UPDATE IN MANAGEMENT OF SURGICAL SITE INFECTION

Essay

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Acknowledgement

There are so many routes in life, and it is the will of **ALLAH** the almighty that guides us to the proper routes and the right decisions, it is the will of **GOD** also that surrounds us with the right people to back us up and make our lives worth living it…

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List of abbreviations

AMP	: Antimicrobial Prophylaxis
ASA	: American Society of Anesthesiologists
CDC	: Centers for Disease Control
ECM	: Extracellular Matrix
EPA	: Environmental Protection Agency
HAIs	: Healthcare associated infections
HEPA	: High efficiency particulate air
MMPs	: Matrix Metalloproteinases
MRSA	: Methicillin-resistant S. aureus
NAS/NRC	: National Academy of Sciences/National Research Council
NNIS	: National Nosocomial Infection Surveillance
PMNs	: Polymorphonuclear Neutrophils
SENIC	: Study on the Efficacy of Infection Control
SIRS	: Systemic inflammatory response syndrome
SSI	: Surgical site infection
TEA	: Total enteral alimentation
TNP	: Topical negative pressure
TPN	: Total parenteral nutrition

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INTRODUCTION

Surgical infections are infections of the tissues, organs or spaces, exposed by surgeons during performance of an invasive procedure. The development of surgical infections is related to 3 factors; the degree of microbial contamination of the wound during surgery, the duration of the procedure and host factors, such as diabetes, malnutrition, obesity immunosuppression, and the number of other underlying disease states ***(Demet et al., 2007).***

Wound infections are a common complication of surgery that adds significantly to the morbidity of patients and costs of treatment. The global trend towards reducing lengthy of hospital stay post surgery and the increase in day case surgery means that surgical site infections will increasingly occur after hospital discharge. Surveillance of surgical site infections is important because rates of performance, however accurate detection of surgical site infections post-hospital discharge is not straightforward ***(Emily et al., 2006).***

Surgical site infections are serious operative complications that occur in approximately 2% of surgical procedures and account for some 20% of health care-associated infections among 723.490 surgical hospitalizations in the sample, 6891 cases of surgical site infection were identified (1%). On average, surgical site infection extended length of

stay by 9.7 days while increasing cost by $20.842 per admission. From the national perspective, these cases of surgical site infection were associated with an additional 406.730 hospital days and hospital costs exceeding $ 900 million. An additional 91.613 readmissions for treatment of surgical site infection accounted for a further 521.933 days of care at a cost of nearly $ 700 million ***(Gregory et al., 2007)***.

If the wound begins to drain yellow or greenish fluid (pus), or if the skin around the wound becomes red, warm, swollen, or increasingly painful; a wound infection may be present and medical care should sought. Any red streaking of the skin around the wound may indicate an infection in the system that drains fluid from the tissues, called the lymph system. This infection (lymphangitis) can be serious, especially if it is accompanied by a fever. Prompt medical care should be sought if streaking redness from a wound is noticed ***(John et al., 2011).***

A structured approach to prevent infection preoperative phase: showering, specific patient and staff theatre wear. Intraoperative phase: hand decontamination, use of sterile gowns and gloves, idophor-impregnated incise drapes, antiseptic skin preparations (povidone-iodine, chlorhexidine). Postoperative phase: dressing changes (aseptic, non-touch technique) postoperative wound cleansing, antibiotic treatment of surgical site infections ***(John et al., 2008).***

Surgical antibiotic prophylaxis is defined as the use of antibiotics to prevent infections at the surgical site. Prophylaxis has become the standard of care for contaminated and clean contaminated surgery and for surgery involving insertion of artificial devices. The antibiotic selected should only cover the likely pathogens. It should be given at the correct time. For most parenteral antibiotics this is usually on induction of anaesthesia. A single dose of antibiotic is usually sufficient if the duration of surgery is four hours or less. Inappropriate use of antibiotics for surgical prophylaxis increase both cost and the selective pressure favouring the emergence of resistance bacteria ***(Wendy Munckhof, 2005).***

AIM OF THE WORK

The aim of this study is to evaluate the causes, management, and prevention of surgical site infection.

