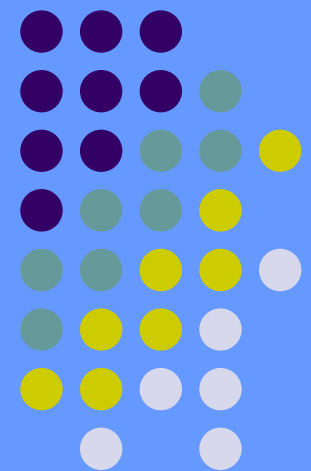
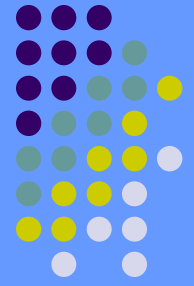


BASIC CONCEPTS OF INFECTION CONTROL

Prevention of Surgical Site Infections

International Federation of
Infection Control

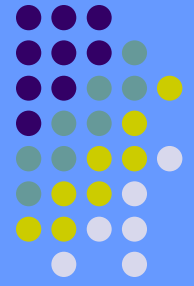




Introduction

- Surgical site infections (SSI)
 - Prolong hospital stay 6-30 days
 - Increase antimicrobial prescribing and laboratory costs
 - May require additional interventions
- An important cause of morbidity and mortality
- Microorganisms can be endogenous or exogenous





Introduction

- Definition of SSI
 - Any infection occurring within 30 days of an operation *or* within 1 year of an implant
- 12-84% of SSIs are detected after the patient leaves hospital
 - Post discharge surveillance is essential



Surveillance



- Surveillance of SSI with feedback to surgeons reduces SSI
- Include standard definitions and risk stratification of patients
 - Main predictor of SSI - the intrinsic degree of wound contamination (clean, clean-contaminated, contaminated and dirty*)
 - Duration of operation and ASA score part of NHSN SSI risk stratification system



Surveillance



- SSI surveillance can be based on specific surgery
 - Cholecystectomy, hernia repair, Caesarean section, hip replacement
 - Assumes that patients with similar operations have similar risk factors
- Another approach - compare the clean wound SSI rates from different surgeons
 - Has been shown to decrease SSIs in some studies
 - It may be unpopular and unfair if the data are not risk adjusted





Wound Classification

- *Class I - Clean*

- An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered e.g., joint replacement

- *Class II - Clean-Contaminated*

- An operative wound in which the respiratory, alimentary, genital or urinary tracts are entered under controlled conditions and without unusual contamination e.g., biliary tract, appendix, vagina, and oropharynx



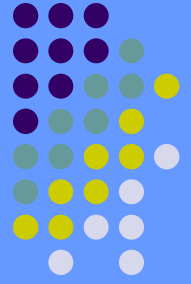
Wound Classification



- *Class III - Contaminated*
 - Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract
- *Class IV - Dirty-Infected*
 - Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera



SSI Risk Factors



- Focus on
 - Patient
 - Operation
 - Environment





Patient Risk Factors

Risk factors	Current state of investigation
Nutritional status	<ul style="list-style-type: none">● Theoretic rational● Difficult to demonstrate● Predicts mortality, not SSI● TPN in reducing SSI risk not proven
Diabetes	<ul style="list-style-type: none">● Significant relationship between increased glucose levels (>200 mg/dL) and SSI● Good glycaemic control and stable serum glucose is essential

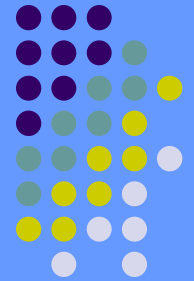




Patient Risk Factors

Risk factors	Current state of investigation
Smoking	<ul style="list-style-type: none">• Nicotine delays wound healing• Some studies have associated smoking with SSI (controversial)
Obesity	<ul style="list-style-type: none">• Obesity (BMI >40) has been associated with SSI (cardiac and orthopaedic surgery)

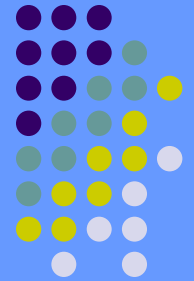




Patient Risk Factors

Risk factors	Current state of investigation
Coexistent remote infections	<ul style="list-style-type: none">● Active infection, skin and respiratory increase SSI● Urinary tract and dental infections have been related to SSI following orthopaedic implants
Colonisation	<ul style="list-style-type: none">● Nasal carriage of <i>S. aureus</i> is a risk factor for SSI● Some studies support pre-operative nasal mupirocin (concern about mupirocin resistance, its use needs further evaluation)





