Surgical Preparation Workshop

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The information and advice within this learning guide is provided solely on the basis that the user will be responsible for making their own assessment of the information and advice and are advised to independently verify all representations, statements and information provided.

Contents

Reference Material

- AIRC *ACMVET408A Coordinate and perform theatre routines* Study guide – Carole Harvey-Stevenson VN VTS (ECC) Dip. ECC Cert IV WPA.
- BSAVA Textbook of Veterinary Nursing 4th Edition – Lane, Cooper and Turner

Understanding Asepsis

Background and Definitions

It is important for any personnel involved in the surgical theatre or performing theatre routines to have an understanding of the basic principles relating to surgical asepsis. Asepsis can be defined as an *absence of microorganisms*, specifically disease causing pathogens.

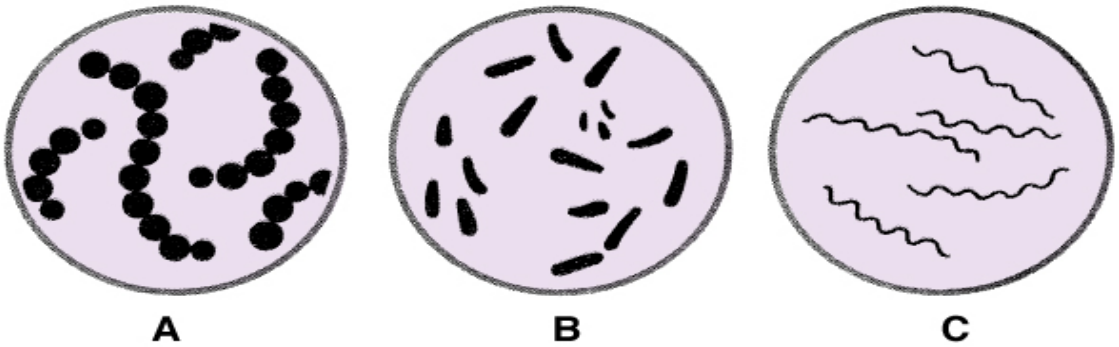
In the past and as recently as the late 19th century, surgery was only performed as a last resort mainly due to the inability to prevent the patient succumbing to fatal infection arising as a direct result of the surgical procedure. When we consider how commonly surgery is performed in clinics and hospitals today it is easy to see how far medical science has come. This is largely due to the understanding of infection and its prevention using aseptic techniques that are commonplace today.

Prevention of infection is paramount in surgical theatre routines. This is of far more benefit to the patient than simply treating infections as they arise. Use of aseptic techniques gives surgery the highest chance of success in all patients as infections occur overwhelmingly during the actual surgical procedure rather than post surgically. Obviously the signs do not develop until after the relevant incubation period but the actual infection with the organism/s occurs at the time of the procedure.

Disease Causing Organisms

Bacteria

Most bacteria are unicellular and large enough to be viewed with a light microscope. They are classified according to their shape and are named using the binomial system (e.g. the genus and species name) e.g. *Eschericia coli.* The three basic categories of bacteria are: coccus - **A** (spherical), bacillus – **B** (rod) and spirillum - **C** (spiral).



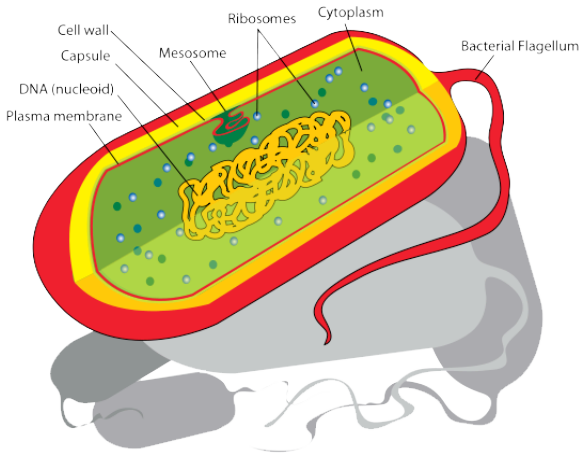
Bacteria replicate quite differently to viruses. Binary fission is the common reproduction method that results in one bacterium dividing into two cells. However, some bacteria replicate by conjugation – this is where one bacteria passes genetic information to another by use of a sex pillus. Some bacteria also utilise spore formation to ensure their survival particularly when environmental conditions are not

favourable for reproduction. Spores are the most resistant form of a bacterium and are shed into the environment where they will develop when conditions improve. Spores are commonly used as a benchmark for the testing of anti-microbial formulations products. The ideal replication conditions for bacteria are:

