Papers

Veterinary surgeons and suicide: a structured review of possible influences on increased risk

D. J. Bartram, D. S. Baldwin

Veterinary surgeons are known to be at a higher risk of suicide compared with the general population. There has been much speculation regarding possible mechanisms underlying the increased suicide risk in the profession, but little empirical research. A computerised search of published literature on the suicide risk and influences on suicide among veterinarians, with comparison to the risk and influences in other occupational groups and in the general population, was used to develop a structured review. Veterinary surgeons have a proportional mortality ratio (PMR) for suicide approximately four times that of the general population and around twice that of other healthcare professions. A complex interaction of possible mechanisms may occur across the course of a veterinary career to increase the risk of suicide. Possible factors include the characteristics of individuals entering the profession, negative effects during undergraduate training, work-related stressors, ready access to and knowledge of means, stigma associated with mental illness, professional and social isolation, and alcohol or drug misuse (mainly prescription drugs to which the profession has ready access). Contextual effects such as attitudes to death and euthanasia, formed through the profession's routine involvement with euthanasia of companion animals and slaughter of farm animals, and suicide 'contagion' due to direct or indirect exposure to suicide of peers within this small profession are other possible influences.

MEMBERS of some occupational groups are at a greatly increased risk of suicide (Agerbo and others 2007). An elevated risk has been reported in healthcare professionals, including doctors (Hawton and others 2001, Schernhammer and Colditz 2004, Torre and others 2005), pharmacists (Kelly and Bunting 1998), dentists (Alexander 2001) and nurses (Hawton and Vislisel 1999). Farmers are also at increased risk (Malmberg and others 1999).

The absolute number of suicides by veterinary surgeons is low, due to the small size of the profession (approximately 16,000 veterinary surgeons practising in the UK) (RCVS 2007), but the profession is at a higher risk of suicide when compared with other occupations and the general population. For example, a survey of the causes of mortality among male veterinarians resident in Britain followed up from between 1949 and 1953 until 1975 reported a twofold increase in deaths from suicide compared with all men in the same occupational social class (Kinlen 1983). While most differences in suicide risk between occupations are accounted for by differences in income and employment status, the most striking exceptions are for veterinarians, doctors, nurses and pharmacists, all of whom have a significantly higher risk of suicide, even when demographic factors are taken into account (Charlton 1995, Stack 2001, Agerbo and others 2007).

The risk factors for suicide include depression, alcohol and drug abuse, certain personality traits, and environmental factors such as chronic major difficulties and undesirable life events (Goldney 2005). An interplay between various potentially malign influences has been suggested for the veterinary profession. The interrelations between work, personality and mental health are well documented (Stansfeld 2002), but reports specific to the veterinary profession (Halliwell and Hoskin 2005) have tended to simply present the observations and opinions of concerned individuals.

As such, it is uncertain whether the increased risk of suicide derives from the characteristics of individuals entering the profession, the nature of the work environment, or other factors. The authors review published data on suicide in the veterinary profession, other healthcare professions and the general population, and summarise the reported possible influences on the increased risk.

Materials and methods

Literature search

Papers relevant to mental health among veterinary surgeons were identified by searching PubMed (which includes MEDLINE) and Google Scholar for articles published after 1970. The search terms included, but were not limited to, veterinary and depression, suicide, stress, burnout, distress, abuse, alcohol drinking, substance-related disorders, psychosocial working conditions, coping or psychiatry. Additional articles were identified by scrutinising the reference lists of relevant articles, hand searching of conference proceedings, examining regular automatic customised e-mail alerts for relevant new articles in journals (Ovid Autoalert), and by consulting experts. The search strategy excluded non-English-language records. Articles were included as appropriate to provide a comprehensive, structured review of the evidence of increased suicide risk among veterinary

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D. J. Bartram, BVetMed, DipM, MCIM, CDipAF, FRCVS,
D. S. Baldwin, MB, BS, DM, FRCPsych,
Division of Clinical Neurosciences, School of Medicine, University of Southampton, RSH Hospital, Brintons Terrace, Southampton SO14 0YG

E-mail for correspondence: d.bartram@soton.co.uk

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TABLE 1: Reported proportional mortality rates (PMRs) for suicide among male and female veterinary surgeons in the UK

Reference	Study period	Region	Age range covered	PMR	95% CI
Males					
Charlton and others (1993)	1979-1990	England and Wales	16-64	364	NR
Kelly and Bunting (1998)	1982-1987	England and Wales	20-64	349	203-559
Kelly and Bunting (1998)	1991-1996	England and Wales	20-64	324	148-615
Mellanby (2005)	1979-1990	England and Wales	20-74	361	252-503
Mellanby (2005)	1991-2000	England and Wales	20-74	374	244-548
Stark and others (2006)	1981-1999	Scotland	16-45	293	80-749*
Stark and others (2006)	1981-1999	Scotland	46-64	301	36-1088*
Females					
Kelly and Bunting (1998)	1991-1996	England and Wales	20-59	500	136-1279
Mellanby (2005)	1979-1990	England and Wales	20-74	414	166-853
Mellanby (2005)	1991-2000	England and Wales	20-74	1240	446-2710
Meltzer and others (2008)	2001-2005	England and Wales	20-64	609	198-1422

* When the 95 per cent confidence interval (CI) includes 100, the difference between the PMR for an occupation and the general population is not statistically significant (P<0.05)
NR Not reported

TABLE 2: Relative risk (RR) of suicide (relative to deaths from other causes) in high-risk occupational groups for men and women in England and Wales in 1990 to 1992, compared with reference groups (Charlton 1995)†

	Men aged 16-44		Men aged 45-64		Women aged 16-64‡	
	RR	95% CI	RR	95% CI	RR	95% CI
Veterinarians	4.61	1.49-14.25*	5.62	1.60-19.74*	7.62	1.04-55.94*
Pharmacists	1.15	0.37-3.52	4.15	2.00-8.58**	1.21	0.27-5.35
Dentists	2.26	0.93-5.47	5.19	2.29-11.76**	–	–
Farmers	0.88	0.60-1.30	1.93	1.48-2.51**	–	–
Medical practitioners	1.50	0.90-2.50	2.22	1.35-3.65*	4.54	2.54-8.13**

* P<0.01
** P<0.001
† Reference groups are married; UK-born; in the corresponding age range; not in the 10 occupational groups with the highest proportional mortality ratio for suicide; in urban wards with owner occupancy of at least 85 per cent, unemployment below 5 per cent, less than 6.5 per cent of occupants changing address per year and less than 9 per cent of adults below pensionable age living alone
‡ There were no significant model differences for women aged under and over 45
CI Confidence interval

surgeons and possible influences on the increased risk, including evidence from other occupational groups, rather than a systematic review with meta-analysis.

