Surgical Site Infection:

Solutions to a Continuing Problem

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Objectives

- Provide overview of surgical site infections (SSI).
- Discuss SSI prevention strategies- Antibiotics Prophylaxis.
- Surveillance of SSI.

Background: Impact

A. Burden-US

- (17% of all HAI; second to UTI)
- 2%-5% of patients undergoing inpatient surgery

B. Mortality

- 3 % mortality
- 2-11 times higher risk of death
- 75% of deaths among patients with SSI are directly attributable to SSI

C. Morbidity

- long-term disabilities

Anderson DJ, etal. Strategies to prevent surgical site infections in acute care hospitals. Infect Control Hosp Epidemiol 2008;29:S51-S61 for individual references

Background: Impact

Length of Hospital Stay

- ~7-10 additional postoperative hospital days

Cost

- $3000-$29,000/SSI depending on procedure & pathogen
- Up to $10 billion annually
- **Most estimates are based on <u>inpatient costs</u> at time of index operation and do not account for the additional costs of rehospitalization, post-discharge outpatient expenses, and long term disabilities**

Anderson DJ, etal. Strategies to prevent surgical site infections in acute care hospitals. Infect Control Hosp Epidemiol 2008;29:S51-S61 for individual references

WHAT'S THE PROBLEM?

Patients develop infections when **bacteria get into incisions made during surgery**. These affect patients in both...

LOW- AND MIDDLE-INCOME COUNTRIES

More than 1 in 10 people who have surgery in low- and middle-income countries (LMICs) **get surgical site infections (SSIs)**

People's risk of SSI in LMICs is **3 TO 5 TIMES HIGHER** than in high-income countries

Up to **1 in 5 women in Africa** who deliver their baby by caesarean section get a **wound infection**

HIGH-INCOME COUNTRIES

In Europe, SSIs affect more than **500 000 PEOPLE** per year costing up to **€ 19 BILLION**

Around 1% of people who have surgery **in the USA get an SSI**

In the USA, SSIs contribute to patients spending more than **400 000 extra days** in hospital, costing **US$ 10 BILLION** per year

SSIs can be caused by bacteria that are **resistant to commonly-used antibiotics**

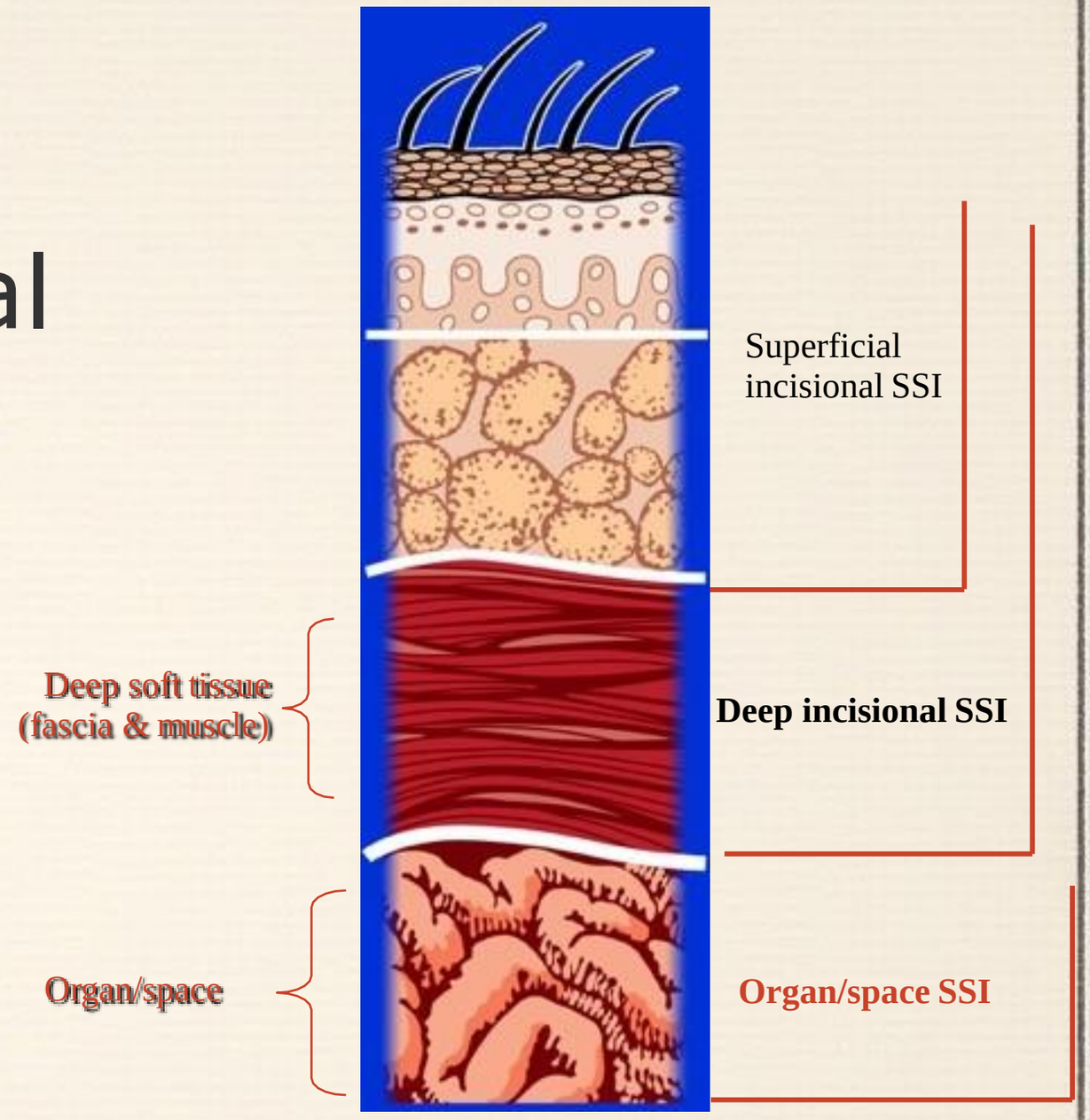
SSIs threaten the lives of millions of surgical patients **each year** and contribute to the spread of **antibiotic resistance**

