

Risk factors for musculoskeletal problems in veterinarians

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Introduction

If risk factors for musculoskeletal problems amongst veterinarians are identified, veterinarians, as well as veterinarian practices, can take appropriate steps to manage the risks in order to minimise their impact. Thus, this paper reviews literature that has attempted to identify risk factors for musculoskeletal problems in veterinarians.

The nature of the activities undertaken by veterinarians in clinical practice exposes them to many occupational hazards. These include: animal bites/kicks/scratches, animal allergens, chemicals, fatigue, manual handling, lifting, needle-stick injuries, radiation, biological agents, traffic, stress and zoonotic diseases (Thigpen and Dorn 1973, Landercasper *et al.* 1988, Fretz 1989, Whitten 1989, Brody 1993, Moore *et al.* 1993, Langley *et al.* 1995, Elbers *et al.* 1996a, Elbers *et al.* 1996b, Hafer *et al.* 1996, Hill *et al.* 1998, Poole *et al.* 1998, Sebastian 1998, Poole *et al.* 1999, Jeyaretnam and Jones 2000, Jeyaretnam *et al.* 2000, Trimpop *et al.* 2000, Chambers *et al.* 2001, Gabel and Gerberich 2002, Reijula *et al.* 2003, Nienhaus *et al.* 2005, Fritschi *et al.* 2006, Gardner and Hini 2006, Shirangi *et al.* 2007, Fritschi *et al.* 2008, Hansez *et al.* 2008, Loomans *et al.* 2008, Meers *et al.* 2008, O'Sullivan and Curran 2008, D'Souza *et al.* 2009, Lucas *et al.* 2009a, Lucas *et al.* 2009b, Smith *et al.* 2009, Scuffham *et al.* 2010b). Musculoskeletal discomfort (MSD) is one facet in the occupational health of veterinarians for which there is a paucity of information concerning prevalence, risk factors and effects. Internationally, a high proportion of work related injuries are attributed to musculoskeletal disorders and these result in absenteeism from the workplace, reduced productivity and personal costs (MacDonald 2004, Buckle 2005). Musculoskeletal disorders are the most common occupational injury workplace insurance claim in New Zealand (Pezzullo and Crook 2006, ACC 2008).

The majority of veterinarians in New Zealand work in clinical practice and undertake a wide range of tasks which are likely to contribute to MSD. Large animal veterinary practice in New Zealand is predominantly seasonal, which means that the yearly cycle of work is characterised by periods where different physical activities predominate. For instance, rectal palpation of cattle and horses to diagnose pregnancy or reproductive disorders is undertaken during short intense time periods. This task involves lifting, bending, twisting, arm and shoulder extension and torque, forceful pushing, and resisting unpredictable movements of the animal (Darmody *et al.* 1998). In small animal practice a common procedure is surgery, which involves lifting of animals and/or cages to tables, bending, twisting, crouching, arm extension, and prolonged standing. Regulatory veterinarians, on the other hand, have a role that includes tasks such as administration, animal and public health, animal welfare, ante and post mortem animal inspections, biosecurity, food safety and quality assurance inspections.

To date, only partial surveys of workplace musculoskeletal problems have been undertaken in veterinarians. These indicate a high prevalence of MSD between 50% and 96% (Faucett and Werner 1999, Fritschi *et al.* 2006, Scuffham *et al.* 2010b). This high range may be real or it may be due to a number of factors related to study methodologies (such as different definitions, no standardised questionnaires used, studying different populations etc).

MSD includes musculoskeletal trouble, symptoms, aches and pains which are self-assessed, subjective and can result in musculoskeletal disorders or diseases (Hamberg-van Reenen *et al.* 2008) whereas musculoskeletal

disorders and diseases are usually medically diagnosed (Hagberg *et al.* 1995). Descatha *et al.* (2007) demonstrated an association between musculoskeletal discomfort and musculoskeletal disorders: individuals with musculoskeletal symptoms subsequently developed musculoskeletal disorders three years later. In order to avoid this confusion, and because accurate diagnosis of injury or discomfort may not be achievable in many cases, in the present paper we have used the term musculoskeletal problems (MSP) to encompass musculoskeletal discomfort, pain, injury and disorders.

