%
	30-49	46% (190)	59%
	Over 50	48% (197)	28%
Year of experience in medicine		22.94 (11.35)	N/A
Grade	Junior doctor	20% (82)	21%
	General practitioner	18% (75)	23%
	Consultant	49% (203)	32%
	Other	14% (57)	23%
Workplace	Community	5% (21)	
	General practice	15% (61)	
	Hospital	58% (239)	N/A
	Multiple-places	15% (61)	
	Other	8% (32)	
Specialty	General practice	17% (71)	23%
	Public health	12% (49)	0.4%
	Anaesthetics and intensive care	9% (39)	8%
	Paediatrics	7% (27)	2%
	Emergency medicine	6% (24)	1%
	Psychiatry	6% (25)	3%
	Other	44% (184)	
Working hours	≤40	34% (141)	N/A
	41-50	41% (170)	
	>50	15% (104)	

Note. LRMP – List of registered medical practitioners

Table 3. Logistic regression predicting substance use problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Substance use in order to feel better	B	-2.239	0.304	0.162	0.096	-0.083	0.092	n/a	0.011	0.053
	SE	0.844	0.258	0.123	0.237	0.100	0.135	n/a	0.010	0.231
	OR	0.107	1.355	1.175	1.101	0.921	1.097	n/a	1.011	1.054
	p	0.008	0.239	0.190	0.685	0.411	0.493	n/a	0.278	0.819
	Model	$X^2(7)=10.96$; p=0.140; R^2 =0.04								
Substance use in order to get through something	B	-3.034	0.423	0.085	0.202	-0.179	**0.318**	n/a	0.002	0.005
	SE	0.963	0.289	0.142	0.274	0.113	**0.154**	n/a	0.012	0.266
	OR	0.048	1.527	1.089	1.224	0.836	**1.374**	n/a	1.002	1.005
	p	0.002	0.143	0.551	0.461	0.113	**0.039**	n/a	0.859	0.986
	Model	$X^2(7)=14.76$; p=0.039; R^2=0.059								
Drinking alcohol 2-3 times a week or more often	B	-2.297	**-0.739**	0.203	-0.360	0.086	-0.183	**2.936**	**0.035**	0.013
	SE	1.001	**0.316**	0.141	0.256	0.114	0.155	**0.393**	**0.011**	0.257
	OR	0.101	**0.478**	1.226	0.698	1.090	0.833	**18.836**	**1.036**	1.013
	p	0.022	**0.019**	0.148	0.160	0.449	0.237	**<0.001**	**0.002**	0.960
	Model	$X^2(8)=123.03$; p<0.001; R^2 =0.379								
Drink more	B	-2.593	-0.222	-0.041	0.185	-0.004	-0.083	**0.955**	0.002	**0.594**

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		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
than 3 drinks typically	SE	0.975	0.314	0.141	0.281	0.119	0.161	**0.206**	0.012	**0.276**
	OR	0.075	0.801	0.772	1.203	0.996	0.920	**2.599**	1.002	**1.812**
	p	0.008	0.480	0.960	0.511	0.971	0.604	**<0.001**	0.885	**0.031**
	Model	$X^2(8)=29.10$; $p<0.001$; $R^2=0.118$								
Drink 6 or more drinks on one occasion	B	-0.341	-0.481	0.038	-0.440	0.148	-0.190	**1.849**	**-0.030**	**0.514**
	SE	0.942	0.308	0.135	0.260	0.113	0.151	**0.267**	**0.011**	**0.255**
	OR	0.711	0.618	1.039	0.644	1.159	0.827	**6.355**	**0.970**	**1.672**
	p	0.717	0.118	0.777	0.090	0.191	0.209	**<0.001**	**0.007**	**0.044**
	Model	$X^2(8)=83.18$; $p<0.001$; $R^2=0.279$								
Alcohol dependence	B	-3.171	-0.047	0.037	-0.855	0.162	-0.091	**1.819**	-0.041	0.095
	SE	1.781	0.581	0.286	0.623	0.269	0.350	**0.359**	0.028	0.616
	OR	0.042	0.955	1.037	0.425	1.176	0.913	**6.165**	0.960	1.100
	p	0.075	0.936	0.898	0.170	0.548	0.795	**<0.001**	0.153	0.877
	Model	$X^2(8)=34.648$; $p<0.001$; $R^2=0.280$								
Drug use	B	-1.732	-0.084	0.073	0.192	0.067	0.068	**0.425**	-0.011	-0.047
	SE	0.830	0.256	0.120	0.228	0.099	0.133	**0.186**	0.010	0.226
	OR	0.177	0.92	1.076	1.211	1.069	1.070	**1.530**	0.989	0.954
	p	0.037	0.744	0.541	0.400	0.501	0.608	**0.022**	0.287	0.835

	Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Model	$X^2(8)=13.935$; p=0.083; $R^2=0.051$								

Note. n/a – scale is not included in the analysis because predictor is a part of it. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 4. Logistic regression predicting substance binge-eating problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Eating large	B	-1.831	0.344	0.127	-0.403	0.176	**0.410**	-0.094	-0.022	-0.040
amounts of	SE	0.935	0.290	0.142	0.275	0.124	**0.156**	0.208	0.011	0.271
food when not	OR	0.160	1.410	1.136	0.669	1.193	**1.507**	0.910	0.978	0.961
physically	p	0.050	0.236	0.370	0.143	0.156	**0.009**	0.652	0.052	0.883
hungry										
	Model	$X^2(8)=29.537$; p<0.001; $R^2 =0.127$								
Eat until	B	-2.229	0.064	0.132	-0.186	**0.271**	0.297	-0.117	-0.018	-0.342
feeling	SE	0.972	0.294	0.144	0.278	**0.131**	0.159	0.214	0.012	0.275
uncomfortably	OR	0.108	1.066	1.141	0.831	**1.311**	1.346	0.890	0.982	0.710
full	p	0.022	0.828	0.359	0.504	**0.038**	0.062	0.585	0.121	0.212
	Model	$X^2(8)=22.420$; p=0.004; $R^2 =0.100$								
Eat alone	B	-3.111	0.233	0.213	-0.139	0.112	0.378	0.089	-0.015	-0.386
because they	SE	1.068	0.314	0.158	0.307	0.139	0.175	0.220	0.013	0.300
feel	OR	0.045	1.262	1.237	0.870	1.119	1.460	1.093	0.985	0.680
embarrassed	p	0.004	0.458	0.178	0.650	0.418	0.031	0.686	0.255	0.199
	Model	$X^2(8)=21.890$; p=0.005; $R^2 =0.105$								
Feel disgusted	B	-2.237	0.079	**0.321**	-0.313	0.208	0.335	0.154	**-0.034**	**-0.791**

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
with themselves, depressed or very guilty after overeating	SE	1.036	0.310	**0.155**	0.299	0.138	0.172	0.218	**0.013**	**0.298**
	OR	0.107	1.082	**1.378**	0.731	1.231	1.398	1.166	**0.966**	**0.453**
	p	0.031	0.799	**0.038**	0.295	0.132	0.052	0.481	**0.009**	**0.008**
	Model	$X^2(8)=38.029$; $p<0.001$; $R^2=0.171$								
Feel upset about their uncontrollable eating or weight gain	B	-2.367	-0.187	**0.324**	-0.234	0.206	**0.337**	0.021	-0.015	-0.200
	SE	0.998	0.302	**0.150**	0.287	0.133	**0.164**	0.212	0.012	0.282
	OR	0.094	0.830	**1.383**	0.792	1.228	**1.400**	1.021	0.986	0.819
	p	0.018	0.537	**0.030**	0.416	0.121	**0.040**	0.922	0.231	0.478
	Model	$X^2(8)=23.374$; $p=0.003$; $R^2=0.106$								
Binge eating	B	-1.064	-0.343	**0.610**	**-1.678**	0.250	0.473	0.220	-0.014	0.224
	SE	1.395	0.445	**0.237**	**0.443**	0.219	0.253	0.309	0.019	0.444
	OR	0.345	0.710	**1.841**	**0.187**	1.284	1.606	1.246	0.986	1.251
	p	0.446	0.440	**0.010**	**<0.001**	0.253	0.062	0.477	0.458	0.614
	Model	$X^2(8)=27.089$; $p=0.001$; $R^2=0.163$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 5. Logistic regression predicting sleep disturbances