Interpretation of data

The standard method used to make comparisons between the death rates by suicide in different occupations and the general population is by calculation of the proportional mortality ratio (PMR). PMRs compare the proportion of deaths in an occupation from a specific cause to the proportion of deaths from the same cause in the general population. A PMR for suicide of 200 indicates that twice the expected proportion of deaths by suicide was recorded in that occupational group (Kelly and Bunting 1998). While PMR is a widely used measure, it is affected by the relative frequency of other causes of death; an increased PMR can indicate lower mortality from other causes as well as higher mortality from the cause being examined. The high PMR for suicide identified for some occupational groups may reflect the fact that the overall mortality is low, and therefore the proportion of deaths from suicide is high relative to other causes (Charlton 1995, Kelly and others 1995, Kelly and Bunting 1998, Hawton 2001). Moreover, lower mortality from other causes may also explain the apparent paradox between high PMRs for suicide identified for some high-social-class occupational groups and robust evidence of an inverse relationship between occupational social class and risk of suicide (the lower the class, the higher the risk) (Platt and Hawton 2000).

International comparisons

International comparisons of suicide risk by occupation are hindered by variation between countries in the classification and recording of suicides (Andriessen 2006) and the use of a range of different measures of suicide risk across the literature.

Risk of suicide in veterinary surgeons

United Kingdom

On the basis of PMRs in England and Wales (Charlton and others 1993, Kelly and others 1995, Kelly and Bunting 1998, Mellanby 2005, Meltzer and others 2008) and Scotland (Stark and others 2006), veterinarians appear to be at particularly high risk of suicide. In this occupational group the chances of a death being due to suicide are approximately four times that of the general population, and around twice that of other healthcare professionals. The PMRs for veterinary surgeons are consistently among the highest of all occupations. Reported PMRs for male and female veterinarians are shown in Table 1. Suicides by veterinarians do not appear to be confined to a restricted age range (Mellanby 2005, Stark and others 2006), as the distribution of suicides by age group is not substantially different from that of all occupations combined (Kelly and others 1995).

There are many difficulties when comparing the risk of suicide across occupational groups. These include the effects of different sociodemographic factors, both between occupations and within occupational specialisms, and potential confounding by these factors should be adequately controlled (Wilhelm and others 2004). Charlton (1995) linked data from death certificates and the characteristics of the electoral ward of the deceased individuals' usual residence to undertake a case-control analysis of suicide risk. The risk of suicide relative to death from natural causes, among male veterinarians aged 16 to 44 years and 45 to 64 years, and female veterinarians aged 16 to 64 years, is elevated by 4.6, 5.6 and 7.6 times, respectively, in comparison with individuals in the general population with similar demographic characteristics (Table 2).

Rest of the world

A study of mortality patterns among veterinarians in the USA from 1947 to 1977 showed significantly elevated mortality from suicide as opposed to other causes for males (1.7 times), particularly for those in small animal practice (3.6 times), and with a higher proportion of self-poisonings compared with the general population (Blair and Hayes 1980, 1982). Barbiturates were the means most commonly used for suicide. In a separate study in California, male and female veterinarians had significantly elevated mortality from suicide – respectively, 2.5 times and 5.9 times higher than the general population of California. The mortality from suicide was significantly higher among veterinarians who had worked in the profession for less than 30 years (Miller and Beaumont 1995).

In a large study in Norway, which examined suicide deaths by occupation over a 40-year period (Hem and others 2005), the highest rate was among male veterinarians, with a suicide rate (44 suicides per 100,000 person years, 95 per cent confidence interval [CI] 25 to 75) approaching twice that of the general population. Using a similar method, a suicide rate among veterinarians of 45 per 100,000 person years (95 per cent CI 25 to 82) was reported for two Australian states combined, approximately four times the rate in the general population for the states concerned (Fairnie 2005, Jones-Fairnie and others 2008). In that study, the principal method of suicide by veterinarians was self-poisoning by drugs, mainly injectable barbiturates, and the suicides were not confined to a restricted age range; the age distribution of suicides for veterinarians was not substantially different from that of the general population of Australia.

TABLE 3: Percentage* of suicides by method for veterinarians and combined suicides for all occupations, for males aged 20 to 64 years and for females aged 20 to 59 years, in England and Wales during 1982 to 1996 (Kelly and Bunting 1998)

	Method of suicide					
	Poisoning with solid or liquid substance	Poisoning with gases or other vapours	Hanging and suffocation	Drowning	Firearms and explosives	Other
Male veterinarians	76	3	5	0	16	0
All men	20	27	27	6	5	16
Female veterinarians	89	11	0	0	–	0
All women	46	10	17	9	–	18

* Percentages may not add up to 100 due to rounding

Conceptual models of suicidal behaviour

Many explanatory and predictive models of suicidal ideation and behaviour have been proposed; these have included sociological, psychiatric, biological and psychological explanations. Three models are described in outline here, in order to offer a theoretical context in which to understand the mechanisms that may underlie the possible influences on suicide risk that occur across the course of a veterinary career. The stress-diathesis model (Mann and others 1999) posits that suicidal behaviour results from the interaction between stressful life events and an individual predisposition or vulnerability. This vulnerability, itself the product of psychobiological factors, genetic predisposition and past life events, influences how the individual perceives, interprets and reacts to adverse life events. It is a dynamic system in which stress and diathesis influence each other (van Heeringen 2002). Consistent with the stress-diathesis model, the 'Cry of Pain' model of suicidal behaviour (Williams and Pollock 2000, Williams 2001) conceptualises suicidal behaviour as the response (the 'cry') to a stressful situation in which environmental cues result in feelings of defeat, loss or humiliation that give rise to an overwhelming feeling of needing to escape, a sense of being unable to escape (entrapment) and a sense that this state of affairs will continue indefinitely (no prospect of rescue). Judgements regarding perceptions of defeat, entrapment and rescue are determined, at least in part, by psychological variables such as problem solving and the ability to think positively about the future (Williams and Pollock 2000). The relationship between occupation and suicide can be conceptualised as a model comprising four components contributing to the differential occupational suicide risk: demographics (the demographic composition of people in the occupation); internal occupational stress (stress associated with the nature of the work); pre-existing psychiatric morbidity (the psychological profile of individuals attracted to the occupation); and opportunity factors (opportunities available for access to lethal means of suicide) (Stack 2001).