- Temperature range of 37-39 ° C
- Available nutrients
- Oxygen for aerobic bacteria or none for anaerobic bacteria
- Correct pH level preferable alkaline

Whilst the bacterium does not actually lyse or destroy the host cell, it will release endotoxins and exotoxins as a by-product of its metabolism, which similarly disrupt homeostasis within the host causing fever, shock and sometimes death.

Bacterial Cell Structure

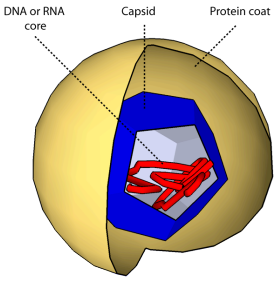


Viruses

As with all microorganisms, a virus is microscopic. Whilst it is not a true cell, it is a simplistic structure and contains DNA (deoxyribonucleic acid) or RNA (ribonucleic acid) to carry the genetic information of the virus necessary for replication. Viruses are therefore always parasitic – viruses require host cells to reproduce. They replicate by essentially invading a host cell and controlling its metabolism to create more viral nucleic acid. The replication process continues and the host cell eventually ruptures to release the many viral strands that are then ready to invade new host cells.

The lifecycle of a virus requires the host cell to be destroyed and the degree to which this happens within the host animal indicates the severity of the viral disease.