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Difficulty falling asleep	B	-5.019	**0.906**	**0.393**	-0.303	0.107	-0.039	**0.617**	-0.022	**0.669**
	SE	1.098	**0.304**	**0.158**	0.313	0.139	0.171	**0.210**	0.013	**0.308**
	OR	0.007	**2.474**	**1.482**	0.738	1.113	0.962	**1.854**	0.979	**1.953**
	p	<0.001	**0.003**	**0.013**	0.333	0.443	0.822	**0.003**	0.103	**0.030**
	Model	$X^2(8)=65.69$; p<0.001; $R^2 = 0.249$								
Difficulty staying asleep	B	-5.593	**0.829**	**0.468**	-0.022	0.038	0.155	**0.443**	0.014	0.275
	SE	1.014	**0.286**	**0.137**	0.267	0.114	0.148	**0.202**	0.012	0.257
	OR	0.004	**2.291**	**1.596**	0.978	1.039	1.168	**1.557**	1.014	1.317
	p	<0.001	**0.004**	**0.001**	0.933	0.741	0.296	**0.028**	0.233	0.285
	Model	$X^2(8)=79.09$; p<0.001; $R^2 =0.264$								
Dissatisfied with sleep pattern	B	-3.678	**0.962**	**0.536**	-0.142	-0.050	-0.006	0.280	-0.014	0.438
	SE	0.937	**0.292**	**0.134**	0.256	0.108	0.143	0.200	0.011	0.250
	OR	0.025	**2.617**	**1.710**	0.868	0.642	0.994	1.324	0.986	1.549
	p	<0.001	**0.001**	**<0.001**	0.579	0.951	0.966	0.160	0.200	0.080
	Model	$X^2(8)=85.18$; p<0.001; $R^2 =0.274$								
Sleep problems interfere with	B	-5.352	**1.047**	**0.492**	-0.303	0.058	**0.347**	**0.485**	-0.016	0.483
	SE	1.040	**0.299**	**0.144**	0.283	0.120	**0.153**	**0.208**	0.012	0.272

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
daily functioning	OR	0.005	**2.848**	**1.6360**	0.739	1.059	**1.414**	**1.625**	0.984	1.621
	p	<0.001	**<0.001**	**0.001**	0.284	0.631	**0.023**	**0.019**	0.187	0.075
	Model	$X^2(8)=102.74$; p<0.001; R^2=0.333								
Worried or distressed about a current sleep problem	B	-6.003	**1.342**	**0.570**	-0.414	0.014	0.267	-0.033	0-.013	**0.776**
	SE	1.202	**0.321**	**0.171**	0.340	0.146	0.179	0.232	0.014	**0.331**
	OR	0.002	**3.826**	**1.768**	0.661	1.014	1.306	0.968	0.987	**2.172**
	p	<0.001	**<0.001**	**0.001**	0.224	0.924	0.136	0.888	0.362	**0.019**
	Model	$X^2(8)=86.58$; p<0.001; R^2=0.327								
Think about work when they go to bed	B	-6.476	**0.750**	**0.295**	0.214	**0.456**	**0.616**	-0.053	-0.010	0.399
	SE	1.091	**0.337**	**0.141**	0.263	**0.116**	**0.160**	0.227	0.012	0.263
	OR	0.002	**2.117**	**1.344**	1.238	**1.577**	**1.851**	0.948	0.990	1.491
	p	<0.001	**0.026**	**0.036**	0.416	**<0.001**	**<0.001**	0.814	0.393	0.128
	Model	$X^2(8)=128.23$; p<0.001; R^2=0.391								
Trouble sleeping if they postpone tasks	B	-3.377	0.434	**0.337**	-0.273	0.243	**0.460**	0.090	-0.013	0.011
	SE	0.901	0.277	**0.128**	0.247	0.107	**0.140**	0.196	0.011	0.239
	OR	0.034	1.544	**1.401**	0.761	1.275	**1.584**	1.094	0.988	1.011
	p	<0.001	0.117	**0.008**	0.270	0.023	**0.001**	0.648	0.237	0.965
	Model	$X^2(8)=72.32$; p<0.001; R^2=0.234								

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		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Insomnia	B	-8.627	**1.458**	**0.597**	-0.109	0.035	0.346	0.148	-0.025	0.802
	SE	1.600	**0.378**	**0.216**	0.433	0.191	0.226	0.270	0.018	0.417
	OR	<0.001	**4.299**	**1.817**	0.897	1.036	1.414	1.160	0.975	2.231
	p	<0.001	**<0.001**	**0.006**	0.802	0.854	0.126	0.582	0.162	0.054
	Model	$X^2(8)=78.24$; p<0.001; $R^2=0.360$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 6. Logistic regression predicting ill health

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Fatigue	B	-3.632	**0.947**	**0.590**	0.127	0.056	0.308	0.083	**-0.029**	-0.130
	SE	1.079	**0.386**	**0.152**	0.267	0.115	0.164	0.247	**0.012**	0.276
	OR	0.026	**2.577**	**1.804**	1.135	1.058	1.360	1.087	**0.972**	0.878
	p	0.001	**0.014**	**<0.001**	0.635	0.623	0.060	0.735	**0.019**	0.637
	Model	$X^2(8)=106.899$; p<0.001; $R^2=0.352$								
Upset stomach or nausea	B	-3.970	**1.265**	0.094	0.091	-0.011	0.057	-0.200	**-0.038**	-0.059
	SE	1.089	**0.312**	0.157	0.313	0.136	0.173	0.237	**0.014**	0.303
	OR	0.019	**3.544**	1.098	1.095	0.989	1.059	0.819	**0.963**	0.942
	p	<0.001	**<0.001**	0.550	0.771	0.936	0.742	0.399	**0.006**	0.845
	Model	$X^2(8)=45.36$; p<0.001; $R^2=0.185$								
Backache	B	-2.011	0.218	0.176	-0.172	0.161	0.026	-0.070	-0.001	-0.025
	SE	0.863	0.262	0.126	0.244	0.108	0.139	0.190	0.010	0.237
	OR	0.134	1.243	1.193	0.842	1.175	1.026	0.932	0.999	0.975
	p	0.020	0.407	0.161	0.481	0.138	0.854	0.712	0.955	0.917
	Model	$X^2(8)=13.96$; p=0.083; $R^2=0.051$								
Headaches	B	-6.523	**0.944**	0.272	**0.644**	0.069	0.035	0.132	**-0.029**	0.394
	SE	1.114	**0.293**	0.143	**0.297**	0.125	0.158	0.208	**0.013**	0.280

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
	OR	0.001	**2.570**	1.313	**1.905**	1.071	1.035	1.141	**0.972**	1.483
	p	<0.001	**0.001**	0.057	**0.030**	0.580	0.826	0.527	**0.024**	0.160
	Model	$X^2(8)=75.67$; p<0.001; R^2 =0.267								
Acid indigestion or heartburn	B	-4.707	**0.826**	0.120	0.323	-0.011	0.007	-0.062	0.007	0.185
	SE	1.030	**0.290**	0.142	0.284	0.119	0.158	0.209	0.012	0.270
	OR	0.009	**2.284**	1.128	1.382	0.989	1.007	0.940	1.007	1.203
	p	<0.001	**0.004**	0.398	0.255	0.928	0.965	0.768	0.549	0.493
	Model	$X^2(8)=27.78$; p=0.001; R^2 =0.109								
Eye strain	B	-3.929	**0.657**	-0.06	0.496	0.066	-0.027	0.088	-0.012	-0.129
	SE	0.945	**0.275**	0.13	0.259	0.110	0.146	0.194	0.011	0.249
	OR	0.020	**1.930**	0.942	1.641	1.068	0.973	1.092	0.988	0.879
	p	<0.001	**0.017**	0.647	0.056	0.550	0.851	0.650	0.299	0.606
	Model	$X^2(8)= 22.45$; p=0.004; R^2 =0.084								
Diarrhea	B	-5.574	0.576	-0.155	-0.245	**0.541**	0.212	-0.020	0.002	0.148
	SE	1.317	0.349	0.179	0.363	**0.191**	0.198	0.259	0.015	0.350
	OR	0.004	1.779	0.857	0.783	**1.717**	1.237	0.981	1.002	1.159
	p	<0.001	0.098	0.386	0.501	**0.005**	0.284	0.940	0.877	0.672
	Model	$X^2(8)=21.640$; p=0.006; R^2 =0.106								

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Ringing in the ears	B	-3.318	0.315	0.292	-0.372	-0.018	0.063	-0.155	**0.048**	<0.0001
	SE	1.204	0.358	0.182	0.342	0.144	0.192	0.262	**0.015**	0.316
	OR	0.036	1.370	1.338	0.689	0.983	1.065	0.857	**1.050**	1.000
	p	0.006	0.379	0.109	0.277	0.903	0.742	0.555	**0.002**	1.000
	Model	$X^2(8)=16.817$; p=0.032; $R^2=0.080$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6-7
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	Not explained as was based on requirements for the RCT
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9-10
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic,	9-10

		clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	10-13; Table 1
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13
		(*b*) Report category boundaries when continuous variables were categorized	9; Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	13-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Does occupational distress raise the risk of alcohol use, binge-eating, ill health and sleep problems among medical doctors? A UK cross-sectional study

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1 **Does occupational distress raise the risk of alcohol use, binge-eating, ill health and sleep**

2 **problems among medical doctors? A UK cross-sectional study**

3

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16

1   **Abstract**

2

3   **Objectives.** This study aims to assess the prevalence of health problems (e.g. insomnia,

4   binge-eating, substance use, and ill health) among UK doctors and to investigate whether

5   occupational distress increases the risk of health problems.

6   **Design.** This study reports the analysis of data collected at the baseline stage of a randomised

7   controlled trial (protocol #NCT02838290).

8   **Setting.** Doctors were invited through medical Royal Colleges, the British Medical

9   Association's research panel, and a random selection of NHS trusts across various UK

10   regions.

