LIVE
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Surgical site infection:
finding a simple solution for a complex problem
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Surgical site infection: finding a simple solution for a complex problem

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Learning objectives

1. To understand why surgical site infection (SSI) is a concern, the impact on patients and the NHS
2. To understand how and why they may develop
3. What preventative strategies should we be implementing to help reduce the burden
4. Using evidence-based practice to implement change in current practice — reduction of SSI using post-operative film dressings

What is a surgical site infection (SSI)?

- Infection that occurs after surgery in or around the area where surgery took place
- Can range from small amounts of wound discharge to a life-threatening postoperative complication
- Can be superficial infections involving the skin only
- Other SSIs are more serious and can involve tissues under the skin, organs, or implanted material

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Epidemiology

- Most are caused by contamination of an incision with micro-organisms from the patient's own body
- 11 million surgical procedures performed in the UK annually
- In the absence of verified data, it is estimated that there are approximately 200,000 SSIs in the UK per annum
- SSIs comprise approximately 20% of healthcare-associated infections (HCAIs)

Defining a surgical site infection (SSI)

There are generally three types of SSI:

- Superficial incisional
- Deep incisional
- Organ/space

Superficial incisional SSI

- Infection within 30 days of procedure involving the skin and subcutaneous tissue

- Patient has at least one of the following:
  - **purulent drainage**
  - **organisms identified from a clinical diagnosis swab**
  - **incision deliberately opened by an attending physician**

- Patient also exhibits the following:
  - **pain or tenderness; localised swelling; erythema; or heat**

- This does NOT include cellulitis/pin site infection/stitch abscess

Open incisional SSI

- Infection within 30 or 90 days of procedure involving fascial and muscle layers

- Patient has at least one of the following:
  - **purulent drainage from the deep incision**
  - **deep incision that dehisces, or is opened/aspirated by a surgeon, with organism identified from clinical diagnosis swab (or no swab)**

- Patient also exhibits fever (>38°C); localised pain or tenderness

- Abscess or other evidence of infection involving the deep incision that is detected via other tests (imaging)

Organ space incisional SSI

- Infection within 30 or 90 days of procedure; infection is in operative site deeper than the fascial/muscle layers

- Patient has at least one of the following:
  - **purulent output from surgical drain**
  - **organisms on a clinical diagnosis aseptically-obtained fluid or tissue sample in the organ/space**
  - **abscess or infection in organ/space that is detected via other tests**

SSI — statistics

- Those that develop an SSI are five times more likely to be readmitted after discharge
- Patients with SSI are 60% more likely to spend time in intensive care and twice as likely to die than those without
- Represents significant costs to the NHS, approximately **£2–10.5k** per infection depending on the nature of the surgery
- Estimated costs to the NHS approximately **£700m a year**

Consequences of an SSI — patient

- **Physical** — pain, reduced mobility, and amputation
- **Emotional** — low mood, psychological effects of scarring
- **Social** — isolation, financial burden

Consequences of an SSI — NHS

- **Additional costs —** due to extended hospital stays, readmissions to hospital, further surgery and additional wound management

- **Antibiotic treatment —** poses considerable financial costs and increases problem of antibiotic resistance

- **Patient dissatisfaction —** infection acquired in hospital may lead to substantial litigation costs to the healthcare system

Dehiscence

- Wound dehiscence usually occurs when the wound edges fail to 'knit' properly along a suture line and can be due to infection
- It is a significant complication in surgical wounds and generally occurs between 5–8 days post-operatively, but can occur up to 30 days later
- If wound dehiscence is noted, assessment for infection should be a top priority

Why are we bothered?

Antimicrobial resistance (AMR) – World Health Organization

- What is it?
  - **Antimicrobial resistance happens when micro-organisms (such as bacteria, fungi, viruses, and parasites) change when they are exposed to antimicrobial drugs (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics)**

- As a result, medicines become ineffective and infections persist in the body, increasing the risk of spread to others

Why are we bothered?