Suicidal behaviour can be conceptualised as a continuum of gradually increasing seriousness: feelings that life is not worth living, thoughts of taking one's own life, seriously considering suicide, suicidal planning, suicidal attempt, and suicide completion. Another view considers that each of these forms of suicidal behaviour does not together represent a continuum but is instead a discrete category, each with a specific risk factor. A longitudinal study of suicidal planning among doctors suggests that a continuum of severity may operate in this occupational group (Tyssen and others 2004). Consistent with the continuum hypothesis, for the purpose of the present structured review, risk factors for suicidal behaviours in general are considered as possible influences on the increased risk of suicide among veterinary surgeons.

Possible influences on increased risk of suicide

Access to means of suicide

Access to potentially lethal means has a strong influence on the suicide rate. Decreases in the rate have been associated with changes to non-toxic domestic gas from coal gas, the installation of catalytic converters in cars, smaller over-the-counter pack sizes of paracetamol and the installation of barriers on high bridges (Bennewith and others 2007, Hawton 2007). Availability and knowledge of medicines is likely to contribute to the suicide risk in doctors (Hawton and others 2000). Veterinarians also have ready access to medicines and knowledge of medicines for self-poisoning, possible contributory factors for their high suicide risk. In addition, veterinarians are supervised less in their use of medicines than doctors are (Fishbain 1986).

Deliberate self-poisoning is the most common method of suicide in both male and female veterinarians, accounting for 76 and 89 per cent of suicides, respectively, compared with 20 and 46 per cent, respectively, in the general population (Kelly and Bunting 1998) (Table 3). Veterinarians and pharmacists have the highest proportions of suicides using this method for all occupational groups; medical practitioners also have an increased risk of this specific method of suicide (Kelly and Bunting 1998, Hawton and others 2000, Agerbo and others 2007). There are many reports of the use of drugs for veterinary anaesthesia and euthanasia as suicide agents (for example, Cordell and others 1986, Sterken and others 2004). Barbiturates are the drugs most commonly used for suicide by doctors (Hawton and others 2000) and were used by at least half of male veterinarians who completed suicide by deliberate self-poisoning between 1982 and 1996 in England and Wales (Kelly and others 1995). Agerbo and others (2007) showed that suicide rates among doctors are slightly elevated even when deaths by medicines are excluded, suggesting that the ready availability of lethal means is not the only factor increasing their occupational suicide risk (Reichenberg and MacCabe 2007). Firearms are the second most common method of suicide by male veterinarians, and the frequency of this method is also raised relative to the general population, accounting for 16 per cent of suicides among male veterinarians and 5 per cent among the general population (Kelly and Bunting 1998). Veterinarians working in equine, farm animal and mixed practice may have ready access to firearms for euthanasia of large animals.

Attitudes to death and euthanasia

Veterinary surgeons are often asked to end the lives of animals, either directly in the case of euthanasia, or indirectly in the case of involvement in the slaughter of meat-producing livestock. Familiarity with death and dying may affect attitudes in regard to the expendability of life: 93 per cent of veterinary healthcare workers interviewed in a small-scale study indicated a favourable inclination towards euthanasia of human beings (Kirwan 2005). This is a higher proportion than in the general population (Clery and others 2007) and contrasts with prevailing medical opinion (Seale 2009), although comparison of these studies is confounded by dissimilar research methods. Positive associations have been demonstrated between tolerance of suicide (more permissive attitudes towards euthanasia, physician-assisted suicide and unassisted suicide) and suicidal thoughts and behaviour (Neeleman and others 1997, Etzersdorfer and others 1998, Zemaitiene and Zaborskis 2005, Gibb and others 2006, Joe and others 2007). The theory of cognitive dissonance (Harmon-Jones and Harmon-Jones 2007) – that psychological discomfort arising from conflicting thoughts or beliefs motivates the modification of existing, or the acquisition of new thoughts and beliefs to reduce the inconsistency and discomfort – may offer an explanation for any effect of euthanasia attitudes on suicide risk. Veterinary surgeons may experience uncomfortable tensions between their desire to preserve life and an inability to treat a case effectively, which could be ameliorated by modifying their attitudes to preserving life to perceive euthanasia as a positive outcome. This altered attitude to death may then facilitate self-justification and lower their inhibitions towards perceiving suicide as a solution to their own problems.

Suicide 'contagion'

Direct or indirect exposure to the suicidal behaviour of others can influence attitudes and increase vulnerability to suicide (Maris and others 2000). Knowledge of individual suicides can travel readily through the social networks of a small profession, and awareness of high levels of suicide among professional peers may be a contributory risk factor for suicidal behaviour in veterinary surgeons, creating a suicide

'contagion' or modelling effect among vulnerable individuals within a high-risk occupational group.

Cognitive and personality factors

Personality and cognitive factors are important in the prediction of suicide risk (Sheehy and O'Connor 2008). The relationship between personality traits and vocational interest is well documented (Mount and others 2005). Individuals have a preference for certain occupations based on their personality or life experiences, which could render them either more vulnerable or resilient to the work environment (Kohn and Schooler 1982, Stansfeld 2002, Wilhelm and others 2004). The personality profiles of medical students (Meit and others 2007) and doctors (Clack and others 2004) differ from those of the general population, and there are associations between personality factors and the choice of medical speciality (Borges and Savickas 2002): for example, mental health professionals are more likely to have early experiences of childhood trauma and family dysfunction than people in other professions (Elliott and Guy 1993), and women psychiatrists are more likely than women in other medical specialities to report personal or family histories of psychiatric disorders (Frank and others 2001). The choice of a veterinary career may be influenced by factors such as a preference for working with animals rather than people; previous interactions with animals may play a critical role in guiding veterinary students into their chosen career (Martin and others 2003, Martin and Taunton 2005, Serpell 2005).

