RESEARCH PAPER

Cross-sectional survey of sleep, fatigue and mental health in veterinary anaesthesia personnel

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Abstract

Objective To evaluate the sleep quality, prevalence of fatigue and depressive symptoms in veterinary anaesthesia personnel.

Study design Anonymous online voluntary survey.

Methods Sleep quality, fatigue, depressive symptoms and self-perceived burnout were scored using the Pittsburgh Sleep Quality Index (PSQI), Fatigue Severity Scale (FSS), Patient Health Questionnaire-9 (PHQ-9) and single-item burnout measure, respectively. Demographic data and questions about work-related fatigue, out-of-hours duty, transport and rest periods were included. PSQI, FSS and PHQ-9 scores were compared using Spearman rank correlation tests.

Results Responses from 393 participants were obtained from an estimated population of 1374 including diplomates of the American and European Colleges of Veterinary An(a)esthesia and Analgesia (43.9%), residency-trained veterinarians (15.6%), residents-in-training (13.8%) and veterinary technicians and nurses (12.0%), from 32 countries. Most were employed in clinical university teaching hospitals (54.2%) or clinical private practice (41.5%).
PSQI scores > 5 were reported by 71.2% of respondents, with 52.4% reporting insufficient sleep to meet their job demands. Many showed high or borderline fatigue (56.4%), and 74.7% reported mistakes due to work-related fatigue. Major depressive symptoms (PHQ-9 score $\geq$ 10) were found in 42.7%, with 19.2% reporting they had thought about suicide or self-harm in the previous 2 weeks. Over half (54.8%) met the criteria for burnout and more veterinary nurses and technicians suffered from burnout than other roles, with 79.6% of this group affected ($p < 0.001$).
Scores for PSQI and FSS [$r\,(388) = 0.40$, $p < 0.001$]; PSQI and PHQ-9 [$r\,(389) = 0.23$, $p < 0.001$]; and FSS and PHQ-9 [$r\,(387) = 0.24$, $p < 0.001$] were all positively correlated.

Conclusions and clinical relevance This survey demonstrates a high prevalence of poor sleep, fatigue, depressive symptoms and burnout in veterinary anaesthesia personnel, and more should be done to improve the health of those in the profession.

Keywords anaesthesia, burnout, fatigue, mental health, sleep, well-being.

Introduction

Sleep deprivation is a widespread problem in the general population, with one third of American adults obtaining $\leq$ 6 hours of sleep per night (Grandner 2020). The veterinary profession is not immune to this, with poor sleep quality, higher than normal daytime sleepiness, poor sleep hygiene and sleep-related problems reported in veterinary students (Royal et al. 2018). Insufficient sleep has been linked to decreased academic performance (Taylor et al. 2013), decreased worker productivity and increased workplace errors and accidents (Lahti et al. 2011).

Fatigue is the self-perceived feeling of mental or physical tiredness that is not relieved by sleep or rest which has a detrimental effect on performance (Gregory & Edsell 2014). Medical anaesthetists are particularly prone to the development of fatigue due to the nature of their work and the state of continued vigilance required, placing them at higher risk of fatigue, depression and burnout (Sun et al. 2019). Personnel working in veterinary anaesthesia may share some similarities in the nature of their work; fatigue, sleep disturbance and anxiety were the three most common health problems reported in a recent survey of veterinary anaesthesia residents (Tayari et al. 2023). Fatigue has been linked to increased risk of worker injury, mistakes, industrial and vehicle accidents (Folkard & Tucker 2003).

Depression has a prevalence estimated at around 6–9% in veterinarians (Bartram et al. 2009; Best et al. 2020), with

higher rates of clinical depression in veterinary students (Nahar et al. 2019). Suicide risk in veterinarians is at least threefold that of the general population (Platt et al. 2010). One study estimated that approximately 20% of veterinarians have considered taking their own lives within the past year (Skipper & Williams 2012).

A recent survey of veterinary house officers (residents) consistently indicated high levels of burnout, with positive correlations between the emotional exhaustion component of burnout with anxiety and depression scores (Chigerwe et al. 2021). Burnout had a prevalence of 14% in a population of Dutch veterinarians within 10 years of graduation (Mastenbroek et al. 2014), and veterinary technicians also have high levels of burnout (Hayes et al. 2020). Burnout has been associated with suicide ideation in veterinarians (Wallace 2017), as well as depression and an increased risk of medical errors in other medical professionals (Menon et al. 2020).

This survey aimed to assess sleep quality, fatigue and mental health in a population of personnel working in veterinary anaesthesia using validated scales for sleep quality, fatigue, depressive symptoms and burnout. The authors hypothesized that results would indicate a high level of poor-quality sleep, fatigue, burnout and depressive symptoms and that these factors would be correlated with each other. It was also hypothesized that those in training positions would be more likely to score more highly on all validated scale measures.

