

Canine Catch-Neuter-Return (CNR) Good Practice Guides

Good aseptic techniques and sterility: Staff, hand hygiene and open gloving

Learning Outcomes:

1. Describe appropriate surgical staff clothing and 'bare below the elbows' principles for working within the surgical area
2. Demonstrate effective WHO (World Health Organisation) hand washing technique
3. Determine the most appropriate pre-surgical hand preparation technique and antiseptic product for use in a CNR clinic
4. Demonstrate effective open gloving technique to ensure sterility
5. Identify breaches in sterility and explain how to correct them to maintain sterility

Bacterial infection is a potentially devastating complication of surgery. If not detected prior to release, infection can cause catastrophic wound breakdown and even death in free-roaming dogs. Fortunately, the risks of bacterial infection can be managed by ensuring good aseptic technique; aseptic technique means using practices and procedures to prevent wound contamination with pathogens. There is no substitute for good aseptic technique, no antibiotic will be effective at removing the risk of peri-operative infection due to poor hygiene standards – as with many things prevention is better than cure! Staff entering and working in the surgical area must take particular care in personal cleanliness, ensuring they have a daily shower and attention to hands and fingernails is particularly important. Fingernails should be kept short (tips less than 0.5cm long) and nail polish or artificial nails should be strictly prohibited. Natural short fingernails are easier to keep clean and are less likely to puncture gloves. Artificial nails and chipped nail polish harbor more bacteria underneath and there is the additional risk of pieces of these falling onto the sterile field during surgery from ungloved hands. Any skin infection, rash or open lesion on the hands, nails or arms should be noted as this means there will be a higher level of bacteria on the skin and could increase the risk of a surgical site infection (SSI) in the dog having surgery.

All staff should be 'bare below the elbows', meaning no rings, wrist watches or bracelets should be worn. For those working in the surgical area but not scrubbing in to perform surgery, a simple thin wedding band is acceptable. No rings should be worn by veterinary surgeons and assistants scrubbing in for surgery because studies have shown that the skin underneath rings is more heavily colonized with bacteria compared to the same areas of skin on fingers without rings.

Clean, short sleeved scrub suits should be worn by any staff entering the surgical area. The scrubs should only be worn in the surgical area not outside and should be washed separately at the end of each day to prevent the transfer of dirt, hair and bacteria and so that they are clean and ready for use the following day. If the scrub tops or trousers get contaminated by dirt or hair which contain bacteria, then they should be changed before returning to the surgical area as this could contaminate the sterile field. The sleeves of the scrubs should be adjusted to be at least four inches above the elbows to prevent them from getting wet during the scrubbing procedure.

Dirt can be brought into the surgical area very easily on the soles of people's shoes. There should be an area to remove normal shoes and exchange for closed toed non-slip surgical shoes to protect the feet from needles or blades. The surgical footwear must be easily washable to ensure they can be decontaminated after use in the surgical area.

Canine Catch-Neuter-Return (CNR) Good Practice Guides



Surgical hat and mask being worn correctly

Ideally all staff working in the surgical area should have their hair covered by a clean, re-usable or disposable surgical hat, ensuring that long hair is fully tucked into the hat. This is to prevent the possible contamination of the sterile field by falling hair or dandruff.

A surgical mask should be worn by veterinary surgeons and assistants when performing surgery to prevent bacteria being exhaled and contaminating the sterile surgical field, for example when talking, sneezing or coughing. When the mask becomes damp, it will no longer act as a physical barrier for bacteria, therefore the mask should be changed regularly.

“Hands are the main pathways of germ transmission during health care. Hand hygiene is therefore the most important measure to avoid the transmission of harmful germs and prevent health care-associated infections.” - *The World Health Organisation*.

Hand hygiene should be considered as one of, if not the most important aspects of infection control. The World Health Organisation hand washing guide should be used to train all staff in how to adequately clean hands before and after handling the dog or items contaminated by the dog.