11   **Participants**: 417 UK doctors with an equivalent split of gender (48% males) and seniority

12   (49% consultants).

13   **Main Outcomes and Measures**: Outcomes were sleep problems (e.g. insomnia),

14   alcohol/drug use (e.g. binge-drinking), ill health (e.g. backache) and binge-eating (e.g.

15   uncontrollable eating). Predictor variables were occupational distress (psychiatric morbidity,

16   burnout, job effort, work-life imbalance, coping with stress through self-blame or substances)

17   and work factors (workplace and years practicing medicine).

18   **Results**: 44% of doctors binge-drank and 5% met the criteria for alcohol dependence; 24-

19   29% experienced negative emotions after overeating and 8% had a binge-eating disorder; 20-

20   61% had some type of sleep problem and 12% had severe/moderate insomnia; 69% had

21   fatigue and 19-29% experienced other types of ill health problems. The results show that

22   occupational distress and job factors increase the odds of doctors using substances, having

23   sleep problems, presenting with frequent symptoms of ill health, and binge-eating. For

24   example, burnout increased the risk of all types of sleep problems, e.g. difficulty

25   falling/staying asleep, insomnia (OR$\geq$1.344; p $\leq$ 0.036). Even taking into consideration

1 whether or not a doctor works in a hospital, the risk of health problems still rises when

2 doctors have signs of occupational distress.

3 **Conclusion**. Early recognition of occupational distress can prevent health problems among

4 UK doctors that can reduce the quality of patient care because of sickness-related absence.

5 **Strengths and limitations of this study**

6

7 • This is the first study to explore a wide range of health problems among UK doctors

8 and to examine work-related risk factors;

9 • The study was piloted by consulting doctors about the method before the study

10 started;

11 • This is a cross-sectional study and therefore it is not possible to draw conclusions

12 about causation;

13 • It was not possible to calculate the response rate because it was not clear if all NHS

14 trusts and Royal Colleges who agreed to invite doctors to take part in this research did

15 send out the invitations, and to how many doctors.

16

4

1 **Introduction**

2

3 Distress suffered by doctors has significant consequences for patient care. A recent meta-

4 analysis of 47 studies found that burned-out doctors were more likely to provide poor quality

5 care because of reduced professionalism, and they were more likely to be associated with

6 poor patient satisfaction and incidents that jeopardise patient safety.[1] There is a high

7 prevalence of distress among doctors in the United Kingdom (UK), with a systematic review

8 of 30 studies showing that 17% to 52% of doctors have psychiatric morbidity,[2] higher than

9 the prevalence rate of 19% in the general population,[3] and 31% to 54% of doctors have a

10 type of burnout called emotional exhaustion.[2] Little is known, however, about whether

11 occupational distress raises the risk of health problems (e.g. insomnia, binge-drinking) that

12 might compel doctors to be absent from work or take sick leave resulting in under-staffing

13 and a risk to patient safety.

14 Occupational distress can be described as a syndrome comprising of burnout, depression,

15 maladaptive coping strategies and other symptoms.[4] The potential implications for risks to

16 patient safety due to sickness-absence make it useful to investigate the impact of different

17 types of occupational distress on the relative risk of: (a) behaviours that have an impact on

18 doctors' health such as alcohol/drug use and binge-eating; (b) health issues such as sleep

19 disturbances and daily or weekly symptoms of ill health (e.g. headaches or fatigue). This is

20 the first study to examine such a broad spectrum of health consequences among doctors. The

21 other innovation of the current study is that, whereas many previous studies have sampled US

22 doctors [5] or individual specialties such as oncology [6] and surgery,[7] this study sheds new

23 light on the impact of occupational distress on health problems among doctors in the UK.

24 *Does occupational distress increase the risk of doctors using alcohol or drugs?*

25 Workers experiencing occupational distress are more likely to regularly drink alcohol, binge-

26 drink or use drugs as a method of coping.[8,9] Doctors, on average, report equivalent or

27 lower rates of alcohol abuse than the general population [10] but daily alcohol consumption

28 or binge-drinking that does not meet the threshold for diagnosis of alcoholism is still

29 problematic,[11,12] and symptomatic of psychological distress. In the US, 10% of doctors

30 drink alcohol daily and 8% report severe alcohol or drug misuse or dependence at some point

31 in their lives.[5] Prescription drug abuse is particularly problematic because doctors are up to

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3   1   5 times more likely to use prescription drugs than the general population due to easier access
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5   2   or familiarity with prescription drugs, e.g. 24% of US doctors use benzodiazepine and 40%
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7   3   use minor opiates.[5] There are many reasons why doctors use substances – not all of which
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9   4   are to do with being distressed – therefore research is needed to clarify the proportion of
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11   5   doctors who use alcohol/drugs as a way of coping with occupational distress. The coping
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13   6   function of alcohol/drug use among doctors, as with the general population, is plausible
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15   7   because alcohol and many drugs have psychoactive properties, e.g. prescription drugs such as
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17   8   benzodiazepine and opiates; illicit drugs such as LSD. Occupational distress is known to
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19   9   predict alcohol misuse in the general population [8] but little is known about whether, for
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21   10   example, doctors with high levels of burnout are at greater risk of using alcohol or drugs
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23   11   (including prescription or legally purchased drugs), and whether other types of occupational
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25   12   distress (e.g. psychiatric morbidity, negative coping strategies) have similar effects. Little is
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27   13   also known about the impact of other job factors such as work experience on the risk of
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29   14   doctors engaging in substance use.
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31   15   *Does occupational distress increase the risk of doctors' binge-eating?*
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33   16   Like alcohol or drug use, binge-eating is more prevalent among workers experiencing
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35   17   occupational distress [13] but, unlike substance use, little is known about binge-eating rates
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37   18   among doctors and risk factors. Binge-eating can be defined as eating a larger amount of food
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39   19   than most people eat in one sitting and finding oneself unable to control ones eating.[14]
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41   20   Binge-eating, like alcohol or drug use, is a common method of coping with psychological
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43   21   distress because eating offers an initial sense of comfort.[15,16] The initial comfort is,
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45   22   however, followed by feelings of shame or guilt, thus exacerbating distress.[16] This is one
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47   23   of the first studies to assess the prevalence of binge-eating among UK doctors and to offer
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49   24   insights into whether doctors who binge-eat experience unpleasant emotions after binging.
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51   25   This study will also offer new insights into the impact of different types of occupational
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53   26   distress (e.g. work-life imbalance) which, together with analysing substance abuse by
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55   27   doctors, will reveal the consequences of occupational distress for doctors' health-related
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57   28   behaviours.
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59   29   *Does occupational distress increase the risk of doctors having sleep disturbances?*
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        30   There have been calls for research into the connection between sleep problems and doctors'

        31   health [17] but most previous studies have focused on sleep deprivation rather than sleep

        32   disturbances that have a psychological aetiology, e.g. trouble falling/staying asleep due to

1 worry. Sleep deprivation can be defined as the lack of the opportunity to sleep, or more

2 simply as sleeping too few hours each day. Sleep deprivation is associated with

3 depression,[18,19] burnout,[20] suicide risk,[19] and immunity or cardiovascular health

4 problems [21] among doctors but sleep deprivation in itself is not necessarily a sign of

5 psychological distress. Doctors who work long shifts [22] or lack block-scheduled shifts [23]

6 sleep too few hours because they have no choice. Therefore, rather than measuring sleep

7 deprivation, this study measured types of sleep disturbance with a psychological aetiology

8 such as trouble falling asleep, waking up prematurely because of worrying about work, and

9 insomnia. It is plausible that the risk of these types of sleep disturbance is higher among

10 doctors suffering from work-life imbalance, psychiatric morbidity, and other types of

11 occupational distress. This study will evaluate whether UK doctors suffering from

12 occupational distress have an increased risk of sleep disturbances.

13 *Does occupational distress increase the risk of doctors presenting with ill health?*

14 There is some research about the physical health of doctors in some specialties (e.g.

15 oncology)[6] but research is needed to assess whether occupational distress predicts the risk

16 of doctors from various specialties suffering from daily or frequent headaches,

17 gastrointestinal problems, and other physical symptoms. Physical health has a complex range

18 of causes (e.g. health behaviours, genetics and infections) but people who are distressed are

19 more susceptible to infections because psychological distress weakens the immune

20 system.[24] The important question, therefore, is the relative risk of ill health symptoms,

21 comparing doctors with and without occupational distress. We recognise that the physical

22 health of doctors is shaped by a complex range of factors – only one of which is occupational

23 distress – because working in a clinical environment can pose some risk to physical

24 health.[25] This study is one of the first to shed light on the impact of occupational distress

25 on ill health symptoms among UK doctors.

26 *Study aims*

27 This study aims to assess whether doctors suffering from occupational distress have an

28 increased risk of (i) using alcohol or drugs (illicit, non-illicit); (ii) binge-eating; (iii) having

29 sleep disturbances; and (iv) presenting with physical health symptoms. This study will extend

30 previous literature about occupational distress in medicine, which has focused on burnout and

31 psychiatric morbidity,[2] by measuring and defining occupational distress in additional ways,

32 e.g. work-life imbalance, job effort, coping with stress through self-blame or through

substance use, drawing on previous literature highlighting the multiple dimensions of

occupational distress.[6] This study will also provide new insights into the prevalence of

alcohol/drug use, binge-eating, sleep and ill health problems among UK doctors, extending

previous research about doctors from other countries or individual specialties.[6,7]

Method

Patient and public involvement statement

All questionnaires were valid, reliable measures selected from previous literature but it was

important to consult doctors about whether the types of occupational distress and health

problems to be measured were relevant to doctors, and whether the instructions were clear.

