Infection control and hygiene: a guide to best practice

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ABSTRACT: Infection prevention and control is a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. Therefore, maintaining high standards of hygiene and cleanliness in veterinary practice is vitally important to ensure the safety of patients, staff and clients by minimising risk of acquiring infection whilst on the premises. Key infection control protocols play an important part in maintaining practice hygiene.

KEYWORDS: Infection control; hygiene; infection

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Infection control practices

Infectious disease outbreaks can be catastrophic in veterinary practice. Human and veterinary infection control practices have gained heightened attention as a result of the emergence of methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) in addition to several other multi-drug resistant organisms in human and small animal critical care practices around the world (Weese, 2012).

The effective implementation of hygienic measures is essential to prevent and contain the colonisation of pathogens and transmission of hospital acquired infection (HAI) to both patients and humans within the veterinary practice and the wider community. It is important to remember that it is impossible to completely prevent HAI from occurring, however, by having good infection control procedures in place, the occurrence can be limited (Figure 1).

The following control methods are recommended:

- good hand hygiene
- personal protective clothing and equipment (PPC &PPE)
- environmental cleaning and disinfection
- fomite consideration

Figure 1. Gloves must be worn during surgical skin preparation.

DOI: 10.1080/17415349.2020.1712826

Figure 2. Surgical asepsis and technique.

Figure 3. WHO hand hygiene technique.

- surgical asepsis and technique including the theatre environment, patient preparation, the surgeon, and theatre staff (Figure 2)
- antibiotic stewardship
- isolation and barrier nursing considerations particularly to those that we think or know are infectious and immune-compromised
- laundry
- staff training and compliance
- client education.

Reservoirs for infection

The reservoir of an infectious agent is the surroundings in which the agent normally lives, grows, and multiplies. Reservoirs include humans, animals, and the environment. An infectious agent may be transmitted from its natural reservoir to a susceptible host in different ways. These include direct: direct contact and droplet spread and indirect: airborne, vehicle and vector. In order to effectively control and prevent the spread of disease, it is important to understand the various routes that pathogens are transmitted by. Infection prevention depends on the disruption of the transmission of pathogens from their source, either the infected animal or human to the new host or locations. Therefore, understanding the routes of disease transmission and how it contributes to the spread of the organisms will enable the implementation of the most effective control measures.

Biosecurity

Infection control and biosecurity are essential in the management of veterinary practices. Infection control is defined as the measures that are taken to prevent infection associated with procedures (either surgical or non-surgical) or hospitalisation. Biosecurity on the other hand is a set of measures designed to reduce the risk of transmission of infection or disease between animals. This can be from animal to animal, human to animal and from animal to human.

In terms of biosecurity, it is important to have a strategy in place to assess patients on their infection risk. It is suggested that a tiered system for classifying patients based on their susceptibility to infection, level of disease present and clinical status is utilised (O'Dwyer, 2013). This is similar to classifying and organising a surgical list by contamination level with the most susceptible/least infectious patients being dealt with prior to infectious patients (Table 1).

Hand hygiene

Hands are the main pathway of germ transmission and therefore hand hygiene is the most important measure to avoid cross contamination. Studies have shown that regular hand washing significantly reduces the risk of nosocomial infections (WHO, 2009). The objective of effective hand hygiene is to reduce the number of microorganisms on the hands, but more specifically the number of microorganisms part of the transient microflora of the skin, as these include the majority of opportunistic pathogens on the hands. The WHO hand hygiene guidelines state that hand hygiene should be performed at five key moments, preferably by using an alcohol-based rub or by handwashing with soap and water if hands are visibly dirty. The five moments of hand hygiene approach recommends hand washing:

1. before touching a patient,
2. before clean/aseptic procedures,
3. after body fluid exposure,
4. after touching a patient, and
5. after touching patient surroundings.