Prevalence of musculoskeletal problems

A cross-sectional survey of 3003 New Zealand workers (Widanarko *et al.* 2011) demonstrated a prevalence of MSP of 92%. The highest prevalence was for low back (54%), neck (43%), and shoulders (42%).

There have been few studies on the prevalence of MSP in veterinarians. These have varied in survey tools, populations, methodologies and response rates. The prevalence of musculoskeletal problems in veterinarians is highly varied. The measured average response rates of the studies were 35% (range 10% to 67%).

The annual prevalence of MSP for large animal veterinarians ranges from 65% for swine veterinarians (Hafer *et al.* 1996), 82% for cattle veterinarians (Cattell 2000), equine veterinarians, 72% (Loomans *et al.* 2008), 100% (Scuffham *et al.* 2010b) and large animal veterinarians 100% (Scuffham *et al.* 2010b). The prevalence of MSP in veterinary populations ranges from 50% for Australian veterinarian graduates (Fritschi *et al.* 2006), Dutch veterinarians 55% (Haverkamp 2006), veterinarians in Flanders 82% (Meers *et al.* 2008) to 96% in New Zealand veterinarians (Scuffham *et al.* 2010b). The body sites most affected were: lower back, with a mean prevalence of 51% (range 45% to 67% of studies), followed by the shoulder, 44% (range 20% to 59%), neck, 40% (range 23% to 58%), hands/wrists/fingers, 31% (range 14% to 52%) and elbows 28% (range 12% to 40%).

Risk factors of musculoskeletal discomfort

It is generally acknowledged that MSP is a multi-factorial problem. Physical and psychosocial factors are generally considered to be risk factors for MSPs. Physical factors include exposure to physical load (weight), awkward postures, prolonged static postures, vibration, repetitive tasks, sedentary tasks and prolonged periods of conducting a given task (Bernard 1997, Fredriksson *et al.* 2000, Hoogendoorn *et al.* 2000, Thorbjornsson *et al.* 2000, Hoogendoorn *et al.* 2002, Leclerc *et al.* 2004, MacDonald 2004, Menzel *et al.* 2004, Cote *et al.* 2008).

As stress is implicated as a psychosocial risk factor for MSP (see below), it is worth noting that several studies have reported moderate to high stress levels amongst veterinarians. High job demands, poor interpersonal relationships, requirements to keep up to date with current veterinary knowledge, financial pressure, career prospects, staffing issues, lack of job clarity, as well as the pressure of living in isolated communities have all been associated with stress (Chambers *et al.* 2001, Reijula *et al.* 2003, Gardner and Hini 2006, Hansez *et al.* 2008, Loomans *et al.* 2008, Smith *et al.* 2009, Scuffham *et al.* 2010b).

Psychosocial risk factors include stress, low job satisfaction, hours worked, low job control, time and work demands, and poor organisational culture (Bongers *et al.* 1993, Bernard 1997, Fredriksson *et al.* 2000, Ariens *et al.* 2001, Bach 2001, Hoogendoorn *et al.* 2002, Huang *et al.* 2002, Devereux *et al.* 2004, Leclerc *et al.* 2004, Palliser *et al.* 2005, Bongers *et al.* 2006, Cote *et al.* 2008). Sauter and Swanson (1996) describe the results of various studies that link psychosocial factors and MSP, with the main pathway being stress and increased muscle tension and fatigue, the latter being due to increased muscle contraction resulting in impaired circulation (Grieco *et al.* 1998). Work related stress may increase with high work demands, lack of job control and an inability to cope (Bongers *et al.* 1993). Psychosocial factors are influenced by an individual's motivation and coping strategies (Bongers *et al.* 1993, Bongers *et al.* 2002, MacDonald 2004).

