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RESEARCH PAPER

Risk of burnout and depression: A survey of veterinary anaesthesia specialists in-training during COVID-19

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Abstract

Objective To investigate risk, risk factors and effects on adherence to adequate clinical standards, of burnout and depression in veterinary anaesthesia residents.

Study design Closed online cross-sectional survey study.

Study population A sample of 89 residents registered to the European and/or the American Colleges of Veterinary An(ae)sthesia and Analgesia out of a total of 185.

Methods A link to access an online questionnaire, which included the Maslach Burnout Inventory-Human Services Survey (MBI-HSS), the Harvard National Depression Screening Day Scale (HANDS) and 28 questions developed to assess adherence to adequate clinical standards, was sent by email to 185 residents. The three components of the MBI-HSS namely emotional exhaustion (EE), depersonalization and reduced personal accomplishment were analysed separately. Analysis of proportions and two-step regression statistical modelling were used for data analysis, and p values < 0.05 were considered statistically significant.

Results The response rate was 48%. Based on HANDS and MBI-HSS scores, 49% of the residents were at high risk of both depression and burnout. These residents expressed greater concern of delivering inadequate animal care ($p < 0.001$), of decreased quality of supervision during COVID-19 ($p = 0.038$) and of negative impact of the pandemic on their training programme ($p = 0.002$) than residents at low-to-moderate risk. Working in a clinical environment for ≥ 60 hours/week was a risk factor for both depression ($p = 0.016$) and EE ($p = 0.022$), while female sex was a risk factor for EE only ($p = 0.018$).

Conclusions and clinical relevance A large proportion of residents is at high risk of depression and burnout, a scenario likely worsened by the pandemic. The findings of this study suggest that reducing the clinical workload and increasing the level of support and supervision may help to improve residents' mental health.

Keywords HANDS, MBI-HSS, veterinary anaesthesia residents, work-related mental disorders.

Introduction

Physicians and veterinarians may develop work-related anxiety and psychological stress (Platt et al. 2012; Siess et al. 2015; Sanfilippo et al. 2017). Whilst mild psychological stress and facing challenges enhance the ability to tackle difficult situations and may eventually help develop self-confidence, chronic exposure to workplace stress can lead to a complex occupational phenomenon known as burnout (Sanfilippo et al. 2017).

More specifically, the burnout syndrome is characterised by three key dimensions—emotional exhaustion (EE), depersonalization (DP) and reduced personal accomplishment (RPA). High EE is defined as a subjective feeling of energy depletion; high DP as a defensive mechanism that causes increased mental distance from one's job and low PA as a feeling of reduced professional efficacy (Maslach and Leiter 2022). It is frequently associated with impaired cognitive function, depression and substance abuse and, if left untreated, this condition may not only affect quality of life but also become life-threatening (Rosenstein & O'Daniel 2006).

Depression is also associated with psychological stress (Yang et al. 2015). Depression is a chronic primary care disease characterized by physical symptoms: primarily fatigue, pain or sleep disturbance (Rakel 1999). A study conducted in a population of human anaesthesiology residents found that 22% of them screened positive for depression; moreover, its prevalence reportedly increased in healthcare workers during the COVID-19 pandemic (Li et al. 2021).

Among medical specialties, anaesthesia is regarded as one of the most stressful disciplines due to the complexity of clinical tasks, intense workload, lack of control over time

management, time pressure, clinical responsibility and out-of-hours shifts. A high prevalence of burnout has been found in both in-training (41%) and trained (50%) human anaesthetists (de Oliveira et al. 2013; Sanfilippo et al. 2017).

Published work suggests that during a physician's career, the training stage is the period which carries greatest risk for developing mental disorders. Anaesthesia trainees have twice the incidence of substance abuse and three times the incidence of suicide compared with trained anaesthesiologists (Fry et al. 2015). In a recent survey on training satisfaction and well-being among veterinary residents, most reportedly suffered from at least one medical condition, with fatigue, sleep disturbance and anxiety being the most frequently reported (Tayari et al. 2021).

Added to this already concerning situation, the COVID-19 pandemic has posed further challenges to both residents and clinical supervisors by affecting their private and professional lives. There is great concern in all disciplines of human medicine about the effects of the pandemic on the quality of training programmes (Papapanou et al. 2022; Seifman et al. 2022); educators in veterinary anaesthesia are likely to be experiencing similar challenges in delivering effective training, supervision and assessment.