Antimicrobial resistance (AMR) – World Health Organization

- Without effective antimicrobials for prevention and treatment of infections, medical procedures become high risk, these may include:
  - **organ transplantation**
  - **cancer chemotherapy**
  - **diabetes management**
  - **major surgery (e.g. caesarean sections or hip replacements)**
- Increasing the cost of health care with lengthier stays in hospitals

Why are we bothered?

Antimicrobial resistance (AMR) – World Health Organization

- Resistance to first-line drugs to treat infections caused by *Staphylococcus aureus* is widespread

- People with MRSA (methicillin-resistant *Staphylococcus aureus*) are estimated to be 64% more likely to die than people with a non-resistant form of the infection

Why are we bothered?

Burden of Wounds — costs and outcomes in evaluating management of unhealed surgical wounds in the community in clinical practice in the UK: A Cohort study (2018)

- Retrospective cohort study analysis of 707 patient records in the health improvement network database
- More than 10 million operations were performed by the NHS in England in 2015–16, with the majority involving an incision
- Suggests that SSI data may be underestimated, as most patients experience signs and symptoms post discharge, which can go unrecorded

Why are we bothered?

Burden of Wounds — costs and outcomes in evaluating management of unhealed surgical wounds in the community in clinical practice in the UK: A Cohort study (2018)

- This paper suggests that unhealed surgical wounds account for 11% of wounds managed in the NHS (2012–13)
- Dehiscence following primary closure accounts for 26–28% in the UK of all wounds requiring continued nursing intervention

SSI – risk factors

- **Endogenous** — factors relating to the patient
- **Exogenous** — factors relating to the process and procedures of surgery
- **Classifications of surgery** — factors relating to cleanliness of surgery

SSI – risk factors

Endogenous

- Compromised immune system
- Multi-resistant *Staphylococcus aureus* (MRSA) colonisation
- Diabetes — especially pre-operative hyperglycaemia
- Age
- Gender
- Smoking
- Malnutrition
- Obesity
- Pre-existing or remote site infection

SSI – risk factors

Exogenous

- Inappropriate use of antibiotic prophylaxis
- Pre-operative hair shaving
- Duration of surgery
- Improper skin preparation
- Asepsis
- Sub-standard surgical team hand hygiene
- Theatre environment (ventilation, sterilisation)
- Surgical attire and drapes
- Surgical technique, haemostasis, sterile field, foreign bodies

SSI – risk factors

Classifications of surgery

- It is regarded that the cleaner the surgery, the lower the risk of infection
- Surgical wounds are often classified based on degree of microbial contamination:
  - **clean** — e.g. inguinal hernia repair
  - **clean-contaminated** — e.g. bowel resection
  - **contaminated** — e.g. knife wound
  - **dirty** — e.g. peritonitis

Signs and symptoms

- Erythema
- Delayed healing
- Increased pain
- Tenderness at wound site
- Heat
- Bleeding
- Swelling

Signs and symptoms

- Pus from wound site
- Wound dehiscence
- Pyrexia
- Tachycardia
- Abnormal blood results (WCC/CRP)
- Abscess formation

How do we prevent SSI?

Guidelines

- National Institute for Health and Care Excellence (NICE)
- World Health Organization (WHO)
- European Wound Management Association (EWMA)

How do we prevent SSI?

- Holistic assessment
- Multi-disciplinary approach
- Wound bed preparation
- Manage patient expectations and educate

How do we prevent SSI?

- A holistic assessment should be performed to identify risk factors that may affect surgical wound healing:
  - **pre-operatively**
  - **intra-operatively**
  - **post-operatively**

How do we prevent SSI?

Pre-operative assessment

- Should focus on:
  - Patient's general health and existing conditions
  - Glycaemic control
  - Recent weight loss or gain
  - Physical activity levels
  - Smoking status
  - Expected length of stay (LoS) in hospital

How do we prevent SSI?

Pre-operative considerations *continued*

- Provide information to patients and carers:
  - Risk of infection
  - Steps patient can take to reduce risk
  - How to recognise infection and who to inform if concerned
  - How to care for their wound
  - Whether they require antibiotics before the operation and why

How do we prevent SSI?