We thus consulted 15 doctors before the main study, using online software (*Qualtrics*). The

pilot study sought the doctors' feedback (through open ended questions) about the relevance

and clarity of the questionnaires. Doctors gave generally positive feedback. Some minor

amendments included revising the wording of demographic questions, questionnaire

instructions and reducing the number of questionnaires to eliminate similar measures.

Study design

The research reported in this article is an analysis of data collected at the baseline stage of a

randomised controlled trial (protocol #NCT02838290) of the effect of an intervention on

doctors' levels of occupational distress and health problems. The trial took place from July to

November 2016. Due to the complexity of the trial this paper reports a cross-sectional

analysis of the baseline data.

Participants and study size

Doctors took part in this study online (*Qualtrics*). They learnt about the study through

medical Royal Colleges, NHS trusts, and the British Medical Association (BMA). To prevent

selection bias based on specialty, we invited all Royal Colleges from which 9 agreed to

distribute information about the research to their members. To prevent selection bias due to

an NHS trust's reputation we randomly selected 25% NHS trusts. From the ones possible to

reach, 9 distributed invitations to this study. The third source of data was the BMA's research

panel. The majority of UK medical doctors are members of the BMA and any of them can

join the BMA's research panel; therefore, this panel represented a broad spectrum of doctors.

All medical doctors working in the UK were included in the baseline data analysis.

1 *Measures*

2 *Outcome measures:* Doctors completed a variety of questionnaires assessing health problems.

3 In some cases, we analysed responses to individual items in addition to the average of whole

4 questionnaires because this offered richer insights into the prevalence of certain types of

5 substance misuse (e.g. binge-drinking), different symptoms of ill health (e.g. backache),

6 different signs of binge-eating (e.g. uncontrollable eating) and sleep disturbances (e.g. trouble

7 falling asleep). This also enabled a better understanding of what aspects of health problems

8 are predicted by occupational distress.

9 1. *Alcohol and drug use*: Alcohol dependence was assessed with the Patient Health

10 Questionnaire [26] and the alcohol use habits with 3 items from the Alcohol Use

11 Disorder Identification Scale (AUDIT).[27] Two items from the Brief COPE

12 questionnaire [28] evaluated doctors' tendency to use substances as a stress coping

13 strategy. Drug use list of 22 illicit and legal drugs was devised from the Commonly

14 Abused Drugs Charts [29] and the UK drug misuse declaration.[30]

15 2. *Binge-eating habits*: These were measured using the binge-eating disorder items from

16 the Eating Disorder Diagnostic Scale (as a scale and separate items).[31]

17 3. *Sleep disturbances*: Insomnia was measured with the Insomnia Severity Index (ISI;

18 Cronbach α=0.891).[32] Sleep problems were items derived from the Effort-Reward

19 scale [33] and ISI.[32]

20 4. *Ill health symptoms*: The Physical Symptom Inventory [34] comprising 12 items was

21 used to assess the frequency with which doctors experienced various symptoms.

22

23 *Predictor measures:* The predictor variables and measuring instruments captured different

24 types of occupational distress and job factors:

25

26 1. *Psychiatric morbidity:* This was measured using the General Health Questionnaire-12

27 (GHQ-12; Cronbach α=0.927).[35] This measure of psychiatric morbidity was chosen

28 instead of others (e.g. Patient Health Questionnaire) because GHQ-12 was previously

29 extensively used to examine working populations (e.g.[3]), including doctors (e.g.[6]).

30 2. *Burnout*: Emotional exhaustion from the Maslach Burnout Inventory (MBI) [36] was

31 assessed in this study (Cronbach α=0.905). Emotional exhaustion was selected

32 because previous research shows that it is the best predictor of stress-related health

33 among the three dimensions.[37]

1   3. *Job effort:* The Job Effort scale from the Effort-Reward scale [33] measured time

2   pressure, interruptions and demands at work (Cronbach α=0.770).

3   4. *Work-life imbalance:* This was measured using the Work-Family Conflict scale [38]

4   (Cronbach α=0.934).

5   5. *Maladaptive coping strategies:* Two scales from the Brief COPE questionnaire [28]

6   were used: coping through substance use (Cronbach α=0.872), and coping through

7   self-blame (Cronbach α=0.783).

8   6. *Work experience:* years working in medicine.

9   7. *Work place type*: doctors indicated whether they work in a hospital or other setting.

10

11 More information about the measures is presented in Table 1.

12

13 [Insert Table 1]

14

15 *Statistical methods*

16 Outcome variables were re-coded into binary variables in order to distinguish between the

17 presence and absence of a health problem and to identify factors that raise the risk of the

18 symptom being present. The cut-off points where possible were identified from the literature

19 (see citations within Table 1). For sleep problems, we determined the cut-off points based on

20 the guidance for the ISI.[32] For each item doctors reporting moderate or severe sleep

21 problems were noted as having the symptom present, and reporting no/mild sleep problems

22 were noted as having the symptom absent. Doctors' responses about using substances to cope

23 with stress were dichotomised as either not doing so, or using substances a little bit, to a

24 medium extent or a lot. Frequency of drinking was divided into drinking alcohol less than 2-3

25 times a week and more than 2-3 times a week. Ill health symptoms were recoded such that the

26 presence of each symptom meant experiencing once/twice per week or more often. See Table

27 1 for more details. Logistic regression tested the impact of predictors on the odds of the

28 outcomes using SPSS v21 software.

29

30 **Results**

31

32 In total, 417 UK doctors participated. The mean age was 47.23 years (SD=10.97), and there

33 was an equivalent split of gender (48% males) and seniority (49% consultants). We compared

34 demographic characteristics of doctors in this study to doctors on the List of Registered

1   Medical Practitioners (LRMP)[39,40] and the comparison showed that the current sample

2   largely mirrors the demographics of UK medical doctors in terms of the proportion of doctors

3   by gender, age, grade and specialty, except that there was a higher representation of

4   consultants and public health doctors than the proportions within the LRMP (Table 2).

5

6   Table 1 shows the prevalence and descriptive statistics of different types of occupational

7   distress; for example, 32.7% of doctors had psychiatric morbidity and 55.3% were

8   emotionally exhausted.

9

10   [Insert Table 2]

11

12   *How many doctors use alcohol or drugs?* Table 1 shows that 53% of doctors drank alcohol

13   ≥2 times a week, 27% consumed ≥3 drinks on a typical day of drinking and 44% binge-drank

14   by consuming 6+ drinks on one occasion. 5% of doctors met the criteria for alcohol

15   dependence but the rest of doctors did not report significant impairments in their occupational

16   or other functioning as a result of drinking alcohol. In terms of illicit/non-illicit drug use,

17   44% of doctors used some type of drugs but almost all were non-illicit drugs: 3% of doctors

18   used prescription opioids, 2% used benzodiazepines, 5% used sleep medication, 5% smoked

19   tobacco, 7% used herbal or homeopathic remedies and 35% used over-the-counter medicines.

20   Illegal drug use was rare: only 1 doctor reported cocaine use and 1 doctor used amyl nitrite.

21   No doctor reported using amphetamines, anabolic steroids, cannabis, ecstasy, heroin,

22   ketamine, khat, LSD, magic mushrooms, mephedrone, methadone, methamphetamine or

23   tranquillizers.

24

25   *Are distressed doctors more likely to use alcohol/drugs?* Coping with stress was the reason

26   given by many doctors for drinking alcohol or taking drugs, with 34% saying that they used

27   substances in order to feel better, and 22% used substances to help them get through stressful

28   events. Table 3 shows logistic regression results analysing the effects of occupational distress

29   and job factors on alcohol and drug use. The model significance testing shows that the

30   predictors significantly explained variance in doctors using substances to help them get

31   through something (6%), drinking alcohol frequently (38%) and large amounts (12%), binge-

32   drinking (28%), and being alcohol dependent (28%). The predictors did not explain variance

33   in drug use and doctors using substances to feel better ($p > 0.05$). Doctors who coped with

34   stress by using substances had a higher risk of frequent alcohol use, binge-drinking, alcohol

1 dependence and drug use (p≤0.022). The results also show that having more experience

2 working in medicine raised the risk of a doctor drinking alcohol frequently (OR=1.036;

3 p=0.002) but lowered the risk of binge-drinking (OR=0.970; p=0.007). Doctors who worked

4 in a hospital were more likely to drink high amounts of alcohol on a typical day of drinking

5 and to binge-drink (OR≥1.672; p≤0.044). Doctors who reacted to stress by blaming

6 themselves were more likely to use substances to get through something (OR=1.374;

7 p=0.039). Burnout, work-life imbalance and job effort were not significant unique predictors

8 of substance use although the combined models were significant. The exception was

9 psychiatric morbidity which had a significant unique effect of decreasing the risk of doctors

10 drinking alcohol frequently (OR=0.478; p=0.019).

