

Needlestick injuries in veterinary medicine

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Abstract – Needlestick injuries are an inherent risk of handling needles during the course of veterinary practice. While significant effort has been expended to reduce needlestick injuries in human medicine, a relatively lax approach seems to be prevalent in veterinary medicine. It appears that needlestick injuries are very common among veterinary personnel and that serious adverse effects, while uncommon, do occur. Clients may also receive injuries in clinics during the course of animal restraint, and at home following prescription of injectable medications or fluids. Because of occupational health, personal health, and liability concerns, veterinary practices should review the measures they are taking to reduce the likelihood of needlestick injuries and develop written needlestick injury avoidance protocols.

Résumé – **Blessures par piqûres d'aiguilles en médecine vétérinaire.** Les blessures causées par les piqûres d'aiguilles constituent un risque inhérent à la manipulation des aiguilles en pratique vétérinaire. Alors que des efforts significatifs ont été consentis pour réduire les blessures causées par les aiguilles en médecine humaine, un certain laxisme semble prévaloir en médecine vétérinaire. Il apparaît pourtant que les blessures causées par les piqûres d'aiguilles sont très fréquentes chez le personnel vétérinaire et que de sérieux incidents, quoique peu nombreux, se produisent. Les clients peuvent aussi être blessés en clinique en participant à l'immobilisation de leur animal ainsi qu'à la maison lors de l'administration de médicaments ou de fluides injectables prescrits. Pour des raisons de sécurité au travail, de santé et de responsabilité, les cliniques vétérinaires devraient revoir leurs mesures pour réduire les risques de blessures causées par les piqûres d'aiguilles et développer des protocoles écrits de prévention.

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Introduction

Inadvertent puncture of the skin by a needle is termed a “needlestick injury” or “needlestick.” Needlestick injuries are an inherent risk of handling needles, and while the physical trauma of needlestick injuries is usually minor, the injuries are of concern because of the potential exposure to infectious agents and syringe contents. Concern is substantial in human medicine, where much effort has been devoted to reducing the incidence of these events. For various reasons, the same aggressive approach has not been used in veterinary medicine. While there are significant differences in the risk of needlestick injury in human and veterinary medicine, needlestick injuries in veterinary medicine should not be considered benign, and the lax attitude concerning these injuries should be replaced with a proactive attitude towards injury avoidance.

Needlestick injuries in human medicine

While significant attention is now paid to needlestick injuries in human medicine, for years the approach was rather lax. Recognition of occupational risks associated with bloodborne viral pathogens such as hepatitis B virus, hepatitis C virus, and human immunodeficiency virus (HIV) was the driving factor in changing attitudes. Hepatitis B virus transmission received the most attention initially, and high rates of infection (12% to 27%) were documented following needlesticks involving infected patients (1,2). Transmission of hepatitis C virus (3.0%) and HIV (0.3%) is less common (3); however, the severity of these diseases and the number of potential exposures indicates that there should be significant concern.

One difficulty in the evaluation of needlestick injuries is determining the scope of the problem. While needlestick injuries are considered to be one of the most common types of injury to human healthcare workers (HCWs), the quality of available data is variable and it is believed that there is significant underreporting (4). This is complicated by variable study methodologies and reporting schemes. Various estimates include 800 000 needlestick injuries/y in American HCWs (5), 100 000 needlesticks/y in British HCWs (6), 0.8 to 5 needlesticks/100 person-years in the UK (4), 30 needlestick/100 hospital beds/y in the US (7)

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and 0.5 needlesticks/10 000 American HCWs (3). The accuracy of reporting, however, is a significant problem, with estimated underreporting rates varying from 90% to 100% (4,8). The true scope of this problem, therefore, is not completely understood.

Needlestick injuries can occur before, during, and after a procedure before needle disposal, during needle disposal, and after improper disposal (leaving needles in a laboratory coat with subsequent needlestick injury to laundry personnel). One study reported that the most common time of injury was during the procedure (39%), followed by after the procedure but before disposal (27%), and during disposal (21%) (9). Nurses tend to have the greatest number of injuries (7,10,11); however, that is not surprising given their frequent contact with needles.

In the year 2000, the *Needlestick Safety and Prevention Act* was passed in the United States out of concerns regarding needlestick injuries (12). This *Act* requires that employers consider engineering specific controls to reduce employee exposure to bloodborne pathogens through use of “safer medical devices.” Exposure control plans must be developed and reviewed annually, with updates based on changes in technology. Needleless systems and related protective devices are not mandated but their annual consideration is. Employers are required to maintain a sharps injury log containing information about the type and brand of device involved, the area in which the exposure occurred, and an explanation of how the injury happened. The *Act* also added a new section to the Occupational Safety and Health Association bloodborne pathogen standards (13), which requires employers to solicit input from patient care staff in the identification, evaluation, and selection of measures to reduce injuries. To the authors’ knowledge, similar legislation does not exist in other countries; however, the mandate for protection of HCWs does exist in most countries through various acts, groups, and guidelines, and the need for proper protection from needlestick injuries can reasonably be implied even if it is not directly stated.