The veterinary profession may be particularly vulnerable to suicide because of selection based on the very high academic requirements for entry into veterinary schools (Halliwell and Hoskin 2005). These admission requirements lead to an undergraduate cohort in which students with a history of outperforming their peers are grouped with similarly high academic achievers, creating an environment in which some students question their own abilities and fear that they will be exposed as intellectual frauds (Zenner and others 2005). Similar sentiments were expressed frequently by veterinary students in the USA during counselling (Kogan and others 2005). This situation also applies to students of other health professions, and predisposes to psychological problems among those who do not adjust and ensure their expectations of their performance are realistic (Henning and others 1998).

First-year students at a veterinary school in the USA possessed psychological characteristics consistent with other high-achieving competitive performance populations, such as professional athletes: they had elevated anxiety levels, placed significant value on positive comparisons with the competence of their peers, and harboured a fear of failure (Zenner and others 2005). Socially prescribed perfectionism (an individual's belief that others hold unrealistic and exaggerated expectations of him/her that must be met in order to gain acceptance and approval), self-criticism, concern about mistakes and doubts about action have been associated with suicidality (O'Connor 2007).

Voracek (2004) reported a positive association of intelligence with suicide, but Gunnell and others (2005) and Andersson and others (2008) have reported inverse associations. Cognitive performance in childhood appears to be significantly and inversely related to morbidity and mortality from all causes in adulthood, even at the higher end of the intelligence spectrum, and independent of childhood socioeconomic status (Martin and Kubzansky 2005). Halliwell and Hoskin (2005) conjectured that the highly demanding veterinary undergraduate course has the potential to stifle the development of communication skills and emotional maturity, possibly more so than the medical curriculum. The considerable volume and pace of learning at veterinary school is a stressor for students (Gelberg and Gelberg 2005). Rice (2008) speculated that a factor influencing the high suicide risk could be that undergraduate admission criteria are based on high academic achievement, which might select a greater proportion of students with low 'emotional intelligence' (EI). EI is described as the ability to perceive emotions in oneself and others, integrate emotions into thought processes, understand emotions and moderate emotions in oneself and others (Mayer and Salovey 1997). However, there is a strong positive correlation between several dimensions of EI and academic achievement (Parker and others 2004, Petrides and others 2004, Austin and others 2005), so it seems unlikely that the current admissions procedure inevitably selects a high proportion of students with low EI. Fostering EI may have a place in veterinary education, both to improve the relationship between veterinary surgeons and clients and to act as a buffer against stress in the profession (Gelberg and Gelberg 2005, Timmins 2006).

Personality traits of hopelessness, neuroticism and extroversion may be major influences on suicide (Brezo and others 2006). A longitudinal study of UK medical graduates showed that career stress, burnout and satisfaction were predicted by trait measures of personality that had been assessed five years earlier when they were medical students (McManus and others 2004). A six-year longitudinal and nationwide study of Norwegian medical students demonstrated that the traits of neuroticism and high conscientiousness are risk factors for stress (Tyssen and others 2007). Tyssen and others (2001a, b, 2004) have shown that specific personality traits and depression are common predictors of mental health problems and suicidal ideation and behaviours among medical students and young doctors, and demonstrated the utility of screening final-year medical students to identify a subgroup that might benefit from intervention.

Little is known about the coping strategies used by veterinarians. Australian veterinary students were shown not to consistently employ a range of effective coping strategies to deal with the stressors they encountered during their course of study (Williams and others 2005). Veterinarians in New Zealand have been shown to make good use of their social networks to seek information and assistance in times of work-related stress, especially from informal sources such as friends, family and colleagues, rather than from resources such as health professionals, counsellors and telephone helplines (Gardner and Hini 2006). The importance of deploying both problem-focused and emotion-focused strategies to cope with the stresses of veterinary work has been emphasised (Bartram and Gardner 2008).

Work-related stressors

Work factors associated with psychological ill health in staff are the demands of work (long hours worked, work overload and pressure) and the associated effects of these on individuals' personal lives; lack of control over work; lack of participation in decision making; poor social support; and unclear management and work role (Michie and Williams 2003). The demand-control model of job strain predicts that the combination of low decision latitude (low level of control over the work environment and limited variety of work or opportunity for use of skills) and heavy job demands is associated with mental strain (Karasek 1979). Similarly, a combination of high demands and low decision latitude, imbalance between effort and reward, and poor social support at work from coworkers and supervisors are risk factors for common mental disorders (Stansfeld and Candy 2006). High levels of decision latitude have been found to be protective of mental health in cross-sectional studies of veterinarians (Hesketh and Shouksmith 1986). Individuals without any pre-employment history of psychiatric disorders, exposed to high psychological job demands, had a twofold risk of onset of new depression and anxiety compared with those with low job demands (Melchior and others 2007). Lack of support from colleagues and supervisors, and deterioration in work characteristics, are associated with onset of depression (Waldenström and others 2008). The central tenet of a complementary job stress model, the effort-reward imbalance model (Siegrist 1996), is that high effort in combination with low reward is a major risk factor for psychological distress and ill health, especially in individuals characterised by a motivational pattern of overcommitment to their work.

Veterinary graduates typically move abruptly from the university environment to the relative professional and social isolation of general private practice. Being on call, the financial aspects of the role, and lack of surgical competence have been identified as the main initial difficulties, and staff turnover is high, with one in three veterinary graduates leaving their first job within two years (Routly and others 2002). Many work with little supervision, do not always have access to assistance from colleagues and can make professional mistakes, which may have a considerable emotional impact and may be significant in the development of suicidal thoughts (Mellanby and Herrtage 2004).

