Science.
Applied to Life.™

Reducing the risk of Surgical Site Infections along the patient pathway

Did you know?

SSIs: a costly problem.

Surgical care is an essential component of health care. Yet each year surgical patients are harmed by complications including surgical site infections (SSIs). SSIs place a huge operational and financial burden on health care systems and providers. A reduction in SSIs means improved outcomes and a better experience for patients and their families.

2–5%
of all surgical patients develop an SSI[1]

Result in
2x
increased risk of mortality[2]

Result in
2x
increased length of stay[3]

5x
more likely to result in readmission[1]

Quality of life
affected[4]

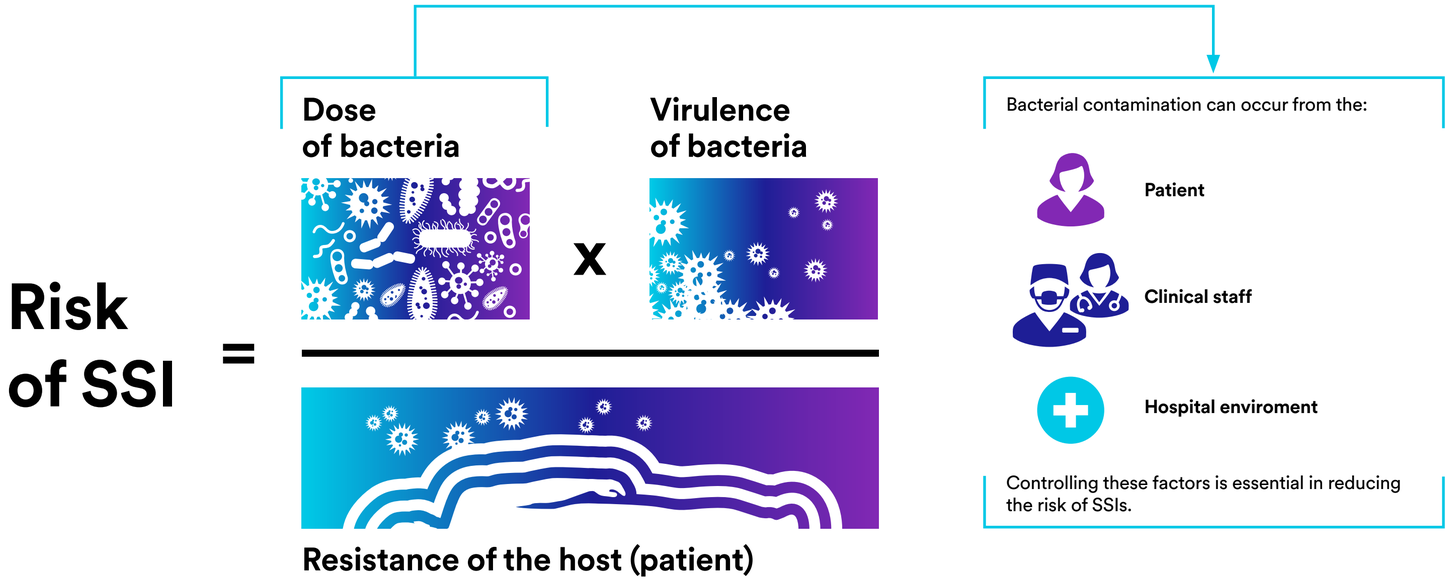
Cost at least
£3,000
per patient[5]

Did you know?

SSIs: a complex problem.

The problem of SSIs is a complex and significant one that cannot be solved by a single solution. There are three variables, as demonstrated by the Centres for Disease Control and Prevention (CDC) formula, that contribute to the risk of SSIs.[38]

Although the variables, virulence of bacteria and the patient risk factors are not easily controllable, the risk of SSIs can be minimised by evidence-based best practices related to the dose of bacteria.



60% of SSIs are preventable[7,40,41]

Every touch point matters

When reducing the risk of surgical site infection, every touch point matters.

Opportunities to reduce risk

There are many opportunities through the patient's surgical journey to make small changes that can make a big difference to clinical outcomes.