Needlestick injuries in veterinary medicine

Needlestick injuries and needlestick avoidance have received much less attention in veterinary medicine. This is probably because we do not *currently* recognize many significant and common zoonotic bloodborne pathogens in animals in most areas and perhaps more importantly we do not *currently* recognize a significant bloodborne zoonotic pathogen that can be present in clinically normal animals. While people may have concern about rabies, blood contact is not considered to be a route of exposure. There is no way of knowing if we will continue to be free of substantial risk, or if a potentially devastating bloodborne zoonotic disease will emerge in the North American animal population.

Despite the absence of bloodborne pathogens such as HIV and hepatitis viruses, there are a variety of potential concerns in veterinary medicine. It is plausible that infections could occur from inoculation of bloodborne pathogens (certain arboviruses), organisms from the animal’s skin (*Staphylococcus* spp., *Pseudomonas* spp.), organisms from fine-needle aspirates (*Blastomyces*, *Pasteurella* spp., *Staphylococcus* spp., *Streptococcus* spp.) or modified live vaccines. Physical trauma can be

significant, especially from large-bore needles or severe laceration that results from animal movement during injection or blood collection. Injection of substances such as vaccines, antimicrobials, chemotherapeutics, euthanasia solutions, and anesthetics also pose potential risks ranging from local irritation to systemic reactions.

There has been less study of the incidence of needlestick injuries in veterinary medicine compared with human medicine. In 1 study, 64% of female veterinarians reported 1 or more needlestick injuries over their career, with vaccines accounting for 50% of the incidents (14). Interestingly, the reported incidence was significantly lower in large animal veterinarians (5.8/100 person-years) compared with mixed animal (9.7/100 person-years), and small animal (9.8 person-years) veterinarians. In another study, 87% of zoo veterinarians reported 1 or more needlesticks, with 6.5% of respondents requiring medical treatment for a needlestick (15). Reasons for medical treatment included adverse reactions to injected agents, infections, and severe lacerations. In that study, 58% of people reporting a needlestick had been exposed to animal blood, 52% to antimicrobials, 52% to vaccines, and 17% to immobilizing agents. Similar results were reported in an Australian study, where 71% of veterinary technicians reported needlestick injuries (16). Two-thirds of individuals who experienced a needlestick reported injection of substances, including antimicrobials (13%), euthanasia agents (11%), sedatives (9%), vaccines (8%), and anesthetics (8%).

A survey of companion animal practice owners and managers reported a needlestick frequency (needlesticks/person/3 y period) of 0.45 in veterinarians, 0.17 in veterinary technicians, 0.18 in professional assistants, 0.18 in lay assistants, and 0.5 in volunteers (17). A similar study of large animal veterinarians reported frequencies of 2.0 needlesticks/person/3y for veterinarian owners or partners, 0.54 for veterinary employees, 0.13 for veterinary technicians, 0.26 for lay assistants, and 0.13 for “others” (18). It is likely that there was significant under-reporting in these studies because the owners or managers would not necessarily be notified of all needlestick injuries. Presumably, the large difference between “owners” and “others” indicates an under-reporting bias in which owners who reported to the survey were probably unaware of needlesticks suffered by personnel other than themselves.

Overall, it is apparent that needlestick injuries are relatively common in veterinary practice. Further, anecdotal information from veterinarians and veterinary technicians suggests that these reported rates are low and likely involve significant under-reporting.

Little information is available concerning the risk factors for needlestick injuries. It is likely that veterinarians frequently engage in high-risk handling procedures. Eighty-six percent of zoo veterinarians reported recapping needles, a very high risk procedure, more than 50% of the time (15). A study of personnel in nonhuman primate laboratories reported that needlestick injuries occurred more frequently in people who had been employed for ≤ 2 years (19). There is no information available on the relative risk of different types of procedures.