Materials and methods

A pilot study used an earlier draft of the survey internally amongst seven anaesthesia residents to assess the ease of use and obtain feedback on the survey. Based on those results, some additions were made, namely questions asking the maximum number of hours one can be on-call or working. The guidelines from the Checklist for Reporting the Results of Internet E-Surveys (CHERRIES) (Eysenbach 2004) were used in the design of the survey. Ethical approval for the survey was obtained from the Royal Veterinary College's Social Sciences Ethical Review Board (URN SR2021-0168).

An anonymous, online, General Data Protection Regulation-compliant closed survey (Appendix SA) was created through Jisc Online Surveys (www.onlinesurveys.ac.uk) and electronically distributed via the American and the European Colleges of Veterinary Anaesthesia and Analgesia e-mailing lists (and other inter/national/regional groups for veterinary professionals with an interest in anaesthesia) for announcement or advertisement of the study and recruitment of participants. The survey was targeted at veterinarians, nurses and technicians working primarily in the field of veterinary anaesthesia. The survey was open from October 2021 to December 2021 with reminders to participate in the survey sent once within a month of the first announcement. Participants were asked to consent to the use of their data before survey commencement and instructed to complete the survey only once. A website link to help those that may be affected by topics covered in the survey (www.vetlife.org.uk) was provided. This voluntary survey offered no incentives or adaptive questioning. Responders could check for completeness and review steps but due to the subject of the survey, no questions were made compulsory.

The survey sections comprised the following components: 1) demographic data; 2) sleep quality — Pittsburgh Sleep Quality Index (Buysse et al. 1989); 3) fatigue — Fatigue Severity Scale (FSS; Krupp et al. 1989); 4) burnout — Non-proprietary single-item burnout measure (Dolan et al. 2015); 5) depression — Patient Health Questionnaire-9 (Kroenke et al. 2001); and 6) personal and work-related safety and habits.

The Pittsburgh Sleep Quality Index (PSQI) is used as a screening measure to distinguish 'good' from 'poor' sleepers (Buysse et al. 1989), containing 19 questions regarding the past month, encompassing seven components: sleep quality, latency, duration, efficiency, disturbance, use of medication and daytime dysfunction. Scores range from 0 to 21, with scores > 5 indicating poor-quality sleepers.

The FSS is a validated scale with nine questions, for which the answers are rated from 1 to 7 (strongly disagree to strongly agree, respectively), enabling divisions to be made on a mean score between those with no (≤ 4), borderline (> 4, < 5) or high fatigue (≥ 5) (Krupp et al. 1989). Its use has been validated for both the general population and those with diseases that may cause or contribute to fatigue such as multiple sclerosis (Lerdal et al. 2005; Valko et al. 2008).

The Patient Health Questionnaire-9 (PHQ-9) consists of nine items where respondents score depressive symptoms over the past 2 weeks on frequency from 0 to 3 (not at all ranging to nearly every day, respectively). Total scores range from 0 to 27 and symptoms can be classified as minimal (PHQ-9 score of 1–4), mild (5–9), moderate (10–14), moderately-severe (15–19) and severe (20–27), with a score of ≥ 10 used to delineate major depressive symptoms (Kroenke et al. 2001; Schwerdtfeger et al. 2020).

The non-proprietary single-item burnout measure has been validated as a reliable substitute for the emotional exhaustion component of the Maslach Burnout Inventory as a standalone measure in healthcare workers (Dolan et al. 2015). The measure asks respondents to rate their perceived level of burnout with five possible answers ranging from no symptoms of burnout to feeling completely burnt out, and responses can then be dichotomized into those with no symptoms of burnout (score ≤ 2) and those with one or more symptoms (score ≥ 3).

There were a total of 32 closed or semi-closed questions with one free entry text question at the end. The full PSQI included a separate section, comprising five questions for a roommate or

co-sleeper to answer, which did not factor into overall scores. This component was therefore not included in the survey.

Statistical analysis

Data from the received surveys were transferred into an electronic spreadsheet for descriptive analysis and statistical testing. Several variables were grouped or dichotomized for statistical analysis (Appendix SB), including country, worked hours, level of training, type of institution, sleep quality based on PSQI score, level of fatigue, frequency of on-call/out-of-hours shifts, reported accidents, presence of depression based on PHQ-9 score and presence of burnout.

Statistical analysis was performed using IBM SPSS Statistics for Mac Version 27.0 (IBM Corp., NY, USA), with statistical significance set as $p < 0.05$. Data are shown as mean ± standard deviation or median (range).

The Shapiro–Wilk test was used to test the distributions of the seven individual components and global PSQI scores for normality within the different groups. Univariate analysis was performed using chi-square or Fisher's exact test to compare categorical variables and Mann–Whitney *U* test or one-way analysis of variance with a *post hoc* Bonferroni correction to compare continuous and ordinal data between the groups of interest. Spearman rank correlation tests were used to assess correlations between PSQI, FSS and PHQ-9 scores.

