

Maintaining Best Practice in the Operating Theatre

Sam McMillan VTS (Anesthesia) DipAVN RVN

The History of Drapes and Gowns

The use of drapes to protect the surgical field from microorganisms when operating in human medicine began over a century ago. At this time drapes consisted of a loosely woven, reusable, cotton material which was readily permeable and similar to muslin. These drapes quickly developed into the more closely woven cotton drapes and gowns that many of us may still be familiar with. However, the use of sterile cotton to prevent peri-operative bacterial transfer to the operative site was shown to be **ineffective** as early as the late 1940s.

Closely woven cotton used in veterinary hospitals and veterinary practices has a pore size of approximately 80-100µm¹ when compared to microorganisms at 0.5-5µm and squames at approximately 5-60 µm, contamination of the surgical site is only marginally decreased by these fabrics². Laundering of cotton drapes and gowns increases this pore size making them an even less effective barrier to microorganisms and skin squames each time they are used. Cotton drapes and gowns have a life span of approximately 50 uses before the significant increase in pore size and deterioration of the fabric makes them totally ineffective.

When cotton gets wet, organisms can readily penetrate the material and can contaminate the surgical site. In 1952 the renowned surgeon and researcher William Beck alerted the surgical nursing community that cotton drapes failed to provide an effective barrier to microorganisms when they became wet due to 'strikerthrough'³. This can result in the transfer of microorganisms from one side of the fabric to the other and surgical site inoculation.

There has been much development in the fabrics used to manufacture disposable drapes and gowns in the last 30-40 years.

The emphasis has been on establishing an effective barrier to reduce microbial transfer and this has led to the evolution of non-woven, disposable fabrics. Non-woven fabrics are formed by a method that does not involve tufting or weaving, and typically the interstices of such fabrics do not facilitate the passage of microbes when wet or dry.

Studies have been performed comparing woven cotton material with non-woven water resistant materials. The result was a clear and concise message; non-disposable cotton fabrics do not provide protection against bacterial contamination⁴.

Running a Productive Operating Theatre

To run a productive operating theatre a veterinary practice must aim to improve four key dimensions of quality:



Value and Efficiency

Efficiency in theatre is influenced by a wide range of surrounding resources. Two of the largest of these are the availability of sterile supplies and staffing. In a busy practice still using reusable theatre consumables, it is essential to evaluate whether the time of the veterinary nurse or nursing assistant could be put to better and more profitable use i.e. nurse consults, nursing care to inpatients, monitoring anaesthesia etc.

There are also hidden costs in reusing theatre consumables which include:

- Initial outlay on material cotton drapes and gowns - 50 uses they are rendered completely ineffective and should be replaced.
- Cost of TST strips, autoclave tape and peel and seal pouches.
- Electricity and water costs to run the washing machine, tumble dryer and autoclave.
- Washing detergent and disinfectant.
- Servicing and maintenance costs of machines.

The retail price of disposable drapes and gowns is now so competitive that the costs involved in laundering these products is likely to be the less profitable option, particularly because the hidden costs are rarely passed onto the client.



Team Performance and Staff Well-being

Job satisfaction related to the laundering, inspecting and packaging of reusable theatre consumables is minimal. By reducing laundering tasks with the instigation of disposable drapes and gowns, staff can focus on a role that not only will create more revenue for the practice but will also provide more job satisfaction. This in turn leads to better staff performance and overall well-being.

Considerable variation in draping practice is prevalent within the veterinary field. Staff rotations inevitably lead to theatre staff worrying about how different clinicians prefer their patients to be draped. Staff collaboration, improved working relations and a stronger working team are the benefits to a healthcare organisation after the introduction of a standardised single-use draping protocol⁵.

Safety and Reliability of Care

Infection is still one of the most frequent causes of morbidity and mortality following surgery in both human and veterinary patients. We now live and work in an era of multi-resistant organisms and all veterinary surgeons and nurses involved in perioperative patient care should have a clear understanding of the techniques involved to prevent infections during surgery. This is especially pertinent when organisms previously restricted to human medicine such as Methicillin-resistant *Staphylococcus aureus* (MRSA) are becoming increasingly prevalent in veterinary medicine. Antiseptic and aseptic techniques play a key role in reducing many factors which contribute to surgical site infections (SSIs) including patient, surgeon and environmental factors. To reduce the risk of post-operative infection, it is key that potential causes of SSIs are minimised. Factors implicated in SSIs which can be addressed include pre-operative patient assessment, pre-operative patient preparation, dress of theatre staff, use of sterile techniques, surgical site preparation and good surgical technique⁶. These are often controlled by the performing surgeon. However, the attire of theatre staff, use of sterile techniques and surgical site preparation should form a large part of an overall practice infection control policy aimed at reducing SSIs.