Veterinary work is perceived as stressful by over 80 per cent of UK veterinarians (Robinson and Hooker 2006). Using a short validated stress evaluation tool to measure and compare a number of work-

related stressors and stress outcomes across 26 different occupations in the UK, veterinarians reported poorer psychological wellbeing than workers in most other occupations (Johnson and others 2005). A large cross-sectional survey of mental health and wellbeing in the UK veterinary profession (Bartram and others 2009b, c) showed that veterinary surgeons have less favourable (that is, a greater risk of work-related stress) psychosocial working conditions in relation to demands and managerial support than the general working population. The number of hours worked, making professional mistakes, and the possibility of client complaints or litigation were the main reported contributors to stress (Bartram and others 2009c), consistent with the findings of a survey of work-related stress in the veterinary profession in New Zealand (Gardner and Hini 2006).

Financial debt is a risk factor for suicidal behaviour in the general population (Hatcher 1994, Hintikka and others 1998, Yip and others 2007). Twenty-nine per cent of working doctors who died by suicide in England and Wales had significant financial problems in the year before death (Hawton and others 2004). There may be an association between rising student debt and suicide among veterinary surgeons (Williams 2006). In 2008, the average debt faced by a final-year first-degree veterinary student in the UK was over £20,000, and 35 per cent of final-year students reported their financial problems as either difficult or severe (British Veterinary Association [BVA] and Association of Veterinary Students [AVS] 2008).

Veterinary practice occupies a difficult and complex moral position because it serves animal and human interests, which may conflict (Tannenbaum 1993, de Graaf 2005). Ethical challenges are commonplace as veterinarians seek to balance their obligations to ensure the welfare of their patients while accommodating the owners' expectations or demands, often within strict economic constraints, the views of professional peers, the wider interests of society as a whole, and the commercial interests of private practice (Rollin 2006). Animal shelter workers involved with the euthanasia of unwanted animals report high levels of work-related stress, work-to-family conflict, poor physical health, substance misuse and low levels of job satisfaction (Rollin 1987, Reeve and others 2005, Rogelberg and others 2007).

Interviews with US graduating veterinary students revealed that their most common upsetting experiences involved procedures they felt were unnecessary, such as when an animal's suffering was prolonged because its owner did not accept that its disease was incurable and that death was inevitable (Herzog and others 1989). Procedures causing pain to animals, such as the castration of calves without anaesthesia, were also considered stressful to the students, and 25 per cent found euthanasia of animals personally distressing.

A survey of veterinarians in Finland reported high levels of work-related stress, particularly among those working in urban areas and academia (Reijula and others 2003). In a cross-sectional study of the occupational health of veterinarians in Australia, the proportion of respondents with high levels of psychological distress was double that of the general population; significant predictors of high levels of distress included being less than 35 years old and having taken non-prescription drugs in the past 12 months. Working long hours and being on call after hours were major contributory factors for stress. Veterinarians working in general practice were significantly more stressed than those in other roles (Fairnie 2005). In a survey of veterinary surgeons in the UK, deaths of animals caused by illness or euthanasia were reported to provoke significant short- and long-term emotional reactions in a substantial proportion of respondents, which may be relevant to the instigation of depression (Fogle and Abrahamson 1990). A study of veterinarians in the USA demonstrated that communicating bad news to clients is stressful and, for some individuals, the feelings of stress are prolonged (Ptacek and others 2004). A large cross-sectional study of veterinarians in Germany also recorded high levels of work-related stress, mainly attributable to workload and out-of-hours on-call duties (Harling and others 2009). Small surveys of veterinary surgeons in Ireland have recorded similar outcomes (Connolly 2003, Kinsella 2006). Finally, Trimpop and others (2000a, b) demonstrated that stress associated with long working hours was a predictor of traffic accident rates in German veterinarians: those who worked over 48 hours per week reported significantly higher levels of work stress and incidences of driving accidents.

The risk of suicide is raised in occupations in which those employed are directly dependent upon clients for their income (Stack 2001). An exploratory study of 36 occupations found that the suicide rate was over 1.5 times higher for people in client-dependent occupations (such as physicians, dentists and retail proprietors) in comparison with those in non-client-dependent occupations, and it was assumed that this increased risk is associated with client dependency being a major source of stress (Labovitz and Hagedorn 1971). Veterinary surgeons in private practice work in a client-dependent environment.

Effects of gender

The PMR for suicide among veterinarians is greater among women than men (Mellanby 2005), but this may reflect the small absolute number of women concerned. This parallels the situation in the medical profession, in which female doctors have higher suicide rates, compared with the general population, than their male colleagues do (Baldwin and Rudge 1995, Hawton and others 2001, Schernhammer and Colditz, 2004, Petersen and Burnett 2008). In marked contrast to the general population, in which the suicide rate for men is approximately three times the suicide rate for women (Brock and others 2006), the absolute suicide rate among doctors is similar in both sexes (Lindeman and others 1996, Hawton and others 2001). This differential increase in risk between the sexes requires particular monitoring in view of the large increase in the number of women entering the veterinary profession. However, Hawton and others (2001) have suggested that the risk among female doctors might be expected to decline as they become the majority in a traditionally male-dominated occupation, and this may also apply within the veterinary profession.

Women have a greater preference for self-poisoning as a method of suicide than men, a pattern that is more pronounced in female doctors and veterinarians than in the general population (Kelly and Bunting 1998), so it is possible that in an occupational context of ready access and knowledge, as in the medical and veterinary professions, the risk of suicide may increase more for women than for men. However, male doctors and veterinarians also use self-poisoning for suicide more often than men in general (Kelly and Bunting 1998), so this is unlikely to be the sole explanation for the difference between the sexes. The particular stresses affecting women in these professions are likely to contribute to the difference (Gross 1997, Hawton and others 2000). By far the largest and most frequent gender-related source of stress identified for female junior doctors is the conflict they feel between their career and their marital and family life, and this is strongly linked to depression (Firth-Cozens 1990).