The aim of this study was to investigate risk, risk factors, effects on veterinary patient safety and adherence to adequate clinical standards, of both burnout and depression in a population of veterinary anaesthesia and analgesia residents.

It was hypothesized that the proportion of individuals in the study population at high risk of developing mental conditions would be comparable with that of human anaesthetists in-training, and that the pandemic might have worsened this situation by affecting the quality of the training programmes as perceived by residents.

Materials and methods

Study design

This study was designed as a closed online cross-sectional survey based on a purpose-designed questionnaire developed by the authors with dedicated software (SurveyMonkey). Both the questionnaire and the study were designed following the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). An ethical approval was granted by the Human Biology Research Ethics Committee of the University of Cambridge (Ref. n.: HBREC.2021.19) before commencing the study.

To prevent duplicate responses, participants were asked to type their email addresses, which were recorded by the system and used to identify and delete subsequent entries from the same individuals. Additionally, Internet Protocol cookies were used to prevent duplicate entries generated from the use of either multiple devices or different email addresses.

Respondents were able to review and change their answers before submitting the survey. There was no maximum time limit to complete the survey; however, the time used by each participant to fill in the questionnaire was recorded.

Based on pilot data collected from a sample of four anaesthesiologists before commencing the study, 8 minutes was identified as the minimum time necessary to read through all the questions. Therefore, responses submitted in less than 8 minutes after accessing the questionnaire were excluded. Response and completion rates were calculated.

Recruitment of participants

The study population included 185 individuals and included all residents registered with the European (ECVAA) and/or the American (ACVAA) College of Veterinary An (ae)sthesia and Analgesia at the time when the survey study was launched. A link to complete the survey was forwarded by email to the residents of both training programmes by the Colleges' Executive Secretaries. Additionally, personalized email invitations were sent via SurveyMonkey to the residents whose contact details were known by the investigators. Reminders were sent after 7 days in the case of no response, with a maximum of three reminders for each identified potential participant.

Data protection

Before commencing the survey, each participant was asked to provide permission for the use of data, according to the General Data Protection Regulations (EU) 2016/679. Electronic signature of the permission form, generated by SurveyMonkey on the introductory page of the survey, was a mandatory requirement before delivering the questionnaire to the participants.

Unauthorized access to personal information and to potentially sensitive data was prevented by password-protected access to both the survey and generated data, to which only the primary investigators had access (PM and CA). To ensure confidentiality, the answers were automatically delinked with the participants' email addresses.

Questionnaire

The questionnaire was composed of six sections and 99 questions. The questions within section 1 were unrestricted, while those of the other sections were mandatory. To minimize response bias, following the section pertaining to general and demographic information, which was always the first to be delivered, the order of both the remaining sections and the questions within each section were randomized by the software.

Section 1: general information

This section was developed to capture general information of the participants, including demographic data, type of programme

(ACVAA/ECVAA, alternate/conforming), year of enrolment, shift working pattern, smoking and drinking habits and personal job satisfaction, as well as engagement in extracurricular activities. A total of 14 multiple choice questions were included.

Section 2: Maslach Burnout Inventory-Human Services Survey

The Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was used to capture the risk of burnout. This scale comprises three subscales, used separately to assess three different variables namely EE (score: 0−54), DP (0−30) and RPA (0−48). A licence for using the scale was acquired from the official source as well as from previously published work (https://www.mindgarden.com/117-maslach-burnout-inventory-mbi; Thorsen et al. 2011). Additionally, a guide for the interpretation of the results and for setting cut-off values for the obtained scores was purchased.

Section 3: Harvard National Depression Screening Day Scale)

The Harvard National Depression Screening Day Scale (HANDS; score: 0−30) was used to characterize the risk of depression (high *versus* low-to-moderate). A total of 10 questions were asked and scored with a purpose-designed Likert Scale (1−5) for frequency of occurrence. The cut-off value for identifying individuals at high risk of developing depression was set as a minimal total score of 9/30 (Baer et al. 2000).