11

12 [Insert Table 3]

13

14 *How many doctors binge-eat?* Table 1 shows that 35% of doctors ate a large amount of food

15 when they were not physically hungry, 31% ate until they felt uncomfortably full, and 24-

16 29% of doctors experienced negative emotions after overeating such as embarrassment,

17 disgust, depression or guilt. We found that 8% of doctors had a binge-eating disorder.

18

19 *Are distressed doctors more likely to binge-eat?* Table 4 shows that all models tested were

20 statistically significant and the predictors explained 8.1-17.1% of variance in binge-eating

21 habits (p<0.05). Types of occupational distress that, individually, significantly predicted

22 binge-eating habits were: self-blaming, work-life imbalance, and burnout. More experienced

23 doctors were less likely to feel disgusted with themselves after binge-eating (OR=0.966;

24 p=0.009), as were doctors who worked in hospitals (OR=0.453; p=0.008). Job effort lowered

25 the risk of a binge-eating disorder (OR=0.179; p<0.001). Psychiatric morbidity, by itself, did

26 not predict binge-eating, and nor did coping with stress through substance use (p>0.05).

27

28 [Insert Table 4]

29

30 *How many doctors have sleep disturbances?* Table 1 shows that 22% of doctors had

31 difficulty falling asleep, 35% difficulty staying asleep, 44% were dissatisfied with their sleep

32 pattern, 20% were worried or distressed about a current sleep problem, and 35% of doctors'

33 sleep problems interfered with daily functioning. Thinking about work contributed to sleep

34 problems; 61% of doctors thought about work when they went to bed and 49% had trouble

1   sleeping if they postponed something they were supposed to do that day. The ISI [32] showed

2   that 12% of doctors had severe/moderate insomnia.

3

4   *Are distressed doctors more likely to have sleep disturbances?* Logistic regression models

5   predicting 7 signs of sleep problems and insomnia are presented in Table 5. All models were

6   statistically significant explaining from 23.4% to 39.1% of variance, showing that

7   occupational distress and job factors significantly predicted sleep disturbances among

8   doctors. Doctors with psychiatric morbidity were more likely to have insomnia, difficulty

9   falling/staying asleep, think about work when they went to bed, find that sleep problems

10   interfered with their daily functioning (OR$\geq$2.117; p$\leq$0.026), and burnout increased the risk

11   of all 7 sleep disturbances (OR$\geq$1.344; p$\leq$0.036). Other significant unique predictors of sleep

12   problems among doctors were: maladaptive coping with stress, work-life imbalance, and

13   working in a hospital (p$\leq$0.030).

14

15   [Insert Table 5]

16

17   *How many doctors suffer from daily or frequent ill health?* 69% of doctors had fatigue and

18   between 19% and 29% frequently experienced other type of ill health problems, e.g. upset

19   stomach, backache and headaches. Only 8% or fewer doctors reported frequent

20   (daily/weekly) non-menstrual stomach cramps, constipation, appetite loss and dizziness,

21   therefore these symptoms were not analysed using logistic regression.

22

23   *Are distressed doctors more likely to have daily or frequent ill health?* Table 6 shows the

24   logistic regression results that the odds of doctors suffering from frequent ill health are raised

25   by occupational distress together with years practising medicine and working in a hospital.

26   The predictors explained 8-35.2% of variance in doctors presenting with ill health symptoms;

27   only the effects on back pain were non-significant (p=0.083). Several types of occupational

28   distress had significant unique effects, meaning that they individually predicted doctors'

29   health. For instance, burnout raised the odds of doctors suffering from fatigue (OR=1.804;

30   p<0.001); job effort raised the odds of headaches (OR=1.905; p=0.030); work-life imbalance

31   raised the odds of diarrhoea (OR=1.717; p=0.005); and psychiatric morbidity raised the odds

32   of doctors suffering from fatigue, upset stomach or nausea, headaches,

33   acid/indigestion/heartburn, and eye strain (OR$\geq$1.930; p$\leq$0.017). Working in a hospital did

34   not, by itself, predict doctors' presentation of ill health symptoms, and nor did using

1   substances to cope with stress (p>0.05). More years of experience in medicine decreased the

2   odds of doctors having fatigue, upset stomach or nausea and headaches (OR≥0.963;

3   p≤0.024), but more experienced doctors had increased odds of ear ringing (OR=1.050;

4   p=0.002).

5

6   [Insert Table 6]

7

8   **Discussion**

9

10   *Prevalence of occupational distress and health problems among UK doctors*

11   This study shows the prevalence of occupational distress and health problems such as ill

12   health symptoms, and health-related problems (e.g. substance use) among UK doctors. The

13   results replicate a recent systematic review about the prevalence of burnout and psychiatric

14   morbidity [2] by finding that 32.7% of UK doctors have psychiatric morbidity and 55.3% a

15   type of burnout called emotional exhaustion while providing new evidence about the

16   prevalence of types of problems that were unrepresented in previous literature. The results

17   showed that 11% of doctors have insomnia; 20-61% experience various sleep problems; 5%

18   are alcohol dependent; 27-53% drink in a hazardous way; 69% have fatigue; 4-33%

19   experience other physical complaints; 8% have a binge-eating disorder; and 24-35%

20   experience binge-eating symptoms. 44% of doctors use some type of drugs, but mostly over-

21   the-counter medications (35%). Prescription drug use was rare (3% use opioids and 2% use

22   benzodiazepines), suggesting that the proportion of doctors getting drug treatment for anxiety

23   is lower than the proportion of doctors with anxiety (14.7%).[41] Compared to the general

24   population more doctors have psychiatric morbidity (32.7% compared 19%),[3] burnout

25   (55.3% compared to 24.8%),[42] and more doctors have physical complaints such as back

26   pain (e.g. 34% compared to 8-28% in the general population).[43] However, fewer doctors

27   have insomnia (11%) or are alcohol dependent (5%) compared to the general population

28   whereby 37% have insomnia and 13.9-29.1% have alcohol use disorder.[44] The results from

29   this study also revealed a higher prevalence of burnout than the National Trainee Survey

30   (NTS) which reported that 23.8% of medical trainees have burnout [45] but this could be

31   because the current study had a high representation of consultants (49%). The current study

32   supports the recent BMA annual survey reporting that 61% of doctors feel that their stress

33   levels have increased over the last year [46] by showing that a similar proportion of doctors

34   (55.3%) have a type of burnout called emotional exhaustion.

1 *Occupational distress increases the odds of health problems among UK doctors*

2 The results show that occupational distress increases the odds of doctors using substances,

3 having sleep disturbances, frequent symptoms of ill health, and binge-eating. Even taking

4 into consideration whether or not a doctor works in a hospital, the risk of health problems still

5 rises when doctors have signs of occupational distress such as burnout. Previous research

6 showed that distress,[8,47] coping strategies [48–50] and job factors [51–56] are associated

7 with health problems. This study replicates previous findings while demonstrating the

8 generalisability of the effects to a wider range of health issues among UK doctors from

9 various specialties:

10

11 *Alcohol/drug use:* Distressed doctors are more likely to use alcohol, with 22-34% of

12 doctors reporting that they use substances to feel better or help them get through

13 stressful events. Doctors who cope with stress by using substances have a higher risk of

14 alcohol dependence (OR=6.165), binge-drinking (OR=6.355), drinking larger amounts

15 of alcohol (OR=2.599), and a higher risk of using alcohol more frequently

16 (OR=18.836). Doctors who react to stress by blaming themselves are more likely to use

17 substances to get through something (OR=1.374). Having more experience working in

18 medicine makes a doctor more likely to drink alcohol frequently (OR=1.036) but

19 lowers the likelihood of binge-drinking (OR=0.970). Doctors who work in a hospital

20 are more likely to drink high amounts of alcohol on a typical day of drinking

21 (OR=1.812) and to binge-drink (OR=1.672). In understanding the effects of

22 occupational distress on alcohol or drug use, the results showed the usefulness of

23 assessing the combined effects of different types of occupational distress, but that,

24 except for psychiatric morbidity, burnout, work-life imbalance and job effort do not

25 individually predict alcohol use. This suggests that occupational distress is best

26 understood as a syndrome when understanding its effect on alcohol use. These findings

27 extend previous studies which show that burnout, depression and psychiatric morbidity

28 individually predict using alcohol dependence/abuse.[7,57] The results also show that –

29 for UK doctors – occupational distress as a syndrome has no significant effect on legal

30 or illegal drug use. Only doctors who cite substance use as a strategy that they use to

31 cope with stress are significantly more likely to use drugs (OR=1.530) – and most of

32 these are prescription or over-the-counter drugs.

33

1 *Binge-eating:* The risks of doctors binge-eating and experiencing negative emotions
2 after over-eating are raised by occupational distress (OR=1.311 to 1.841), e.g. burnout,
3 coping with stress by blaming oneself, and work-life imbalance. This supports previous
4 studies showing that binge-eating is a method of coping with stress that offers people
5 an initial sense of comfort.[15,16] Doctors who have longer experience working in
6 medicine, and doctors who work in hospitals, are less likely to have unpleasant
7 emotions after binge-eating (OR=0.966 and 0.453), suggesting that community-based
8 doctors are more at risk of finding that binge-eating makes them feel worse, rather than
9 better. The amount of effort that a doctor puts into their job lowers the risk of their
10 suffering from a binge-eating disorder (OR=0.187). Psychiatric morbidity, by itself, did
11 not predict binge-eating, and nor did coping with stress through substance use.