Other risk factors for MSP include smoking (Battie *et al.* 1991, Leino-Arjas 1998, Bach 2001), gender (Hafer *et al.* 1996, Wijnhoven *et al.* 2006, Hooftman *et al.* 2009), obesity, arthritis, gout and muscle strength (Punnett and Wegman 2004). Tanaka *et al.* (2001) estimated that 37% of upper limb musculoskeletal disorders were attributable to work-related activities. Punnett and Wegman (2004) argue that there are many non-work activities such as sporting activities and housework that are related to musculoskeletal disorders. It is notable that musculoskeletal problems are cumulative – i.e. crafts, tasks, sporting activities and housework often use the same muscles as those used for work and it is difficult to demonstrate work relatedness of MSP.

Risk factors for musculoskeletal problems in veterinarians

Lifting weights greater than 18.5kg, manual handling and movement of pigs, manual handling of zoo animals have been associated with MSP (Hafer *et al.* 1996, Hill *et al.* 1998, Gabel and Gerberich 2002). Veterinarians

considered that handling and lifting animals are tasks associated with MSP (O'Sullivan and Curran 2008, Scuffham *et al.* 2010a).

Within small animal veterinary clinics in the United Kingdom, 40% of practices used a trolley and 68% used a stretcher to transport animals (D'Souza *et al.* 2009). D'Souza *et al.* also found that it was routine in 95% of practices to treat heavy dogs on the floor. Treating heavy dogs on the floor may reduce the risk of injury due to lifting, however, the veterinarians will place themselves at risk of MSP by assuming awkward postures (D'Souza *et al.* 2009).

According to Reijula *et al.* (2003), over 33% of veterinarians worked in awkward postures and 15% worked with arms raised over shoulder level for over one hour per day. Working with arms raised is a risk factor for neck and shoulder MSP (Palmer *et al.* 2003). Scuffham *et al.* (2010b) found that awkward and tiring postures as well as carrying out repetitive tasks were associated with MSP.

Repetitive actions due to the equipment used whilst undertaking venepuncture or injections resulted in 51% of swine veterinarians reporting MSP (Hafer *et al.* 1996). Miller (1994), after informal discussions with equine veterinarian colleagues, found that shoulder problems were common among his colleagues, and considered that these problems were due to rectal palpations, dental procedures and horses jerking on the lead rope. Miller (2005) also found that female colleagues did not have shoulder pain – as he surmised that they let the lead rope go on the horse and did not fight the horse. He also considered that height was a protective factor to prevent shoulder injuries as the veterinarian does have to reach. However, he commented that tall veterinarians have lower back problems. No further study has used Miller's work to further examine his hypothesis.

There have been only three studies where any association between psychosocial risk factors and MSP has been examined. Scuffham *et al.* (2010b) found difficulty of work, varying pace, work organisation, organisational culture as well as dissatisfaction with the level and difficulty of work were associated with musculoskeletal discomfort. They found that veterinarians being satisfied with the level and difficulty of work was a protective factor, and they had reduced odds of having MSP. Smith *et al.* (2009) found stress, career structure, time pressures, client attitudes, lack of public and colleague recognition, lack of understanding and lack of holidays were all associated with MSP within specific body sites. Loomans *et al.* (2008) found that equine veterinarians considered that some MSP were caused by work-related stress.

Scuffham *et al.* (2010a) asked veterinarians the reasons why 'tasks likely to be the most risky' result in MSP, and few (4%) veterinarians considered psychosocial risk factors to be associated with MSP. A possible explanation for this is that there is a tendency for the veterinary profession to think of a problem in terms of physical (i.e. tangible) issues as opposed to subjective (psychosocial) issues. Anecdotal evidence shows that most professionals find it easier to manage the physical risk factors rather than manage the psychosocial risk factors.