Results

There were approximately 1374 recipients of the online survey, with 393 responses received out of 584 individuals who started the survey (completion rate 67.3%; 393/584), of which 35 responses were partially complete (9%). Partially complete surveys were included for analysis except for incompletely filled sections required for scoring of indices.

Demographic data

Demographic data of respondents are summarized in Table 1. Respondents included diplomates of the American and European Colleges of Veterinary An(a)esthesia and Analgesia (43.9%; 172/392), residency-trained veterinarians (15.6%; 61/392), residents-in-training (13.8%; 54/392), veterinary technicians and nurses (12.0%; 47/392), from 32 countries. Most respondents were employed in clinical university teaching hospitals (54.2%; 213/393) or clinical private practice (41.5%; 163/393). Those working in university teaching hospitals declared a median of 39 (0–999) maximum scheduled consecutive on-call hours compared with 16 (3–336) hours in private practice ($p < 0.001$). Median (range)

Table 1 Demographic characteristics of 393 survey participants. The survey was open to personnel working primarily in veterinary anaesthesia, approximately 1374 in total. Categorical multiple-choice questions were used. Response options for factors impacting on sleep/fatigue and main mode of transport when commuting were not mutually exclusive as multiple answers could be selected by respondents

Variable	*n*	%
Role ($n = 392$)		
American/European College of Veterinary An(a)esthesia and Analgesia diplomate	172	43.9
Residency-trained veterinarian	61	15.6
Veterinary clinician/advanced practitioner	25	6.4
Registered veterinary nurse/technician	47	12.0
Veterinary technician student	8	2.0
Resident-in-training	54	13.8
Intern	18	4.6
PhD/Master's	7	1.7
Sex ($n = 393$)		
Female	268	68.2
Male	122	31.0
Other/Prefer not to say	3	0.8
Age range (years, $n = 393$)		
18–24	4	1.0
25–34	120	30.5
35–44	176	44.8
45–54	72	18.3
55–64	15	3.8
65+	6	1.6
Country/region ($n = 385$)		
United Kingdom	99	25.7
Europe	112	29.1
North America	108	28.1
Asia	9	2.3
South America	39	10.1
Australasia	17	4.4
Africa	1	0.3
Factors impacting on sleep/fatigue ($n = 383$)		
Family/personal stress	149	38.9
Co-sleeping	102	26.6
Sleep disorder	59	15.4
Parenthood	50	13.1
Non-sleep-related illness	35	9.1
Other	22	5.7
Smoking	13	3.4
Pregnancy	11	2.9
None of the above	124	32.4

(*continued on next page*)

Table 1 (*continued*)

Variable	*n*	%
Average weekly hours worked (hours, $n = 393$)		
0−39	76	19.3
40−59	238	60.6
60+	76	19.3
Prefer not say/Not applicable	3	0.8
Main mode of transport when commuting ($n = 393$)		
Car	335	85.5
Motorbike	9	2.3
Bicycle	32	8.2
Public transport/walking/other	38	9.6

maximum consecutive hours worked were 22 (6−336) in university teaching hospitals *versus* 16 (7−120) hours in private practice ($p = 0.001$).

Over two thirds of respondents were female (68.2%; 268/393), with the rest male (31.0%; 122/393) or prefer not to say/other (0.8%; 3/393). The most frequent age range was 35−44 years (44.8%; 176/393), followed by 25−34 years (30.5%; 120/393) and 45−54 years (18.3%; 72/393).

The main locations of work specified were Europe (29.1%; 112/385), North America (28.1%; 108/385), the UK (25.7%; 99/385) and South America (10.1%; 39/385), with the remaining responses from Australasia, Asia and Africa (7.0%; 27/385). Regarding hours worked per week, most worked 40−59 hours (60.6%; 238/393), and equal numbers worked 0−39 hours and 60 hours or more (19.3%; 76/393).

Many reported at least one or more factors impacting upon their sleep or fatigue (66.9%; 263/393), including but not limited to personal/family stress, work stress, sleep disorders and non-sleep-related illness.

PSQI and sleep

For PSQI, 388 complete datasets were available (98.7%; 388/393). A PSQI score > 5 (indicative of poor-quality sleep) was found in 280 respondents (72.2%; 280/388), whilst 108 respondents (27.8%; 108/388) had a score ≤ 5 (Table 2). The breakdowns of the sub-components of PSQI are illustrated in Table S1. When sex was investigated as an independent variable, PSQI values were 7 (1−19) in females and 6 (1−16) in males, and this difference was statistically significant ($p = 0.003$), although this association was not found following dichotomization of poor sleep quality.

Over half of respondents indicated that they did not sleep enough for the demands of their job (52.4%; 205/391), and 29.8% (117/393) reported that they had slept, napped or microslept during work, with 60.6% (237/393) reporting that they had colleagues do so.