Section 4: adherence to safety and practice standards

A total of 20 questions were included in this section. The questions were developed to detect whether there was an association between risk of burnout and depression and performance at work, evaluated on level of engagement and adherence to adequate safety and clinical practice. The Likert scale to assess the frequency of the behaviours was used as response template.

*Subsection 4.1: best practice in anaesthesiology*This section was used to evaluate clinical behaviours previously identified as best practice in veterinary anaesthesia. Questions were either formulated based on the Association of Veterinary Anaesthetists Anaesthesia Safety Checklist (https://ava.eu.com/wp-content/uploads/2015/11/AVA-Anaesthetic-Safety-Checklist-FINAL-UK-WEB-copy-2.pdf) or extrapolated from previous investigations in human anaesthesia (White et al. 2009). Response templates included a 5-point frequency-of-occurrence Likert scale.

*Subsection 4.2: self-reported errors*This section, originally developed for human physicians, was used to assess the frequency of errors, their acknowledgment and the tendency to report them (West et al. 2006; Prins et al. 2009; de Oliveira et al. 2013). The questions were reviewed and readapted to suit the veterinary working environment. A 5-point Likert scale for frequency of occurrence was used as a response template.

Section 5: engagement

The Utrecht Work Engagement Scale-15 (Schaufeli & Bakker 2003) was used to assess the level of engagement. A total of 15 statements about how residents feel at work were scored using a 7-point Likert scale. Engagement (vigour, dedication and absorption) was evaluated using three different domains and with specific subscales. Previously reported cut-off scores were then used for each subscale (Schaufeli & Bakker 2003).

Section 6: influence of COVID-19

This section, which included seven specific questions, was developed to determine whether COVID-19 negatively affected the residency experience. It examined whether there was an association between the risk of burnout/depression and the level of concern expressed by the residents regarding the effects of the pandemic on their training programmes. Response templates included level of concern and frequency-type 5-point Likert scales as well as dichotomous outcomes (yes/no).

Data analysis and statistical methods

Descriptive statistics, two-steps regression analysis and analysis of proportions were used for data analysis. The Cronbach's alpha test was used to evaluate internal consistency of section 6, which was designed and developed by the authors. Binary logistic univariate regression was used as the first step to identify associations between various covariates and four dichotomous outcome variables namely high risk for depression based on HANDS score ≥ 9 (yes/no), high risk for EE based on score ≥ 27 (yes/no), high risk for DP based on score ≥ 10 (yes/no), and high risk for RPA based on score ≤ 34 (yes/no) (Thorsen et al. 2011).

Low-to-moderate risk for the above variables was defined as HANDS score <9 (yes/no), EE score <27 (yes/no), DP score <10 (yes/no) and RPA score >34 (yes/no) (Thorsen et al. 2011). Manual forward selection procedures were used to build a separate multiple logistic regression model for each dependent variable using the covariates which showed significant association as determined by univariate analysis. The likelihood ratio test, the Hosmer-Lemeshow test and the chi-square goodness-of-fit test were used to assess the quality of model fit for each multiple regression model.

To analyse data gathered from sections 4, 5 and 6 of the survey, the participants were assigned to one of three groups

based on their HANDS and MBI-HSS scores: group A (high risk of both depression and burnout), group B (high risk of either depression or burnout) and group C (low-to-moderate risk of both depression and burnout). Residents were classified at high risk for burnout if, based on the cut-off values, they classified at high risk for at least two of the three MBI-HSS components namely EE, DP and RPA. A chi-square test was used to assess whether, for each specific question, there was an association between risk category (A, B or C) and the answers provided.

Commercially available statistical software (SigmaStat 3.5 and SigmaPolt 10; Systat, CA, USA; and SPSS version 26; IBM Corp., CA, USA) was used. The p values ≤ 0.05 were considered statistically significant.

Data are represented as either medians and ranges (25%–75% interquartile) or means and standard deviations, depending on their distribution.

Results

The response rate was 48%, with 89/185 residents responding to the survey, while completion rate was 72%. For section 6, the Cronbach's alpha value was 0.68, indicating acceptable internal consistency (Cronbach 1951).