Download and print a copy of the hand washing procedure at
[https://www.who.int/gpsc/5may/Hand Hygiene Why How and When Brochure.pdf](https://www.who.int/gpsc/5may/Hand_Hygiene_Why_How_and_When_Brochure.pdf)

Pre-surgical hand preparation

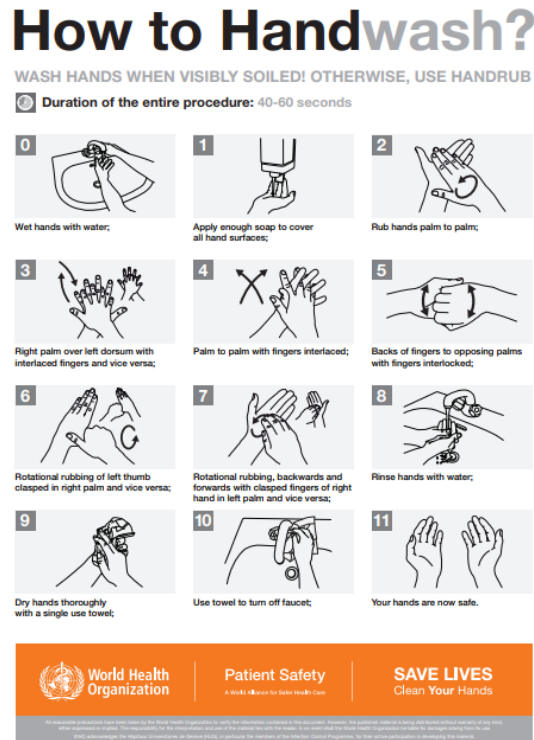
The use of sterile surgical gloves does not render surgical hand preparation unnecessary. The veterinary surgeon performing the surgery and other staff members involved in assisting during surgical procedures must perform a pre-surgical hand preparation by either scrubbing with medical soap or hand rubbing with an alcohol-based product. This is because, it has been reported that as many as 38% of sterile surgical gloves have punctures by the end of surgery, so it is essential to perform surgical hand scrubbing adequately to ensure hands are aseptically prepared in case of surgical glove puncture.

There should be a designated area, sink or container providing running water close to the operating room for hand washing and surgical scrubbing with medical soap. Not all clinics will have a continuous water supply, and so a pre-filled container with a tap may be used, ideally with taps

Canine Catch-Neuter-Return (CNR) Good Practice Guides

which can be opened using an elbow or foot. The use of still-standing water in a basin should be avoided.

Firstly, the basic hand wash advised by the World Health Organisation should be performed using non-medical soap and water to remove any dirt and oil from the skin before starting the surgical hand preparation (see How to Handwash image below).



How to Handwash poster' by the World Health Organisation. Available at:

https://www.who.int/gpsc/5may/How_To_HandWash_Poster.pdf

This handwash must be performed first regardless of whether scrubbing with medical soap or hand rubbing with an alcohol-based product to remove any gross contamination, such as dirt, blood, or oil present on the hands. This is to minimise the risk of the dirt, blood or oil interfering with the efficacy of the medical soaps, and to ensure there is no risk of it contaminating the sterile field if the sterile surgical glove were to tear.

Now that the surgeon's hands are clean, the hands must be aseptically prepared prior to putting on sterile surgical gloves. The most common medical soaps used for surgical hand scrubbing are chlorhexidine and povidone-iodine, or alcohol-based products can be used for hand rubbing.

Chlorhexidine medical soaps:

- Solution of 4% chlorhexidine gluconate is used and has a good safety record and allergic reactions are uncommon.
- Have good activity against Gram-positive bacteria, less activity against Gram-negative bacteria and fungi, minimal activity against mycobacteria and is not sporicidal.
- It has significant residual activity, and its antimicrobial activity is not affected by organic material, such as blood or dirt, being present on the skin. However, its activity can be

Canine Catch-Neuter-Return (CNR) Good Practice Guides

reduced by natural soaps and hand creams so the initial hand wash must remove all traces of these before starting the hand scrub.

- Studies have found this to be significantly more effective at reducing bacterial count when compared to Povidone-Iodine.

Povidone-Iodine medical soaps:

- Solutions of 7.5-10% Povidone-Iodine have largely replaced Iodine as it is less irritant on the skin and causes less allergic reactions. Although, povidone-iodine has been found to cause more dermatitis than other antiseptics used for hand hygiene.
- Have bactericidal activity against Gram-positive, Gram-negative, some spore-forming bacteria, mycobacteria, viruses and fungi, but is not usually sporicidal.
- Clean hands are essential prior to scrubbing using povidone iodine as its antimicrobial activity is significantly reduced in the presence of organic substances, such as blood or dirt.
- Despite studies demonstrating that Chlorhexidine is more efficacious than povidone iodine, and has better residual effects, povidone iodine continues to be widely used for surgical hand antisepsis.

Alcohol-based products:

- Found to have less skin irritation and dermatitis when compared to chlorhexidine based medical soaps.
- They reduce the resident skin bacteria rapidly and the regrowth of that bacteria can take up to six hours, so has good residual activity.
- The antibacterial efficacy of products containing high concentrations of alcohol have been shown to be far higher than that of any medical soap currently available.
- Alcohol-based hand hygiene products vary in their efficacy depending on the type of alcohol used, concentration of alcohol, contact time on the skin, volume of alcohol used and whether the hands are wet when the alcohol is applied.