SURGICAL SITE INFECTION

Infection has always been a feature of human life and sepsis in modern surgery continues to be a significant problem for healthcare practitioners across the globe. Until the middle of the 19th century, when ***Ignaz Semmelweis*** and ***Joseph Lister*** became the pioneers of infection control by introducing antiseptic surgery, most wounds became infected. In cases of deep or extensive infection this resulted in a mortality rate of 70-80%. Since then a number of significant developments, particularly in the field of microbiology, have made surgery safer. However, the overall incidence of healthcare associated infections (HAIs) remains high and represents a substantial burden of disease ***(Nguyen et al., 2004).***

In 1992, the **US Centers for Disease Control (CDC)** revised its definition of 'wound infection', creating the definition **'surgical site infection' (SSI)** to prevent confusion between the infection of a surgical incision and the infection of a traumatic wound. Most SSIs are superficial, but even so they contribute greatly to the morbidity and mortality associated with surgery. Estimating the cost of SSIs has proved to be difficult but many studies agree that additional bed occupancy is the most significant factor. A review of the incidence and economic burden of SSIs in Europe estimated that the mean length of extended stay attributable to SSIs was 9.8 days, at an average cost per day of €325 ***(Stadelmann et al., 2000).***

Identifying Surgical Site Infections:

The CDC definition states that only infections occurring within 30 days of surgery or within a year in the case of implants should be classified as SSIs. The most widely recognised definition of infection, which is used throughout the USA and Europe, is that devised by **Horan and colleagues** and adopted by the CDC . This splits surgical site infections into three groups - superficial and deep incisional SSIs and organ-space SSIs - depending on the site and the extent of infection. SSIs can be classified as incisional and organ/space manipulated during an operation. Incisional infections are further divided in superficial (skin and subcutaneous tissue) and deep (deep soft tissue muscle and fascia). Deep incisional and organ/space are the types of SSIs that cause the most morbidity ***(Quinn et al., 2004).***

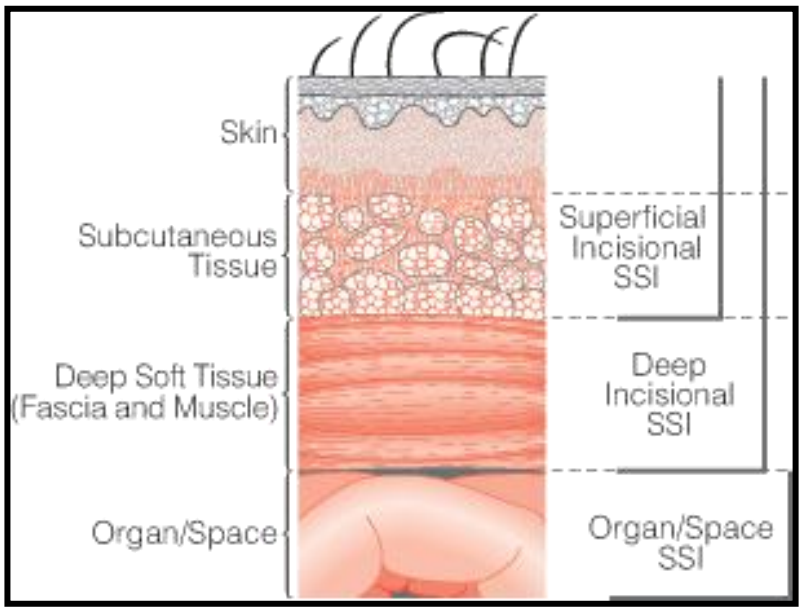

Figure 1: Classification of SSIs ***(Quinn et al., 2004)***

The definitions of superficial and deep infections are summarized in **(Table 1).**

Table 1: Summary of the definitions of superficial and deep SSi.

