Alison Mann BSc (Hons), Dip AVN (Small Animal), AFHEA, RVN

Alison graduated from Writtle College in 2005 with a BSc in Equine Science. She qualified as a small animal VN in 2009 while working in mixed practice in Bristol. In 2010 she moved to Langford Vets to work as a surgical nurse. During this time Alison achieved her Dip AVN (Small Animal). She now works as a clinical teaching nurse at Langford Vets, University of Bristol, teaching practicals and lectures to undergraduate VNs in the Veterinary Nursing and Bioveterinary degree course, while still maintaining her clinical veterinary nurse skills.
Email: Alison.Mann@bristol.ac.uk

Hospital-acquired infections in the veterinary establishment

Alison Mann BSc (Hons), Dip AVN (Small Animal), AFHEA, RVN

University of Bristol, UK

ABSTRACT: Hospital-acquired infections (HAIs) are present in both human and veterinary hospitals with data for each. There is no surveillance into the numbers and types of HAIs in veterinary establishments, but studies have found that they are a problem. This article discusses some of the more common HAIs that can occur in the veterinary establishment as well as patient risk factors and ways of minimising them so that HAIs and their consequences can be kept to a minimum.

Keywords: HAI; hand hygiene; infections; risk factors

Hospital-acquired infections (HAIs), also known as nosocomial infections, are defined by Stull and Weese (2015) as an infection which can develop during hospitalisation.

Data from the veterinary field are limited due to there being no official reporting protocol for HAIs. In 2011, 6.4% of human patients in England developed an HAI (NICE, 2014). Common HAIs in humans include respiratory infections, urinary tract infections (UTIs), bloodstream infections and surgical site infections (SSIs), and it is suggested in the literature that this could be similar for veterinary patients (Stull & Weese, 2015). Exact numbers of these infections are unknown, again, due to the fact that infection rates do not need to be recorded or shared in the veterinary industry. The only evidence of infections is from studies such as those which will be discussed in this article.

Evidence from veterinary studies (Benedict, Morley, & Van Metre, 2008; Ruple-Czerniak et al., 2014) demonstrates that HAIs are a similar problem in the veterinary setting with similar infections being reported. These common HAIs will be discussed individually, looking at patient risk factors and how these infections can hopefully be prevented. We will first, however, discuss a common theme for reducing HAIs in each of these sections: hand hygiene.

Hand hygiene

This is the most important line of defence against the transmission of HAIs (World Health Organisation, 2009). A common theme throughout all the HAIs to be discussed in this article will be hand hygiene and so to avoid repetition this will be discussed now.

All members of the veterinary team, whether that is front of house or the patient care team, should all be fluent in the methods of effective hand hygiene and the products which can be used. The World Health Organisation (WHO) six steps of hand washing is an evidence-based method of hand hygiene which can easily be taught to all members of the team (Figure 1). Along with the five moments for hand hygiene, also from the WHO, this can form the basis for a good hand hygiene protocol in any establishment. Literature and resources for both can be downloaded for the internet and adapted for use (Figure 2).

The appropriate use of products should also be considered, as this can help to break down barriers to effective hand hygiene, the most common one being that staff are too busy to wash hands (Nakamura, Tompkins, Braasch, Martinez, & Bianco, 2012). Specific alcohol products can be used instead of soap and water, making the process quicker but just as effective (World Health

