

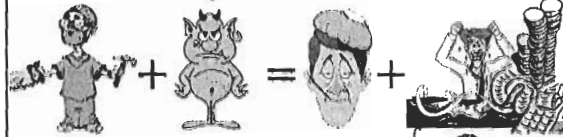
# SURGICAL SITE INFECTIONS IN UROGYNECOLOGY

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Infection in a hospital patient



significantly longer hospitalisation

larger treatment costs

unhappy patient, doctor and director



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## HOSPITAL INFECTION NOMENCLATURE

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- *Hospital – acquired infections*
- *Hospital associated infections*
- *Nosocomial infections*
- *Healthcare-Associated Infection*

## HOSPITAL INFECTION DEFINITION

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An infection acquired in hospital by a patient who was admitted for a reason other than that infection. An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility.

- Infection acquired in hospital
- Did not exist prior to hospital admission
- Nor was it in incubation phase



Health Canada's Practice guidelines and standards for preventing transmission of infection in health care. Can Commun Rep Rep 1999; 25 Suppl 4:1-25.

## SURGICAL SITE INFECTIONS DEFINITIONS



Infections that occur in the site of surgical incision or near it during 30 days of surgical procedure or within a year in case of implants.

*(Surgical Site Infections – SSI)*

### Clinical criteria

that are used to define SSI include:

- pus draining from surgical site
- positive smear culture from surgical site
- diagnosis of infection made by the surgeon
- surgical site that needs revision



## DISEASE THAT IS CAUSED BY THE HOSPITAL STAY

### leads to:

- Prolonged hospital stay (7,3 days)
  - Higher morbidity
  - Mortality
  - Treatment cost
- so it presents an important healthcare problem, which deserves attention, education and close monitoring.



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## SSI does not include:

### COLONISATION

The presence of microorganisms (on the skin, lesion, excretion, secretion) but without clinical signs or symptoms

### INFLAMMATION

The response or reaction of tissue to injury or chemical substance

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## HOSPITAL INFECTIONS TYPES



## TYPES

### Endogenous:

Caused by microorganisms present in physiological flora of the patient

### Egzogenous:

Caused by microorganisms from hospital staff, equipment or environment

## Categories of hospital infections:

Based on anatomical site and frequency:

- *Urinary Tract Infection* - UTI; 80%
- *Surgical Site Infections* - SSI; 33%
- *pneumonia*; 0,5-45%
- *Catheter Related Bacteremia* - CRB;
- **other infections**
  - Skin and soft tissue
  - gastroenteritis, and other enteral infections
  - sinusitis
  - Endometritis and other infections of reproductive tract after delivery

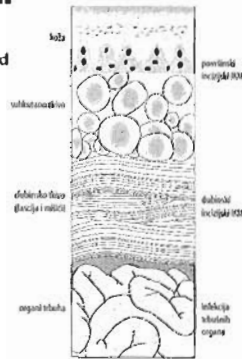
## Surgical Site Infection TYPES



## Surgical Site Infection

Categories:

- 1. **Superficial incisional (involves skin and subcutaneous tissue) 47%**  
gnojni iscedjak, otok, crvenilo, toplina, kultura
- 2. **Deep incisional (deeper tissues, e.g. Muscle and fascia) 23%**  
gnojni iscedjak, otok, crvenilo, toplina, kultura, dehiscijencija, vrućica)
- 3. **Infection of organ or space (organs beneath fascia) 30%**  
gnojni iscedjak iz drena, apscos



Groves RT, Cohen DR, Rosen TC, et al. Surgical site infections (SSI) rates in the United States, 1992-1998: the National Nosocomial Infection Surveillance System. *Am J Infect Contr*. 2001;29(1):21-30-39.