Pre-operative considerations *continued*

- Showering
- Pre-operative hair shaving
- Theatre wear
- Nasal decontamination — not routinely used but may be indicated in certain procedures
- Bowel preparation — mechanical bowel preparation not routinely done to reduce risk of SSI

How do we prevent SSI?

Pre-operative considerations *continued*

- Antibiotic prophylaxis should be given before:
  - **clean surgery involving prosthesis or implant**
  - **clean-contaminated surgery**
  - **contaminated surgery**

- Antibiotic treatment, including prophylaxis to patients having surgery on a dirty or infected wound

How do we prevent SSI?

Intra-operative considerations

- Hand decontamination
- Sterile gloves and gowns
- Skin preparation
- Diathermy — should never be used for surgical incision
- Maintaining homeostasis
  - **adequate perfusion, oxygenation and temperature should be maintained**
  - **insulin should not be routinely given to non-diabetics to optimise blood glucose**

How do we prevent SSI?

Intra-operative considerations *continued*

- Wound irrigation and lavage
  - **should not be used to prevent SSI**
  - **antimicrobial skin disinfection should not be repeated before skin closure**

How do we prevent SSI?

Intra-operative considerations *continued*

- Appropriate interactive wound dressing should be used, these may include:
  - **Film and pad**
  - **Visible postoperative film and pad dressing**
  - **Antimicrobial film and pad**
  - **Postoperative foam dressing**
  - **Negative pressure wound therapy (NPWT)**
- Cleaning and dressing changes
  - **patients may shower after 48 hours**
  - **Aseptic, non-touch technique for dressing changes, use sterile saline to clean for up to 48 hours, tap water thereafter**

Post-operative dressings — Leukomed® Sorbact®

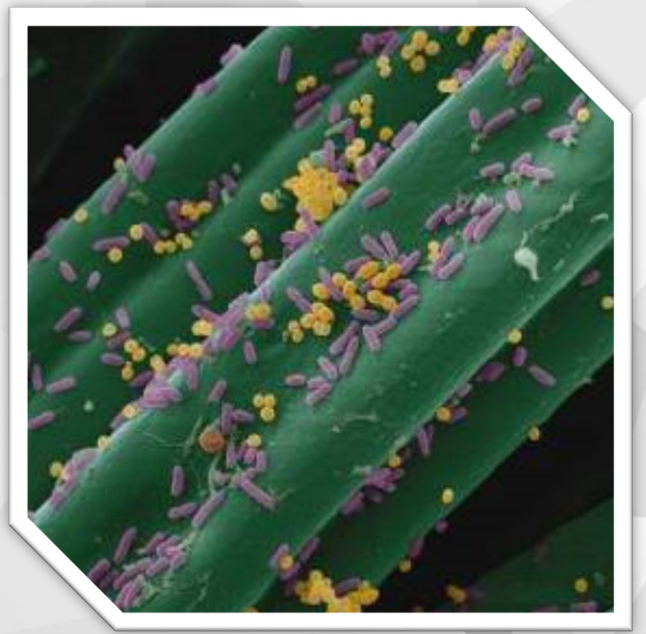
Purely by its physical mode of action, it binds microbes to the pad and helps to prevent/reduce critical colonisation

What is Sorbact® Technology?

Naturally bacteria binding dressings

- A range of wound dressings that help to promote natural healing in any unclean, colonised or infected wounds

- The dressings have a unique mode of action that works without a chemically active agent