SSI is a primary factor in the increase in human and veterinary healthcare costs due to delayed wound healing, increased use of antibiotics, increased hospital stay or even death of the patient.

More controversially consideration should be given to the use of prophylactic antibiotics to patients for short surgical procedures where their use is not indicated because there is not complete confidence in aseptic practice. By improving aseptic practices with guaranteed sterility of disposable consumables it is possible to reduce the amount of systemic medication given to the patient and achieve the same result.

Patient/Client Experience and Outcome

Client awareness and expectation in the UK regarding aseptic practice and clinical management is increasing. Public awareness of the consequences of poor aseptic practice has no doubt been driven by the considerable media coverage regarding MRSA. In one study, 93% of pet owners expected a veterinary surgeon to wear a gown when operating on their pet with 86% of pet owners surveyed stating that they would be unhappy or very unhappy if a gown were not worn⁷.

Client experience and patient outcome are paramount to any successful veterinary practice. Should a patient contract a SSI where there has been a 'best practice' approach to asepsis including the use of disposable theatre consumables then the practice has done everything it can to prevent the SSI and meet client expectation. Where public expectation differs from what actually happens in the operating theatre environment there is potential for liability and blame.

Disposable Drapes and Gowns - What to look for

Human medicine has now entirely moved away from cotton fabric drapes to non-woven, water resistant, single-use disposable drapes.

The modern drape for any veterinary practice needs to possess the following attributes:

- **Provide an effective dry bacterial barrier. (Dry Barrier)**
 - This will prevent any bacteria penetrating from the dirty side of the drape to the sterile side, thus maintaining a sterile surface on the top.
- **Provide an effective fluid barrier. (Fluid Barrier)**
 - If any fluid penetrates through (known as strikethrough) this renders the dry bacterial barrier of the material useless and the drape should be considered non-sterile. Therefore the drape needs to have a very good fluid barrier.
- **Be low in lint production. (Linting)**
 - Most materials shed small microfibrils when they are handled. Under normal circumstance this causes no problems and on a sterile drape as this lint is sterile. However, it is normally very light and will float in the air. As it does so it attracts and picks up any bacteria that is circulating in the air. It will eventually settle down, potentially in a fully open wound and therefore is an excellent vehicle for carrying bacteria into a wound site. Linting drapes can also contribute to the reduced function of air conditioning units.
 - Any material used in a drape therefore needs to be very low linting.
- **Not to burn with an open flame. (Flammability)**
 - Fire hazard is an ever-present risk in an operating theatre. With many combustible materials used during the procedure, and possible ignition sources such as diathermy and laser, you have a risk of fire occurring during a surgical procedure.
 - It is therefore essential that any material used should be slow burning and smoulder or melt rather than burn with an open flame. This provides theatre staff vital time to put out the fire.

- **To drape and form easily over the item of equipment or patient. (Drapeability)**
 - Drapes which do not hang down straight or have large sections of material sticking out at awkward angles are not easy to work with and can also be a contamination hazard if an edge of the drape that has touched something non-sterile and it "springs back" into the centre of the sterile field. Very much like a table cloth needs to sit well over a table, a drape needs to sit nicely over the object that it needs to cover.
- **Strong enough to resist tearing during the procedure. (Strength)**
 - During the procedure itself the drapes may need to be manipulated by the clinical staff or have heavy instruments placed on them or be hung from them. The material needs to be strong enough to withstand this.
- **Can transmit water vapour through during the procedure. (Breathability)**
 - During the procedure it is useful if the material can breathe, therefore providing a slightly higher comfort level for the patient.
- **Can absorb and therefore control fluid spilt onto it. (Fluid Control)**
 - During a surgical procedure large amounts of operating fluid or body fluid (i.e. blood) may come away from the wound site. It is useful then for the material to have absorbency in order to stop this running on to the floor.

These drape attributes are often in contrast to each other, for instance, the drape needs to be a good barrier both dry and wet, it must however remain breathable for comfort. In addition, it needs to be a good fluid barrier and therefore repel fluid whilst also soaking up fluid to prevent it spilling onto the floor. Any allowance for breathability will decrease barrier properties. Strength is also affected by drapeability, the thicker and stronger a material is, the less conformable it will become. The choice of attributes in a draping material is therefore always a compromise.