I.Up to 60% of SSIs have been estimated to be preventable by using evidence- based guidelines.

II. The Actual rates of SSI for most operations remain poorly defined

Types of SSIs

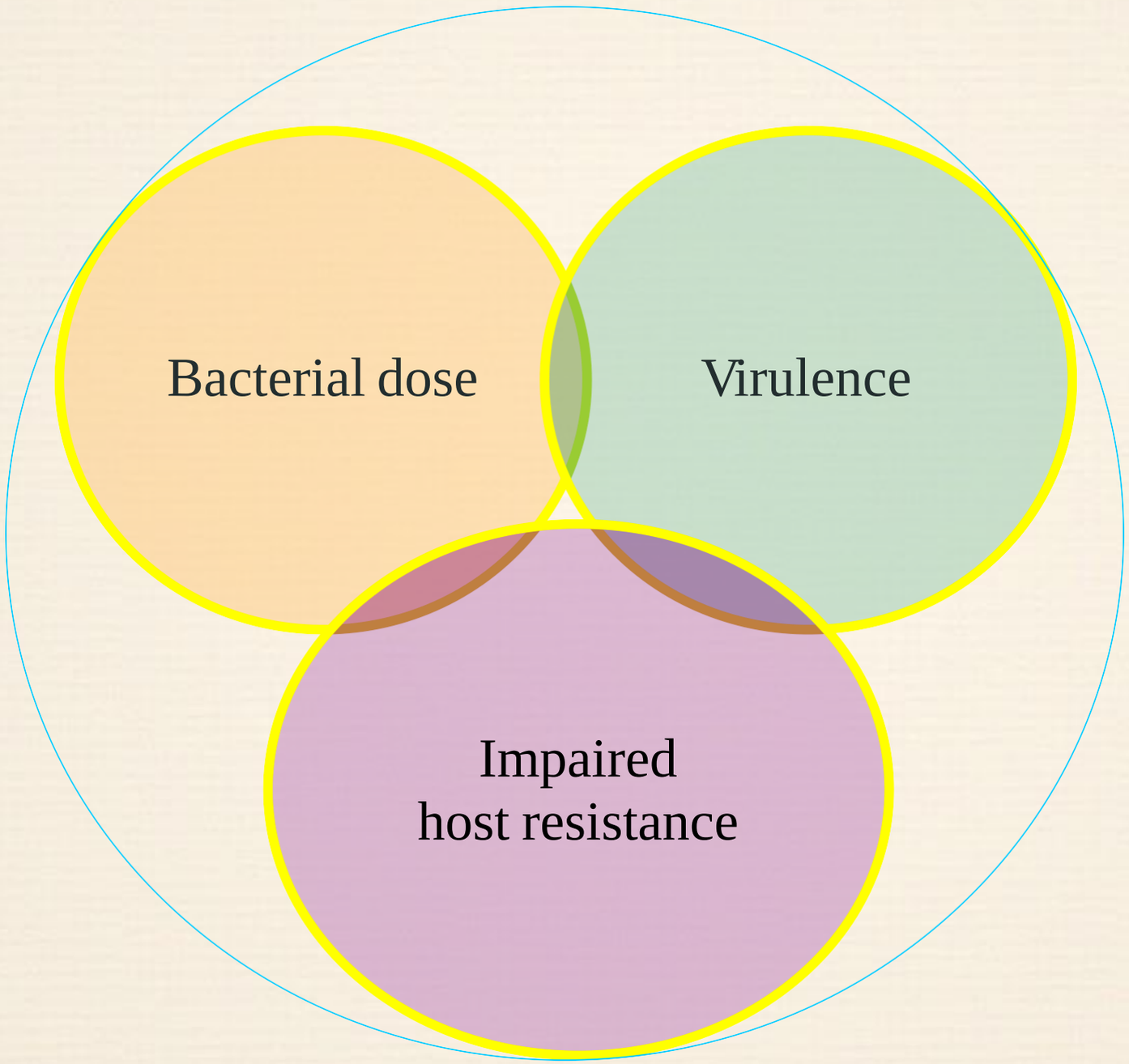
- Superficial incisional
- Deep incisional
- Organ or body space