## EPIDEMIOLOGY

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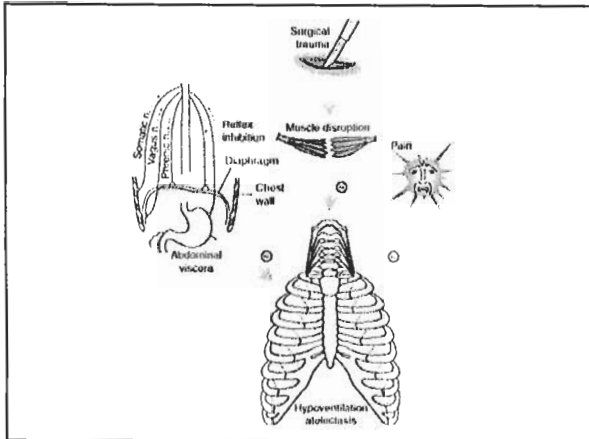


- III in developed countries 5-10 %
- III in developing countries 25 % and more
- **SSI is the most common hospital infection in surgical patients** and comprises for approximately 38 % of all hospital infections
- SSI is the second most common surgical infection
- SSI develops in 2-5 % of patients that undergo a surgical procedure every year
- 1/24 patients that undergo surgical procedures in USA develop SSI
- In about 20 % of intraabdominal procedures performed in the US there are around 500 000 of SSI's yearly

Kořina J, Gorenberg JA. Reducing surgical site infections: a review. *Rev Obstet Gynecol* 2009;3:212-21.  
 Citirajte ovaj rad na mrežnoj stranici: [www.sciencedirect.com](http://www.sciencedirect.com)  
 The Society for Hospital Epidemiology and Infection Control, The Association for Practitioners in Infection Control, The Centers for Disease Control, The Surgical Infection Society, *Surg Infect* 1992;13:599-608.  
 Toran TC, Coyne RP, Martone WS, Jarvis WR, Ernst TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Am J Infect Control* 1992;20:272-4.

Type of procedure	N	SSI (%)	fever (%)	SSI and fever (%)
Caesarean section	2193	35 (2)	30 (1)	7 (0.3)
Larger gynecologic procedures	1839	9 (0.4)	5 (0.3)	4 (0.2)
Total	4032	35 (0.9)	35 (0.9)	11(0.3)

*Saudi Medical Journal* 2000; Vol 21 (3) 270-273



## Around 30% of women operated for gynecological causes develop temperature of 38 or more °C

De la Torre SH, Mandel, L, Goff, BA. Evaluation of postoperative fever: usefulness and cost-effectiveness of routine workup. *Am J Obstet Gynecol* 2003; 188:1642.

High temperature in the first 48 hours following surgical procedure is almost always related to atelectasis (pulmonary collapse, airless alveoles)

Treatment: stimulating spirometry, respiratory tract toilets – blood and urine cultures are not necessary

Dadillo, et al. Optimizing the use of blood cultures in the febrile postoperative patient. *J Am Coll Surg* 2002; 194:477

Schwartz, A, Andrews, SJ, Fleming, J. Prospective analysis of a fever evaluation algorithm after major gynecologic surgery. *Am J Obstet Gynecol* 2001; 184:1056.

## Surgical Site Infection PREDISPOSING FACTORS



## Predisposing factors

- Old age
- Obesity
- Malnutrition
- Smoking
- Diabetes
- Immunocompromizing disease or treatment (oncologic)
- Other infections (it is important to cure vaginosis in gynaecology)
- Nasal carriage of *S.aureus*
- Dermal diseases
- Duration of pre-operative hospitalization
- Shaving (especially day earlier)
- Blood transfusion
- Inadequate antibiotic prophylaxis
- Inadequate skin toilet
- Duration of surgical procedure
- Use of drain
- Inadequate surgical technique (the length of incision, number of stitches, inadequate hemostasis and similar)
- Oxygenation of patient before and during surgery
- Contaminated antiseptics
- Duration of post-operative hospital stay
- Carrier state
- Inadequate equipment sterilization
- Conditions in the operation room (temperature: hypothermia - vasoconstriction, humidity)

## Microorganisms causing post-operative infections in Gynaecology and Obstetrics

- Gram-negative bacilli
- Enterococci
- group B
- Streptococci
- anaerobes

Genitourinary flora is an important source of contamination during surgery

Saudi Medical Journal 2000; Vol 21 (3) 270-273.

