

**State of Kuwait
Ministry of Health
Infection Control Directorate**

**Guidelines for Prevention of Surgical Site
Infection (SSI)**

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Surgical Wound:

According to 1998 Kuwait National Nosocomial Infections Surveillance (KNNIS) data, surgical site infections, are the second most frequently reported nosocomial infection.

Definition of Surgical Wound:

Surgical wound is defined as: - An incision made by a surgeon, through the skin or mucous membrane.

and

Closed by a surgeon.

and

Performed in an operating theatre. (O.T)

Procedures not classified as surgical wound:-

1. Skin or mucous membrane incision, but no closure. e.g.; debridement, abscess drainage, tracheotomy.
2. Episiotomy, circumcision.
3. Diagnostic procedure e.g.:- Aspiration, injection, catheterization, biopsy.

Classification of Surgical Site Infections (S S Is)

Refer to the surveillance Policy

Microbiology and Pathogenesis

According to the NNIS (CDC),

Risk of Surgical Site Infection=

$$\frac{\text{Dose of bacterial contamination} \times \text{Virulence}}{\text{Resistance of the host}}$$

Quantitatively, if a surgical site is contaminated with $>10^5$ microorganisms per gram of tissue, the risk of SSI is increased.

However, in case of implantation of foreign material, such as sutures, indwelling devices, or prosthesis, the risk of surgical site infection is markedly increased and the infecting dose decreased and SSI may occur with $<10^3$ microorganism per gram of tissue. Staphylococcus aureus, enterococcus and E.coli usually are the most frequently isolated pathogens,

The primary reservoir for organisms causing SSI is the patient's endogenous flora.

Exogenous sources of SSI pathogens include the operating room environment, personnel and equipments.

The endogenous flora causing SSI vary according to the specific body site, for SSI from skin infection is mainly due to gram positive organisms (e.g. staph) while SSI from gastrointestinal system are composed of a mixed group of organisms (staph and enterococci). SSI from genitourinary system are usually due to gram negative organisms (e.g., E.coli, klebsiella spp. and pseudomonas). The organisms causing SSI in the female reproductive system include enteric, gram negative bacilli, enterococci, group B streptococci and anaerobes.

Fungal pathogens rarely cause SSIs.

Factors that increase the risk of fungal infections in surgical patients include:-

1. Fungal colonization of the upper gastrointestinal tract following exposure to broad spectrum antimicrobial.
2. Using of drugs that decrease stomach acidity and promote growth of microorganisms. (e.g., histamine B.Bolockers)
3. Disruption of gastrointestinal mucosal barrier.
4. Impaired host defense.
5. Implantation of foreign bodies. (e.g., prosthesis)
6. Colonized operating room personnel. (e.g, Fungal colonization of artificial nails).

Classification of Post-operative Wound According to the Degree of Contamination During The Operation. (Appendix-1)

1. Clean Wound:-

Is a wound done electively, primarily closed, undrained or drained with closed drainage, non-traumatic, uninfected, no inflammation encountered with no break in aseptic technique.

In clean wound, respiratory, alimentary, genito-urinary or oro-pharyngeal tract are not entered.

2. Clean-Contaminated Wound:-

Is a wound done under controlled conditions without contamination.

And /or

Minor break in technique.

And/or

Mechanical drainage.

In which biliary tract in absence of infected bite, and genito-urinary tract in absence of positive culture are entered. Alimentary, respiratory tract, oropharynx, vagina and appendectomy are encountered.

3. **Contaminated Wound:-**

Is an open, fresh traumatic wound, in which major break in technique.

In which gastrointestinal tract with gross spillage, genito-urinary or biliary tract in presence of infected urine or bile are entered. Incisions with acute, non-purulent inflammation are included.

4. **Dirty or infected Wound:-**

Is an old traumatic wound with retained devitalized tissue, foreign bodies, fecal contamination, or delayed treatment or from a dirty source or perforated viscus (e.g., perforated appendix)

This definition suggests that organisms causing post-operative infection were present in the operative field before the operation.