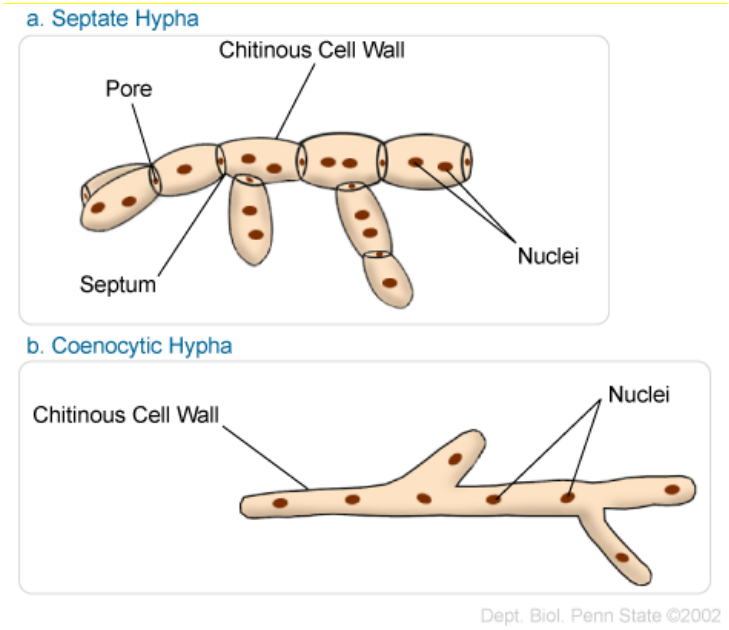
Structure of virus



Fungi

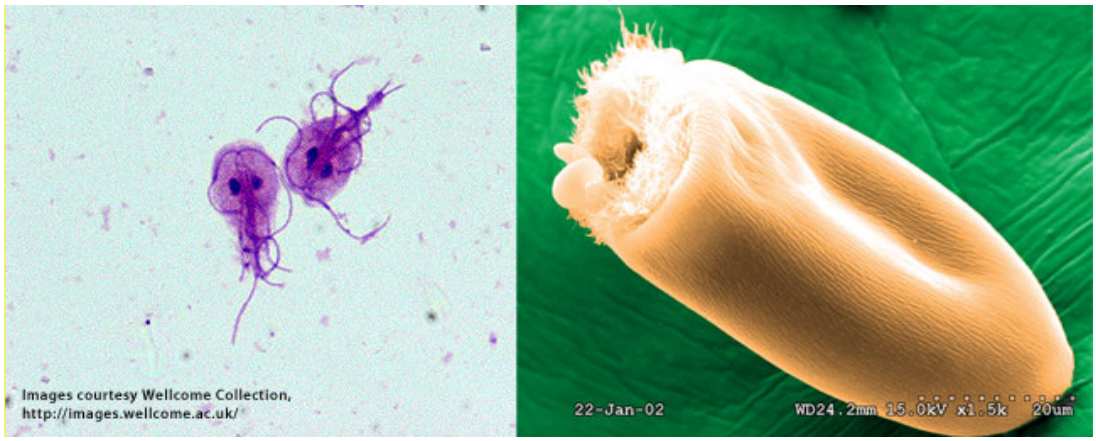
Moulds and yeasts are micro-organisms that can also cause disease in animals. As part of the plant kingdom, fungi are parasitic and saprophytic (living upon dead or decaying matter), as they cannot survive without a constant food source. Yeasts reproduce asexually whereas moulds can also reproduce sexually.

Fungal Structure



Protozoa

As the most simplistic animal form, protozoa are microorganisms that are motile at one stage of their lifecycle. This is known as a known as a trophozoite. At some point they form a cyst after replication and they can survive outside the host temporarily when they shed in the urine and faeces of the host. It is the cyst form of this microorganism that forms the infective stage.



Aseptic Technique

Aseptic technique is used in all areas of theatre practice from the preparation of the actual theatre room through to the preparation of instruments, equipment, the patient, personnel, actual in theatre etiquette and post surgical procedures. All veterinary clinics and hospitals will have their own protocols and procedures for maintaining aseptic technique and strict adherence to your clinic's guidelines is always required.

Surgical Personnel

Amount of Personnel

Surgical personnel are a major cause of microbial contamination during surgery (microbial = relating to a microbe(s), microbe = any very minute organism). Therefore, it is vital that all sterile and non-sterile personnel perform careful preparation to reduce the amount of bacteria in the surgical room.

There is proven correlation between the number of people, their movement and the number of airborne bacteria in a theatre, this is due to the number of skin particles (some of which are microbes) that are shed from normal skin. The more people in the operating room the more the amount of organisms shed; the activity of persons within the area encourages the organisms to become airborne and increases the risk of contamination of the surgical site. Therefore, if possible, operating room personnel should be reduced to only those that are essential for anaesthetic and surgical support.

Protective Clothing

Protective clothing for theatre personnel reduces the risk of infection by ensuring that normal bacteria and other debris from people's clothing, footwear and general person are less likely to contaminate the theatre area and the patient.

Commonly available protective clothing for surgical theatre use includes:

- Surgical caps or hats
- Surgical masks
- Theatre 'Scrub' Suits
- Surgical shoe covers or dedicated theatre footwear

Surgical Caps / Hats

Surgical hats are required to prevent hair that is constantly shed contaminating the surgical environment. The hats are usually disposable although linen caps are available. Several hat styles are available ranging from the "mop style" caps to full-face covers, which accommodate beards (facial hair also sheds constantly and often this area is directly over the surgical site). Regardless of the choice of hat / cap they must be worn correctly, including:

- All hair must be covered by the hat
- Longhair must be tied back to facilitate 'tucking' into the hat
- Linen caps MUST be clean, dry, dust and debris free
- Disposable caps must be disposed off after each use
- All facial hair should be covered

Head and face covered

Disposable cap

Linen reusable cap

Surgical Masks

The surgical mask should cover the mouth and be 'pinched' at the nose. They are available in several styles from just covering the lower part of the face to including a plastic shield to cover the eyes.