Mangram AJ et al. *Infect Control Hosp Epidemiol*. 1999;20:250-278.

Wound classification based on estimation of bacterial density, contamination and risk of subsequent infections		
Surgical procedure	**Definition**	**Expected infection rate**
Clean	• Non-traumatic, uninfected operative wounds in which no inflammation is encountered; there is no break in technique; and the respiratory, alimentary, or genitourinary tracts or the oropharyngeal cavities are not entered. • In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. • Non-penetrating (blunt) trauma should be included in this category if they meet the criteria.	**1–3%**
Clean-contaminated	• Operation in which the respiratory, alimentary, or genitourinary tracts are entered under controlled conditions and without unusual contamination Specifically, • 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	**8–10%**
Contaminated	Operation associated with: ◆Open, fresh trauma wounds ◆Major breaks in a sterile technique or gross spillage from the gastrointestinal tract ◆ Acute, non-purulent inflammation.	**15–20%**
Dirty and infected	• Operation involving old trauma wounds with retained devitalized tissue, foreign bodies, or faecal contamination, and those with existing infection. • This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.	**25–40%**

Risk of Infection



Pathogenesis of SSI

- Relationship equation=

<u>Dose of bacterial contamination x Virulence</u>

Resistance of host

II. Pathogen Sources

A.Endogenous (Patient flora)