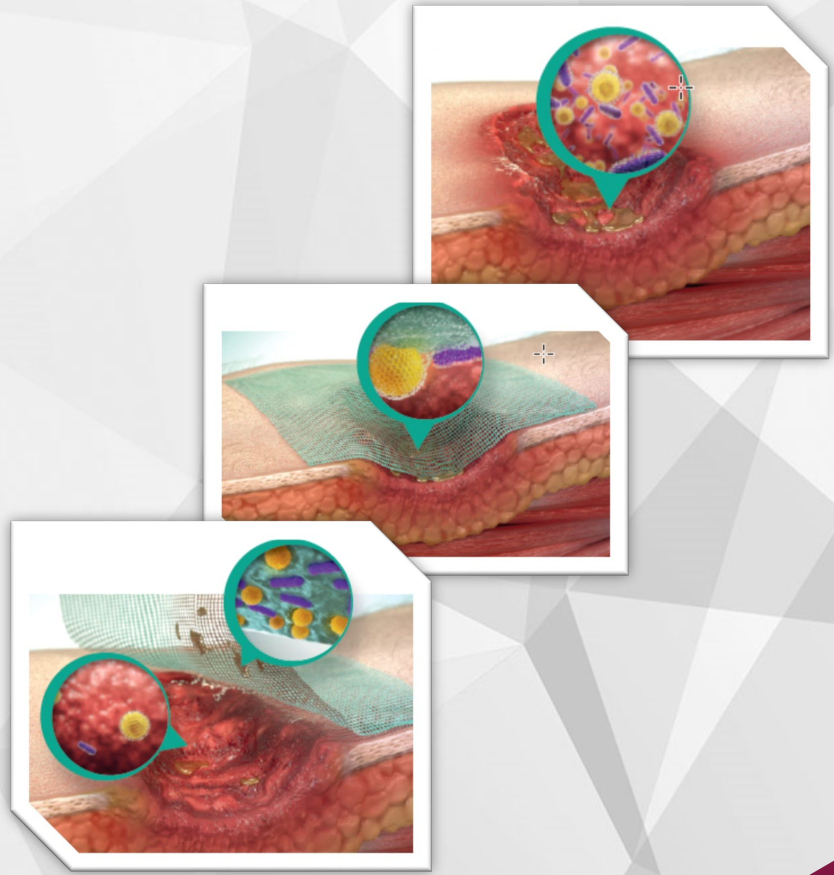


How does Sorbact® Technology work?

The dressings are naturally hydrophobic

Wound bacteria and fungi also display hydrophobic properties — the more virulent, the more hydrophobic

This means that bacteria are attracted to, and irreversibly bind to the dressings, like iron filings to a magnet



Why is Sorbact® Technology different?

- No bacterial resistance described
- Does not trigger endotoxin release
- No upper binding limit described
- Binds a wide variety of pathogenic organisms
- No systemic absorption/no known side-effects

So where is the evidence?

Sorbact® Technology has a significant amount of evidence to support its effectiveness, including:

- **Systematic reviews**
- **Randomised controlled trials (RCTs)**
- **Observational studies**
- **Case series**
- **Case studies**

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Sorbact® Technology evidence

Comparative study of two antimicrobial dressings in infected leg ulcers: a pilot study — Mosti *et al*, 2014

- **Objective**: To compare the efficacy of a microorganism-binding dressing with a silver-containing Hydrofiber™ dressing in controlling bacterial loads in chronic venous leg ulcers, before surgical management with homologous skin grafts
- **Method**: A randomised comparative single-centre study recruited patients presenting with hard-to-heal critically colonised or locally infected leg ulcers. Dressings were changed daily over a four-day observation period
- **Results**: An average bacterial load reduction of 41.6%, with an average reduction of 73.1% in the microorganism-binding group

Sorbact® Technology evidence

Randomized controlled trial evaluating dialkylcarbamoyl chloride impregnated dressings for the prevention of surgical site infections in adult women undergoing Caesarean section — Stanirowski *et al*, 2016

- **Objective**: To evaluate the efficacy and cost-effectiveness of DACC impregnated dressings to prevent SSI in women following caesarean section surgical procedure
- **Method**: Patients were randomly allocated to receive either Sorbact® surgical dressing or standard surgical dressing (SSD)
- **Results**: 543 were enrolled. The SSI rates in the Sorbact® group were significantly lower (**1.8%**) than in the SSD group (**5.2%**) **(p = 0.04) — a 65%** risk reduction

Sorbact® Technology evidence

Dialkylcarbamoyl chloride dressings in the prevention of surgical site infections after non-implant vascular surgery. Bua N *et al*, 2017