During surgery, unnecessary talking should be avoided unless it is relevant to the case as talking increases bacterial contamination due to saturation of the surgical mask.

Mask correctly placed – 'pinched' at nose

Mask including shield for eyes

Shoe covers / Theatre Shoes

Shoe covers or specific theatre footwear should be worn in the operating theatre; this is to reduce contamination of the surgical area. Shoes worn throughout other parts of the clinic and/or outside will carry many organisms, dirt and debris and this will be spread throughout the surgical area greatly compromising the aseptic status of the room.

Example shoe covers

Theatre Scrub Suits

Specific scrub suits should be available to be worn in the operating theatre only. An absolute minimum (if a scrub suit is not available) is that a clean scrub top is worn. Clothes worn throughout the clinic and for 'general' duties should not be worn within the operating theatre as they will lead to contamination of the area from organisms, hair, dirt and debris.

All outfits worn within the operating theatre should be washed and dried separately from any other items within the clinic (e.g. towels, bedding etc), lint free, stored in a closed cupboard (or similar) and only used for the specific purpose.

Specialist clinics often have one particular colour for their surgical scrub outfits so they are easily identified and used accordingly.

General Theatre Rules

The role performed within the theatre will define the level of protective clothing required, however, the above items are required at all times and the following general personnel preparation rules should be followed:

- Make up should not be worn
- Nail polish should not be worn
- Nails should be short and clean
- Jewellery should be removed
- A theatre 'scrub' suit should be worn preferably tucked in at the waist
- Appropriate footwear should be worn (shoe covers or theatre specific shoes – closed in shoes must be worn)
- Mask should be worn
- Hair should be tied back away from face
- Theatre hat must be worn with all hair tucked into hat

Hand Scrubbing

Hand scrubbing is an important aspect of preparation for any personnel involved in the actual surgical procedure (surgeon and assistant/s). It is not possible to actually 'sterilise' living tissue (i.e. hands) due to normal microflora found on the skin. These microflora are divided into three types:

- Transient Flora
- Resident Flora
- Deep Bacteria

Transient flora are microorganisms easily removed by washing with soap and running water. Transient organisms are picked up by contact with other people, animals, objects or the environment and although they do not survive indefinitely on the hands, they have the potential to do harm as they have the ability to survive long enough to be transferred to other people, animals, objects etc.

Resident flora are persistent residents of the skin. Mechanical cleaning and use of antiseptic solutions can significantly reduce the numbers of bacteria present. However, the bacterial population on the skin can increase significantly when wearing gloves for a few hours

Deep bacteria live in the hair follicles and sebaceous glands. These cannot be removed without sterilizing the skin. Unfortunately, this is impossible!

The purpose of the surgical hand scrubs is to:

- Remove any debris and transient microorganisms from the nails, hands and forearms
- Reduce the resident microbial count as much as possible
- Inhibit the rapid rebound growth of the microorganisms

Surgical Hand Scrub Solutions

The ideal surgical hand scrub solution should have the following properties:

- Quick application
- Ability to reduce microbial count quickly
- Wide spectrum of antimicrobial activity
- Long residual lethal effect against microorganisms
- Remains effective and active when organic matter is present
- Economical
- To be used without causing skin irritation or sensitisation

The two most commonly used hand scrub solutions are povidone-iodine and chlorhexidine.

Agent	***Properties***
Povidone-iodine	Is Iodine combined with a detergent; it has a broad spectrum antimicrobial activity (viricidal, bactericidal, fungicidal) Can cause severe skin reactions and irritations in some individuals Efficacy is impaired by organic matter
Chlorhexidine	Effective against many bacteria and has fungicidal, viricial and sporicidal properties Longer residual activity than povidone-iodine Not impaired by the presence of organic matter Relatively low toxicity to tissue

Surgical Hand Scrub Techniques

The basic principle of a surgical hand scrub is to wash the hands thoroughly and then wash from a clean area (the hands) to a less clean area (the arm).