Of the 89 participants, 56 (63%) were females and 33 (37%) were males. The most represented age range was 36–40 years, with 44/89 (49%) participants being in this group, followed by 25–30 ($n = 26/89$, 29%), 31–35 ($n = 14/89$, 16%) and >40 ($n = 5/89$, 6%) age ranges. Regarding marital status, 37/89 (42%) participants were single while the remaining 52/89 (58%) declared to be either married or in a stable relationship; only 10/89 (11%) participants had children. Regarding the training programme, 57/89 (64%) residents were registered to the ECVAA, 26/89 (29%) to the ACVAA and 6/89 (7%) to both.

Based on the HANDS score, 46/89 (52%) residents were at high risk of developing depression; clinical working >60 hours per week was found to be a confirmed risk factor for being predisposed to depression ($p = 0.016$; Table 1).

Based on the MBI-HSS score, 66/89 (74%) residents were at high risk of developing RPA, 57/89 (64%) at high risk for EE and 53/89 (59%) at high risk for DP. Female sex ($p = 0.022$) and clinical working >60 hours per week ($p = 0.018$) were risk factors for being predisposed to develop EE (Table 2). Regarding the outcomes DP and RPA, although univariate regression showed an association between these independent variables and some covariates (third-to-fourth year of training, $p = 0.034$; and < one extracurricular activity per week, $p = 0.015$), these significances were not maintained in the multiple model (Tables 3 and 4).

Based on HANDS and MBI-HSS scores, a total of 44/89 (49.4%) residents were at high risk for both depression and burnout (group A), whereas 20/89 (22.5%) residents were at high risk for only one condition (group B) and the remaining 25/89 (28.1%) at low-to-moderate risk for both conditions (group C). Regarding section 4, an association was found between risk category (A, B or C) and type of response to one question only. A greater proportion of residents in group A (10/44, 22.7%) declared that they were often concerned about delivering inadequate patient care than groups B and C (0/20 and 0/25, 0%; $p < 0.001$) (Table 5). No association was found between risk category and level of engagement, as per answers to questions in section 5. Regarding section 6, a greater proportion of residents in groups A (40/44, 91%) and B (17/20, 85%) than in group C (14/25, 56%) answered that the pandemic had a negative impact on their training programme ($p = 0.002$). A greater proportion of residents in group A (13/44, 29.5%) than groups B (2/20, 10%) and C (0/25, 0%) declared themselves to be extremely concerned about the

Table 1 Risk factors for developing depression in 89 residents in veterinary anaesthesia and analgesia during the COVID-19 pandemic.

Dependent variable	Independent covariate	OR (CI)	*p*1	*p*2
High risk of depression (yes/no)	Sex (F/M)	2.01 (0.85–4.93)	0.108	
	Being in a relationship (yes or no)	1.37 (0.59–3.20)	0.462	
	Parenthood status (yes or no)	1.54 (0.40–5.87)	0.529	
	Mortgage (yes or no)	1.27 (0.55–2.96)	0.579	
	Age category (<35 or ≥35 years)	1.10 (0.69–1.66)	0.761	
	Type of institution (academia or private practice)	1.03 (0.33–3.21)	0.963	
	Year of training (first/second or third/fourth)	0.89 (0.53–1.47)	0.640	
	Number of clinical working hours per week (≤60 or >60)	1.85 (1.17–2.93)	**0.009**	**0.016***
	Number of non-clinical working hours per week (<10 or ≥10)	1.30 (0.92–1.84)	0.131	
	Number of 12 hour on-call shifts per week (<6 or ≥6)	2.04 (0.72–5.78)	0.182	
	Frequency of meeting with friends or relatives per month (≤1 or >1)	0.64 (0.41–0.99)	**0.046**	0.102
	Number of extracurricular activities per week (<1 or ≥1)	1.11 (0.66–1.85)	0.695	

CI, 95% Confidence interval associated to OR; OR, odds ratio; *p*1, *p* value from binary logistic regression; *p*2, *p* value from multiple regression model.
*Likelihood ratio test statistic $p = 0.006$; Hosmer-Lemeshow statistic $p = 0.001$.

Table 2 Risk factors for the development of emotional exhaustion (EE) in 89 residents in veterinary anaesthesia and analgesia during the COVID-19 pandemic.