Patient Risk Factors

Risk factors	Current state of investigation
Length of preoperative stay	<ul style="list-style-type: none">● Prolonged preoperative hospitalisation has been associated with increased SSI (it may indicate severe illness)
Perioperative transfusion	<ul style="list-style-type: none">● SSI has been associated with perioperative transfusion● Interpretation of data difficult due to methodological problems



Operation Risk Factors



Risk factors	Current state of investigation
Antiseptic bath	<ul style="list-style-type: none">● Decreases skin microbial colony counts● Has not definitively been shown to reduce SSI
Surgical scrub	<ul style="list-style-type: none">● Aim is to reduce colonisation of the team's hands● Various antiseptics have been used<ul style="list-style-type: none">● Isopropyl alcohol (rapid effect), chlorhexidine (persistence)● Artificial nails increase bacterial and fungal colonization● No clinical trials have evaluated the effectiveness on SSI





Operation Risk Factors

Risk factors	Current state of investigation
Preoperative shaving	<ul style="list-style-type: none">● Associated with a significantly higher SSI risk● Clipping immediately before or depilatories is better● Some studies show association with any removal and SSI
Skin antisepsis	<ul style="list-style-type: none">● Antiseptics decrease skin colonization● Preoperative skin preparation with an antiseptic is recommended for all operations● Iodophors, alcohols, and chlorhexidine are the most common● No data available to show which is best





Operation Risk Factors

Risk factors	Current state of investigation
Infected or colonized surgical personnel	<ul style="list-style-type: none">● Active infections linked to outbreaks of SSIs● Organizations should exclude infected individuals from surgery
Duration of operation	<ul style="list-style-type: none">● Lengthy operations associated with increased risk of SSI● Long exposures of tissues could be due to poor surgical technique, poor organization, or practices● Operation time should be kept to a minimum



Operation Risk Factors



Risk factors	Current state of investigation
Antimicrobial prophylaxis	<ul style="list-style-type: none">● Antimicrobial prophylaxis reduces SSI and is recommended in selected operations● A single dose is usually sufficient at the time of the incision● Usually it is given at induction of anaesthesia● The prophylactic agent should be safe, inexpensive, and have a good spectrum<ul style="list-style-type: none">● First and generation cephalosporins most common● Prophylaxis is not indicated in contaminated or dirty interventions



Operation Risk Factors



Risk factors	Current state of investigation
Foreign material in the surgical site (Sutures and drains)	<ul style="list-style-type: none">● Foreign body may promote inflammation and act as a point of entry for microorganisms● Drains should be passed through a separate incision away from the operative wound and removed as soon as possible<ul style="list-style-type: none">● Use closed suction● Monofilament suture material is the least irritant



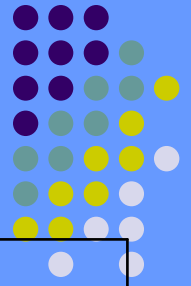
Operation Risk Factors



Risk factors	Current state of investigation
Aseptic and Surgical technique	<ul style="list-style-type: none">● Breaks in aseptic technique associated with SSI● Hypothermia causes vasoconstriction, decreased delivery of oxygen to the wound space, and impairment of leukocyte function● Good surgical technique reduces the risk of SSI<ul style="list-style-type: none">● Effective homeostasis, gentle handling of tissues, removal of devitalized tissues● Hyper-oxygenation of tissues



Operation Risk Factors



Risk factors	Current state of investigation
Aseptic and Surgical technique	<ul style="list-style-type: none">● Risk of SSI strongly associated with the experience of surgical teams<ul style="list-style-type: none">● Institutions should select experienced surgeons for complex interventions and monitor surgical technique



Environmental Risk Factors



Risk factors	Current state of investigation
Operating room air	<ul style="list-style-type: none">● Positive pressure - provide 20 air changes per hour● Use of ultra clean air in implants is controversial● Ultraviolet radiation has not been shown to decrease SSI● Microbial count in OR proportional to the number of people● Movement must be controlled