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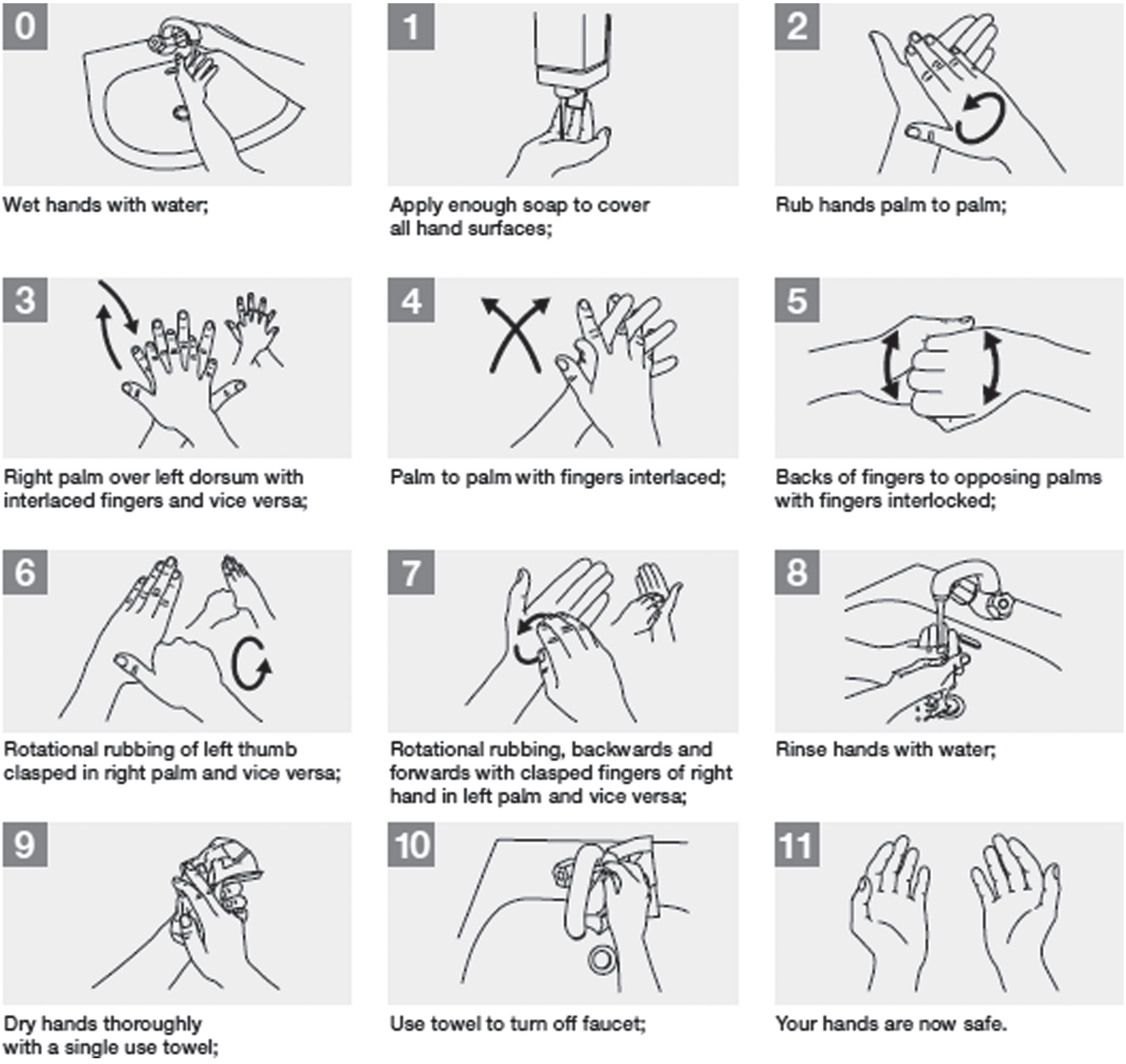

Figure 1. The six steps of hand washing. The same can be done with hand rub. Downloaded via the World Health Organisation.

Organisation, 2009). However, this is provided the hands are not visibly soiled. An example of this might be the receptionist who has been stroking a client's dog while they await consult. Hands won't become visibly soiled from this and an alcohol hand rub should be sufficient for hand hygiene in this instance. However, the veterinary nurse who gets blood contamination on their hands after placing an intravenous catheter should wash hands using soap and water, as alcohol will be denatured in the presence of blood (organic matter) on the hands (NICE, 2012).

Respiratory infections

More commonly known as pneumonia, one of the ways in which these are acquired in human patients is by the prolonged use of ventilators. This is not commonly encountered in veterinary patients and pneumonia infections are more commonly acquired via failure of the usual defence mechanisms which the respiratory system has such, as coughing and the muco-ciliary apparatus, as well as aspiration pneumonia (O'Dwyer, 2017a). Aspiration pneumonia can occur due to a disease process but can also be caused through inappropriate methods of feeding, such as syringe feeding or force feeding patients.

Recumbent patients are at risk of damage to the lung parenchyma due to prolonged time in lateral recumbency, meaning that the lower-most lung suffers from increasing pressure from abdominal and thoracic contents. This can lead to atelectasis and the accumulation of fluid in the chest (hypostatic pneumonia). Patients at high risk for this are those who may be recumbent for some time, such as the critical care patients and some neurological patients. These patients should be turned every 2–4 hours and this should be closely monitored and recorded on the patient records.