1.skin
2.mucous membranes 3.GI tract

B.Exogenous

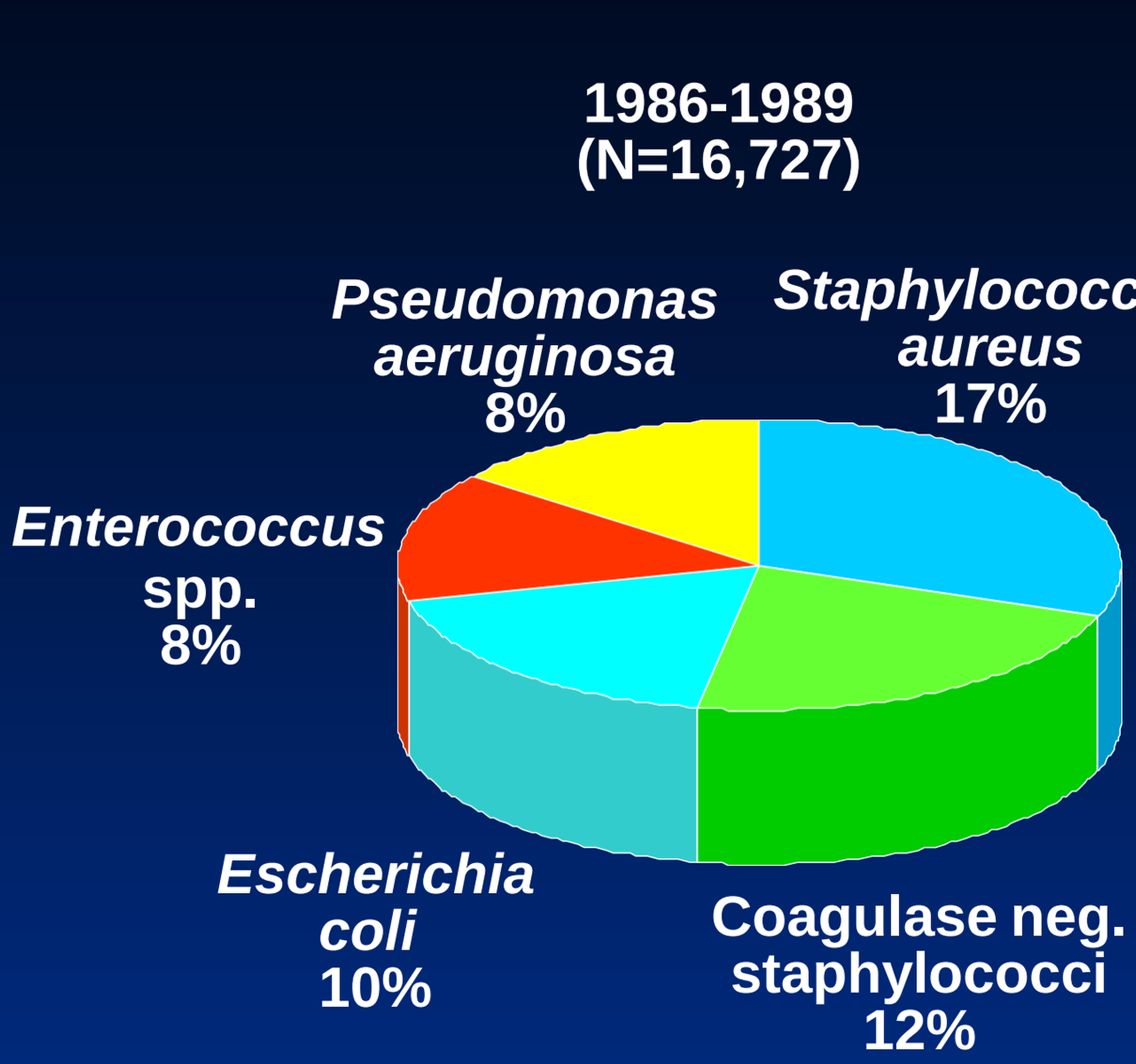
1.Surgical Personnel (surgeon and team)
2.Soiled attire
3.Breaks in aseptic technique
4.Inadequate hand hygiene
5.Operation room physical environment and ventilation
6.Tools & equipment