Table 2 Pittsburgh Sleep Quality Index (PSQI), Fatigue Severity Scale (FSS), Patient Health Questionnaire-9 (PHQ-9) and burnout score categories in a survey population of veterinary anaesthesia personnel. For each row, *n* refers to the number of individuals who provided a complete response to each respective component of the questionnaire.

Measure	*n*	%
PSQI ($n = 388$)		
Good sleep quality (<5)	108	27.8
Poor sleep quality (≥5)	280	72.2
FSS ($n = 390$)		
Non-fatigued (≤4)	170	43.6
Borderline fatigue (>4, <5)	93	23.8
High fatigue (≥5)	127	32.6
PHQ-9 ($n = 391$)		
Minimal to mild depressive symptoms (<10)	224	57.3
Moderate, moderate-severe, or severe depressive symptoms (≥10)	167	42.7
Burnout score ($n = 391$)		
No symptoms of burnout (≤2)	192	49.1
One or more symptoms of burnout (≥3)	199	50.9

FSS and work-related fatigue

Most respondents were considered non-fatigued, as judged by FSS mean score of ≤ 4 (43.5%; 170/390), with the rest considered borderline fatigued at scores of > 4 and < 5 (23.8%; 93/390) or as having high fatigue with a score ≥ 6 (32.6%; 127/390). FSS scores were significantly higher in post-residency, diploma-eligible respondents (46; interquartile range 16.5) than in diploma holders (35; interquartile range 20) ($p < 0.001$).

When the distribution of this score was compared between sexes, FSS was 40 (9−63) for females and 36 (14−60) for males ($p = 0.012$), but this association was lost when dichotomizing the fatigued from the non-fatigued.

Almost three quarters reported mistakes at work owing to work-related fatigue (74.4%; 292/392) and 59.0% (232/393) reported that they considered their work performance was affected by work-related fatigue always, frequently or sometimes.

Caffeine was the most common method always used to counteract work-related fatigue (41.7%; 163/391), whereas asking for help was the least common method (1.0%; 4/382) (Fig. 1).

PHQ-9

Many respondents could be classed as having 'major' depressive symptoms based on a PHQ-9 score ≥ 10 (42.7%; 167/391), and 19.2% (75/391) had thoughts of self-harm or suicide in the past fortnight. Thoughts about self-harm or suicide were associated with high fatigue ($p = 0.001$), major symptoms of depression ($p < 0.001$) and burnout ($p < 0.001$).

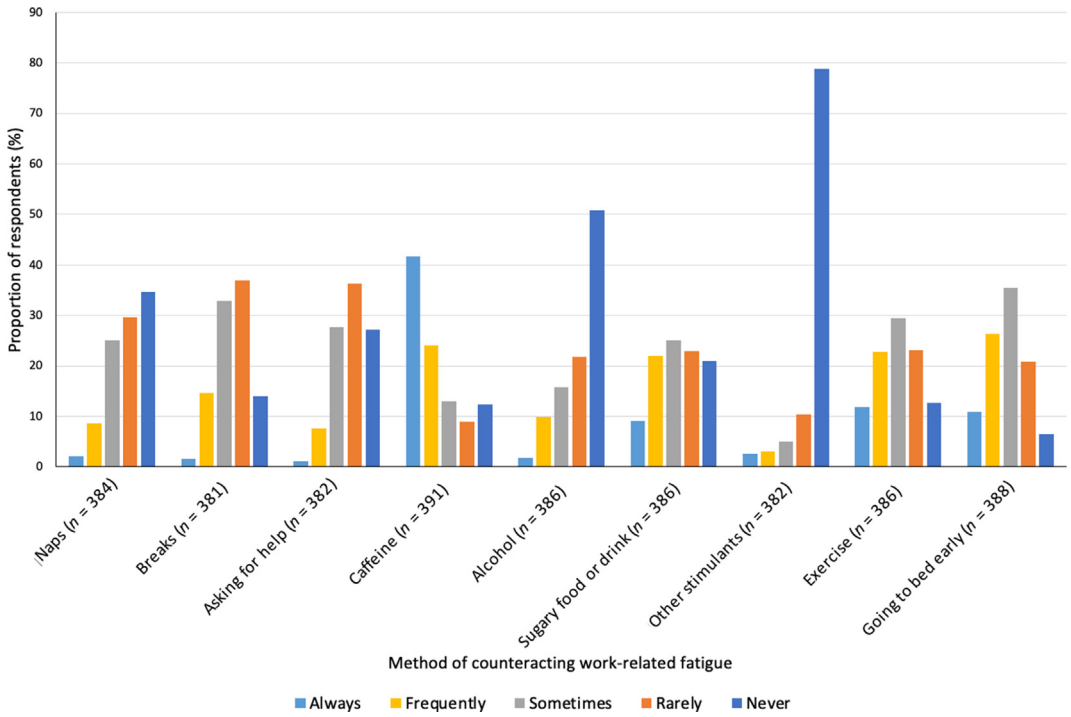

Figure 1 Bar graph to show frequency of methods used to counteract work-related fatigue in a survey population of veterinary anaesthesia personnel. For each label on the x-axis, *n* refers to the number of individuals who provided a response to each respective component of the questionnaire.