12

13 *Sleep disturbances:* Occupational distress and job factors significantly predict sleep
14 problems and insomnia among doctors, supporting the view of occupational distress as
15 a syndrome, whilst also revealing that certain types of occupational distress can also,
16 individually, predict sleep disturbances. Previous research show that physicians with
17 high burnout, for example, are more likely to experience sleep related problems.[58]
18 This study extends our understanding of the risk factors and shows that burnout,
19 psychiatric morbidity, maladaptive coping strategies, work-life imbalance, and working
20 in a hospital increase the risk of sleep disturbances (OR=1.344 to 3.826). This means
21 that the risk of sleep problems or insomnia exists even if doctors are suffering from just
22 one of these types of occupational distress which is particularly noticeable with the
23 increase in psychiatric morbidity. The sleep problems doctors experience include
24 trouble falling/staying sleep, worrying about work when trying to sleep, and finding
25 that sleep problems interfere with daily functioning.

26

27 *Daily or frequent ill health:* Occupational distress increases the odds of doctors
28 suffering from fatigue, upset stomach or nausea, headaches, acid/indigestion or
29 heartburn, eye strain, diarrhoea, and ringing in the ears but not back pain. Psychiatric
30 morbidity, burnout, coping with stress by blaming oneself, job effort, and work-life
31 imbalance each, as individual predictors, also raise the odds of doctors suffering from
32 frequent ill health (OR=1.050 to 3.544). These findings extend previous studies which
33 investigate how the working conditions experienced by doctors relate to ill health [25]
34 by showing that occupational distress, especially psychiatric morbidity, increases the

risk of physical health problems. Doctors who work in a hospital do not have increased odds of ill health symptoms, and nor do doctors who use substances to cope with stress. More experienced doctors have lower odds of fatigue , upset stomach or nausea and headaches (OR=0.963 to 0.972), but are at a greater risk of suffering from ringing ears (OR=1.050).

Strengths and weaknesses of the study and future research

This study is the first to explore the impact of occupational distress and work factors on the risk of health problems among UK doctors from various specialties. A weakness of this study is that the analysis is cross-sectional. We need future experimental research to test causation between occupational distress and health problems using a longitudinal design, and an evaluation of effect sizes using indicators such as Cohen's *d*. It was not possible to reliably convert odds ratios into Cohen's *d* within the current study because of the limitations of interpreting Cohen's *d* from data with dichotomous outcome variables. We also encourage future research to measure hypotheses that were not possible to test within the current study, e.g. whether the risk of gastrointestinal problems among doctors rises with patient caseload or infection exposure.

It was not possible to calculate the response rate because it was not clear whether all NHS trusts and medical Royal Colleges who agreed to take part in this study actually distributed the invitation and to how many doctors. We are also mindful that some participants might not have been comfortable answering some sensitive questions (e.g. about illicit drug or alcohol use) but the risk of response bias was mitigated by allowing doctors to complete confidential self-reported questionnaires. This is a recognised methods of measuring health and health-related behaviours (e.g. alcohol intake [59]). We also recognise that using individual items from previously validated questionnaires (rather than all items) might have an impact on the validity and reliability of the measurement methods.

The meaning of the study: possible implications for clinicians and policymakers

Occupational distress among doctors has a detrimental effect on the quality of care and patient safety.[1] This study has revealed that occupational distress also increases the risk of doctors suffering from health problems (OR=1.036 to 18.836). The impact of occupational distress on ill health could increase levels of sickness-absence among doctors, thus reducing patient safety because of under-staffing. Likewise, the impact of occupational distress on

1 substance use and sleep problems could mean that distress indirectly impairs doctors' fitness

2 to practice, judgement or decision-making because of being intoxicated, hung-over or having

3 disturbed sleep. Therefore, we recommend that doctors' mentors, supervisors, peers and

4 occupational health support services recognise and act upon (1) the prevalence of

5 occupational distress and health problems among doctors; (2) the possibility that occupational

6 distress raises the risk of several health problems; and (3) the need to provide early

7 interventions that prevent doctors who are experiencing occupational distress from suffering

8 the long-term health effects of sleep disturbances, frequent symptoms of ill health, and

9 adopting negative health behaviours, such as binge-drinking or eating in order to cope.

10

25 *Authors' contributions*

26 AM and CK participated in the conception and design of the study. AM collected and

27 analysed data. AM and CK were involved in the interpretation of the data and preparation of

28 this article. Both authors read and approved the final manuscript.

29

32

33

34

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Table

Table 1. Description of measures

Item	N	No of Items	% of doctors with present symptom/ M(SD)	Recoding (if applicable)	Measure	Measure/Original Scoring
Sleep disturbances						
Difficulty falling asleep	390	1	22%			
Difficulty staying asleep	390	1	35%			
Sleep problems interfere with daily functioning	389	1	35%	0,1 – Symptom absent; 2,3,4 - Symptom present		0 (scores showing no insomnia) to 4 (showing severe insomnia)
Worried or distressed about a current sleep problem	390	1	20%		ISI	
Dissatisfied with sleep pattern	390	1	44%	0,1,2 – Symptom absent *(2 is included as it means "unsure");* 3,4 - Symptom present		
Think about work when they go to bed	417	1	61%	0,1 – Symptom absent; 2,3 - Symptom present	Effort-Reward scale	1 (strongly disagree) to 4 (strongly agree)
Trouble sleeping if they postpone tasks	416	1	49%			
Insomnia	390	7	11%	≤14 – Symptom absent *(no, subthreshold insomnia);*≥15 – Symptom present *(moderate, severe insomnia)*[32]	ISI	7 items; 0 (scores showing no insomnia) to 4 (showing severe insomnia)

Substance use

Substance use in order to feel better	392	1	34%	1 – Symptom absent; 2, 3, 4 - Symptom present	The Brief COPE	1 (I usually don't do this) to 4 (I usually do this a lot)
Substance use in order to get through something	393	1	22%			
Frequency of drinking alcohol	386	1	53%	1,2,3 – not drinking or drinking less than 2-3 times a week; 4,5 - drinking 2-3 times a week or more often	AUDIT	1 (never/1-2) to 5 (daily/more than 10)
Quantity of drinks on typical day of drinking	362	1	27%	1 – drinking 1,2 drinks; 2, 3, 4, 5 – drinking 3 or more drinks		
Drink 6 or more drinks on one occasion	373	1	44%	1 – never; 2, 3, 4, 5 – binge-drinking		
Alcohol dependence	377	5	5%	Substance abuse was identified if any of the items were answered "*yes*" [26]	The Patient Health Questionnaire	0 (no) and 1 (yes)
Drug use	380	22	44%	Drug use was identified if any of the items were answered "*yes*"	Commonly Abused Drugs	22 items; 0 (no) and 1 (yes)

Physical symptoms

Fatigue	390	1	69%	1,2 – Symptom absent; 3,4,5 - Symptom present	The Physical Symptom Inventory	1 (not at all) to 5 (every day)
Upset stomach or nausea	390	1	19%			
Backache	390	1	33%			

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Headaches	390	1	27%			
Acid indigestion or heartburn	390	1	23%			
Eye strain	390	1	29%			
Diarrhoea	390	1	12%			
Ringing in the ears	390	1	13%			
Stomach cramps	389	1	8%			
Constipation	390	1	4%			
Loss of appetite	390	1	7%			
Dizziness	390	1	8%			
Eating problems						
Eating large amounts of food when not physically hungry	316	1	35%			
Eat until feeling uncomfortably full	316	1	31%			
Eat alone because they feel embarrassed	315	1	24%	n/a	The Binge Eating Scale	0 (no) and 1 (yes)
Feel disgusted with themselves, depressed or very guilty after overeating	316	1	28%			
Feel upset about their uncontrollable eating or weight gain	316	1	29%			
Binge eating	316	9	8%	Please see [31] details for coding	The Binge Eating Scale	8 items - 0 (no) and 1 (yes); 1 question – 0 to 7 days

Predictor variables

Burnout: Emotional exhaustion	406	8	55% (M = 3.16; SD = 1.34)	Recoded for prevalence: <27 – Symptom absent; ≥27 – Symptom present [36]	MBI	9 items; 0 (never) to 6 (every day)
Psychiatric morbidity	393	12	33% (M = 2.19; SD = 0.55)	Recoded for prevalence: 0,1 into 0 and 2,3 into 2; & < 4 – Symptom absent; ≥4 – Symptom present [35]	GHQ-12	12 items; 0 (better than usual/not at all) to 3 (much less than usual/much less capable)
Effort scale	415	3	M = 3.3 (SD = 0.6)	n/a	Effort-Reward scale	3 items; 1 (strongly disagree) to 4 (strongly agree)
Work-family Imbalance	416	5	M = 5.26 (SD = 1.38)	n/a	Work-Family Conflict scale	5 items; 0 (strongly disagree) to 6 (strongly agree)
Coping: Substance use	392	2	M = 2.33 (SD = 0.88)	n/a	The Brief COPE	2 items; 1 (I usually don't do this) to 4 (I usually do this a lot)
Coping: Self-blame	393	2	M = 1.37 (SD = 0.61)	n/a		