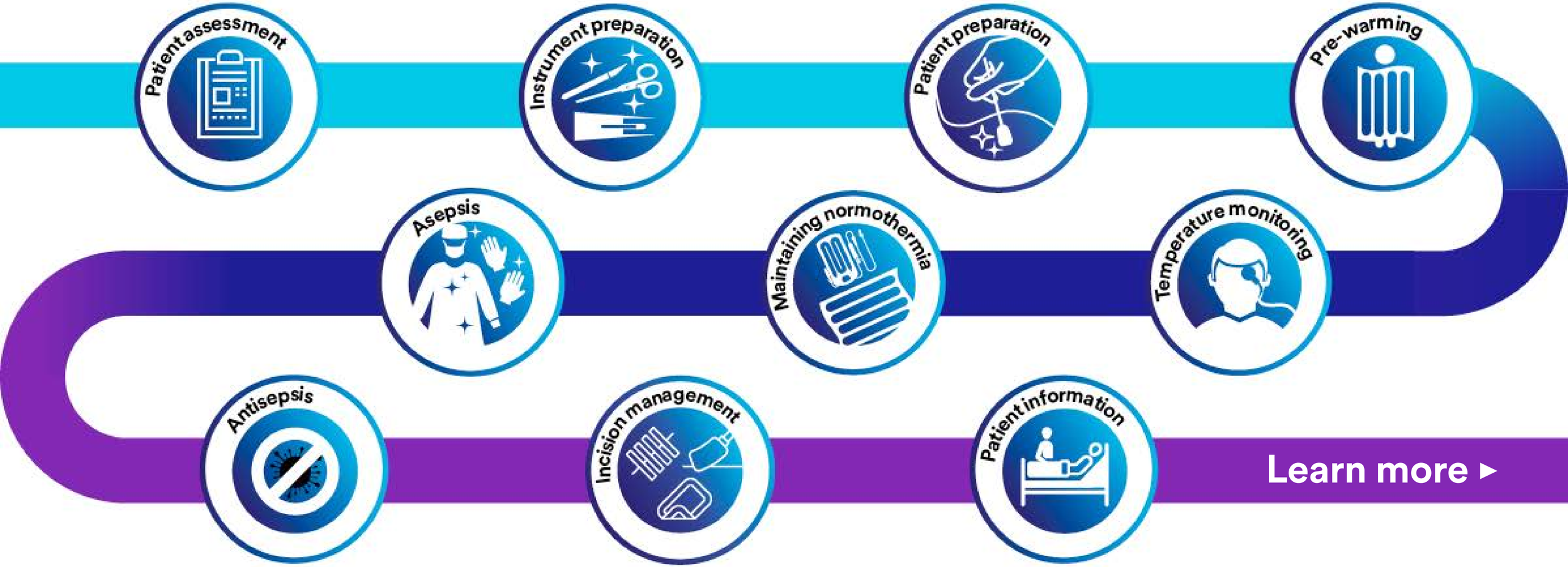
Evidence and guidelines

All recommendations referenced in this module are supported by clinical evidence and guidelines.

3M Solution

We have a wide range of solutions to support clinicians in their mission to protect patients from preventable surgical site infections.

Every touch point matters



Learn more ▸

Patients should be assessed and provided with relevant information before their surgery.

Opportunity to inform and prepare the patient for successful surgery.

Evidence and guidelines

Guidelines recommend providing the patient with relevant information in advance of their surgery.[8]

All patients undergoing elective surgery should have a preoperative assessment to stratify risk of developing a surgical site infection or wound breakdown, as well as the risk the surgery will pose.[9]

These risks together, influence decision to ensure appropriate therapy or dressing is planned and explained to each patient.

3M Solution

Our clinical experts have prepared a patient information guide to help them take an active role in preparing for their surgery.


3M Science. Applied to Life.™

Take an active role in your surgical recovery.

This useful guide provides some easy to follow steps to improve your surgical recovery and reduce your risk of surgical site infection.

What is a surgical site infection?

What are the symptoms of a surgical site infection?

How can I prevent getting a surgical site infection?


Before your surgery

1 Share your medical history

2 Stop smoking as soon as possible

3 Make positive lifestyle choices

4 Don't remove hair

This can be accessed here.

An undetected sterilization process failure can put patients at risk. Frequent monitoring can help to reduce risk of SSI.

Opportunity to monitor and check the sterility of instrumentation.

Evidence and guidelines

Surgical site infections have been attributed to incompletely processed instruments.[10]

Using fully effective sterilization practices in the CSSD can reduce the risk of surgical site infections and their potential impact on hospital and healthcare costs.

Monitoring using sterilization process indicators plays an important role in sterility assurance.