When the type of institution was considered, fewer respondents from university teaching hospitals (13.7%; 29/211) had these kinds of thoughts compared with respondents from private hospitals (28.4%; 46/163; $p = 0.001$).

Non-proprietary single-item burnout measure

Over half of respondents (54.8%; 199/392) met the threshold for burnout. Nurses and veterinary technicians as a group tended to have the highest levels of burnout (Fig. 2). When country was considered as a risk factor, 63.9% (69/108) of those in the North America region showed signs of burnout ($p = 0.024$). A higher proportion of veterinary nurses and technicians suffered from burnout than all other categories, with 79.6% (43/54) of this group affected ($p < 0.001$). Furthermore, 88.2% (30/34) of veterinary nurses and technicians working in the North America region suffered from burnout.

After grouping and dichotomization, an association was found between burnout and poor sleep quality ($p < 0.001$), high fatigue ($p < 0.001$) and the symptoms of major depression ($p < 0.001$).

Correlations between PSQI, FSS and PHQ-9

A low positive correlation was found between the following variables: PSQI and FSS [$r\,(388) = 0.40$, $p < 0.001$]; PSQI and PHQ-9 [$r\,(389) = 0.23$, $p < 0.001$]; and FSS and PHQ-9 [$r\,(387) = 0.24$, $p < 0.001$] (Figs S1–S3). Survey respondents' scores for FSS and PHQ-9 can be seen in Table S2.

Personal and work safety habits

Transportation

Most respondents (85.2%; 335/393) used cars to commute, and of those that used a motor vehicle, 84.2% (319/379) admitted to having driven whilst fatigued and 46.2% (175/379) having suffered adverse consequences of driving whilst fatigued (Fig. 3), ranging from near misses in 37.2% (141/379), minor incidents in 6.1% (23/379) and major incidents in 2.1% (8/379).

Working hours, on-calls, breaks and rest periods

The result of the questions derived from the European Working Time Directives are illustrated in Fig. 4. Many reported that they never received a minimum rest break of 20 minutes if working more than 6 hours (27.8%; 108/388), with a similar percentage (28.2%; 109/387) never having 11 hours continuous rest in every 24 hour period. However, most (33.4%; 129/386) reported that they frequently received 24 hours rest per 7 days or 48 hours rest per 14 days.

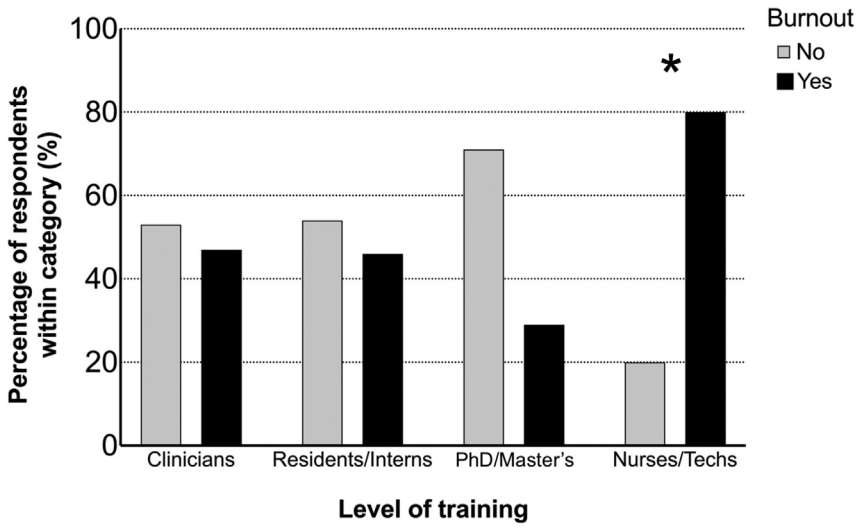

Figure 2 Percentage of survey respondents (%) stratified by training level with and without symptoms of burnout ($n = 390$). An asterisk (*) denotes a group with a statistically significant difference from other groups shown. A significantly higher proportion of registered veterinary nurses/technicians suffered from burnout than those at other levels of training ($p < 0.001$), with 79.6% (43/54) of this group affected, in contrast to 46.7% of clinicians (120/257), 28.6% of PhD/Master's students (2/7) and 45.8% of residents/interns (33/72). Differences between all other groups were not statistically significant ($p > 0.05$).