Selecting which products are most appropriate for use in your CNR project will depend on cost, availability of products, and access to running water.

Using either Chlorhexidine or Povidone-Iodine requires clean running water which may not always be available when using mobile catch neuter return (CNR) clinics. Additionally, studies have frequently isolated *Pseudomonas* spp from taps in hospitals, and so recontamination of the hands is a risk even after correctly scrubbing the hands with medical soaps. When using alcohol products, hand rubbing is used which does not require running water, although some water is still required for performing the initial handwash to clean hands.

The use of both Chlorhexidine and Povidone Iodine are suitable for minimizing the risk of surgical site infections from contamination by the surgeon's hands and as such are used worldwide. However, the antibacterial efficacy of products containing high concentrations of alcohol have been shown to be far higher than that of any medical soap currently available.

The WHO Guidelines on hand hygiene in health care provides two different formulations of alcohol-based handrubs to allow for local production if required, but there are several alcohol-based handrubs which have been licensed for commercial use, for example Sterillium.



Canine Catch-Neuter-Return (CNR) Good Practice Guides

Surgical hand scrubbing

Surgical hand scrubbing performed correctly will eliminate the transient and reduce the resident bacteria on the hands and inhibit growth of bacteria under the gloved hand, thereby minimising the risk of contamination but does not make hands sterile. Scrubbing should be performed on every surface of the hands and forearms to the elbows, including the insides of the fingers and the nails.

Most studies discourage the use of a bristle brush for surgical hand scrubbing because if the skin is irritated or scrubbed too hard, this can cause abrasions which breaks the skin barrier, can lead to dermatitis and increases the bacterial population on the hands, thus increasing infection risk. The recommendation when using medical soap, is to perform the hand scrubbing technique by simply using hands for 5 minutes. However, time is not the most important thing, the most important thing is to ensure maximum contact between all skin surfaces of the hands and forearms and the medical soap. If the hands of arms accidentally touch the taps, sink or other unsterile object during the scrubbing procedure, the hands are considered contaminated and the scrub must be started again.

Surgical hand scrubbing technique with medical soap:

Step 1 - Prior to starting the scrub:

- Ensure fingernails are short and no artificial nails or nail polish are present
- Remove all jewelry (watch, bracelets, rings) to be 'bare below the elbows'
- Adjust the sleeves of the scrub top to be at least four inches above the elbows
- Wear a clean surgical hat and mask
- Clean away any debris from under the fingernails with a nail cleaner or pick, preferably under running water
- Before entering the surgical area or if hands and arms are visibly soiled, hands should be washed with non-medical soap to remove any gross contamination using the WHO 'How to Handwash' technique
- Remember - not to touch anything else such as taps or bottles whilst you are scrubbing and care should be taken not to splash water onto scrub suits.

Step 2 – Scrubbing:

There are two traditional methods used, the anatomic timed method and the counted brush stroke method.

Anatomic timed method

- Start timing. Scrub each side of each finger, between the fingers, and the back and front of the hand for 2 minutes.
- Proceed to scrub the arms, keeping the hand higher than the arm at all times. This helps to avoid recontamination of the hands by water from the elbows and prevents bacteria-laden soap and water from contaminating the hands.
- Wash each side of the arm from wrist to the elbow for 1 minute.

Counted brush strokes method

- Always start at the fingertips and move towards the elbows keeping the fingertips upright and hands above elbows to prevent contaminated water running from the elbows back towards your hands.
- Apply 30 strokes to the tips of fingers and thumb
- Divide each finger and thumb into 4 parts and apply 20 strokes to each of the four surfaces
- Apply 20 strokes to the webs of the fingers
- Divide hand into 4 parts and apply 20 brush strokes to each part

Canine Catch-Neuter-Return (CNR) Good Practice Guides

- Repeat the process on the other hand and arm, keeping hands above elbows at all times. If the hand touches anything at any time, the scrub must be lengthened by 1 minute for the area that has been contaminated.
- Divide arms into top and bottom (top closest to wrist)
- Divide top of arm into 4 parts and apply 20 brush strokes to each part
- Divide bottom of arm into 4 parts and apply 20 brush strokes to each part

Step 3 – after completing the scrub

- Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Proceed to the operating room continuing to keep hands above elbows to prevent contamination of the hands with dirty water. Clapping hands in front of the chest can help to prevent accidentally touching anything and contaminating hands.
- Once in the operating room, hands and arms should be dried using a sterile towel or allow to dry in the open air but do not shake the hands as this risks accidentally touching an unsterile item.
- Once hands are dry, the veterinary surgeon may either, gown and then place their gloves using the closed gloving technique, or if gowns are not available, use the open gloving technique to put on sterile surgical gloves.