There are two recognised scrub procedures:

- **Numbered Stroke Method** – a certain number of strokes (scrubs) are designated for each finger, palm, back of hand and arm
- **Timed Method**- performed by repeated scrubs over a set period of time. The first scrub of the day would last up to 10 minutes with subsequent scrubs lasting 5 minutes unless some form of gross contamination occurs

Slight variations may occur when reading different instructions on how to perform a hand scrub but the basic principle is the same – to work from the finger tips downwards to a couple of inches above the elbow. Hands should always be held elevated so water runs downwards.

The following procedure is an example the 5 minute timed hand scrub:

- Remove all jewellery (rings, watches, bracelets)
- Wash hands and arms with antimicrobial soap. Excessively hot water is harder on the skin, dries the skin, and is too uncomfortable to wash with for the recommended amount of time. However, because cold water prevents soap from lathering properly, soil and germs may not be washed away. Use warm water
- Clean subungual areas with a nail file
- Start timing. Scrub each side of each finger, between the fingers, and the palm and the back of the hand for two minutes
- Proceed to scrub the arms, keeping the hand higher than the arm at all times. This prevents bacteria-laden soap and water from contaminating the hand
- Wash each side of the arm to three inches above the elbow for one minute
- Repeat the process on the other hand and arm, keeping hands above elbows at all times. If the hand touches anything except the brush at any time, the scrub must be lengthened by one minute for the area that has been contaminated.
- 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 suite holding hands above elbows
- If the hands and arms are grossly soiled, the scrub time should be lengthened. However, vigorous scrubbing that causes the skin to become abraded should be avoided
- At all times during the scrub procedure care should be taken not to splash water onto surgical attire

Overview of a Hand Scrub

***1** - Remove all jewellery, including watches*

***2** - Nails are short, clean & free from nail varnish*

***3** - Perform general wash of hands and arms*

***4** - Extend wash to approx 2 inches from elbow*

***5** - Scrub each side and in-between fingers*

***6** - Scrub tips of fingers*

***7** - Scrubs palm of hand*

***8** - Scrub back of hand*

***9** - Rinse – maintain hands elevated above elbow*

***10** - Dry hands on sterile towel*

When drying hands after the hand scrub a sterile hand towel is used. The 'four quadrant' technique is employed. This ensures that a separate section of the towel is used for the palm, back of the hand, inner forearm and outer forearm.

Gowns

Personnel involved in the surgical procedure wear sterilised gowns to further prevent contamination of the patient and the surgical site. The front surface of the surgical gown should remain sterile. For this reason, gowns are packed inside out and are folded in certain way (rolled or concertina-folded) to ensure minimal handling and movement when surgical personnel are ready to put them on.

There are a couple of different types of surgical gown, some tying at the back and some tying at the side.

Disposable paper gowns are resistant to wetting so they are less permeable to bacteria. They are useful for procedures that may require frequent irrigation of the

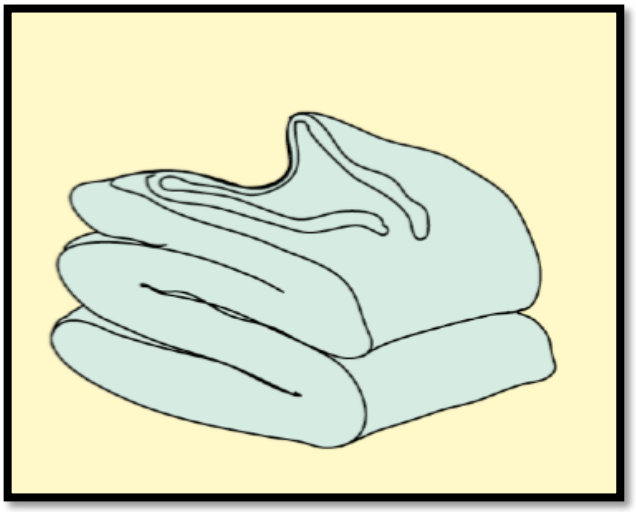
surgical site. Donning a new gown for each surgical procedure and disposing of it at the end ensures sterility.