Frequency of monitoring is determined by national guidelines or standards. The World Health Organization recommends testing steam and hydrogen peroxide sterilizers a minimum of daily and testing every EO sterilization cycle.[11]

Due to process variability, international standards e.g. EN ISO 17665 (1-3):2006 require that every cycle be monitored to ensure sterility assurance is guaranteed.[14]

> "Patients depend on sterile processing personnel to be monitoring the effectiveness of their sterilization processes and producing a safe product for patient use." Havrilla (2005)[12]

3M Solution

Sterilization process monitoring should include every load and every pack as each cycle should be considered a unique event. 3M offers four opportunities to monitor the process:

1 **Equipment monitoring** using 3M™ Comply™ Bowie-Dick Test Packs or 3M™ Electronic Test System (ETS).

2 **Load monitoring** – Steam, vaporized hydrogen peroxide (VH2O2) and Ethylene Oxide (EO) sterilization cycles can all be monitored using 3M™ Attest™ Super Rapid Readout Biological Indicators.

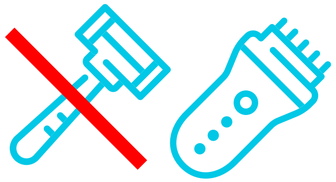
3 **Internal pack monitoring** – 3M™ Comply™ SteriGage™ Steam Chemical Indicators placed inside the pack can be inspected when the pack is opened in the OR.

4 **External pack monitoring** – Packs should have an external process indicator, such as 3M™ Comply™ Indicator Tapes, for visual confirmation that the pack was exposed to the sterilization process.

Preoperative showering, hair removal and nasal decolonization are recommended as part of the patient preparation process.[8,11,15,16]

Opportunity to prepare the patient's skin for surgery.

Evidence and guidelines



Guidelines recommend using a clipper with a single use blade, if hair has to be removed, as close to the time of surgery as possible.[6,8,11,15–19]

Razors should not be used as they cause nicks on the skin which can create an entry point for microorganisms and increase risk of SSI.[23,24]

S. aureus is the leading cause of SSI.

30% of the population carry *S. aureus* in the nose.

84% of the *S. aureus* strains isolated from the nares were identical to those isolated from the surgical site.[20–22]

NICE and CDC recommends nasal decolonization alongside undergoing a chlorhexidine wash or wipe, for identified high risk patients, high risk procedures, and known *S. aureus* carriers.[8,6]

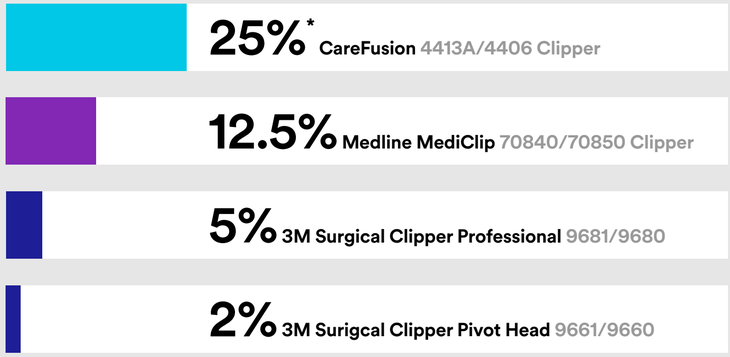
3M Solution

We have a 3M™ Surgical Clipper to meet your needs. Superior design and performance minimizes the potential for nicks or cuts combined with a long lasting battery, short recharge time, battery indicator light, and submersible ergonomically designed handle. In addition the Pivoting clipper has a unique flexible head to conform to patient's skin.

Not all clippers are the same

3M Surgical Clippers minimise nicks and cuts, which helps reduce risk of SSIs. A nick rate of 2–5% was observed in a clinical study.[25]

Per cent (%) of subjects experiencing ≥ 1 nick or cutmean (±SE)



*Difference is statistically significant (P = 0.004)

Pre-warming

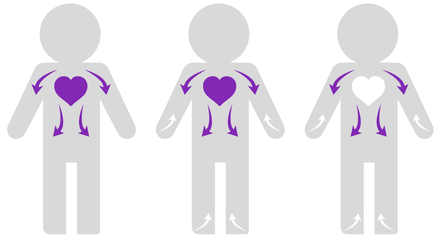
Applying active warming to the periphery reduces the effects of redistribution temperature drop and therefore the risk of perioperative hypothermia.

First opportunity to prevent inadvertent perioperative hypothermia.