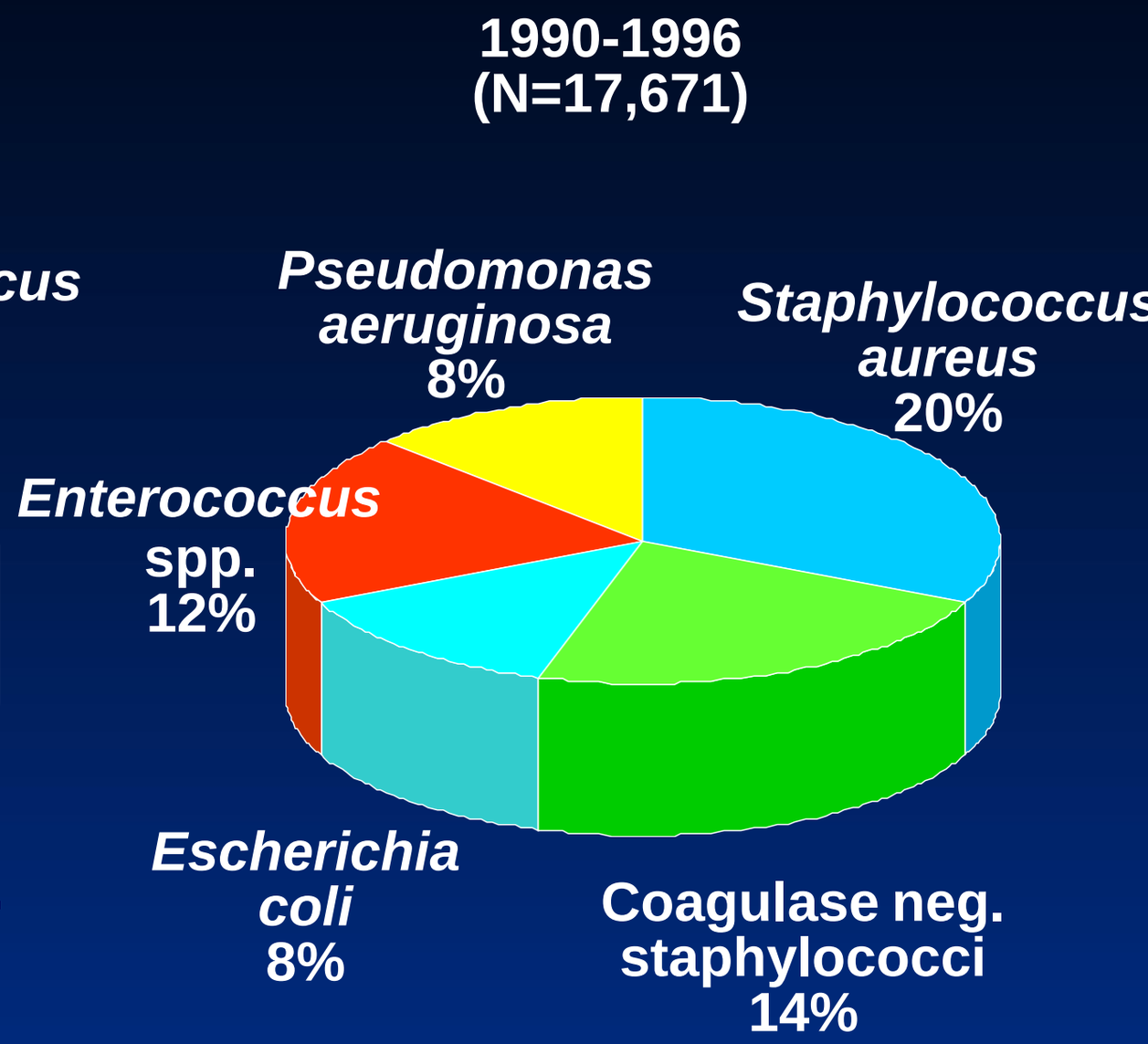
Endogenous at Site of Incision

20% of skin flora reside in skin appendages
- sebaceous glands
- sweat glands
- hair follicles

Obtained from google-images for educational purposes under Fair Dealing exemption

Microbiology of SSIs





CDC

Determinants and Risk Factors

- **Whether a wound infection occurs after surgery depends on a complex interaction between the following:-**

(1) Patient-related factors

(2) Procedure- related factors

(3) Pathogen factors (e.g., tissue adherence and invasion)

(4) Preventive measures (e.g., perioperative anti-microbial prophylaxis).

Selected factors associated with an increased risk for SSI

Patient Factors
-Diabetes mellitus/perioperative hyperglycemia
-Smoking
-Remote infection at time of surgery
-Obesity
-Low preoperative serum albumin
-Malnutrition
-Concurrent steroid use
-Prolonged preoperative stay
-Prior site irradiation
-Colonization with *Staphylococcus aureus*
Procedural factors
-Shaving of site
-Use of razor for hair removal
-Improper preoperative skin preparation / Use of non-alcohol-based skin preparation
-Improper antimicrobial prophylaxis (wrong drug, wrong dose, wrong time of administration)
-Failure to timely redoes antibiotics in prolonged procedures
-Inadequate OR ventilation
-Increased OR traffic
-Perioperative hypothermia
-Perioperative hypoxia
Proceduralist Factors
-Surgical technique (poor hemostasis, tissue trauma)
-Lapses in sterile technique and asepsis
-Glove micropenetrations
-Behavioral factors / proceduralist impairment

PREVENTION OF SURGICAL SITE INFECTIONS

- Given the presence of many risk factors noted earlier that are largely unalterable, it is **unlikely** that all SSIs are preventable.

- Interventions exist to reduce SSI risk can be grouped into two major categories:-

1. Reduce bacterial inoculation into the wound site.
2. Improving host containment and elimination of bacteria that have circumvented the front line of defense and have been inoculated into the wound.