To avoid aspiration pneumonia care should be taken with force feeding anorexic patients. Overzealous syringe feeding can easily lead to aspiration pneumonia and if a patient is anorexic a more appropriate form of getting

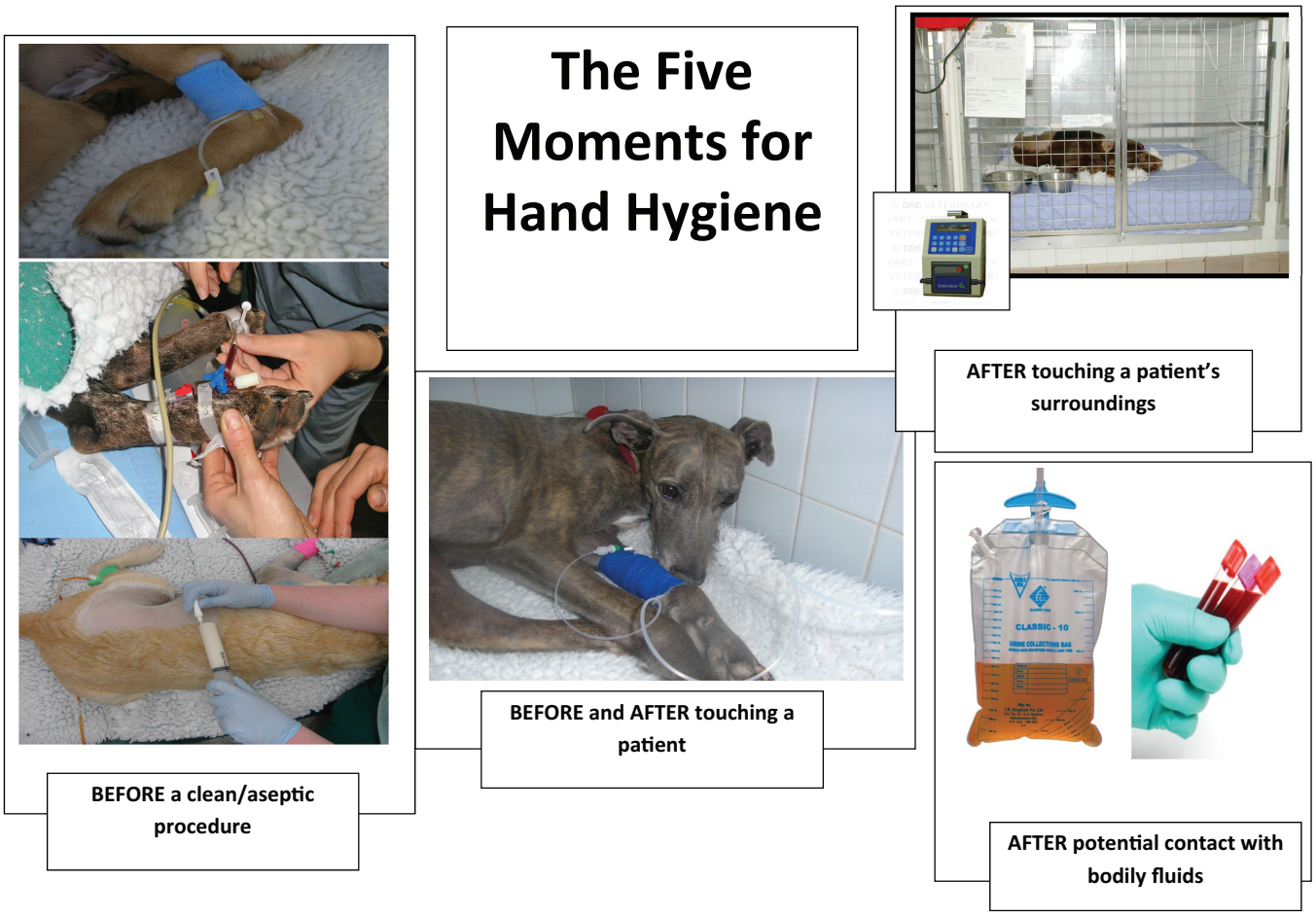

Figure 2. An example of how the "Five moments for hand washing" can be accustomed for the veterinary establishment.

nutrition into that patient should be considered, such as a feeding tube, as long as one is not contraindicated.