- **Objective**: to assess whether postoperative wound dressings coated with DACC demonstrate an effect in preventing vascular surgical site infection
- **Method**: prospective collection of data from 100 consecutive clean non-implant vascular cases with standard dressings and again from 100 consecutive clean non-implant vascular cases with Leukomed® Sorbact® postoperative dressings
- **Results**: The study showed a significant reduction of early SSI and a relative reduction of SSI of 47%, demonstrating a NNT = 12

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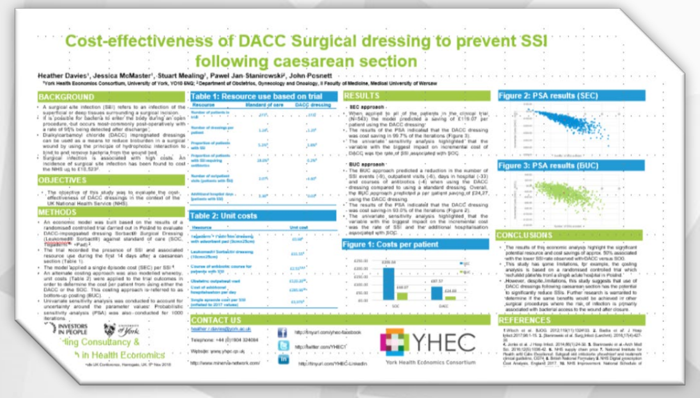
Sorbact® Technology, is it cost-effective?

Cost-effectiveness of DACC surgical dressing to prevent SSI following caesarean section. Davies *et al*, 2018

Health economic evidence to support a simple change

- York Health Economic Consortium (YHEC) used the Stanirowski *et al* 2016 RCT and worked on a health economic model relating to the NHS
- This attributed the following costs:
  - **£3,976 per patient (average cost of a caesarean section SSI)**
  - **£285.96 per day on SSI increased hospital length of stay**
  - **£120.20 per outpatient appointment**



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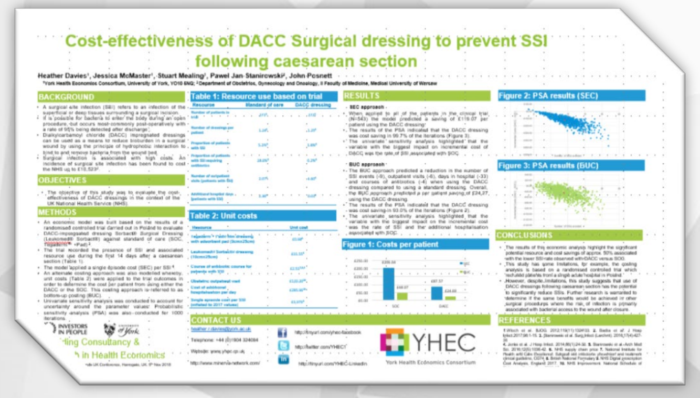

Benefits to the patients can include:

- Discharged from hospital as planned
- Improvement in quality of life
- Shorter post surgery recovery

Benefits to the NHS can include:

- Reduction in:
  - **extended hospital length of stay due to SSI**
  - **extra outpatient appointments**
  - **the need for antibiotics**

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Sorbact® Technology, is it cost-effective?

Cost-effectiveness of DACC surgical dressing to prevent SSI following caesarean section. Davies *et al*, 2018

Results

Cost benefits identified were:

- **When applied to all patients in the clinical trial (N=543) a predicted saving of £119.07 per patient using DACC dressings was observed using this model**
- **The results highlight the significant potential resource and cost savings of up to approximately 50% associated with the lower SSI rate observed with DACC versus standard of care**

Summary

- SSI is an ever-increasing problem in health care
- Combined with the rise in antimicrobial resistance the problem threatens to worsen
- New methods for reducing SSI warrant further investigation with high quality research

Essity Academies

Free education and training is available via Essity's Academies

31 modules available including:

- **Anatomy and physiology of skin**
- **Factors affecting wound healing**
- **Infection management**
- **Surgical site infection**
- **Litigation and the law and the NHS**
- **Improving the assessment of wounds**

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