As well as hand washing technique (Figure 3), consideration should be made with regards to hand PPE. Gloves act as a barrier and will reduce the risk of transmission of pathogens. It is a common misconception that wearing gloves is a substitute for suitable hand hygiene (Bearman et al., 2007). Gloves must be worn at various times during the working day (Figure 4). Gloves must be changed when moving from a dirty to clean procedures on the same patient, between patients and before touching equipment and surfaces that will be handled by non-gloved staff members. It is important to remove gloves promptly after

Table 1. Tiered handling.

Tier	Classification
Tier 1	Patients with a poor immune status and, therefore at a high risk of infection. E.g. immune-compromised, critically ill, long-term hospitalised, unvaccinated or neonates. These patients should be housed in the main hospitalisation area or intensive care areas, depending on the level of care required
Tier 2	Patients with no history, clinical signs or laboratory evidence of contagious disease. E.g. elective surgical procedures, non-infectious disease work ups, minor trauma. These patients should be dealt with after tier one patients. This is to limit the possibility of transmitting disease from patients with subclinical/latent infections.
Tier 3	Patients with infectious diseases that are considered to be mildly or moderately contagious to other patients or personnel. E.g. multidrug-resistant bacterial infection excluding meticillin-resistant *Staphylococcus aureus*; (MRSA) open draining wounds, long-term antibiotic therapy and FIV, FIP, FeLV, ringworm, *Campylobacter*, *Giardia*, leptospirosis and pyoderma If there is any question regarding the possibility of contagious disease, patients should be designated as tier 3, until appropriate diagnostics can be run. These patients can be housed in the general hospital area, provided barrier nursing protocols are followed. MRSA patients, however, must be hospitalised in isolation.
Tier 4	Patients known or suspected to have highly contagious diseases. e.g. canine infectious enteritis (parvovirus), distemper (adenovirus), feline infectious enteritis (coronavirus), kennel cough (Bordetella bronchiseptica), cat flu (calicivirus, chlamydia and herpesvirus), infectious hepatitis and bacterial enteritis (Salmonella). These patients must be housed in isolation and barrier nurses until they are discharged.

Adapted from O'Dwyer (2013).

Handling blood
Body fluid
Secretions
Excretions
Mucous membranes
Potentially infectious material and patients
Managing wounds
During surgery
Cleaning kennels
Environmental surfaces
Handling laundry

Figure 4. When gloves should be worn.

use, avoiding contact between skin and the outer glove surface and not touching surfaces used by ungloved hands. Hand hygiene must be performed immediately after glove removal to prevent contamination and further transmission and dissemination of microorganisms. A study by Okomoto et al. (2019) found that more than one-third of healthcare workers were contaminated with multi-drug resistant organisms after caring for patients who were colonised or infected with the bacteria. The study found that 39 percent of workers made errors in removing personal protective equipment including gowns and gloves, increasing the incidence of contamination. Observational clinical audits assessing hand hygiene should be implemented to ensure all staff are adhering to hand hygiene protocols. To maximise adherence to hand hygiene protocols, regular staff training on its importance is suggested (O'Dwyer, 2013).

Personal protective clothing and equipment

Personal protective clothing and equipment is a vital tool in infection control. Its purpose is to reduce the risk of exposure of pathogens to skin and mucous membranes of staff, prevent contamination of personal clothing and reduce transmission of pathogens between patients and staff. Each case should be considered on a holistic basis, taking into account the basic principles of infection control, the patient, environment, procedure being performed and infectious disease suspected.

Personal protective outerwear should be used to protect and to reduce the risk of pathogen transmission by clothing to patients, owners, staff and the public. Protective outerwear should be worn whenever there may be contact with an animal or when working in the clinical environment. Uniforms should be restricted to use only within the practice and should not be worn outside of the workplace, nor should they be taken home by staff. Personal protective clothing should be washed on-site at the end of the day, or whenever contaminated. This will prevent the transmission of potential pathogens from patients to pets within the home environment.

Theatre staff should wear designated surgical attire in line with best practice recommendations. These items should not be used outside of theatre and for other tasks. This will help to minimise the spread of pathogens from clothing worn whilst dealing with patients in other parts of the practice and then into theatre.