Airway infections could also be acquired from equipment associated with anaesthesia and, as a result, establishments should have a protocol in place for the cleaning and disinfection of endotracheal tubes and anaesthetic circuits (including disposal of heavily soiled or contaminated equipment). Patients may also risk aspirating gastric contents if they were to regurgitate when under anaesthesia. This is one of the main reasons that patients are starved before procedures which require them to have a general anaesthetic, but this is not always possible in some emergency situations. If a patient is at risk of regurgitation then this should be communicated before anaesthesia. The patient's airway should be protected as soon as possible and it is a good idea to keep the patients' head up (as done for intubation) until the airway has been protected through the inflation of the ET tube cuff. Suction should also be available in these cases and then in the event of regurgitation the contents can be suctioned to prevent it from going into the airway (Self, 2013).

Urinary tract infections (UTIs)

These are often implicated in patients where catheterisation is necessary but also any condition where normal voiding of urine is disrupted (Langfitt, Prittie, Buriko, & Calabro, 2017). They are one of the more common HAIs seen in establishments, but like with all HAIs in veterinary practice, the lack of reporting means that true numbers are unknown. There also needs to be a differentiation between bacteriuria (bacteria in the urine) and a true UTI (Stull & Weese, 2015).

Patients may need catheterisation for a number of reasons, such as gaining a urine sample, draining the bladder pre-operatively, for urinary incontinence management, radiograph investigations and urinary tract disorders. Hygiene is the most important factor to stop patients from getting UTIs and in addition, the decision to place a urinary catheter in the first place should not be taken lightly.

Bacteria can be both intra- or extraluminal, intraluminal being from a failure in the closed device system meaning that bacteria can ascend into the urinary tract. Extraluminal bacteria can occur at the time of placement from the patient's own flora or contamination from the person placing the catheter (Langfitt et al., 2017).

Once there is a justified decision by the veterinary surgeon to place a urinary catheter, there should be a sterile approach to its placement. The prepuce or vulva of the patient should be adequately prepared by flushing with 0.05% chlorhexidine (O'Dwyer, 2017b) and sterile gloves should be worn by the person placing the catheter. If indwelling then a closed system should be used with a bag to collect urine. When kennelled, the bag should be lower than the patient and it should never be in contact with the floor. A zip-lock bag or a litter tray lined with an incontinence sheet can be used to prevent this.

Hands should be washed before and after tending to the urinary catheter and as with all invasive, indwelling devices, the urinary catheter should be removed as soon as it is no longer required.

The use of antimicrobials is not indicated routinely for patients with indwelling urinary catheters unless they show signs of an infection such as pyrexia

and a positive urine culture. A study into urinary catheterisation by Bubenik, Hosgood, Waldron and Snow (2007) found that the use of antimicrobials in patients with indwelling urinary catheters increased the risk factor of getting a UTI by 454%. The study did not, however, distinguish whether those antimicrobials were given during catheterisation or pre-/peri-operative (some dogs in the study had intervertebral disk disease). It also did not establish what the patients were receiving antimicrobials for if they had had them before catheterisation. The reason for having antimicrobials in the first place may have put the patient at a higher risk of getting a UTI.

Bloodstream infections

These occur mainly through the use of intravenous catheters and the most common source of infection is thought to be the patient's skin flora (Marsh-Ng, Burney, & Garcia, 2007). With that in mind, good, aseptic preparation of the intended catheter placement site is critical.

Historically it was thought that one of the main risk factors for catheter-related bloodstream infections was the duration of time the catheter was placed. However, recent evidence suggests that this is not the case (Marsh-Ng et al., 2007; Coolman et al. 1998) and that aseptic preparation of the site is the most important aspect. Other risk factors include taking blood through the catheter, solutions infused through the catheter and patient immunosuppression (Stull & Weese, 2015).

One aspect which may be implicated in the contamination of intravenous catheters is the use of reusable spray bottles of antiseptic solutions. A study by Brooks, Walczak, Hameed and Coonan (2002) found several strains of bacteria cultured from the plastic dispenser mechanism from a number of soap dispensers (containing 2% chlorhexidine) in a hospital, some of which were multidrug-resistant when tested under laboratory conditions. It could be suggested that the best way to manage such consumables is to replace both the bottle and the dispenser when the bottles are empty rather than refilling from a larger container or "topping up" such solutions.

Single-use "no touch" prep solutions containing both chlorhexidine and isopropyl alcohol are available for preparing small surface areas.

Surgical site infections (SSIs)

In human surgery, SSIs are the most common HAI. It is unknown whether this is the case in veterinary surgery due to the lack of reporting of such infections.