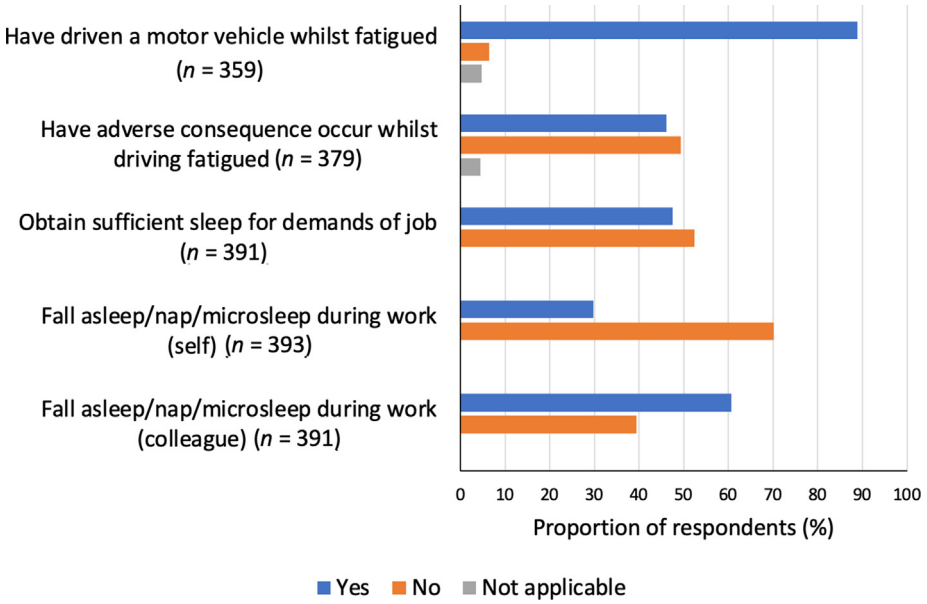

Figure 3 Bar graph showing the proportion of respondents in a survey population of veterinary anaesthesia personnel that have driven a motor vehicle whilst fatigued and had adverse consequences; proportion considering that adequate sleep is obtained for the demands of the job and those that report that they themselves or colleagues have fallen asleep at work. For each row, *n* refers to the number of individuals who provided a response to each respective component of the questionnaire.

North America was the region with the highest distribution of respondents working ≥ 60 hours per week (22.2%; 24/108) and the lowest within the 0–39 range (10.2%; 11/108) ($p = 0.035$).

The maximum number of consecutive scheduled working hours was 16 (3–336) in private hospitals and 39 (0–999) in university teaching hospitals. This difference was statistically significant ($p < 0.001$). When this value was compared between geographical regions, the mean (range) values were 12 (8–200) in South America, 24 (0–504) in Europe, 32 (3–999) in North America and 60 (6–228) in the UK. This

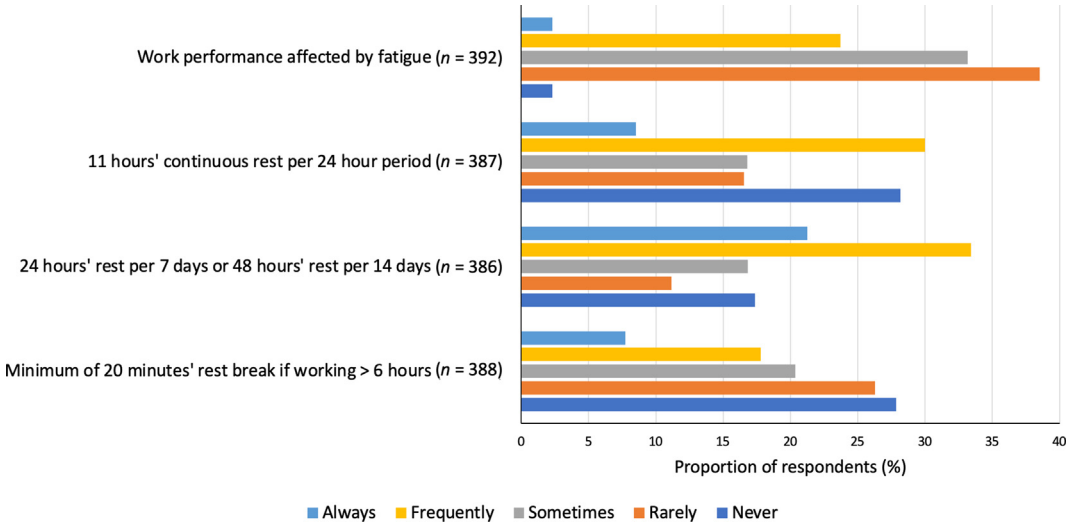

Figure 4 Bar graph showing the frequency of work-related fatigue impairing work-performance and frequency of breaks/rest periods in a survey population of veterinary anaesthesia personnel. For each row, *n* refers to the number of individuals who provided a response to each respective component of the questionnaire.

difference was statistically significant between South and North America ($p < 0.001$), South America and the UK ($p < 0.001$), North America and Europe ($p < 0.046$), and Europe and the UK ($p < 0.001$).