Superficial incisional surgical site infections	**Deep incisional surgical site infections**
Superficial incisional surgical site infections must meet the following two criteria : • occur within 30 days of procedure • involve only the skin or subcutaneous tissue around the incision. ***Plus*** ***At least one of the following criteria:*** • Purulent drainage from the incision • Organisms isolated from an aseptically obtained culture of fluid or tissue from the incision • At least one of the following signs or symptoms of infection - pain or tenderness, localised swelling, redness or heat - and the incision is deliberately opened by a surgeon, unless the culture is negative. • Diagnosis of superficial incisional SSI by a surgeon or attending physician ***The following are not considered superficial SSIs***: • Stitch abscesses (minimal inflammation and discharge confined to the points of suture penetration) • Infection of an episiotomy or neonatal circumcision site • Infected burn wounds • Incisional SSIs that extend into the fascial and muscle layers.	***Deep incisional surgical site infections must meet the following three criteria :*** • Occur within 30 days of procedure (or one year in the case of implants) • Are related to the procedure • Involve deep soft tissues, such as the fascia and muscles. ***Plus*** ***At least one of the following criteria:*** • Purulent drainage from the incision but not from the organ/space of the surgical site • A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms • Fever (>38°C), localised pain or tenderness • Unless the culture is negative • An abscess or other evidence of infection involving the incision is found on direct examination or by histopathologic or radiological examination. • Diagnosis of a deep incisional SSI by a surgeon or attending physician.

(Quinn et al., 2004).

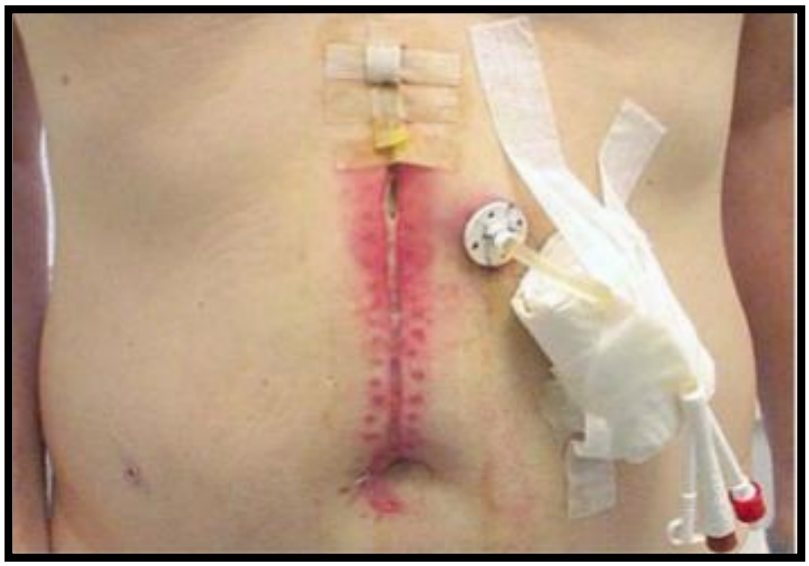

Figure 2: Superficial incisional surgical site infections ***(Quinn et al., 2004)***.

Figure 3 : Deep incisional surgical site infections ***(Quinn et al., 2004)***.

The Classification of Operative Wounds:

A system of classification for operative wounds that is based on the degree of microbial contamination was developed by the ***US National Research Council group in 1964.*** Four wound classes with an increasing risk of SSIs were described: clean, clean-contaminated, contaminated and dirty **[Table 2]**. The simplicity of this system of classification has resulted in it being widely used to predict the rate of infection after surgery ***(Midwood et al., 2004).***

Table 2: Classification of operative wounds based on degree of microbial contamination.

Classification	Criteria
Clean	Elective, not emergency, non-traumatic, primarily closed; no acute inflammation; no break in technique; respiratory, gastrointestinal, biliary and genitourinary tracts not entered.
Clean-contaminated	Urgent or emergency case that is otherwise clean; elective opening of respiratory, gastrointestinal, biliary or genitourinary tract with minimal spillage (e.g. appendectomy) not encountering infected urine or bile; minor technique break.
Contaminated	Non-purulent inflammation; gross spillage from gastrointestinal tract; entry into biliary or genitourinary tract in the presence of infected bile or urine; major break in technique; penetrating trauma <4 hours old; chronic open wounds to be grafted or covered.
Dirty	Purulent inflammation (e.g. abscess); preoperative perforation of respiratory, gastrointestinal, biliary or genitourinary tract; penetrating trauma >4 hours old.

(Midwood et al., 2004) .