Environmental Risk Factors



Risk factors	Current state of investigation
Inanimate surfaces	<ul style="list-style-type: none">● Surfaces (floor, walls, tables, etc.) are not associated with SSI● No data to support the use of environmental disinfectants● Tacky mats placed outside OR and overshoes unnecessary





Environmental Risk Factors

Risk factors	Current state of investigation
Inadequate sterilization	<ul style="list-style-type: none">● Sterilization of instruments an essential part of aseptic technique● Must be performed with validated methods● Inadequate sterilization has caused increased SSI and outbreaks● Flash sterilization should only be used in an emergency● Flash sterilization should be never be used for implants



Environmental Risk Factors



Risk factors	Current state of investigation
Surgical clothes and gloves	<ul style="list-style-type: none">● Barriers are necessary to minimize exposures to the surgical team and patients<ul style="list-style-type: none">● Masks● Surgical caps● Footwear to protect the team from accidentally dropped sharps● Sterile gloves minimize contamination to the patients and exposures to the team<ul style="list-style-type: none">● Two pairs of gloves add protection

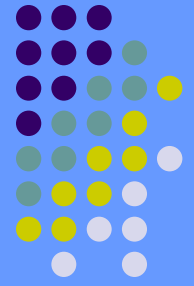


Recommendations: Preoperative



- Identify and treat all infections before elective operations
- Keep preoperative hospital stay to a minimum
- Do not remove hair
 - If it is necessary, remove immediately before the operation with a non invasive procedure, e.g., clipper
- Good control of glycemia
- Use an antiseptic for skin preparation
- Administer prophylactic antibiotics according to local policy





Recommendations: Preoperative

- Perform a preoperative surgical scrub for 2-3 minutes using an appropriate antiseptic
 - Do not use a brush
 - Remove debris underneath the fingernails using a nail cleaner before the first procedure in the morning
- Personnel with signs and symptoms of a transmissible infection and draining skin lesions to be excluded from surgical activities



Recommendations: Intraoperative



- Limit duration of the procedure
- Sterilize with validated methods
 - No routine flash sterilization
- Sterile gloves, water repellent gowns and drapes, surgical mask and cap
- Positive pressure, 20 air changes per hour, filter air
- Operating room doors closed
- Restrict personnel entering the OR and minimize movement
- Strict asepsis



Recommendations: Intraoperative



- Handle tissue gently
 - Effective homeostasis
 - Minimize devitalized tissue and foreign bodies, dead space at the surgical site
- Closed suction drains through separate incision
 - Remove as soon as possible
- No special procedures after contaminated or dirty operations
- No over-shoes and tacky mats

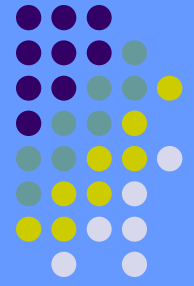


Recomendations: Postoperative



- Don't touch the wound unless necessary
- On-going surveillance system for SSI using standard definitions and risk classifications
- Post-discharge surveillance for patients with ambulatory surgery or a short hospital stay



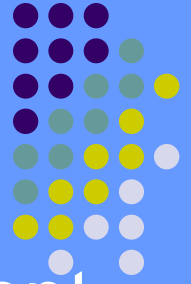


Minimum Requirements

- Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation
- Use an antiseptic agent for skin preparation immediately prior to the operation
- Perform a preoperative surgical scrub using an antiseptic

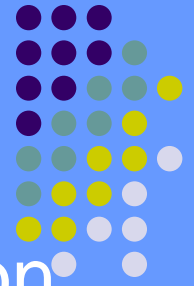


Minimum Requirements



- Administer a prophylactic antimicrobial agent when indicated according to criteria
- Sterilize all surgical instruments with validated methods
- Adhere to principles of asepsis during interventions and any invasive procedure in the operating room
- Have an on-going surveillance system of SSI using definitions and risk classification



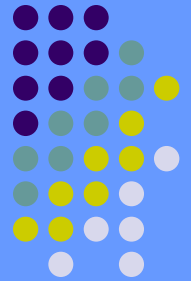


Key Points

- In many countries SSI are the most common HAI accounting for up to 25% of infections
- Although sterilization, aseptic technique, and antimicrobial prophylaxis have reduced SSIs, it remains an important problem
- Risk factors involve the patient, the operation, and the environment
- SSI acquired in the operating theatre often occur within 3 days of surgery
- Infection acquired in the ward often superficial



References and Further Reading



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