Table 2. Participants' sociodemographic characteristics

Sociodemographic characteristics		%(n) or M(SD)	LRMP
Gender (Male)		48% (199)	54.5%
Age		47.23 (10.97)	
	Under 30	7% (28)	13%
	30-49	46% (190)	59%
	Over 50	48% (197)	28%
Year of experience in medicine		22.94 (11.35)	N/A
Grade	Junior doctor	20% (82)	21%
	General practitioner	18% (75)	23%
	Consultant	49% (203)	32%
	Other	14% (57)	23%
Workplace	Community	5% (21)	
	General practice	15% (61)	
	Hospital	58% (239)	N/A
	Multiple-places	15% (61)	
	Other	8% (32)	
Specialty	General practice	17% (71)	23%
	Public health	12% (49)	0.4%
	Anaesthetics and intensive care	9% (39)	8%
	Paediatrics	7% (27)	2%
	Emergency medicine	6% (24)	1%
	Psychiatry	6% (25)	3%
	Other	44% (184)	
Working hours	≤40	34% (141)	N/A
	41-50	41% (170)	
	>50	15% (104)	

Note. LRMP – List of registered medical practitioners

Table 3. Logistic regression predicting substance use problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Substance use in order to feel better	B	-2.239	0.304	0.162	0.096	-0.083	0.092	n/a	0.011	0.053
	SE	0.844	0.258	0.123	0.237	0.100	0.135	n/a	0.010	0.231
	OR	0.107	1.355	1.175	1.101	0.921	1.097	n/a	1.011	1.054
	p	0.008	0.239	0.190	0.685	0.411	0.493	n/a	0.278	0.819
	Model	$X^2(7)=10.96$; p=0.140; R^2=0.04								
Substance use in order to get through something	B	-3.034	0.423	0.085	0.202	-0.179	**0.318**	n/a	0.002	0.005
	SE	0.963	0.289	0.142	0.274	0.113	**0.154**	n/a	0.012	0.266
	OR	0.048	1.527	1.089	1.224	0.836	**1.374**	n/a	1.002	1.005
	p	0.002	0.143	0.551	0.461	0.113	**0.039**	n/a	0.859	0.986
	Model	$X^2(7)=14.76$; p=0.039; R^2=0.059								
Drinking alcohol 2-3 times a week or more often	B	-2.297	**-0.739**	0.203	-0.360	0.086	-0.183	**2.936**	**0.035**	0.013
	SE	1.001	**0.316**	0.141	0.256	0.114	0.155	**0.393**	**0.011**	0.257
	OR	0.101	**0.478**	1.226	0.698	1.090	0.833	**18.836**	**1.036**	1.013
	p	0.022	**0.019**	0.148	0.160	0.449	0.237	**<0.001**	**0.002**	0.960
	Model	$X^2(8)=123.03$; p<0.001; R^2=0.379								
Drink more	B	-2.593	-0.222	-0.041	0.185	-0.004	-0.083	**0.955**	0.002	**0.594**

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
than 3 drinks typically	SE	0.975	0.314	0.141	0.281	0.119	0.161	**0.206**	0.012	**0.276**
	OR	0.075	0.801	0.772	1.203	0.996	0.920	**2.599**	1.002	**1.812**
	p	0.008	0.480	0.960	0.511	0.971	0.604	**<0.001**	0.885	**0.031**
	Model	$X^2(8)=29.10$; p<0.001; R^2=0.118								
Drink 6 or more drinks on one occasion	B	-0.341	-0.481	0.038	-0.440	0.148	-0.190	**1.849**	**-0.030**	**0.514**
	SE	0.942	0.308	0.135	0.260	0.113	0.151	**0.267**	**0.011**	**0.255**
	OR	0.711	0.618	1.039	0.644	1.159	0.827	**6.355**	**0.970**	**1.672**
	p	0.717	0.118	0.777	0.090	0.191	0.209	**<0.001**	**0.007**	**0.044**
	Model	$X^2(8)=83.18$; p<0.001; R^2=0.279								
Alcohol dependence	B	-3.171	-0.047	0.037	-0.855	0.162	-0.091	**1.819**	-0.041	0.095
	SE	1.781	0.581	0.286	0.623	0.269	0.350	**0.359**	0.028	0.616
	OR	0.042	0.955	1.037	0.425	1.176	0.913	**6.165**	0.960	1.100
	p	0.075	0.936	0.898	0.170	0.548	0.795	**<0.001**	0.153	0.877
	Model	$X^2(8)=34.648$; p<0.001; R^2=0.280								
Drug use	B	-1.732	-0.084	0.073	0.192	0.067	0.068	**0.425**	-0.011	-0.047
	SE	0.830	0.256	0.120	0.228	0.099	0.133	**0.186**	0.010	0.226
	OR	0.177	0.92	1.076	1.211	1.069	1.070	**1.530**	0.989	0.954
	p	0.037	0.744	0.541	0.400	0.501	0.608	**0.022**	0.287	0.835

	Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Model	$X^2(8)=13.935$; p=0.083; R^2=0.051								

Note. n/a – scale is not included in the analysis because predictor is a part of it. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 4. Logistic regression predicting substance binge-eating problems

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Eating large amounts of food when not physically hungry	B	-1.831	0.344	0.127	-0.403	0.176	**0.410**	-0.094	-0.022	-0.040
	SE	0.935	0.290	0.142	0.275	0.124	**0.156**	0.208	0.011	0.271
	OR	0.160	1.410	1.136	0.669	1.193	**1.507**	0.910	0.978	0.961
	p	0.050	0.236	0.370	0.143	0.156	**0.009**	0.652	0.052	0.883
	Model	$X^2(8)=29.537$; $p<0.001$; $R^2=0.127$								
Eat until feeling uncomfortably full	B	-2.229	0.064	0.132	-0.186	**0.271**	0.297	-0.117	-0.018	-0.342
	SE	0.972	0.294	0.144	0.278	**0.131**	0.159	0.214	0.012	0.275
	OR	0.108	1.066	1.141	0.831	**1.311**	1.346	0.890	0.982	0.710
	p	0.022	0.828	0.359	0.504	**0.038**	0.062	0.585	0.121	0.212
	Model	$X^2(8)=22.420$; $p=0.004$; $R^2=0.100$								
Eat alone because they feel embarrassed	B	-3.111	0.233	0.213	-0.139	0.112	0.378	0.089	-0.015	-0.386
	SE	1.068	0.314	0.158	0.307	0.139	0.175	0.220	0.013	0.300
	OR	0.045	1.262	1.237	0.870	1.119	1.460	1.093	0.985	0.680
	p	0.004	0.458	0.178	0.650	0.418	0.031	0.686	0.255	0.199
	Model	$X^2(8)=21.890$; $p=0.005$; $R^2=0.105$								
Feel disgusted	B	-2.237	0.079	**0.321**	-0.313	0.208	0.335	0.154	**-0.034**	**-0.791**

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
with themselves, depressed or very guilty after overeating	SE	1.036	0.310	**0.155**	0.299	0.138	0.172	0.218	**0.013**	**0.298**
	OR	0.107	1.082	**1.378**	0.731	1.231	1.398	1.166	**0.966**	**0.453**
	p	0.031	0.799	**0.038**	0.295	0.132	0.052	0.481	**0.009**	**0.008**
	Model	$X^2(8)=38.029$; $p<0.001$; $R^2=0.171$								
Feel upset about their uncontrollable eating or weight gain	B	-2.367	-0.187	**0.324**	-0.234	0.206	**0.337**	0.021	-0.015	-0.200
	SE	0.998	0.302	**0.150**	0.287	0.133	**0.164**	0.212	0.012	0.282
	OR	0.094	0.830	**1.383**	0.792	1.228	**1.400**	1.021	0.986	0.819
	p	0.018	0.537	**0.030**	0.416	0.121	**0.040**	0.922	0.231	0.478
	Model	$X^2(8)=23.374$; $p=0.003$; $R^2=0.106$								
Binge eating	B	-1.064	-0.343	**0.610**	**-1.678**	0.250	0.473	0.220	-0.014	0.224
	SE	1.395	0.445	**0.237**	**0.443**	0.219	0.253	0.309	0.019	0.444
	OR	0.345	0.710	**1.841**	**0.187**	1.284	1.606	1.246	0.986	1.251
	p	0.446	0.440	**0.010**	**<0.001**	0.253	0.062	0.477	0.458	0.614
	Model	$X^2(8)=27.089$; $p=0.001$; $R^2=0.163$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 5. Logistic regression predicting sleep disturbances