When the maximum number of consecutive hours worked was analysed, respondents from private hospitals reported a significantly lower value, with 16.5 (7−120) hours, *versus* 22 (6−336) hours in university teaching hospitals ($p = 0.002$). The median maximum consecutive hours worked by North American respondents [23 (0−336) hours] was statistically significantly longer than that worked by European respondents [17.5 (7−72) hours; $p = 0.006$].

When the frequency of weekend shifts was compared between training levels, 74.7% of the clinicians were working weekend night shifts once per month or fewer. Similarly, 73.0% of clinicians were working weekend day shifts once per month or fewer. There was a statistically significant difference in the proportion of clinicians working a lower frequency of weekend day or weekend night shifts compared with other training levels ($p = 0.007$ and $p = 0.015$, respectively, for weekend day and night).

Free text responses

Voluntary free text entries were given by 80 respondents. A word cloud of the responses can be seen in Fig. S4. When thematic analysis was performed, 28.8% (23/80) of responses had references to burnout, 15% (12/80) to fatigue and long or extended working hours. A job change, being content with their current job and work/case overload were each mentioned in 12.5% (10/80) of responses, and a similar number (11.3%; 9/80) each mentioned stress relating to family or work-life balance, sleep deprivation or disorder, and insufficient breaks or holiday.

Discussion

This study was the first to examine sleep and fatigue across a veterinary anaesthesia population. Whilst it is known that fatigue and sleep disturbance are extremely common in veterinary anaesthesia residents (Tayari et al. 2023), this study showed that this is not exclusive to residents-in-training, but rather a generalised problem across job roles in veterinary anaesthesia. Poor sleep quality and sleep hygiene have been reported in veterinary students (Royal et al. 2018) and without education on management strategies, this will probably continue throughout their careers, even as factors impacting on sleep quality change. It is therefore no surprise that sleep quality was poor overall across all groups, especially when considering that this is a population for which additional sleep disruptions such as unsocial working hours, night shifts and on-call shifts occur frequently, even with the observation that clinicians as a group tended to do fewer out-of-hours shifts than their counterparts.

Driving whilst fatigued was reported by 88.9% of respondents, with 46.2% suffering 'adverse' consequences as result of driving whilst fatigued, which agrees with the 45% value reported by medical anaesthetists (McClelland et al. 2019). These results show that improvements in both the education of employees about driving when fatigued and the awareness of the responsibility of employers for their employees' safety and well-being are needed. In aviation and human healthcare, checklists are available that allow fatigue risk to be subjectively quantified for the safety of the individual

(Arab & Khayyat 2017) and these may also be suitable for use in veterinary anaesthesia.

Whilst many countries have instituted working time limits and minimum rest periods for medical workers (Stuetzle et al. 2018), many in the veterinary profession are unbound by such constraints. This predisposes them to sleep deprivation and fatigue, and thereby increases the risk of medical errors. This was evidenced by this survey confirming that almost three quarters reported mistakes at work due to work-related fatigue (74.5%; 292/392), but a concerningly low number of respondents (1.0%; 4/382) report asking for help when combating work-related fatigue in this study.

Fatigue also had a high prevalence in this study, with 56.4% of respondents showing borderline or high fatigue which was significantly higher than that of the general population, ranging from 21.9% to 23.1% (Lerdal et al. 2005; Valko et al. 2008). Medical anaesthetists are more prone to fatigue than other medical specialities (Gregory & Edsell 2014), and it could be argued that veterinary anaesthetists share certain similarities in their work regime that predispose to fatigue, such as a high cognitive demand and the need for constant vigilance. Fatigue and depression are associated with each other (Corfield et al. 2016), and this is consistent with our study findings.

In this survey, 42.7% of respondents could be considered to have major depressive symptoms as measured by a PHQ-9 score $\geq$ 10. This figure exceeds that of a German study of veterinarians (Schwerdtfeger et al. 2020) using the same PHQ-9 scale and cut-off value, where 27.8% screened positive. However, the percentage of those with thoughts of suicide or self-harm was the same in this survey, which at 19.2% was significantly higher than that of the general population (Platt et al. 2010). The reason for the higher incidence of major depressive symptoms in this study was unclear. We speculate that the COVID-19 pandemic has had some impact on mental well-being. It is worrying that such a high proportion of those surveyed have thought about suicide or self-harm, and this is something that should be addressed. Suicide continues to be a major cause of death amongst veterinarians (Platt et al. 2010), and this finding could be improved by removing the stigma associated with seeking mental health help and restricting access to lethal drugs in high-risk individuals (Fink-Miller & Nestler 2018).