Evidence and guidelines

Guidelines recommend pre-warming before induction of anaesthesia.[27–34]

After induction of anaesthesia, the thermoregulatory threshold for vasoconstriction is immediately reduced. Vasodilation allows redistribution of the warmer core circulation, to the cooler periphery, which results in a fast decrease in core body temperature, that is difficult to reverse, especially in shorter procedures.[35]



Heat redistribution is responsible for approximately **80%** of core temperature drop, following the induction of anaesthesia.[35]

Pre-warming the patient before induction of anaesthesia increases the temperature of their periphery, reducing the gradient between the core and peripheral temperatures and therefore a significantly smaller drop in core temperature.[26]

3M Solution

3M™ Bair Hugger™ Warming Gown and Blanket Systems can be utilised preoperatively or during the induction of anaesthesia, to narrow the temperature gradient between the core and peripheral temperatures, minimising the impact of heat redistribution.

Did you know?

As little as 10–20 minutes of pre-induction warming with the 3M™ Bair Hugger™ Normothermia System banks heat in the patient's periphery, helping minimise reduction in core temperature caused by redistribution temperature drop.[26]

Continuously and accurately monitor patient core temperature before, during and after surgery to ensure the patient is normothermic.

Opportunity to monitor core temperature continuously.

Evidence and guidelines

Guidelines recommend that patients should have their core temperature monitored throughout the perioperative period.[27–32]

NICE recommends the measurement of temperature at sites which are a:

- direct measure of core temperature or
- direct estimate of core temperature that has been shown in research studies to be accurate to within 0.5°C of direct measurement[27]

Due to inaccuracy, indirect estimates of temperature are not recommended for use in surgical patients.[27]

Knowing your patient's core temperature can help you respond quickly to help reduce complications of inadvertent perioperative hypothermia, including 3x increased risk of SSI.[35]

3M Solution

The 3M™ Bair Hugger™ Core Temperature Monitoring System is a non-invasive continuous core temperature monitoring system, that has been proven to perform as accurately as a pulmonary artery catheter and other commonly used invasive systems.[36]

Just one 3M™ Bair Hugger™ Temperature Monitoring Sensor can accurately monitor the patient's core temperature throughout surgery.

Did you know?

NICE now recommends zero heat flux technology as an accurate measurement of core temperature and recently published a medical innovation briefing on the Bair Hugger Temperature Monitoring System.[37]

Maintain normothermia during the perioperative period using active forced-air warming and fluid warming to prevent negative consequences of inadvertent perioperative hypothemia.

Opportunity to maintain normothermia during surgery.

Evidence and guidelines

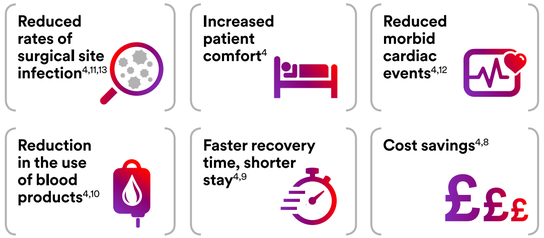
Guidelines recommend actively warming patients using forced air warming to maintain normothermia intraoperatively.[27–34]

Fluids over 500ml should also be warmed in order to prevent the drop in core temperature caused by the infusion of cold fluids.[27–30,33]

Benefits of maintaining normothermia include:[35]

- Reduced risk of surgical site infection
- Increased patient comfort
- Reduced morbid cardiac events
- Faster recovery time, shorter hospital stay
- Reduction in use of blood products
- Costs savings

Patients should not be discharged from recovery until they are 36°C or above. If required, continue to warm using forced-air warming.[27,28,32,34]



3M Solution

The 3M™ Bair Hugger™ Normothermia System can be used to reduce further heat loss, maintain core temperature and treat hypothermia. The interconnecting channel design of Bair Hugger blankets and gowns reduces resistance to airflow; maximising temperature uniformity within the blanket. Heat is transferred to the patient through convection from uniform perforations created in the blanket, conduction and radiation.

The **3M™ Ranger™ Blood and Fluid Warming System** uses warming plates that monitor the temperature of fluid through the disposable cassette, ensuring it is warmed and reducing its impact on mean body temperature, irrespective of the flow rate or the ambient temperature of the fluid.

Did you know?

There are 170+ clinical studies that support the use of the Bair Hugger forced air warming system.[48]

Bair Hugger blankets demonstrate superior heat transfer and even distribution of warm air.[13]

Prepare healthcare workers, instruments and surgical environment, to exclude microorganisms from the surgical field.