Dependent variable	Independent covariate	OR (CI)	*p*1	*p*2
High risk of EE (yes/no)	Sex (F/M)	3.60 (1.44−8.98)	**0.006**	**0.022***
	Being in a relationship (yes or no)	1.71 (0.71−4.12)	0.229	
	Parenthood status (yes or no)	2.45 (0.49−12.3)	0.277	
	Mortgage (yes or no)	1.30 (0.54−3.16)	0.559	
	Age category (<35 or ≥35 years)	0.80 (0.50−1.28)	0.359	
	Type of institution (academia or private practice)	0.99 (0.30−3.25	0.984	
	Year of training (first/second or third/fourth)	1.11 (0.66−1.88)	0.689	
	Number of clinical working hours per week (≤60 or >60)	1.99 (1.22−3.23)	**0.006**	**0.018***
	Number of non-clinical working hours per week (<10 or ≥10)	1.28 (0.89−1.83)	0.175	
	Number of 12 hour on-call shifts per week (<6 or ≥6)	1.39 (0.49−3.93)	0.530	
	Frequency of meeting with friends or relatives per month (≤1 or >1)	0.80 (0.51−1.25)	0.327	
	Number of extracurricular activities per week (<1 or ≥1)	0.63 (0.36−1.08)	0.09	

CI, 95% Confidence interval associated to OR; OR, odds ratio; *p*1, *p* value from binary logistic regression; *p*2, *p* value from multiple regression model.
*Likelihood ratio test statistic $p = 0.003$; Hosmer-Lemeshow statistic $p = 0.017$.

quality of clinical supervision during COVID-19 ($p = 0.002$). Additionally, more residents in groups A (12/44, 27.3%) and B (4/20, 20%) than in group C (0/25, 0%) declared that they were extremely concerned that the level of overall support/supervision had decreased during the pandemic ($p = 0.038$).

Discussion

Most of the respondents were at a high risk of developing mental health conditions such as depression and burnout. Performing clinical work for more than 60 hours a week was a contributing factor, and the COVID-19 pandemic appeared to worsen the situation by increasing the level of concern in those residents at high risk of mental disorders.

The study hypothesis that the proportion of veterinary residents at high risk for developing mental conditions would be comparable with those in human medicine was proven, with an even higher percentage of veterinary residents at risk of depression than their medical counterparts (52% *versus* 41%).

The association between having more than 60 clinical working hours a week and an increased risk for both depression and EE was not an unexpected finding. Several previous studies demonstrated an association between sleep deprivation and longer working hours with higher risk of depression, suicidal tendencies, stress and perceived medical errors (de Oliveira et al. 2013; Jaulin et al. 2021; Kwok 2021). These findings suggest that reducing the number of clinical working hours per week could help to make training programmes more sustainable and therefore improve the work-life balance of the trainees; however, this may be difficult to implement because of the complexity of such training programmes.

In addition to intense clinical work, female sex was also associated with a higher risk of EE in the study population. Similarly, studies conducted in human medicine found that EE, symptoms of anxiety and burnout are overrepresented in female medical staff and suggested that work-family conflicts could contribute to this (Zhang et al. 2020; Al-Humadi et al. 2021). Whilst the observation that EE was more represented in certain subpopulations than in others, it should be emphasized that EE alone cannot be used to define burnout.

In this study, residents at high risk for both depression and burnout expressed a greater concern about delivering inadequate patient care than those at low-to-moderate risk. These findings are similar to those of a previous study (Brunsberg et al. 2019), which found that resident physicians with a positive depression screen were three times more likely to make harmful errors than those who screened negative.

We were unable to draw similar conclusions as tracking the residents' medical error was beyond the aim of this study. Nevertheless, it is reasonable to assume that, in both veterinary and human medicine, mental health conditions may negatively affect patients' safety; this may be applicable particularly to medical specialities that deal more frequently with critical cases (Brunsberg et al. 2019).

The residents at high risk for both burnout and depression expressed greater concerns about the perceived negative impact of the pandemic on both the quality of the training programmes and the level of support/supervision. In the light of these findings, the role of supervisors appears to be crucial to improve the working environment or to reduce the factors that may increase the risk of burnout/depression.