There is no clear evidence for specific theatre wear such as the wearing of laundered theatre scrubs, surgical caps, masks and theatre shoes preventing transmission (McMillan, 2014). Nevertheless using correct attire encourages theatre discipline and will have the potential to reduce the risk of surgical site infection (SSIs) and these practices remain as recommendations in many human operating theatres (NICE, 2008). Despite there being no substantial evidence for the use of theatre clothing, staff should consider preventing bacterial transmission and select the most appropriate theatre wear for the procedure being performed in the absence of evidence.

Cleaning and disinfecting premises

A practice cleaning protocol must be simple and consistent. This will be different in each practice depending on the types of reservoirs for infection, the products being used and protocols in place. The implementation of a protocol that staff understand is really important. In order to maintain a high level of cleanliness within each area of the veterinary practice, there must be a written protocol which is, taught, followed and upheld. Evidence that this is being carried out is vital. Laminated protocols should be visible in each room detailing specific cleaning and disinfection guidelines.

With so many disinfectants available for use, it is important that all members of staff understand the types and mechanisms of the range of commonly used preparations and how and why correct selection and usage is so important. Disinfectants are poor at penetrating debris, and a cleaning detergent will facilitate more effective contact between the disinfectant chemical and the remaining target microorganisms, and minimise inactivation of the disinfectant by organic matter. Appropriate disinfection selection is a vital component of practice biosecurity and it is only through proper use of disinfectants that pathogenic load can be effectively managed.

Antibiotic microbial resistance (AMR)

In 2014, the World Health Organisation described the onward development of antimicrobial resistance (AMR) as a major global threat. Development of AMR by microbial pathogens and commensals represents a major threat to animal and public health. Antibacterial resistance is an increasing problem, particularly in human healthcare, and this affects both disease morbidity and mortality, with significant financial implications (Gould, 2009; Wilcox, 2009). A practice standard operating procedure (SOP) should be established on the responsible antimicrobial use in combination with infection control protocols. The development of infection

control protocols and a good surgical technique will help to minimise tissue trauma and infection, thus reducing the use of routine antibiotics to prevent post-operative infections. Antibiotic prophylaxis should not be administered in clean, uncomplicated surgeries where no implants are used (NICE, 2008) and only administered to clean surgeries involving the placement of implants, clean-contaminated surgery and contaminated and dirty surgeries.

Education, training and clinical governance

Education and training are an integral part to any successful infection control program. Every member of the team has to be on board for strategies to be successful. Studies have demonstrated decreases in HAIs after some form of educational or training program was completed (Lobo et al., 2005). Training should include the basic principles of infection control, evidence-based protocols, and an evaluation of staff compliance through surveillance, testing, and auditing (Ruis, Shaffer, Shirley, & Safdar, 2016). Clinical audits are an imperative tool to check the effectiveness and adherence of infection control practices. Audits can be as simple as a post-operative surgical wound audit or regular environmental swabs from key areas. A post-operative audit can be invaluable for assessing the frequency of post-operative sepsis. This audit will quickly identify an outbreak of hospital acquired infections and enables the practice to localise the outbreak to a specific routine or member of staff.

Infection control officer and protocols

The appointment of a designated infection control officer (ICO) should be considered when developing, enforcing and maintaining infection control protocols. This person will act as the point of contact for personnel within the practice, and will ensure that infection control protocols are implemented, known, understood and complied with by all. The ICO, with practice support, should establish protocols for subjects such as hand hygiene; use of personal protective equipment; patient management; and cleaning and disinfection, and provide staff training on such topics (Stull & Weese, 2015). Protocols should form the basis of an infection control manual for all areas of biosecurity and infection control. This should include a list of all rooms, surfaces and equipment that are to be cleaned, with what product, at what dilution and how frequently as well as other aspects of infection control such as hand hygiene, infectious and raw fed patients. A single folder used as a reference will ensure that all practice staff members are provided the same level of care.

Summary

Infection control is a vast topic and one that affects all members of the practice. VNs can play a central role in the development and review of protocols. By maintaining standards of cleanliness and practising good hand hygiene, the risk to infection can be minimised.

Disclosure statement

No potential conflict of interest was reported by the author.

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