Microorganisms	N (%)
<b>Gram positive</b>	
<i>S.aureus</i>	3 (3)
<i>S.epidermidis</i>	13 (14)
<i>Streptococci</i>	6 (6)
<i>Enterococci</i>	19 (20)
<b>Gram negative</b>	
<i>Enterobacter</i>	4 (4)
<i>Klebsiella</i>	14 (15)
<i>E.coli</i>	11 (12)
<i>Proteus</i>	9 (10)
<i>Paeruginosa</i>	8 (8.5)
<i>Acinetobacter</i>	1 (1)
<i>Gram negative bacilli</i>	1 (1)
<i>Candida</i>	5 (5)



## PROCEDURE



## Surgical Site Infection - procedure

- OPEN
- DRAIN
- EXPLORE
- IRIGATE (PHYSIOLOGICAL SOLUTION - ISOTONIC)
- REFRESH THE EDGES (DEBRIDMENT)

(knife, scissors, devitalized tissue promotes infection and slows down the healing process)

Sterile swab (tupfer) wettened with physiological solution should be changed 3 times a day until granulations form  
Antibiotic according to antibiogram

Fernandez, R, Griffiths, R, Ussia, C. Water for wound cleansing. Cochrane Database Syst Rev 2002; C: D001861.

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## Antiseptics:

- povidone iodide
- hydrogen peroxide
- sodium hypochlorite

are not appropriate because of their toxicity to fibroblasts

Ovington, LG. Hanging wet-to-dry dressings out to dry. Home Health Nurse 2001; 19:477.

## PREVENTION

- HI can be reduced (prevented) for 35 %
- SSI can be reduced for 20% (monitoring, control, feedback)

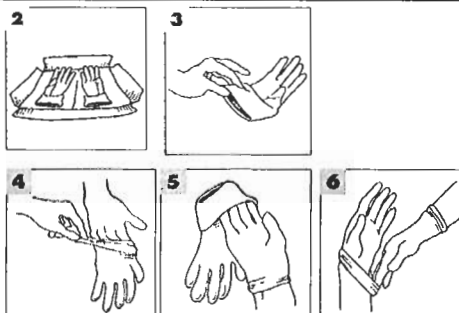
Reference: Harbarth et al.

### Ignaz Philipp Semmelweis (1818. – 1865.)

One of the pioneers in the field of hospital infections was dr. Semmelweis in 1850, who assumed that puerperal fever was in fact transmitted from the hands of doctors that would come to maternity ward after performing obductions and would not properly wash their hands previously.

Mortality that was then 8,3 % was reduced to 2,3 % introducing the simple measure of obligatory hand washing before and after clinical exam.

- Hungarian physician now known as an early pioneer of antiseptic procedures
- working in Vienna General Hospital's First Obstetrical Clinic, where doctors' wards had three times the mortality of midwives' w
- He published a book of his findings in *Etiology, Concept and Prophylaxis of Childbed Fever*.



Hand-rubbing with aqueous alcoholic solution may be as effective as traditional hand-scrubbing with antiseptic soap in preventing surgical site infections

Taylor, J, Swarbrick, S, Seaton, J. Surgical hand disinfectants reduce surgical site infections. Cochrane Database Syst Rev 2008; CD004733.