This study failed to demonstrate that work engagement (defined as a positive, fulfilling, work-related state of mind characterized by vigour, dedication and absorption) protects against burnout (Schaufeli & Bakker 2003, 2004). This contrasts with the findings of a previous study, in which highly engaged specialists in-training were found to make fewer

Table 3 Risk factors for the development of depersonalization (DP) in 89 residents in veterinary anaesthesia and analgesia during the COVID-19 pandemic.

Dependent variable	Independent covariate	OR (CI)	*p*1	*p*2
High risk of DP (yes/no)	Sex (F/M)	1.39 (0.58−3.32)	0.461	
	Being in a relationship (yes or no)	2.17 (0.91−5.17)	0.079	
	Parenthood status (yes or no)	3.02 (0.60−15.1)	0.179	
	Mortgage (yes or no)	1.20 (0.51−2.85)	0.672	
	Age category (<35 or ≥35 years)	0.77 (0.49−1.22)	0.286	
	Type of institution (academia or private practice)	1.12 (0.35−3.57)	0.842	
	Year of training (first/second or third/fourth)	1.76 (1.03−3.03)	**0.039**	0.096
	Number of clinical working hours per week (≤60 or >60)	1.35 (0.87−2.08)	0.176	
	Number of non-clinical working hours per week (<10 or ≥10)	1.02 (0.72−1.44)	0.901	
	Number of 12 hour on-call shifts per week (<6 or ≥6)	1.88 (0.68−5.23)	0.226	
	Frequency of meeting with friends or relatives per month (≤1 or >1)	0.90 (0.59−1.39)	0.651	
	Number of extracurricular activities per week (<1 or ≥1)	0.84 (0.50−1.42)	0.525	

CI, 95% Confidence interval associated to OR; OR, odds ratio; *p*1, *p* value from binary logistic regression; *p*2: *p* value from multiple regression model.

Table 4 Risk factors for the development of reduced personal accomplishment (RPA) in 89 residents in veterinary anaesthesia and analgesia during the COVID-19 pandemic.

Dependent variable	Independent covariate	OR (CI)	*p*1
High risk of RPA (yes/no)	Sex (F/M)	1.83 (0.70−4.81)	0.218
	Being in a relationship (yes or no)	1.11 (0.43−2.90)	0.830
	Parenthood status (yes or no)	0.79 (0.19−3.35)	0.750
	Mortgage (yes or no)	0.90 (1.34−2.35)	0.830
	Age category (<35 or ≥35 years)	0.96 (0.58−1.60)	0.890
	Type of institution (academia or private practice)	0.43 (0.08−2.08)	0.239
	Year of training (first/second or third/fourth)	0.89 (0.50−1.60)	0.709
	Number of clinical working hours per week (≤60 or >60)	1.20 (0.75−1.95)	0.435
	Number of non-clinical working hours per week (<10 or ≥10)	0.85 (0.60−1.19)	0.350
	Number of 12 hour on-call shifts per week (<6 or ≥6)	1.97 (0.66−5.83)	0.222
	Frequency of meeting with friends or relatives per month (≤1 or >1)	0.70 (0.43−1.14)	0.153
	Number of extracurricular activities per week (<1 or ≥1)	0.48 (0.27−0.88)	**0.018**

CI, 95% Confidence interval associated to OR; OR, odds ratio; *p*1, *p* value from binary logistic regression; *p*2, *p* value from multiple regression model.

errors than those who were less engaged and experienced burnout (Prins et al. 2009).

The CHERRIES guidance was extremely useful as a starting point to report the data gained from a web-based survey. Regarding data analysis, assessing the quality of model fit for each multiple regression model was used to improve accuracy of the statistical model building. In addition, the closed survey design prevented the gathering of data from a non-representative sample, making statistical correction methods such as weighting of items or propensity scores unnecessary.

Nevertheless, this study has some limitations. Although there is no unanimous agreement, the response rate was below the range of values (60%−80%) commonly regarded as desirable in studies in human medicine (Fincham 2008; Parekh et al. 2020) and therefore, the findings may not accurately reflect the overall resident population. Another limitation is that only the risk of developing mental health conditions, and not their actual prevalence, was investigated. Analysing the prevalence of depression and burnout would have implied knowledge of their medical diagnosis in the sample population. While several studies have confirmed the construct validity of both the HANDS and MBI-HSS and highlighted their good psychometric properties as screening tools, these scales cannot replace a medical diagnosis based on comprehensive patient assessment of the individual (Hare 2003; Mészáros et al. 2014; Lin et al. 2022). Moreover, some studies have shown that the psychometric properties of the MBI-HSS scale may be affected by the presence of underlying major depressive disorders and that, owing to poor internal reliability, data from the subscale developed to assess DP should be interpreted cautiously (Trigo et al. 2018; Mukherjee et al. 2020). As a result, it is reasonable to assume that the relatively high proportion (59%) of residents at high risk for DP could have been overestimated in the present study.