The surgical classification (Table 1) should be taken into account as the risk of SSI is higher for contaminated and dirty surgeries compared with clean surgeries. This will also aid the veterinary surgeon in deciding on the best course, if any, of antibiotic (Fossum, 2007).

Surgical site infections can involve the superficial structures or can involve deeper structures and organ spaces. They can lead to further surgeries, poor cosmesis and client dissatisfaction as well as effects on patient welfare.

The bacteria most implicated in SSIs are those which live within the skin of the patient such as *Staphylococcus pseudintermedius* and these are increasingly showing bacterial resistance (Verwilghen & Singh, 2015).

There are ways in which we can try and reduce the risk of SSIs, such as adequately preparing the surgical site by atraumatic clipping and preparation of the surgical site with appropriate antiseptic preparations. For procedures such as this which are carried out often, standard operating procedures (SOPs) are a good idea to ensure that all members of the team are carrying out patient preparation to the same standards at all times. One observational study carried out in 10 veterinary practices found inconsistencies between how patients were surgically prepared, including the contact time with the antiseptic being as low as 10 seconds (Anderson, Foster, & Scott-Weese, 2013).

Table 1. Surgical classifications and examples (Fossum, 2007)

Clean	Non-traumatic wound where there has been no entry into any of the gastrointestinal, respiratory, genitourinary or oropharyngeal tracts e.g. – bitch spay
Clean contaminated	One of the above tracts are entered but under controlled conditions with little or no spillage of contents e.g. – enterotomy
Contaminated	When one of the above tracts is entered and contents have spilled out or there has been a break in asepsis e.g. – cystotomy with spillage of urine
Dirty	Old infected wounds, necrotic tissue, faecal contamination e.g. – abscesses

Education and compliance

All members of the veterinary team from front of house to behind the scenes have a part to play in preventing HAIs, and in order for people to understand the importance, education is paramount. For example, some staff members may not know what to use to wash their hands with or the appropriate technique for hand washing. Rather than assuming that they are not compliant, think about whether that person has ever been told how to do these things properly. Regular training should therefore be carried out to educate new members of the team, but also to keep the topics fresh in everyone's minds.

RVNs could be involved in writing up SOPs for procedures which can, again, be used for training new staff but can also be referred to as and when needed. For example, SOPs could be written for placing a urinary catheter and managing patients with indwelling urinary catheters. These could then be the responsibility of that nurse to update annually, ensuring that they are taking into account the current evidence for best practice if available.

In conclusion, there are a number of studies which have revealed that HAIs are a very real issue in veterinary establishments. For each of the most common HAIs there are things that can be done to try and decrease the risk to the patient. Effective hand hygiene is the most effective first line of defence against HAIs and education is paramount in order for all staff to have a knowledge of the common HAIs as well as who is at risk and how the risk can be minimised.

Disclosure statement

No potential conflict of interest was reported by the author.

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Multiple Choice Questions

1. What percentage of human patients in England developed a hospital acquired infection in 2011 according to NICE?

(a) 1.2%
(b) 6.4%
(c) 8.6%
(d) 12%

2. In the study by Bubenik, Hosgood, Waldron and Snow (2007), The use of antimicrobials in patients with indwelling urinary catheters increased the risk factor of contracting a urinary tract infection by:

(a) 14%
(b) 54%
(c) 104%
(d) 454%

3. A surgery where the gastrointestinal tract is entered under controlled conditions with little or no spillage of contents would be classified as:

(a) Clean
(b) Clean contaminated
(c) Contaminated
(d) Dirty

4. The main risk factor for catheter-related bloodstream infections is the duration of time the catheter is left in place:

(a) True
(b) False

5. The most commonly implicated bacteria in surgical site infections in dogs and cats is:

(a) Staphylococcus pseudintermedius
(b) Staphylococcus aureus
(c) Escherichia coli
(d) Enterococcus

6. The concentration of chlorhexidine gluconate that should be used to flush the prepuce or vulva prior to urinary catheter placement is:

(a) 2%
(b) 1%
(c) 0.5%
(d) 0.05%

7. Patients at high risk of hypostatic pneumonia should be turned:

(a) Every hour
(b) Every 2-4 hours
(c) Every 6-8 hours
(d) Twice daily

8. Pneumonia in veterinary patients is most commonly caused by:

(a) Prolonged use of ventilators
(b) Aspiration pneumonia
(c) Turning recumbent patients
(d) Administering bronchodilators

For the answers to the MCQs, please go to: **http://www.bvna.org.uk/publications/veterinary-nursing-journal**