### We can affect many risk factors:

- Quit smoking 30 days prior to surgery
- Maximally reduce the preoperative hospital stay (hospitalisation should not be the day before, let alone more days)
- Avoid depilation, especially shaving on the day before
- Not administering blood in the days preceding surgery
- Urinary catheters should be used only when necessary
- Normoglycaemia
- Antibiotic prophylaxis

### How to reduce the incidence of SSI?

#### • PREOPERATIVE MEASURES

#### • INTRAOPERATIVE MEASURES

#### • POSTOPERATIVE MEASURES

### How to reduce the incidence of SSI?

#### PREOPERATIVE MEASURES

- Screen for vaginosis and treat it, at least a month before surgery
- Antibiotic prophylaxis before surgery or after umbilical cord clamping
- Hair cutting with electrical device (with a sterile head) immediately prior the surgery
- Surgical hand-washing (3-5 mins for the first time, and in-between procedures dry each hand with a separate sterile towel)
- Sterile protection in the operation room
- Toilet of abdomen and cervix with vagina (alcoholic antiseptics increase the risk of burn during diathermy)

### How to reduce the incidence SSI?

#### INTRAOPERATIVE MEASURES

• Surgeon's skill – the main factor (cutting, stitches, hemostasis, duration, peritonization...)

• Duration of operation

• Drains should not be used as a substitute for well performed hemostasis (closed system – not an open one by any means)

• Urinary catheter should be removed after surgery!



### How to reduce the incidence of SSI?

#### POSTOPERATIVE MEASURES

- SHORTER POSTOPERATIVE HOSPITAL STAY
- ANTIBIOTICS SHOULD NOT BE GIVEN FOR LONGER THAN 24 HOURS

Traditional hair removal from the incision site: shaving (with a knife, razor blade...), cutting (el. device), depilation (cream ...)

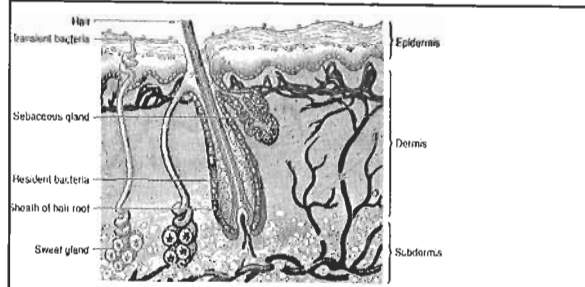


Preoperative hair removal is an important predisposing factor for SSI because it causes skin abrasions and micro-injuries of the tissue which are good media for colonisation with pathogens and are firmly prohibited by the CDC

Risk is even higher if shaving is performed the day before surgery.

Alexander JW Fischer JE Boyajian M Palmquist J Morris MJ. The influence of hair removal methods on wound infections. Archives of Surgery 1983;118:347-352.  
Cran-Brown CM. Pre-operative skin depilation and its effect on postoperative wound infections. Journal of the Royal College of Surgeons of Edinburgh 1981;26:218-241.  
Horgan MA Platt JH. Shaving of the scalp may increase the rate of infection in CSF shunt surgery. Paediatric Neurology 1997;26:180-184.  
Mangram AJ Horan TC Pearson ML Silver LC Jarvis WR. Guideline for prevention of surgical site infection: Hospital Infection Control Advisory Committee. American Journal of Infectious Control 1999;27(2):97-134.

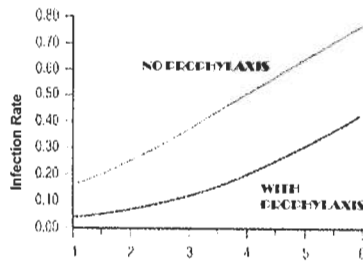
Hair removal should be avoided unless necessary, and if necessary, it should be performed by electrical device (cutting) or even better, with a depilation cream, but immediately before the surgical procedure.



Over 20 % of bacteria cannot be affected by skin toilet, because they are placed in hair follicles or sebaceous glands (*S.aureus*). Surgical incision through these structures can promote the infection to deeper layers.

Selwyn, S, Ellis, H. Skin bacteria and skin disinfection reconsidered. Br Med J 1972; 1:136.