Modes of Transmission of Infection in Surgical Wounds

Infection can be transmitted by:-

1. Contact:-

- a. Direct: e.g. hands the most common mode.
- b. Indirect

2. Airborne

Risk Factors for Post Operative Wound Infection:

(i) Patient Related Risk Factors:-

- Age: Patient groups at extremes of age are more liable to infection.
- Sex: Males are more liable to infection.(?)
- Underlying diseases:- Chronic debilitating diseases e.g., (D.M, malignancy, malnutrition).
- Obesity.
- Immuno-suppressive drugs:-
(e.g. Chemotherapy, steroids)
- Remote infections:- Infections at any area of the body, other than the site of the surgical wound.

(ii) Operation- Related Factors:-

- Duration of pre-operative stay: - Prolonged preoperative hospitalization a risk factors for post-operative wound infection.
- Timing and type of preoperative hair removal:- Hair removal by shaving with a razor has higher post operative infection rate than removal by clipping or depilatory cream.
- Hair removal is not recommended as a routine pre-operative procedure, however, if it is needed, it should be done within two hours before surgery, shaving done more than two hours, increases risk of acquiring post operative infection.
- Pre-operative skin disinfection: - Good pre-operative patient shower and scrub decreases risk of post-operative wound infection.
- Duration of Surgery: - Prolonged duration of surgery posses higher risk of post-operative infection.
- Surgical Technique: - Some factors such as failure to obliterate dead space, tissue trauma, foreign material, poor haemostasis, etc.. increase risk of post-operative wound infection.
- Surgical Wound Type:- With dirty operations, there is more risk of post-operative wound infection.
- Usage of Prophylactic Antibiotics:- Proper timing, dosage and type of antibiotic should be considered.
- Urgency of operation.

(iii) Surgeon Related Risk Factors:-

- Unskilled and inexperienced Surgeon
- Improper hand washing and gowning.
- Break-down of aseptic technique and procedure.
- In appropriate post-operative follow up.

(iv) Environment Related Risk Factors:-

- Design of theatre.
- Ventilation system.
- Hygiene of theatre.
- Sterilization of instruments.

Prevention of Surgical Site Wound Infection.

(i) Pre-operative measures:-

1. Patient Hospitalization: - Patient should be hospitalized as short as possible before surgery. Unnecessary prolonged hospitalization should be avoided.
2. Underlying diseases: - (e.g. D.M and Malnutrition) should be controlled and treated pre-operatively.
3. Pre-operative Patient Skin Care:-
 - pre-operative patient shower with an appropriate detergent(e.g., chlorhexidine)
 - Drapes:- Proper and sterile drapes should be used.
4. Proper hand scrubbing reduces risk of post operative infection.
5. Use of protectives (e.g., masks, gowns, gloves..etc.)

(ii) Intro-operative measures:-

- Good operative technique minimize post-operative wound infection.
- Any operation should be performed as quickly as possible within limits of safety.
- Experienced and well trained surgeon has low infection rate.
- If a drainage is necessary, use a closed suction drain. Place the drain through a separate incision distant from the operative incision.
Remove the drain as soon as possible.

(iii) Post-operative Measures:-

- Proper post-operative aseptic wound care should be followed.
- Unnecessary post-operative hospital stay should be avoided.

(iv) Environmental Measures:-

- Proper design of theatre.
- Proper ventilation system with highly efficient air filters.
- Proper sterilization of instruments.
- Adoption of proper cleaning and disinfection policy.

Appendix-1

Surgical 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. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage, operative incisional wounds that follow non-penetrating (blunt) trauma should be included in this criteria.

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. Specially, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered

Class III/Contaminated: Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac message) or gross spillage from the gastrointestinal tract, and incisions in which acute, non purulent inflammation is encountered are included in this category.

Class IV/ Dirty-infected: Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

References:

1. CDC Guideline for the prevention of surgical site infection, 1998
2. Prevention and Control of Nosocomial Infections by Richard Wenzel 1993.
3. CDC definitions of surgical site infection, 1992.
4. MMWR, March 14, 1997.
5. Consensus paper on the surveillance of surgical wound infections, 1992.
6. Wound care source book, 1997.
7. Regulations for Control of Infection, 1984.