Apply 30 strokes to the tips of fingers and thumb



Divide each finger and thumb into 4 parts and apply 20 strokes to each of the four surfaces

Canine Catch-Neuter-Return (CNR) Good Practice Guides



Apply 20 strokes to the webs of the fingers



Divide hand into 4 parts and apply 20 brush strokes to each part



Divide arms into top and bottom (top closest to wrist)



Divide top of arm into 4 parts and apply 20 brush strokes to each part

Canine Catch-Neuter-Return (CNR) Good Practice Guides



Divide bottom of arm into 4 parts and apply 20 brush strokes to each part

Surgical handrubbing

This is an alternative to surgical hand scrubbing and can be performed using alcohol-based products without requiring running water. The alcohol is rubbed onto every surface of the hands, and forearms, including the insides of the fingers and the around the nails, for a set duration dependent on the product used, to effectively reduce the resident skin bacteria and the regrowth of that bacteria. The antibacterial efficacy of products containing high concentrations of alcohol have been shown to be far higher than that of any medical soap currently available. When there is limited availability of clean running water, alcohol-based handrubs are preferable to using potentially contaminated water for hand scrubbing. Based on scientific evidence, the WHO considers alcohol-based handrubs the gold standard approach to pre-surgical hand preparation based on its antimicrobial efficacy, rapid action, time saving, less side-effects, no risk of recontamination with water and cost-effectiveness.

Surgical handrubbing technique with alcohol-based products:

- Hands must be clean before performing the handrub as alcohols are not good cleansing agents so should not be applied to dirty or visibly contaminated hands. The use of normal non-medical soap to perform a basic WHO hand wash to clean the hands is sufficient. This does not need to be repeated in between procedures, only the handrub, unless hands are visibly soiled, because regularly washing with soap and water will increase the risk of skin irritation and dermatitis.
- Following handwashing, ensure hands are dry before starting the handrub as wet hands will dilute the alcohol-based product.
- As with hand scrubbing, keep hands above elbows at all times and if the hands or arms accidentally touch the taps, sink or other unsterile object during hand rubbing, the hands are considered contaminated and the hand rubbing process must be started again.
- Apply sufficient volume of alcohol onto the hands to ensure hands and arms are wet throughout the surgical hand preparation procedure. Ideally there should be a pump on the container of alcohol-based product, which can be operated by an elbow to add more alcohol to the hands when needed.
- The duration required for handrubbing varies depending on the product used. Ensure to read the manufacturer's instructions as the timing can vary from 90 seconds to 3 minutes.
- After handrubbing for the recommended time, allow hands and forearms to air dry thoroughly.

Canine Catch-Neuter-Return (CNR) Good Practice Guides

Surgical Handrubbing Technique

- Handwash with soap and water on arrival to OR, after having donned theatre clothing (cap/hat/boonnet and mask).
- Use an alcohol-based handrub (ABHR) product for surgical hand preparation, by carefully following the technique illustrated in Images 1 to 17, before every surgical procedure.
- If any residual talc or biological fluids are present when gloves are removed following the operation, handwash with soap and water.

Image 1-2: Put approximately 5ml (1 ounce) of ABHR in the palm of your left hand, using the elbow of your other arm to operate the dispenser. Dip the fingertips of your right hand in the handrub to decontaminate under the nails (5 seconds).

Image 3-7: Simultaneously scrub the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds).

Image 8-10: Now repeat steps 1-7 for the left hand and forearm.

Image 11-12: Put approximately 5ml (1 ounce) of ABHR in the palm of your left hand as illustrated, to rub both hands at the same time up to the wrists, following all steps in images 13-17 (20-30 seconds).

Image 13-17: Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice versa. Rub palm against palm back and forth with fingers interlocked. Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement. Rub the thumb of the left hand by rotating it in the closed palm of the right hand and vice versa. When the hands are dry, sterile surgical clothing and gloves can be donned.

Repeat this sequence (average 60 sec) the number of times that adds up to the total duration recommended by the ABHR manufacturer's instructions. This could be two or even three times.

'Surgical Handrubbing Technique' by the World Health Organisation. Available at: <https://www.who.int/gpsc/5may/hh-surgicalA3.pdf?ua=1>

Open-gloving technique

Following either hand scrubbing with medical soap or handrubbing with alcohol-based products, ensure hands are completely dry before starting the open-gloving technique. Putting on gloves when hands are still wet increases the risk of skin irritation and dermatitis.