### ANTIBIOTIC PROPHYLAXIS



### Indications for antibiotic prophylaxis in Gynaecology and Obstetrics:

- *Sectio caesarea*
- *Exploreatio seu lysis uteri manualis*
- *Hysterectomia*
- *Adnexectomia*
- *RVP (B streptococcus)*

LPSC – antibiotic prophylaxis is not required

### Antibiotic prophylaxis

- Which antibiotic
- What dose
- When to start
- How to administer
- For how long

### Prophylaxis

Antibiotics of choice for prophylaxis

Cephalosporines: cefazoline 1-2 g,  
cefoxitine 1-2 g,  
cefotetane 1-2 g

First generation cephalosporine  
30 (30-60) minutes before  
incision

1. Hansen, A, Hansen, V, Møller, BR. A prospective randomised double-blind trial of cefotaxime versus no treatment for abdominal surgery. Eur J Obstet Gynaecol Reprod Biol 1992; 47:235.

Bratler DW et al. Clin Infect Dis 2004;38:1706-15.

Cephalosporines: cefazoline 1 - 2 g, cefoxitine 1 - 2 g, cefotetan 1 - 2 g present the treatment of choice for SSI prophylaxis in gynaecologic surgery because of their wide antimicrobial spectrum, long half-life, price and rare allergic reactions and other side-effects.

**BETA-LACTAM ALLERGY:**

Clindamycin (600 - 900 mg) + gentamicin (1.5 mg/kg)  
Clindamycin (600 - 900 mg) + fluoroquinolone (ciprofloxacin 400 mg ili levofloxacin 750 mg or moxifloxacin 400 mg)

Metronidazole (0.5 - 1 g) + gentamicin or fluoroquinolon

Bratzler, DW, Hunt, DR. The surgical infection prevention and surgical care improvement projects: national initiatives to improve outcomes for patients having surgery. Clin Infect Dis 2006; 43:322.

Prophylactic antibiotics should be administered intravenously 30 - 45 minutes prior to surgery, and should not be given for longer than 24 hours

The dose of antibiotic depends on patient's weight (e.g. Patient that weighs less than 70 kg needs 1 g of Cefazoline and the one that weighs more needs 2g)

Additional intraoperative dose should be given if the operation lasts for longer than 3 hours or larger bleeding is present.

Cephalosporines of the third and fourth generation are not advised, because of their high cost, and some of them show lesser effect on staphylococci in comparison to the first generation.

Bratzler DW et al. Clin Infect Dis 2004;38:1706-15.

**If the operation lasts longer than 6 hours or the blood loss is larger than 1500 ml additional dose should be administered.**

Gyssens 1999; Polk and Christmas 2000.

## **INCISION OF SUBCUTANEOUS TISSUE**

### **KNIFE OR DIATHERMY**

Animal studies show increased risk of infection with the use of diathermy, but human studies are controversial.

Rappaport, WD, Hunter, GC, Allen, R, et al. Effect of electrocautery on wound healing in murine laparotomy incisions. Am J Surg 1995; 160: 611.

Well designed studies proved no benefit in preventing SSI by complete body disinfection by preoperative showering or bathing in antiseptics.

Chee PL, Food R. The epidemiology of wound infection. A 10 year prospective study of 62,299 wounds. Surg Clin North Am 1980; 60:27.  
Hick JJ, Emerson JJ, Gardner AH. A placebo-controlled trial of the effect of two preoperative baths or showers with chlorhexidine detergent on postoperative wound infection rates. J Hosp Infect 1992; 19:145.  
Bates ML, Henschel AH, Keller SP. Effect of chlorhexidine-containing detergent, non-medicated soap or soap and the influence of normalizer on bacterial pathogen counts. J Hosp Infect 1998; 11:226.

Meta-analysis (6 researches) performed on 10,007 patients proved the same)

Winters T, Shauer S. Preoperative bathing or showering with skin antiseptics to prevent surgical site infections. Cochrane Database Syst Rev 2006; CD004985.

## **CONCLUSIONS**

- Surgeon should always bare SSI in mind, take all the measures to prevent it and react promptly to a possible postoperative infection.
- Body temperature and surgical site should be closely monitored, as well as diuresis and laboratory exams when necessary.