Various tasks or commonly performed procedures have been shown to be associated with MSP in veterinarians. For example, Scuffham *et al.* (2010b) have shown that necropsy, dental, obstetric and surgical procedures (<1 hour) are associated with MSP. However the procedures most commonly shown to be associated with MSP are: rectal palpations; ultrasonographic examinations and foot trimming.

Rogers (2011) recently published a thesis "Identifying and Evaluating Risk Factors for Musculoskeletal Disorders in Equine Veterinary Work". Rogers analysed tasks, postures, spinal forces and undertook a strain index to determine tasks that have a musculoskeletal risk to equine veterinarians. Undertaking lameness examinations, lifting, and undertaking ultrasound examinations were the three high-risk tasks, followed by rectal palpation which was considered an 'increased risk' for equine veterinarians to develop upper extremity musculoskeletal disorders. The tasks that resulted in the greatest lower back spinal compression forces were lifting and conducting lameness examinations. The overall analysis demonstrated that undertaking ultrasound examinations, lameness exams, and lifting followed by rectal palpations, positioning obstetric procedures, restraint and injections were the tasks in order of highest to lowest risk of musculoskeletal disorders to equine veterinarians (Rogers 2011).

Ailsby (1996), a human orthopaedic surgeon, was the first to report an association between rectal palpations and MSP of the shoulder in large animal veterinarians. He found that the MSP worsened during periods of undertaking rectal palpations and improved during resting in the off season and commented that shorter veterinarians were at higher risk of MSP. Cattell (2000), Chambers *et al.* (2001) and Scuffham *et al.* (2010b) all demonstrated that rectal palpation was associated with musculoskeletal discomfort using cross sectional surveys.

Fourie and Hoffman (2004), found that 83% of veterinary ultrasonographers reported MSP resulting from scanning. Awkward posture and poor scanning techniques were identified as the main contributory factors. In human ultrasonographers twisting, reaching, arm abduction and forceful gripping are associated with musculoskeletal dysfunction (Brown and Baker 2004). These risks may also apply to veterinary ultrasonographers. Human and veterinary ultrasonographers use similar equipment, but the differences between the various species and procedures must be taken into account.

Boyle *et al.* (1997) found an association with foot trimming of cattle and injury, while Scuffham *et al.* (2010b) demonstrated that foot trimming was associated with musculoskeletal discomfort.

Conclusions

Veterinarians are exposed to a range of physical and psychosocial occupational hazards that are associated with MSP.

There is a large range of reported prevalence of MSP - 50% (Fritschi *et al.* 2006) to 96% (Scuffham *et al.* 2010b) within veterinarians. This may be due to different definitions, methodologies used, a wide range of response rates as well as different populations being studied. The body site most affected in veterinarians is the lower back followed by the shoulders and neck.

Although there is a plethora of evidence which demonstrates that physical and psychosocial risk factors are associated with MSP in the general population and in many occupational groups, research into MSP in veterinarians has predominantly been focused on the physical risk factors, such as animal/manual handling (Hafer *et al.* 1996, Hill *et al.* 1998, Gabel and Gerberich 2002, D'Souza *et al.* 2009), rectal palpations (Carayon and Smith 2000, Cattell 2000, Chambers *et al.* 2001) or tasks (Hill *et al.* 1998, O'Sullivan and Curran 2008).

The variation and magnitude of the reported prevalence justifies the need for further research (e.g. prospective cohort studies, task analysis, verbal protocol analysis, postural analysis or biomechanical analysis), this research should be undertaken to triangulate data and determine other factors associated with MSD. It is essential that any further studies on MSP in veterinarians use a standardised musculoskeletal questionnaire with clear definitions of MSP to enable comparison between studies. The lack of studies into psychosocial risk factors and MSP is also an area that needs to be addressed, by using a standardised questionnaire, such as a job content questionnaire (Karasek *et al.* 1998). Future study should also include a proactive participative approach to identification of ways for veterinarians to avoid or minimise their risks of MSP, based on known risk factors as outlined in this paper.

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