WHO Guidelines for hand hygiene in health care, poster on open gloving: https://www.ncbi.nlm.nih.gov/books/NBK144047/figure/parti_ch23.f3/?report=objectonly



Ask an assistant to open the packet of sterile gloves, taking care not to touch the contents with the outside of the packet or their hands as this would make the gloves no longer sterile.

Canine Catch-Neuter-Return (CNR) Good Practice Guides



Lay the packet on a clean flat surface, such as the surgical table. Taking care not to touch anything other than the sterile packet. Do not touch the outside of the gloves, only the folded inner surfaces should be touched by your skin.



Pick up the right glove by its inner cuff using your left hand and slide the glove onto your sterile right hand but do not unfold the cuff



Slide your left hand into the left glove, using your partly gloved right hand to stabilise the outside of the left glove.



Once the left glove is properly placed, use your left hand to unfold the cuff of your right glove.



The outside of the glove must only touch other sterile items or they will be contaminated and no longer sterile.

Canine Catch-Neuter-Return (CNR) Good Practice Guides

If anything non-sterile, for example, a light handle or door, is touched by the sterile gloves, or if non-sterile hands touch sterile items, such as the surgical kit, then sterility has been breached. If this happens it's important to stop what you are doing, inform another staff member so that they can help you to either put on new sterile gloves or remove the contaminated item. Scrubbing, gowning and gloving should be done in a clear area to prevent bumping into objects and contaminating the veterinary surgeon. An assistant should be used to open packages and fasten the gown. Everyone in the surgical team should take care not to touch the aseptic veterinary surgeon or surgical site.

Example of breach in sterility:



This is an example of a veterinary surgeon who is using sterile gloves but rendering them pointless because he is contaminating them during the gloving process. This is a waste of resources and a risk to the dog.

Sterile glove being contaminated by non-sterile hand

Once wearing sterile surgical gloves, the veterinary surgeon can now handle the sterile surgical kits, opening them carefully to not breach sterility and place the sterile drape over the surgical site on the dog.

Additional notes:

- Do not add soap or alcohol-based products to partially empty soap dispensers. If re-using containers, ensure to cleanse the container before re-filling following the WHO recommendation for cleansing.
- Ideally, non-powdered latex sterile gloves should be used as some alcohol-based hand rubs may interact with residual powder on the hands resulting in a gritty feeling and can cause skin irritation if repeat hand rubbing between procedures is performed.
- The latex surgical gloves should be thrown away after use or they can be washed and used for non-sterile examination purposes.
- Some evidence exists that cleansing latex-gloved hands with alcohol-based handrub solution is effective in removing micro-organisms up to 9-10 times of cleansing, depending on the quality of the glove. This would offer a more cost-effective approach when performing several neuter surgeries in a day. However, the alcohol-based solutions will lead to early dissolving of the plastic material in the gloves and there is insufficient evidence to support this as a suitable alternative to the recommended handrub and repeat open-gloving procedures between surgeries.



Canine Catch-Neuter-Return (CNR) Good Practice Guides

Checklist:

- ✓ Clean scrub suits, surgical shoes and surgical hats should be worn in the surgical area
- ✓ Hand hygiene is the most important aspect of infection control
- ✓ WHO hand washing guide should be used to train all staff
- ✓ Aseptic technique for surgical hand scrubbing but this does not make hands sterile
- ✓ Handrub with alcohol-based product is the gold standard for surgical hand preparation
- ✓ Sterile items can only touch other sterile items

References:

Fossum TW, 2013. Small Animal Surgery Textbook. Elsevier Health Sciences: Oxford, UK

Newcastle Hospitals Theatre User Groups & Clinical Policy Group (2017). The Newcastle upon Tyne Hospitals NHS Foundation Trust Surgical Scrub, Gown and Glove Procedure. Available from <https://www.newcastle-hospitals.org.uk/downloads/policies/Infection%20Control/SurgicalScrubGownandGloveProceduresPolicy201706.pdf>.

University of Edinburgh and Animals Asia (2011). Desexing of the dog and cat for Chinese Veterinary Practitioners.

World Health Organization (2009). "Hand hygiene When and How leaflet." Available from: <https://www.who.int/gpsc/5may/resources/posters/en/>.

World Health Organization (2009). "WHO guidelines on hand hygiene in health care: first global patient safety challenge: clean care is safer care Geneva, Switzerland." World Health Organization. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK144036/>