Opportunity to complete the surgical field ready for incision.

Evidence and guidelines

Guidelines recommend hand disinfection should be carried out by the entire OR team using an antiseptic hand scrub.[8,11,15]

Surgical masks should cover the mouth and nose completely, cover all facial hair, and should be replaced for every operation. When a surgical mask is removed, hands should be disinfected.[15]

The operating team should wear sterile gowns in the operating theatre during the operation[8] and sterile drapes should be used to create a physical barrier around the surgical site.[15]

Surgical drapes and gowns should meet or exceed the minimum performance criteria of EN13795.[39]

Wound edge protectors may offer protection against SSI in certain procedures.[11,42]

3M Solution

Ensure a sterile field with a selection of 3M™ Steri-Drape™ 9000 Surgical Drapes and 3M™ Steri-Drape™ Wound Edge Protectors.

Choosing the correct personal protective equipment (PPE) is vital to protect both clinicians and patients, we have a range of surgical masks and respirators for all situations.

OR staff can complete final checks on instrument sterility using a 3M™ Comply™ SteriGage™ Chemical Indicator that has been placed inside the pack by the sterilization department.

Products you can trust

All 3M surgical drapes and gowns either meet or exceed the minimum performance criteria of EN13795.

Disinfect skin and create a chemical and physical barrier to eliminate microorganisms that could lead to SSI.

Opportunity to reduce skin recolonization and eliminate microorganisms.

Evidence and guidelines

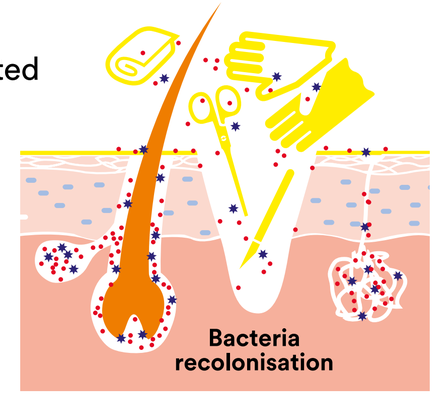
Most SSIs are caused by the contamination of a surgical incision with microbes from the patient's own body during surgery. Infection caused by microorganisms from an outside source following surgery is less common.[8]

Whilst skin preps reduce microbes on the skin surface, bacteria in the deeper skin layers will remain. Over time these microbes can recolonise the skin surface.[43]

Disinfect skin using an alcohol-based antiseptic solution.[1,3,4,5,6,7,9]

Guidelines recommend if an incise drape is required, it should be iodophor impregnated.[8,15]

Do not use non-iodophor-impregnated incise drapes routinely for surgery as they may increase the risk of surgical site infection.[8,15]



3M Solution

Create a chemical and physical barrier around the incision site with a 3M™ Ioban™ 2 Antimicrobial Incise Drape to reduce skin recolonization and therefore the risk of SSI.[44,45]

Evidence demonstrates that iodine released from 3M™ Ioban™ 2 Antimicrobial Incise Drapes is able to penetrate these deeper skin layers at a concentration required for microbial death.[43]

Not all incise drapes are created equal

3M™ Ioban™ 2 Incise Drapes are classified as Class III medical, because the iodine in the incise drape is a drug which works in the deeper layers of a patient's skin to reduce the risk of SSI.[43–45]

Class II iodophor incise drapes do not offer the same level of assurance. Their drug component has not been assessed for safety or efficacy and does not act on the human body.

Close, protect and cover the incision; choosing the most appropriate post-operative dressing or therapy.

Monitor incision after surgery and during recovery.

Opportunity for successful wound healing and monitoring.

Evidence and guidelines

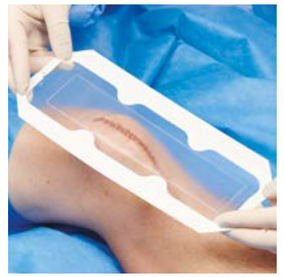
Poor incision healing can lead to surgical site complications (SSCs) such as surgical site infection (SSI), dehiscence, haematoma and seroma. Each of these complications can lead to delayed healing, increased length of stay, readmissions, re-operation and increased morbidity and mortality.[37]

Surgical incisions should be covered with an appropriate interactive dressing at the end of the operation.[8] Dressing should not be removed until at least 48 hours post-op, unless there is a reason to inspect the wound.[6,8,15,16]