Female veterinary students report higher levels of emotional empathy with animals (Paul and Podberscek 2000), greater concerns for the welfare or rights of animals (Serpell 2005) and attach greater importance to the human-animal bond (Martin and others 2003, Martin and Taunton 2005) than their male counterparts. This is reflected in differences between male and female veterinary surgeons' reported emotional responses to treatment failure and carrying out euthanasia (Fogle and Abrahamson 1990), and in attitudes to pain control in animals (Capner and others 1999, Raekallio and others 2003, Hugonnard and others 2004). This may affect the ability of women to cope with the emotional stresses and moral conflicts inherent in veterinary practice (Paul and Podberscek 2000).

Phillips-Miller and others (2000, 2001) surveyed married or partnered veterinarians in the USA about work satisfaction, work-related stress, marital and family stress, and perceived level of spousal support for their career. The two sexes reported similar levels of work satisfaction and work-related stress, but women reported a significantly higher effect of marital and family stress on their career and lower levels of spousal support than their male counterparts. The areas of greatest work dissatisfaction for both sexes were income and long working hours. Emergency calls outside office hours and unwillingness of clients to agree to diagnostic or treatment procedures were also cited as being particularly stressful.

Disease epidemics

Major incidents such as the outbreak of foot-and-mouth disease in the UK in 2001 can increase the levels of psychological morbidity in affected communities (Peck 2005), potentially including veterinarians

TABLE 4: Summary of studies included in this review with findings relevant to mental health in veterinarians

Study	Design	Sample population	Location	Sample size	Response rate (%)	Key findings
Anon 2002	Cross-sectional	Veterinary surgeons and support staff	Australia	313 183	34 20	Euthanasia, specific client behaviours or characteristics, and long working hours were important stressors
Bartram and others 2009a, b, c	Cross-sectional	Veterinary surgeons	UK	1796	56	Symptoms of mental ill health elevated relative to general population. High psychological demands and low levels of support
Brown 1994	Cross-sectional	Veterinary students	USA	207	96	Students deploy a range of both problem-focused and emotion-focused coping styles with relatively equal frequency
Connolly 2003	Cross-sectional	Veterinary surgeons	Ireland	46	26	Workload reported as main source of stress
Fairnie 2005	Cross-sectional	Veterinary surgeons	Australia	419	43	Proportion of highly distressed respondents was double that of the general population. Distress highest for those <35 years old
Fishbain 1986	Case series	Veterinary surgeons	USA	4	–	Pethidine by intramuscular injection was principal drug abused; history of drug abuse in veterinary school; veterinary-sourced
Fogle and Abrahamson 1990	Cross-sectional	Veterinary surgeons	UK	167	56	Animal deaths provoke severe short-term (76 per cent) and long-term (20 per cent) emotional reactions in veterinarians
Fritschi and others 2009	Cross-sectional	Veterinary surgeons	Australia	2125	37	One-third reported poor psychological health but levels of distress, anxiety and depression similar to other professions
Gardner and Hini 2006	Cross-sectional	Veterinary surgeons	NZ	927	49	Those working in small animal practice, women and younger veterinarians reported the highest levels of stress
Hafen and others 2006, 2008	Cohort	Veterinary students	USA	T1:93 T2:78	T1: 90 T2: 84	One-third of first-year students report clinical levels of depressive symptoms. Predictors include academic concerns
Hansez and others 2008	Cross-sectional	Veterinary surgeons	Belgium	216	9	Mean job strain and job engagement levels not higher than other professions, but greater negative work-home interaction
Harling and others 2009	Cross-sectional	Veterinary surgeons	Germany	1136	53	Work-related stress mainly attributable to workload, out-of-hours on-call duties and difficult clients. High alcohol consumption
Heath 2007	Cross-sectional	Veterinary surgeons	Australia	134	98	Only 52 per cent would opt for the veterinary profession if they could start their career again
Herzog and others 1989	Cross-sectional*	Graduating veterinary students	USA	24	–	Distress was associated with prolongation of animal suffering, procedures causing pain to animals, and euthanasia
Hesketh and Shouksmith 1986	Cross-sectional	Veterinary surgeons	New Zealand	411	59	Decision latitude protective of mental health; lack of control over speed of work and discretion are associated with anxiety
Johnson and others 2005	Cross-sectional	Veterinary surgeons	UK and Ireland	262	36†	Low psychological wellbeing, intermediate job satisfaction and good physical health compared with 25 other occupations
Kinsella 2006	Cross-sectional	Veterinary surgeons	Ireland	14	44	Unsociable hours and workload ranked highest as stressors
Kirwan 2005	Cross-sectional*	Veterinary surgeons, nurses and receptionists	UK	15	–	93 per cent have favourable inclination towards euthanasia of human beings
Kogan and others 2005	Cross-sectional	Veterinary students	USA	233	44	Non-academic stressors include additional employment, relationship concerns and poor self-care habits
Martin and others 2003	Cross-sectional	Veterinary students	USA	146	NR	Human-animal bond influences decisions to become veterinarians, especially for women
Martin and Taunton 2005	Cross-sectional	Veterinary surgeons	USA	415	26	81 per cent indicated that the human-animal bond was important to their decisions to become veterinarians, especially for women
Mellanby and Herrtage 2004	Cross-sectional	Recent graduates	UK	108	27	Poor supervision, minimal support, many mistakes result in distress to veterinarians
Paul and Podberscek 2000	Cross-sectional	Veterinary students	UK	319	NR	Females have higher emotional empathy with animals, which is sustained throughout their degree for females but declines for males
Phillips-Miller and others 2000, 2001	Cross-sectional	Veterinary surgeons	USA	305	54	Women report greater effects of marital and family stress and lower spousal support
Ptacek and others 2004	Cross-sectional*	Veterinary surgeons	USA	62	–	Communicating bad news is stressful and, for some individuals, the feelings of stress are prolonged
Reijula and others 2003	Cross-sectional	Veterinary surgeons	Finland	785	67	Those working in towns or involved in education and research reported the most stress
Robinson and Hooker 2006	Cross-sectional	Veterinary surgeons	UK	9671	47	Work is perceived as stressful by 80 per cent of the profession. Only 53 per cent would choose veterinary career again
Routly and others 2002	Cross-sectional	Recent graduates and senior partners	UK	58 34	54 59	Main difficulties for new graduates are being on call, financial aspects of the role, and lack of surgical competence
Serpell 2005	Cross-sectional	Veterinary students	USA	302	92	Females have greater concern for animal welfare/rights. Interactions with animals influences attitudes and career choice
Trimpop and others 2000a, b	Cross-sectional	Veterinary surgeons and support staff	Germany	494 284	NR	Stress associated with long working hours was a predictor of traffic accident rates
Williams and others 2005	Cross-sectional	Veterinary students	USA	57	41	Narrow range of effective coping strategies
Zenner and others 2005	Cross-sectional	Veterinary students	USA	61	80	Psychological characteristics similar to other high-achieving populations