Surgical Gowns

The most important aspect of a gown is now thought to be its ability to be moisture impermeable as this decreases the transmission of bacteria from the skin surface. Different gowns and moisture impermeability levels are suited to different surgeries and length of surgical time, for example it has been suggested that the following should apply⁸.

For surgeries or short duration (less than two hours), where minimal blood loss is expected (less than 100ml) and lavage fluids will not be employed a 1ply gown may be used.



For longer procedures lasting two to four hours, or with 100-500ml of blood loss, or operations involving the chest or abdominal cavity a 2ply reinforced gown should be used.

The Vygon Vet Solution

Spunbond Meltdown Spunbond (SMS) has been used for around 20 years as a medical fabric.

The fibres of SMS are stacked up forming a probability filter, but unlike the paper based products where the fibres are random sizes as in spunlace, the polypropylene fibres are a uniform size. This

means that their distribution and layout can be more precisely controlled giving a more effective dry barrier. Because the fibres sizes are small, they can be reduced to a level which will prevent water molecules from penetrating through. The fibres are non-absorbent so this also means SMS shows excellent fluid barrier properties. The fibres in outer spunbond layers are very long which means that linting levels in SMS are extremely low and gives the finished product good drapeability. SMS consists of complex polymers like polyester so when exposed to an ignition source they will melt and not burn with an open flame. SMS also has a high tensile strength and very good breathability qualities.



A selection of drapes

Laminate fabrics are achieved by laminating two different materials together in order to exploit the benefits from each material. Vygon's drapes are loosely Spunbond polypropylene laminated with an impervious backing of polyethylene.

The top layer is highly absorbent due to its looser bonds and gives good fluid control over the whole drape whilst the polyethylene provides 100% impermeability to both fluid and bacteria. The opposite effect of having 100% impervious material is no breathability.

This will not cause ill effects to patients for most procedures, however the balance between sweating from the patient vs a 100% bacterial barrier should be given consideration in more lengthily procedures (over two hours).

Vygon Unidrapes are a laminated SMS material. They benefit from having a high absorbency, are impervious to fluid and bacteria, have good draping properties, are low in linting level, will smoulder rather than burn and are strong; overall making them the best possible choice for a single-use sterile drape. A large range of both plain, adhesive and fenestrated drapes are available through a guaranteed supply chain.

Vygon Vet's customised procedure packs provide you with the ability to tailor-make a theatre pack that is specific to your clinical requirements. By standardising draping procedures and maximum barrier precautions you can reduce the associated risk of infection to the patient. Custom packs decrease waste, ordering costs and packaging. This in turn reduces set-up time giving skilled clinicians more time for hands on patient care.

Vygon Vet offers both a standard and reinforced gowns in three sizes. The standard gown is 3ply and therefore an effective barrier for both fluid and bacteria for most procedures. However a 4ply reinforced gown is also available.

For more information contact:

The Veterinary Team

t: 01793 748900

e: veterinary@vygon.co.uk

References:

1. Eisen, D. (2010). Surgeon's garb and infection control: What's the evidence? Journal of the American Academy of Dermatology, online.
2. Humes, D., and Lobo, D. (2009). Antisepsis, asepsis and skin preparation. Surgery, 27:10, 441-445.
3. Belkin, N. (2006). Masks, barriers, laundering and gloving: Where is the evidence? AORN Journal, 84:4, 655-664.
4. Blom, A et al (2000) The passage of Bacteria through surgical drapes The Royal college of surgeons of England, 82, 405-207
5. Eyles, M., Cox, D (2006) Surgical Drapes and gowns- a case study for standardising single use product usage across a large independent acute hospital group The Operating Theatre Journal, 89, 10-11
6. Manley, K., and McNamara, I. (2010). Theatre etiquette, sterile technique and surgical site preparation. Surgery, 29:2, 55-58.
7. Demetriou, J., Geddes, R., and Jeffrey, N. (2009). Survey of pet owners' expectations of surgical practice within first opinion veterinary clinics in Great Britain. Journal of Small Animal Practice, 50, 478-487.
8. Widmer, A., Rotter, M., Voss, A., Nthumba, P., Allegranzi, B., Boyce, J., and Pittet, D. (2010). Surgical Hand Preparation: state-of-the-art. Journal of Hospital Infection, 74, 112-122.