Cloth gowns are both comfortable and reusable. It is however, time consuming to launder the gowns and re-sterilise them. As linen is a woven material, when it becomes wet, bacteria permeate through the gown causing a breakdown in sterility.

Plastic gowns – plastic is superior in its resistance to wetting and bacterial penetration. Plastic can be used to reinforce paper or cloth gowns during wet procedures e.g. plastic sleeves for equine abdominal surgery.

Gowning Procedure / Assisting with Gowning

As mentioned the gown must be packed correctly to enable the front of the gown to remain sterile. The inside of the gown must be the only area touched and the folding and packing procedure must be performed so that only the inside of the gown is presented to the surgeon.



When the package is opened the inside of the gown is presented to the surgeon. It is folded in a concertina fashion so once the inside of the shoulders have been located the gown is picked up and allow to 'fall' open.

Assisting with gowning

The technique involves putting on and securing a sterilised gown by only touching the inside surfaces. The outer surface of the gown is not to be touched by any personnel, including the scrubbed surgeon.
To help with this, the gown is folded using a technique that exposes only the inner surface when the packaging is opened.

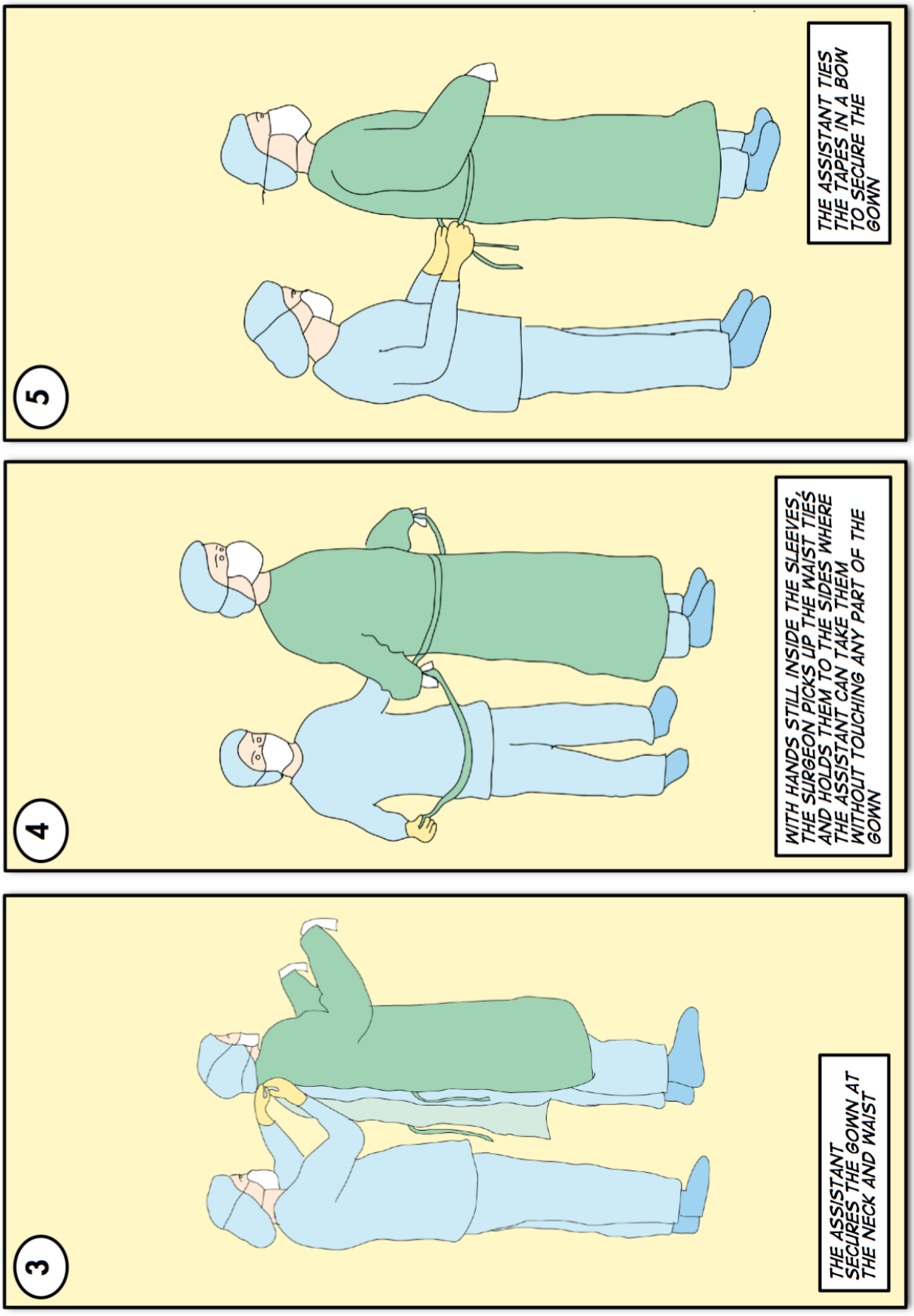
1

THE SURGEON PICKS UP THE GOWN AT THE INSIDE PART OF THE SHOULDERS AND ALLOWS IT TO UNFOLD WITHOUT TOUCHING ANY SURFACES.

NEXT THE SURGEON SLIDES FIRST ONE ARM, THEN THE OTHER DOWN INTO THE SLEEVES.
THE HANDS REMAIN INSIDE THE SLEEVE AT THIS STAGE.

2

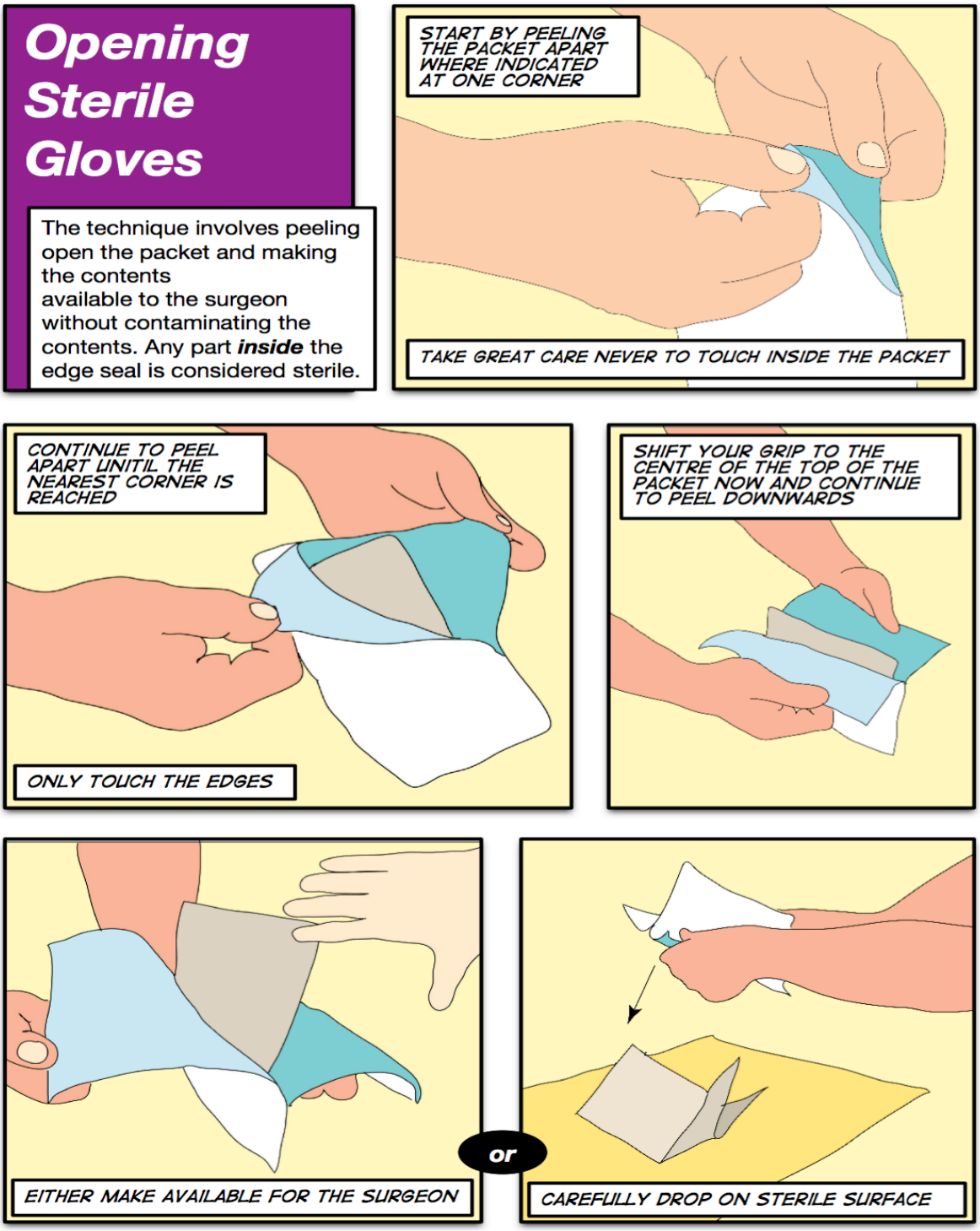
NEXT AN ASSISTANT POSITIONS THE GOWN ON THE SHOULDERS OF THE SURGEON. THE ASSISTANT TOUCHES ONLY THE INNER SURFACES.