While most needlestick injuries are minor, potentially serious consequences can occur. A study of female veterinarians

reported adverse effects in 16% of needlesticks (14); however, adverse effect data must be examined critically since people experiencing adverse reactions are more likely to report having had a needlestick than others. Severe reactions included severe local inflammation, abscess formation, joint infection, localized necrosis, skin slough, local nerve damage, brucellosis, severe allergic reaction, psychedelic experience, bronchial and laryngeal spasm, and miscarriage. Anthelmintics, euthanasia agents, and anesthetics were more commonly associated with adverse effects. The miscarriage resulted from a needlestick in which the syringe contained prostaglandin. Long-term or severe complications have been reported elsewhere. Accidental injection of Johne's bacterin in a finger can result in the presence of a small nodule persisting for 4 to 6 mo to painful inflammation for 24 mo (20). Exposure to the RB51 brucellosis vaccine caused long-term (> 6 mo) adverse incidents in 27% of people reporting adverse reactions, including erythema, induration, fever, chills, sweats, fatigue, myalgia, and arthralgia (21). Mineral oil adjuvants can produce a prolonged chronic granulomatous reaction with sterile abscess formation (22). A farm worker's injection of an oil-based bovine vaccine into his finger resulted in amputation of the finger because of ischemic necrosis following increased pressure in the flexor tendon sheath (23). In a study of adverse effects of human exposure to tilmicosin, 61% of exposures involved inadvertent injection, with most presumed to be from needlesticks (24). Of the 3168 exposures, 156 (5%) resulted in severe reactions, as designated by the presence of 1 or more of tachycardia, bradycardia, hypertension, hypotension, heart disorder, chest pain, tachypnea, or death. Thirty-six percent of those cases involved injection of ≤ 0.5 mL. Accidental injection following fine-needle aspiration is also a concern. Blastomycosis developed in a veterinarian from a needlestick following fine-needle aspiration (25).

Needlestick injury avoidance

It has been estimated that 62% to 88% of injuries to human HCWs by sharps can be avoided through the use of safer devices (12). One study of human HCWs reported that 56% of all injuries and 80% of injuries due to venipuncture or injection were probably or definitely preventable through the use of safety devices, 52% of all injuries and 56% of venipuncture/injection injuries could have been prevented with adherence to existing guidelines, and 72% of all injuries and 88% of venipuncture/injection injuries could have been prevented through either intervention (9). Italian researchers reported that 74% of needlestick injuries were attributable to incorrect needle handling by health care workers that could have been prevented, while 24% of the remaining injuries could have been prevented through use of safety devices (26).

A variety of practical, common sense measures can be implemented to reduce the risk of needlestick injury (Table 1). All clinics should have an infection control program, and part of that program should involve education with respect to safe handling of sharps and avoidance of needlestick injury. Education is perhaps the most important aspect of a prevention program because human error is a major, if not the most important, contributing factor. A variety of informational and educational

Table 1. Basic measures for reducing needlestick injuries

Educate all employees and volunteers about safe sharps handling and needlestick avoidance.
Do not recap needles unless absolutely necessary. If recapping is necessary, use a one-hand scoop method, hold the cap with a mechanical device such as forceps or use a needle recapping device.
Ensure convenient access to sharps containers in all areas where needles might be used.
Promptly dispose of needles into approved sharps containers.
Never use temporary or unapproved containers for sharps.
Never try to remove anything from a sharps container.
Do not fill sharps containers beyond the designated fill limit.
Consider the use of protective devices such as retractable needles or hinged syringe caps.
Do not walk around with an uncapped needle.
Ensure all personnel report all needlestick injuries and record information regarding the circumstances.

resources are available, such as from the Centers for Disease Control and Prevention (<http://www.cdc.gov/niosh/topics/bbp/#prevent>).

One area that requires close attention is recapping of needles. Recapping is a high-risk procedure and injuries can occur from missing the cap or pushing the needle through the side of the cap and into the hand or finger. Recapping should be avoided if at all possible, and should never be done by hand. If recapping is necessary, there are ways to do this safely. The "one-handed scoop method" involves placing the cap horizontally on a flat surface, inserting the needle into the cap while only holding the syringe, and pressing the cap firmly onto the needle by pressing down on the surface. The cap is not touched until after it is firmly attached. Another method involves holding the cap with an instrument such as forceps. Needle cap replacement devices are also available. These are blocks made of various materials that will hold the needle in a vertical position with the tip down. The cap is placed in the device and the needle is pressed firmly into place. These are cost-effective and reusable.

Compliance is an inherent problem with most infection control practices. Efforts should be taken to make compliance as easy as possible. These include placing approved sharps containers in all areas where sharps are handled. Temporary containers, such as empty fluid bottles or large pill vials, should never be used. In most other situations, the needle may be removed from the syringe for disposal (27). This is preferably done with the needle removal device on the sharps container or with forceps.

Safer devices

One potentially useful preventative measure is the use of safer injection and blood collection devices. Various devices are readily available that could have a significant affect on the incidence of needlestick injuries.

Resheathable winged steel (butterfly) needles are designed so that the needle can be withdrawn into the protective sheath after use (28) Bluntable needles can be used for blood collection. With these systems, a blunted cannula within the lumen of the needle is advanced beyond the needle tip by forward

pressure of the blood collection vial against the adapter end of the needle (29). Hinged recapping sheaths, which are pressed over the needle after withdrawal from the vein, can also decrease the risk of needlesticks after blood collection (29). Retractable needles may be particularly useful. With these systems, the needle is automatically retracted into the syringe or vacutainer after injection or blood withdrawal, thereby greatly reducing the risk of injury. Considering that a large number of needlestick injuries occurs after the procedure (9), the use of this type of system should have a marked effect. Needleless IV systems can reduce injuries associated with injection into IV line ports by using a combination of a blunt plastic cannula and split septum access port instead of injection with a standard needle (30).