Burnout has been independently associated with suicide ideation in veterinarians (Wallace 2017) and an increased risk of medical errors, while burnout has been positively associated with depression in veterinary technicians (Hayes et al. 2020). Levels of burnout in this survey were higher in the North American region than in other continents. This may result from differences in culture and employment laws, leading to long working hours, fewer weeks of vacation/paid leave and different work hour limitations (Weaver et al. 2020). Long working hours have been linked to psychological distress (Jaulin et al. 2021) and burnout (Chia et al. 2022) in human medicine. In this survey, the North America region had the highest proportion of those working 60 hours or more per week, and the longest maximum consecutive hours worked so this may be a contributing factor.

Burnout was higher in veterinary technicians and nurses compared with other job roles. This finding concurs with the available literature, which indicates that technicians have a higher risk of exhaustion and cynicism, with a lower level of job satisfaction (Kogan et al. 2020). Appreciation for and recognition of the important role that veterinary nurses and technicians fulfil would be beneficial and may help reduce the risk of burnout. Stress-reduction strategies may be needed to mitigate burnout risk and build resilience at the organisational and individual level.

All the validated measures used in this survey (PSQI, FSS, PHQ-9 and single-item burnout measure) were found to be positively associated with each other, confirming a hypothesis of this study. These findings matched those reported in the literature, specifically that burnout is associated with depressive symptoms (Salvagioni et al. 2017), poor sleep quality (Wu et al. 2020) and fatigue (Vinnikov et al. 2019); poor sleep quality with fatigue (Hyun 2021) and depression (Chang et al. 2021); and depression with fatigue (Corfield et al. 2016).

Study limitations

The survey was distributed at a time when the COVID-19 pandemic was ongoing and could still be having an impact on survey participants' well-being. Therefore, it cannot be excluded that the scoring systems used may have produced different results at another time. Respondents were asked to complete the survey only once, but the risk of duplicates cannot be completely excluded due to the survey being designed to be taken anonymously with IP addresses not recorded. The cross-sectional nature of the survey means that causation could not be determined and changes over time were not tracked. Furthermore, the survey was only available in English, which may explain the bias of responses from primarily English-speaking regions. The survey subject relied on honesty and self-reporting which made it susceptible to not only to recall bias but also respondent bias, where those who have strongly skewed responses are more likely to respond to survey recruitment.

Conclusions

There is a high prevalence of poor sleep quality, fatigue, depressive symptoms and burnout in veterinary anaesthesia, and the same is probably true in the wider veterinary population.

All validated measures used in the survey (PSQI, FSS, PHQ-9 and single-item burnout measure) were found to be positively associated with each other. The profession may benefit from implementing techniques shown to improve sleep quality and counteract fatigue in other safety-critical industries, as well as emphasizing the importance of management strategies at an early training level and implementing tools to self-assess fatigue. More should be done to improve the health and well-being of those working in veterinary anaesthesia.

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Authors' contributions

NTZH: concept, data acquisition, data interpretation and drafting of manuscript. FS: survey distribution, data and statistical analysis, revision of manuscript. CPJ: survey distribution, revision of manuscript. LP: data interpretation, preparation and revision of manuscript. We confirm that all authors have read and approved the submitted version of the manuscript.

Conflict of interest statement

The authors declare no conflict of interest.

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Supporting Information.

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Figure S1. Scatterplot graph with regression line of survey respondents' scores ($n = 389$) regarding depressive symptoms and sleep quality, with five Patient Health Questionnaire-9 (PHQ-9) score categories from minimal (score of 1–4), mild (5–9), moderate (10–14), moderately-severe (15–19) and severe (20–27) compared with Pittsburgh Sleep Quality Index (PSQI) scores.

Figure S2. Scatterplot graph with regression line of survey respondents' scores ($n = 387$) regarding depressive symptoms and fatigue, with five Patient Health Questionnaire-9 (PHQ-9) score categories from minimal (score of 1–4), mild (5–9), moderate (10–14), moderately-severe (15–19) and severe (20–27) compared with Fatigue Severity Scale (FSS) score.

Figure S3. Scatterplot graph with regression line comparing survey respondents' Fatigue Severity Scale (FSS) scores and Pittsburgh Sleep Quality Index (PSQI) scores ($n = 388$), with higher scores indicating higher severity of fatigue and poorer sleep quality, respectively.

Figure S4. Word cloud of free text responses obtained at the end of the survey ($n = 80$); generated using 'wordclouds.com'.

Table S1. Pittsburgh Sleep Quality Index component scores ($n = 388$) in a survey population of veterinary anaesthesia personnel.

Table S2 Summary of Fatigue Severity Scale (FSS), Patient Health Questionnaire-9 (PHQ-9) and burnout scores in a survey population of veterinary anaesthesia personnel.

Appendix SA. Survey questionnaire of sleep, fatigue and mental health in veterinary anaesthesia containing questions pertaining to demographic data, sleep quality, fatigue, burnout, depression, and personal and work-related safety and habits.

Appendix SB. Information regarding grouping and dichotomization of data.