* Interview based; all other included studies are questionnaire based
† Response rate for veterinarians is not reported in Johnson and others (2005). Figure obtained from the original source Connolly (2002)
NR Not reported

because of their involvement in large-scale slaughter and disposal of animals, provision of emotional support to farmers, and the economic effects on private practices. During this outbreak, veterinary surgeons were turned to for emotional support by 40 per cent of farmers surveyed, and were the second most cited source of support, after family, friends and other farmers (Peck and others 2002). Calls from veterinarians to Vet Helpline, a peer-support telephone helpline providing emotional support to members of the profession in the UK, increased during the outbreak and decreased to pre-outbreak levels by mid-2002 (Peck 2005). Nusbaum and others (2007) described a number of negative psychological reactions in veterinarians involved with the outbreak, and advocated training in 'psychologic first aid' for public health professionals involved in such incidents, to limit emotional distress in the rural community and themselves.

Complaints at work

Seventy-one per cent of working doctors who died by suicide in England and Wales between January 1991 and December 1993

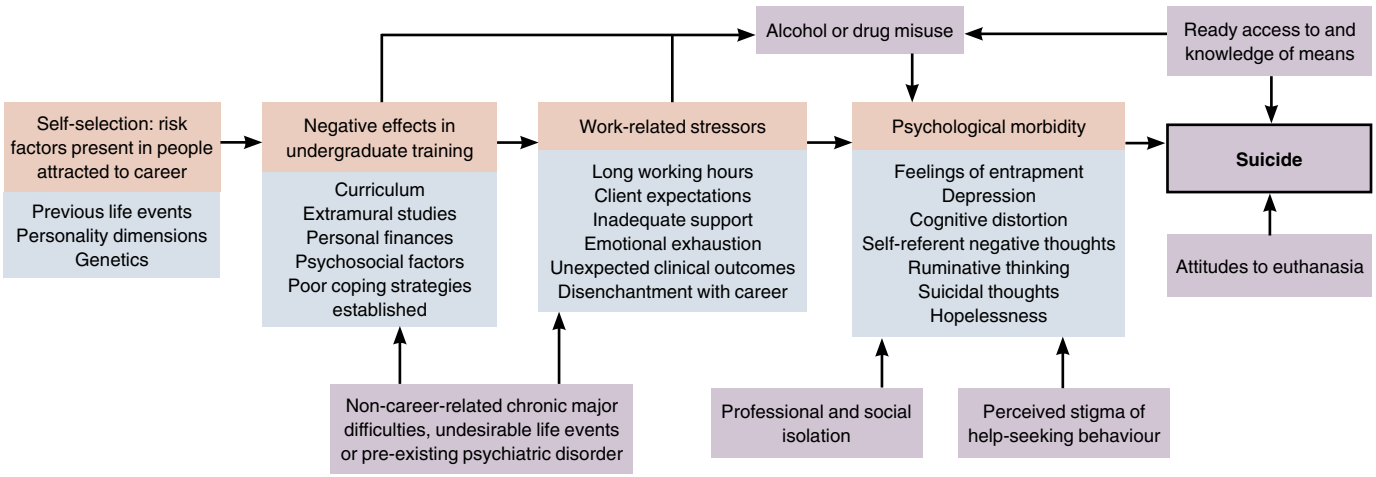

FIG 1: Schematic representation of a hypothetical model to explain the risk of suicide in veterinary surgeons (reproduced with permission from Bartram and Baldwin 2008)

had had significant problems at work in the year before their death; over one-third of those were facing complaints, which in most cases appeared to have been a key factor leading to suicide, although most of them were also facing other problems at work and at home. Other common occupational problems included feeling overloaded by their volume of work, working long hours and feeling unable to cope with the responsibility of their job (Hawton and others 2004). The number of complaints received by the Royal College of Veterinary Surgeons (RCVS) from the general public increases steadily each year, with the main category being alleged inadequate care (RCVS 2007).

Perceived stigma

The stigma associated with mental illness is increasingly recognised as an important obstacle to the provision of care to people with this disorder (Sartorius 2007). Mental illness may be particularly stigmatising for those working in professions where vulnerabilities are not readily tolerated. Stigma is recognised as an important influence on doctors' decisions not to seek mental healthcare (White and others 2006, Worley 2008), and the risk of suicide may be greater in higher income earners who develop mental illness, as they may feel more stigmatised than others with lower incomes (Agerbo and others 2001). A similar stigma may apply within the veterinary profession, with a consequent reduction in help-seeking behaviour.

Psychiatric illness

The risk of diagnosis with affective and stress-related disorders is higher in the human service professions (healthcare, education, social work and customer services) relative to all other occupations, after adjustment for an extensive range of sociodemographic variables (Wieclaw and others 2005, 2006). Specific professions contribute differentially to the magnitude of this increased risk: for example, teaching and social services display the highest risk of stress-related disorders, and health professionals have an elevated risk of depression. The elevated risk among the human service professions may be associated with factors including job characteristics such as irregular working hours and exposure to distressing events; high and conflicting job demands; self-selection into certain occupations of individuals who are inclined to display a high degree of commitment; and men and women occupying occupations in which the opposite sex predominates.

Agerbo and others (2001) explored the impact of psychiatric factors on the relative risk of suicide across 55 occupations. Only modest associations between suicide and occupation were observed among individuals who had been hospitalised previously for psychiatric illness. This implies that mental disorder lies on the causal pathway between occupation and suicide, or that occupational differences are less important once a person suffers from a psychiatric illness. However, doctors were a notable exception, being at almost fourfold higher risk than other occupations of dying by suicide if they had been hospitalised previously for a psychiatric disorder. Thus, the increased risk of suicide among doctors may be related to both an increased risk of psychiatric disorder and the increased risk of those with a psychiatric disorder to die by suicide. Although no cases of suicide among veterinarians were identified in the cohort of suicides examined by Agerbo and others (2001), it is possible that the dual effect seen in doctors may also apply in the veterinary profession.