Table 5 Response distribution to 20 questions evaluating adherence to adequate safety and clinical practice of 89 residents in veterinary anaesthesia and analgesia during the COVID-19 pandemic (section 4 of the questionnaire).

Question	Likert scale, n (%)				
	Never	Rarely	Sometimes	Often	Always
Checks blood results perioperatively	0 (0)	1 (1.1)	4 (4.5)	24 (27)	60 (67.4)
Performs preanaesthetic examination	1 (1.1)	2 (2.2)	6 (6.7)	15 (17)	65 (73)
Checks presence/patency of intravenous access	1 (1.1)	5 (5.6)	11 (12.3)	24 (27)	48 (53.9)
Checks name, consent and procedures	0 (0)	0 (0)	5 (5.6)	12 (13.5)	72 (80.9)
Checks the anaesthetic equipment	0 (0)	0 (0)	4 (4.5)	17 (19.1)	68 (76.4)
Uses checklists	5 (5.6)	13 (14.6)	10 (11.2)	29 (32.6)	32 (36)
Disables monitoring alarms	2 (2.2)	17 (19.1)	23 (25.8)	30 (33.7)	17 (19.1)
Records variables at 5 minute intervals	1 (1.1)	4 (4.5)	6 (6.7)	48 (53.9)	30 (33.7)
Uses smartphone while monitoring	11 (12.4)	28 (31.5)	30 (33.7)	17 (19.1)	3 (3.3)
Checks that patient safety concerns have been communicated	0 (0)	5 (5.6)	3 (3.4)	26 (29.2)	55 (61.8)
Checks assessments, interventions and analgesic plan	2 (2.2)	5 (5.6)	6 (6.7)	28 (31.5)	48 (53.9)
Checks that there is always one person monitoring the patient	2 (2.2)	5 (5.6)	6 (6.7)	28 (31.5)	48 (53.9)
Has made mistakes resulting in adverse effects on patients	15 (16.8)	69 (76.4)	5 (5.6)	0 (0)	1 (1.1)
Has made mistakes resulting in no adverse effects on patients	1 (1.1)	45 (50.6)	38 (42.7)	5 (5.6)	0 (0)
Has performed procedures for which they felt they were not properly trained	14 (15.7)	33 (37.1)	30 (33.7)	12 (13.5)	0 (0)
Has been concerned of major medical errors within the last months	49 (55.0)	26 (29.2)	11 (12.3)	3 (3.4)	0 (0)
Has been concerned of being delivering inadequate patient care	7 (7.9)	37 (41.6)	34 (38.2)	10 (11.2)	1 (1.1)
Has been concerned of not dedicating enough time to patient care	3 (3.4)	10 (11.2)	33 (37.1)	35 (39.3)	8 (9.0)
Feels that they are not monitoring the patient closely enough	6 (6.7)	44 (49.4)	33 (37.1)	5 (5.6)	1 (1.1)
Has administered the wrong drug/wrong dose to a patient	6 (6.7)	44 (49.4)	33 (37.1)	5 (5.6)	1 (1.1)

In conclusion, this study suggested that a high proportion of residents in veterinary anaesthesia and analgesia is at a high risk of developing mental health conditions such as depression and burnout. Reducing the number of clinical working hours and increasing the level of support and supervision during periods of intense stress, such as occurred during the COVID-19 pandemic, are proposed as measures to improve the mental health of residents.

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Not applicable.

Authors' contributions

PM: conceptualisation, data collection, study design, manuscript preparation. CS: study design, critical appraisal of the manuscript, editing. CA: study design, statistical analysis and interpretation of the results, manuscript preparation, editing.

Conflict of interest statement

The authors declare no conflict of interest.

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