Gloving

Once the gown has been donned, gloving will be performed. Ensure that the correct size is available for the surgeon / assistant / nurse. Gloves should fit comfortably without cutting off circulation or leaving loose, 'flappy' bits at the tips of the fingers. If the gloves are the wrong size, sensation may be impeded in the fingertips compromising the surgical technique.

Opening Sterile Gloves



Gloving Techniques

When applying surgical gloves, the outer surface of the sterile gloves should not be touched. There are 3 recognised gloving techniques – open, closed and plunge. Gloves are available with maize starch, to help facilitate the gloving procedure, by reducing the wetness within the glove. However, some people can be allergic to this and there are starch-free gloves now available. Other gloves can be totally powder-free, and starch is optional by being provided in sachets, therefore giving the surgical team member the choice.

Open Gloving Technique

The open gloving technique is most commonly used with the technique described below:

- Open the inner wrap of the glove pack, with the opening for the wrists nearest to you. The left glove should be on the left side and the right glove on the right
- Being careful not to touch the outside of the gloves with any part of your hands, pick up the everted cuff of the right glove with the thumb and forefinger of the left hand, touching only the inner, folded back surface of the cuff
- Holding the glove open with the left hand, slide the right hand into the glove, pulling the glove over the hand, being sure that the thumb of the right hand slides into the thumb of the right glove, until the tips of the fingers reach the start of the glove fingers; hook the rim of the glove over the thumb, to secure the glove into its current position
- Properly position the fingers of the hand to the ends of the glove fingers, using the left hand to pull the glove over the palm of the right hand
- Use the gloved right hand to pick up the left glove by sliding the gloved fingers into the space between the palm of the left glove and the folded back cuff
- Lift the gloved right hand up slightly to hold the left glove open while sliding the left hand into the opened glove
- After positioning the fingers and the thumb, thrust the left hand all the way into the left glove, pushing with the right hand to draw the glove over the left palm to the wrist
- The fingers of the right-gloved hand are still under the folded cuff of the left glove. Using the right finger flip the left glove cuff over the left sleeve of the gown to complete gloving the left hand
- Insert the gloved finger or fingers of the left hand under the rim of the right glove. Flip the glove cuff by stretching the glove over the right gown cuff to complete the gloving of the right hand

Open Gloving

Closed Gloving

Plunge Gloving

This technique is not commonly performed within the veterinary industry; it is when a sterile assistant will hold the glove open and the surgeon will insert their hand into the glove. There is a risk of contaminating both the surgeon and the scrubbed assistant when using this technique.