The principal psychological problems experienced by doctors are depression and alcoholism, and these are more frequent than in the general population (Firth-Cozens 2001). Pre-existing psychiatric disorders, mainly depressive illness and alcohol or drug dependence, were present in over 86 per cent of doctors dying by suicide (Hawton and others 2004), and in over 90 per cent of nurses (Hawton and others 2002). In a study of UK healthcare professionals referred to a specialist drug and alcohol treatment service, approximately one-third had previously received treatment for depression and about one-fifth had previously taken an overdose (Gossop and others 2001). No such data are available for veterinarians, but it is reasonable to speculate that psychiatric disorders may be a similar factor in suicides by veterinary surgeons. There is a ready opportunity in both professions for misuse of prescription medications. Among UK veterinary surgeons referred to a health support programme, the order of preference of substance misuse was alcohol, ketamine, benzodiazepines, opiates, street drugs (cannabis, heroin, cocaine and ecstasy) and nitrous oxide, and approximately half of those treated admitted to having had suicidal thoughts (Veterinary Benevolent Fund [VBF] 2007).

Bartram and others (2009a, b, c) estimated that, compared with the general population, UK veterinary surgeons report higher levels of anxiety and depressive symptoms, a higher 12-month prevalence of suicidal thoughts, less favourable psychosocial working conditions in relation to demands and managerial support, lower levels of positive mental wellbeing, and higher levels of negative work-home interaction. The level of alcohol consumption did not appear to be a negative influence on mental health within the profession as a whole. This last observation is consistent with the findings of Mellanby and others (2008) that the PMRs for alcohol-related deaths among male and female veterinary surgeons aged 20 to 64 years in England and Wales during the period from 1993 to 2005 were lower than for the general population, although the differences were not statistically significant. Harling and others (2009) explored the use of psychotropic substances among German veterinarians and found that the prevalence of smoking was lower than that in the general population, and that the prevalence of drug use was similar in both groups. However, alcohol consumption was higher among veterinarians, and the prevalence of dangerous levels of alcohol consumption was markedly elevated among female veterinarians. Hafen and others (2006, 2008) reported that one-third of first-year students at a veterinary school in the USA had symptoms of depression associated with both academic and non-academic stressors, but it is not clear to what extent these findings can be generalised to veterinary undergraduates elsewhere. Allister (2009)

reported elevated signs of mental ill health among fourth-year veterinary students in the UK. Finally, Fishbain (1986) compared the characteristics of four US veterinary surgeons with psychiatric illness with those of published descriptions of psychiatrically impaired doctors; similarities included the type of misused drug (mainly opiates), the number of drugs (multiple), and the source of supply (self-prescribed rather than street-sourced). The veterinarians in that study considered overwork, fatigue, situational stress and problems with significant others to be precipitating factors. The outcomes must be interpreted very cautiously, however, due to the small number of veterinarians studied.

Studies with findings relevant to mental health in veterinarians are summarised in Table 4.

Towards a hypothetical model of suicide risk in veterinary surgeons

A hypothetical model to explain the risk of suicide in veterinary surgeons has been proposed (Fig 1) (Bartram and Baldwin 2008). The model attempts to clarify the complex interaction of possible influences, is based on specific testable constructs, and may facilitate a more focused and systematic approach for suicide research and the development of prevention strategies within the profession. The model is congruent with the stress-diathesis (Mann and others 1999), Cry of Pain (Williams and Pollock 2000, Williams 2001) and differential occupational risk (Stack 2001) models of suicide described above.

The principal hypotheses within this model are that suicide risk in veterinarians is influenced by: individuals entering the profession having characteristics that confer a predisposition or vulnerability; psychological morbidity induced by psychosocial factors during undergraduate training and work-related stress; attitudes to suicide induced by the practice of euthanasia of animals and awareness of suicide within the profession; and access to and knowledge of means of suicide. The model attempts to clarify a complex interaction of possible mechanisms across the course of the veterinary career, and may serve as a useful heuristic to facilitate a more focused and systematic approach to research. Research is required to validate or disprove the component hypotheses.

Implications for research

Despite the low absolute number of suicides by veterinarians compared with workers in other healthcare professions, the high PMR for suicide within the veterinary profession – one of the highest for any occupation – warrants dedicated research to expand the presently limited evidence base, to inform the development and implementation of suitable interventions. Such research would be important, not only for the wellbeing of individual members of the profession, but also in view of the potentially deleterious impact of practitioners' mental ill health on the welfare of animals under their care, and the insight that research in this professional group might provide into influences on suicide in other occupations.

Each stage of the veterinary career path – from the characteristics of applicants to veterinary schools, undergraduate training, subsequent employment, and through to retirement – can be examined to identify early predisposing factors and later triggers for suicidal behaviour in the profession. This 'life course' approach (Gunnell and Lewis 2005) would enable multiple points on the career continuum to be targeted with appropriate interventions.

Interviews with veterinary surgeons who have experienced suicidal thoughts could yield informative insights into the circumstances that they believe contributed to those thoughts, the nature and sources of help they sought, and their perceived barriers to seeking help. An investigation based on examination of coroners' records on deaths of veterinary surgeons that received a verdict of suicide or undetermined cause could provide insight into the circumstances of suicides in the profession and help to identify proximal risk factors.

The veterinary profession's role in providing animal euthanasia and so facilitating a 'good death', may normalise suicide, with death perceived as a rational solution to intractable problems. There has been no rigorous examination of this hypothesis to date.

Research with veterinary students could help identify whether there is a predilection towards mental health problems in applicants to veterinary school, whether there are negative influences on mental health during undergraduate training, and whether individuals' maladaptive coping strategies might play a role in the development of ill health. This in turn could lead to the development of enhanced assessments for entry to the veterinary degree course, and inform the development and timing of educational interventions at a systemic or individual level to improve the wellbeing of students and their resilience during their subsequent careers.

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