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Difficulty falling asleep	B	-5.019	**0.906**	**0.393**	-0.303	0.107	-0.039	**0.617**	-0.022	**0.669**
	SE	1.098	**0.304**	**0.158**	0.313	0.139	0.171	**0.210**	0.013	**0.308**
	OR	0.007	**2.474**	**1.482**	0.738	1.113	0.962	**1.854**	0.979	**1.953**
	p	<0.001	**0.003**	**0.013**	0.333	0.443	0.822	**0.003**	0.103	**0.030**
	Model	$X^2(8)=65.69$; p<0.001; $R^2 = 0.249$								
Difficulty staying asleep	B	-5.593	**0.829**	**0.468**	-0.022	0.038	0.155	**0.443**	0.014	0.275
	SE	1.014	**0.286**	**0.137**	0.267	0.114	0.148	**0.202**	0.012	0.257
	OR	0.004	**2.291**	**1.596**	0.978	1.039	1.168	**1.557**	1.014	1.317
	p	<0.001	**0.004**	**0.001**	0.933	0.741	0.296	**0.028**	0.233	0.285
	Model	$X^2(8)=79.09$; p<0.001; $R^2 =0.264$								
Dissatisfied with sleep pattern	B	-3.678	**0.962**	**0.536**	-0.142	-0.050	-0.006	0.280	-0.014	0.438
	SE	0.937	**0.292**	**0.134**	0.256	0.108	0.143	0.200	0.011	0.250
	OR	0.025	**2.617**	**1.710**	0.868	0.642	0.994	1.324	0.986	1.549
	p	<0.001	**0.001**	**<0.001**	0.579	0.951	0.966	0.160	0.200	0.080
	Model	$X^2(8)=85.18$; p<0.001; $R^2 =0.274$								
Sleep problems interfere with	B	-5.352	**1.047**	**0.492**	-0.303	0.058	**0.347**	**0.485**	-0.016	0.483
	SE	1.040	**0.299**	**0.144**	0.283	0.120	**0.153**	**0.208**	0.012	0.272

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
daily functioning	OR	0.005	**2.848**	**1.636**	0.739	1.059	**1.414**	**1.625**	0.984	1.621
	p	<0.001	**<0.001**	**0.001**	0.284	0.631	**0.023**	**0.019**	0.187	0.075
	Model	$X^2(8)=102.74$; p<0.001; $R^2=0.333$								
Worried or distressed about a current sleep problem	B	-6.003	**1.342**	**0.570**	-0.414	0.014	0.267	-0.033	0-.013	**0.776**
	SE	1.202	**0.321**	**0.171**	0.340	0.146	0.179	0.232	0.014	**0.331**
	OR	0.002	**3.826**	**1.768**	0.661	1.014	1.306	0.968	0.987	**2.172**
	p	<0.001	**<0.001**	**0.001**	0.224	0.924	0.136	0.888	0.362	**0.019**
	Model	$X^2(8)=86.58$; p<0.001; $R^2=0.327$								
Think about work when they go to bed	B	-6.476	**0.750**	**0.295**	0.214	**0.456**	**0.616**	-0.053	-0.010	0.399
	SE	1.091	**0.337**	**0.141**	0.263	**0.116**	**0.160**	0.227	0.012	0.263
	OR	0.002	**2.117**	**1.344**	1.238	**1.577**	**1.851**	0.948	0.990	1.491
	p	<0.001	**0.026**	**0.036**	0.416	**<0.001**	**<0.001**	0.814	0.393	0.128
	Model	$X^2(8)=128.23$; p<0.001; $R^2=0.391$								
Trouble sleeping if they postpone tasks	B	-3.377	0.434	**0.337**	-0.273	0.243	**0.460**	0.090	-0.013	0.011
	SE	0.901	0.277	**0.128**	0.247	0.107	**0.140**	0.196	0.011	0.239
	OR	0.034	1.544	**1.401**	0.761	1.275	**1.584**	1.094	0.988	1.011
	p	<0.001	0.117	**0.008**	0.270	0.023	**0.001**	0.648	0.237	0.965
	Model	$X^2(8)=72.32$; p<0.001; $R^2=0.234$								

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Insomnia	B	-8.627	**1.458**	**0.597**	-0.109	0.035	0.346	0.148	-0.025	0.802
	SE	1.600	**0.378**	**0.216**	0.433	0.191	0.226	0.270	0.018	0.417
	OR	<0.001	**4.299**	**1.817**	0.897	1.036	1.414	1.160	0.975	2.231
	p	<0.001	**<0.001**	**0.006**	0.802	0.854	0.126	0.582	0.162	0.054
	Model	$X^2(8)=78.24$; p<0.001; $R^2=0.360$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

Table 6. Logistic regression predicting ill health

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Fatigue	B	-3.632	**0.947**	**0.590**	0.127	0.056	0.308	0.083	**-0.029**	-0.130
	SE	1.079	**0.386**	**0.152**	0.267	0.115	0.164	0.247	**0.012**	0.276
	OR	0.026	**2.577**	**1.804**	1.135	1.058	1.360	1.087	**0.972**	0.878
	p	0.001	**0.014**	**<0.001**	0.635	0.623	0.060	0.735	**0.019**	0.637
	Model	$X^2(8)=106.899$; p<0.001; $R^2=0.352$								
Upset stomach or nausea	B	-3.970	**1.265**	0.094	0.091	-0.011	0.057	-0.200	**-0.038**	-0.059
	SE	1.089	**0.312**	0.157	0.313	0.136	0.173	0.237	**0.014**	0.303
	OR	0.019	**3.544**	1.098	1.095	0.989	1.059	0.819	**0.963**	0.942
	p	<0.001	**<0.001**	0.550	0.771	0.936	0.742	0.399	**0.006**	0.845
	Model	$X^2(8)=45.36$; p<0.001; $R^2=0.185$								
Backache	B	-2.011	0.218	0.176	-0.172	0.161	0.026	-0.070	-0.001	-0.025
	SE	0.863	0.262	0.126	0.244	0.108	0.139	0.190	0.010	0.237
	OR	0.134	1.243	1.193	0.842	1.175	1.026	0.932	0.999	0.975
	p	0.020	0.407	0.161	0.481	0.138	0.854	0.712	0.955	0.917
	Model	$X^2(8)=13.96$; p=0.083; $R^2=0.051$								
Headaches	B	-6.523	**0.944**	0.272	**0.644**	0.069	0.035	0.132	**-0.029**	0.394
	SE	1.114	**0.293**	0.143	**0.297**	0.125	0.158	0.208	**0.013**	0.280

		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
	OR	0.001	**2.570**	1.313	**1.905**	1.071	1.035	1.141	**0.972**	1.483
	p	<0.001	**0.001**	0.057	**0.030**	0.580	0.826	0.527	**0.024**	0.160
	Model	$X^2(8)$=75.67; p<0.001; R^2=0.267								
Acid indigestion or heartburn	B	-4.707	**0.826**	0.120	0.323	-0.011	0.007	-0.062	0.007	0.185
	SE	1.030	**0.290**	0.142	0.284	0.119	0.158	0.209	0.012	0.270
	OR	0.009	**2.284**	1.128	1.382	0.989	1.007	0.940	1.007	1.203
	p	<0.001	**0.004**	0.398	0.255	0.928	0.965	0.768	0.549	0.493
	Model	$X^2(8)$=27.78; p=0.001; R^2=0.109								
Eye strain	B	-3.929	**0.657**	-0.06	0.496	0.066	-0.027	0.088	-0.012	-0.129
	SE	0.945	**0.275**	0.13	0.259	0.110	0.146	0.194	0.011	0.249
	OR	0.020	**1.930**	0.942	1.641	1.068	0.973	1.092	0.988	0.879
	p	<0.001	**0.017**	0.647	0.056	0.550	0.851	0.650	0.299	0.606
	Model	$X^2(8)$= 22.45; p=0.004; R^2=0.084								
Diarrhea	B	-5.574	0.576	-0.155	-0.245	**0.541**	0.212	-0.020	0.002	0.148
	SE	1.317	0.349	0.179	0.363	**0.191**	0.198	0.259	0.015	0.350
	OR	0.004	1.779	0.857	0.783	**1.717**	1.237	0.981	1.002	1.159
	p	<0.001	0.098	0.386	0.501	**0.005**	0.284	0.940	0.877	0.672
	Model	$X^2(8)$=21.640; p=0.006; R^2=0.106								

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		Constant	Psychiatric morbidity	Burnout (emotional exhaustion)	Job effort	Work-life balance	Coping: Self-blame	Coping: Substance use	Work experience (years)	Work place (hospital)[a]
Ringing in the ears	B	-3.318	0.315	0.292	-0.372	-0.018	0.063	-0.155	**0.048**	<0.0001
	SE	1.204	0.358	0.182	0.342	0.144	0.192	0.262	**0.015**	0.316
	OR	0.036	1.370	1.338	0.689	0.983	1.065	0.857	**1.050**	1.000
	p	0.006	0.379	0.109	0.277	0.903	0.742	0.555	**0.002**	1.000
	Model	$X^2(8)=16.817$; p=0.032; $R^2=0.080$								

Note. [a] 1= Hospital (n=239); 0 = Other (n=175)

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page number
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6-7
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	Not explained as was based on requirements for the RCT
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9-10
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic,	9-10

		clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	10-13; Table 1
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-13
		(*b*) Report category boundaries when continuous variables were categorized	9; Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	13-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.