NICE (2019) indicate that the first dressing can be removed at 48 hours post operatively. However, if the incision can be viewed the dressing can be left until stitch/staple removal or the first follow up appointment depending on the wear time of the dressing.[8]

WHO (2016) suggests the use of prophylactic negative pressure wound therapy in adult patients on primarily closed surgical incisions in high-risk wounds for the purpose of the prevention of SSI, while taking resources into account.[11]

3M Solution



3M™ Tegaderm™ Absorbent Clear Acrylic Dressings offer a completely transparent barrier – allowing active monitoring for signs of infection and early intervention without disturbing the incision. Wear time of 7–28 days gives patients extended protection beyond their initial hospital stay,[46] and waterproof barrier supports early showering without removing the dressing, allowing patients to return more quickly to daily activities.[47]

PREVENA™ Incision Management System is the first powered negative pressure therapy designed specifically for closed surgical incisions. Applying continuous negative pressure therapy for up to 7 days, PREVENA helps to promote healing by holding the incision edges together, drawing fluid and exudate out of the wound, reducing oedema and stimulating perfusion. It is recommended that the therapy should be considered as an alternative to standard of care in people at risk of developing surgical site complications.

Patients should be discharged with the relevant information to care for their surgical wound.

Opportunity to empower the patient to improve their quality of life.

Evidence and guidelines

NICE (2019) guidelines state that patients and carers should be given information and advice about how to recognise a surgical site infection and who to contact if they are concerned.[8]

Patients should be prepared about the care of the incision site post operatively.

Well prepared patients can actively contribute to their own after care and report early signs of complications to a healthcare professional. This can also offer assurance of what they should expect to see during the normal healing of a surgical incision.

3M Solution

Our patient information document provides a guide for what to expect when wearing a 3M™ Tegaderm™ Absorbent Clear Acrylic Dressing. Patients can monitor their own incision following surgeon's instructions and contact a healthcare professional with any concerns.

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Dressing Guide

Your surgeon placed a 3M™ Tegaderm™ Absorbent Clear Acrylic Dressing over your incision.

Follow your surgeon's instructions for incision monitoring. Use this document as a guide for what to expect when wearing your dressing. Contact your surgeon with questions about your incision or dressing.

Frequently asked questions

What might I see when I wear the dressing?

Your dressing has a clear absorbent pad with a waterproof cover dressing. This allows you to see your incision. As you wear the dressing, the pad may get stained with blood and fluid.

This is okay, and does not mean you need to remove your dressing. In fact, keeping the dressing on provides a healing environment.[1]

Can I shower or bathe with the dressing?

Yes. You may shower with this dressing if it is firmly in place and the edges have not lifted or rolled. Do not soak in the bathtub or whirlpool while wearing the dressing.

Follow dressing-removal recommendations from your surgeon/provider:

What might I expect while wearing the dressing?

The dressing is designed to stay in place longer than you may have experienced with other dressings. The information below can help you understand what to expect while wearing the dressing.

If you are concerned about your incision or dressing, call your surgeon's office.

Bubbles

Bubbles are expected and represent the pad swelling to absorb and capture fluid.

Keep the dressing on.

Fluid in pad or cracked appearance

Fluid within the pad appears or there is a cracked appearance, but the edges of the dressing remain sealed to the skin. This is expected.

Keep the dressing on.

Rolled edges

Rolled edges appear, but the dressing and pad are still in place. This is okay and does not necessarily require reinforcement.

Keep the dressing on.

Fluid present in the dressing border

Fluid or staining is seen outside the pad area, but it is not actively leaking. This is expected for some types of incisions.

Keep the dressing on.

3M

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Web 3M.com/Medical

[1]3M data on file. EM-05-000214

Summary

Opportunities to reduce risk

There are several opportunities along the patient pathway to make small changes that can make a big difference to patient outcomes.

Evidence and guidelines

Evidence and guidelines support proactive measures to reduce the risk of preventable surgical site infections.

3M Solution

3M can support clinicians with evidence-based solutions and practical resources to deliver positive patient outcomes.

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Disclaimer

Please note, the design or ‘flow’ of the pathway is not intended to be linear. The steps are not necessarily carried out in this order and many will take place at the same time. The steps are separated to demonstrate to evidence and guidelines associated with each step of the journey.

All recommendations are taken from clinical studies and/or published guidelines and are not the opinion of 3M.

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