The use of safety devices can reduce the incidence of needlestick injuries. The use of protective devices has been associated with a 74% decrease in needlestick injuries during blood collection (31). Another study reported a decrease in injuries from 20/100 000 devices to 6/100 000 devices following introduction of various safety devices (32). The use of resheathable butterfly needles has been associated with 23% to 59% reductions in needlesticks (3,28). Veterinary studies have not been reported but there is no reason why these devices would be less effective in a veterinary environment.

Cost is an obvious concern with needle safety devices, particularly when the benefits are difficult to quantify. Human HCW studies have demonstrated a net savings with the use of safer devices (30,33), but extrapolation to veterinary medicine should be avoided because much of the cost savings in human medicine involves cost savings through decreased HIV and hepatitis C testing and prophylactic treatment.

Proper animal restraint is also important, as poor restraint can endanger not only the person injecting, but also other staff and animal owners who may be assisting. Adequate staffing and personnel training, therefore, need to be considered.

Responsibility/liability

Closely associated with the concern for the safety of those associated with the daily use of needles and other sharps is the issue of possible liability for the owner of the facility. Whether the seemingly minor injury is caused to an employee or a client, the owner of the facility may be legally responsible for the payment of damages in the event that a court were to find that inadequate safety precautions had been adopted.

Statutory liability

Throughout North America, various jurisdictions have enacted legislation for the protection of employees in the workplace relating to occupational health. In all cases, the employee is obliged to conduct himself or herself in a cautious manner so as to avoid injury; however, the statutes universally require employers to provide a safe working environment. The failure to institute appropriate and generally accepted standards of safety protocols could result in a claim by the employee for a breach of the applicable statutory duty and give rise to investigations and sanctions by government authorities having a mandate to enforce such legislation. In the case of needlestick injuries it would be prudent for facilities owners to ensure that they are in

compliance with any statutory regulations relating to the proper use, storage, and disposal of the instruments in question.

Common law liability

In addition to any legislative requirements, owners and employers are also required by common law principles to ensure that they are not negligent in connection with the use of needles and other sharps in a facility. The common law (essentially the precedents established by the courts over the centuries) requires that an owner or employer owes a duty of care to an employee to provide a safe working environment; the standard of care has been determined to dictate that an owner or employer must demonstrate a reasonable standard of safety having regard for other owners or employers in similar circumstances. The failure to meet the standard can give rise to a claim for damages arising from the negligent conduct of the owner or employer.

The common law duty would apply to injuries sustained by both employees and clients of the facility. In the former case, most claims would be barred by the operation of workers' compensation legislation, which restricts the ability of an employee to sue an employer in exchange for a governmental scheme of compensation, where such legislation applies. In the latter case, clients of a facility can be injured in circumstances where they are near a needle or other sharp during the course of treatment. In a veterinary context, owners often volunteer to assist in the restraint of their animals and therefore may be exposed to unpredictable behaviors during the course of treatment. If a fractious cat attempts a spirited escape immediately before an injection, the needle can, in some cases, get misdirected and pierce the client. In such cases, it is difficult to consider a situation in which the attending veterinarian would not be liable for negligence having been responsible for the care of the animal at that time. As such, it would be prudent for a veterinary facility to adopt a policy dictating that animal owners are not to be included as part of the health providing "team" by way of assisting with restraint. If this is not possible in some cases, then it is incumbent upon the veterinary professional to properly advise the owner to be cautious.

Another area of potential liability is prescription of injectable medications or fluid therapy, such as subcutaneous fluid, for administration at home by clients. It should be considered that pet owners have no baseline knowledge of needlestick injuries, needlestick avoidance, and safe sharps handling practices. If veterinary practices dispense or prescribe injectable treatments, education regarding safe handling practices including safe administration, needle handling, and sharps disposal must be provided and documented.

Conclusion

Infection control has been an overlooked and underappreciated field in veterinary medicine; however, the attitudes towards zoonotic infections and occupational injuries are changing, as is the expected level of care. Increasing information concerning zoonotic infections and occupational injuries, and publication of infection control guidelines (27) suggests that the expected standard of care is increasing. It is prudent for veterinarians and veterinary practices to proactively address issues such

as needlestick injuries for the benefit of their staff and their practice.

Authors' contributions

Dr. Weese wrote the general and needlestick injury sections. Doug Jack wrote the sections pertaining to liability. Both authors reviewed the manuscript.

CWJ

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