- **Resistance of host**
- **Dose of bacterial contamination x Virulence**

Maneuvers to Diminish Inoculation of Bacteria into Wound	Maneuvers to Improve Host Containment of Contaminating Bacteria
Preoperative Factors	**Preoperative Factors**
• Avoid preoperative antibiotic use (excluding surgical prophylaxis)	
• Minimize preoperative hospitalization	• Resolve malnutrition or obesity
• Treat remote sites of infection before surgery	• Discontinue tobacco use for at least 30 days preoperatively
• Avoid shaving or razor use at operative site	• Maximize diabetes control
• Delay hair removal at operative site until time of surgery and remove hair (only if necessary) with electric **clippers or depilatories**	**Intraoperative and Postoperative Factors**
• Ensure timely administration (including appropriate dose) of prophylactic antibiotics	• Minimize dead space, devitalized tissue, and hematomas
• Consider elimination of staphylococcus aureus nasal carriage via decolonization techniques	• Consider use of supplemental oxygen therapy
• Use standardized checklist for implementation at preprocedural time-out	• Maintain perioperative normothermia (core temperature at or above 36.0°C)
Intraoperative and Postoperative Factors	• Maintain adequate hydration and nutrition
• Carefully prepare patient's skin with antiseptic + alcohol-based skin preparation	• Identify and minimize hyperglycemia (through 48 hours postprocedure)
• Rigorously adhere to aseptic techniques	
• Isolate clean from contaminated surgical fields (e.g, reglove and change instruments used to harvest saphenous vein before working in intrathoracic field)	
• Maintain high flow of filtered air	
• Redoes prophylactic antibiotics in prolonged procedures	
• Minimize operative personnel traffic	
• Minimize immediate use team sterilization of surgical instruments	
• Minimize use of drains	
• Bring drains, if use, through a separate stab wound	

WHAT'S THE SOLUTION?

A range of precautions - **before, during and after surgery** - reduces the risk of infection

BEFORE SURGERY

- Ensure patients bathe or shower
- Do not shave patients
- Only use antibiotics when recommended
- Use chlorexidine alcohol-based antiseptic solutions to prepare skin
- Surgical scrub technique: hand wash or alcohol-based handrub

DURING SURGERY

- Limit the number of people and doors being opened
- Ensure all surgical equipment is sterile and maintain asepsis throughout surgery

AFTER SURGERY

- Do not continue antibiotics to prevent infection – **this is unnecessary and contributes to the spread of antibiotic resistance**
- Check wounds for infection and use standard dressings on primary wounds

ORIGINAL ARTICLE

Chlorhexidine–Alcohol versus Povidone–Iodine for Surgical-Site Antisepsis

Rabih O. Darouiche, M.D., Matthew J. Wall, Jr., M.D., Kamal M.F. Itani, M.D., Mary F. Otterson, M.D., Alexandra L. Webb, M.D., Matthew M. Carrick, M.D., Harold J. Miller, M.D., Samir S. Awad, M.D., Cynthia T. Crosby, B.S., Michael C. Mosier, Ph.D., Atef AlSharif, M.D., and David H. Berger, M.D.

Table 2. Proportion of Patients with Surgical-Site Infection, According to Type of Infection (Intention-to-Treat Population).

Type of Infection	Chlorhexidine–Alcohol (N=409)	Povidone–Iodine (N=440)	Relative Risk (95% CI)*	P Value†
	no. (%)			
Any surgical-site infection	39 (9.5)	71 (16.1)	0.59 (0.41–0.85)	0.004
Superficial incisional infection	17 (4.2)	38 (8.6)	0.48 (0.28–0.84)	0.008
Deep incisional infection	4 (1.0)	13 (3.0)	0.33 (0.11–1.01)	0.05
Organ-space infection	18 (4.4)	20 (4.5)	0.97 (0.52–1.80)	>0.99
Sepsis from surgical-site infection	11 (2.7)	19 (4.3)	0.62 (0.30–1.29)	0.26

Darouiche *NEJM* 2010

Surveillance

- Systematic collection, analysis, and interpretation of data on specific infections and disease, followed by dissemination of that information to those who can improve the outcomes.

- Its is the foundation for organizing, implementing, and maintaining an effective IPAC programme in the health care facility.

- **'If you don't measure it, you cannot improve it'. "Lord Kelvin"**

Surgical Site Infection Surveillance

- A key component in the prevention of SSIs
- Regularly detect and monitor rates of procedure-specific infections
- Define the changing ecology of resistant pathogens that cause surgical infections
- Comparisons of infection rates to national benchmarks

End result

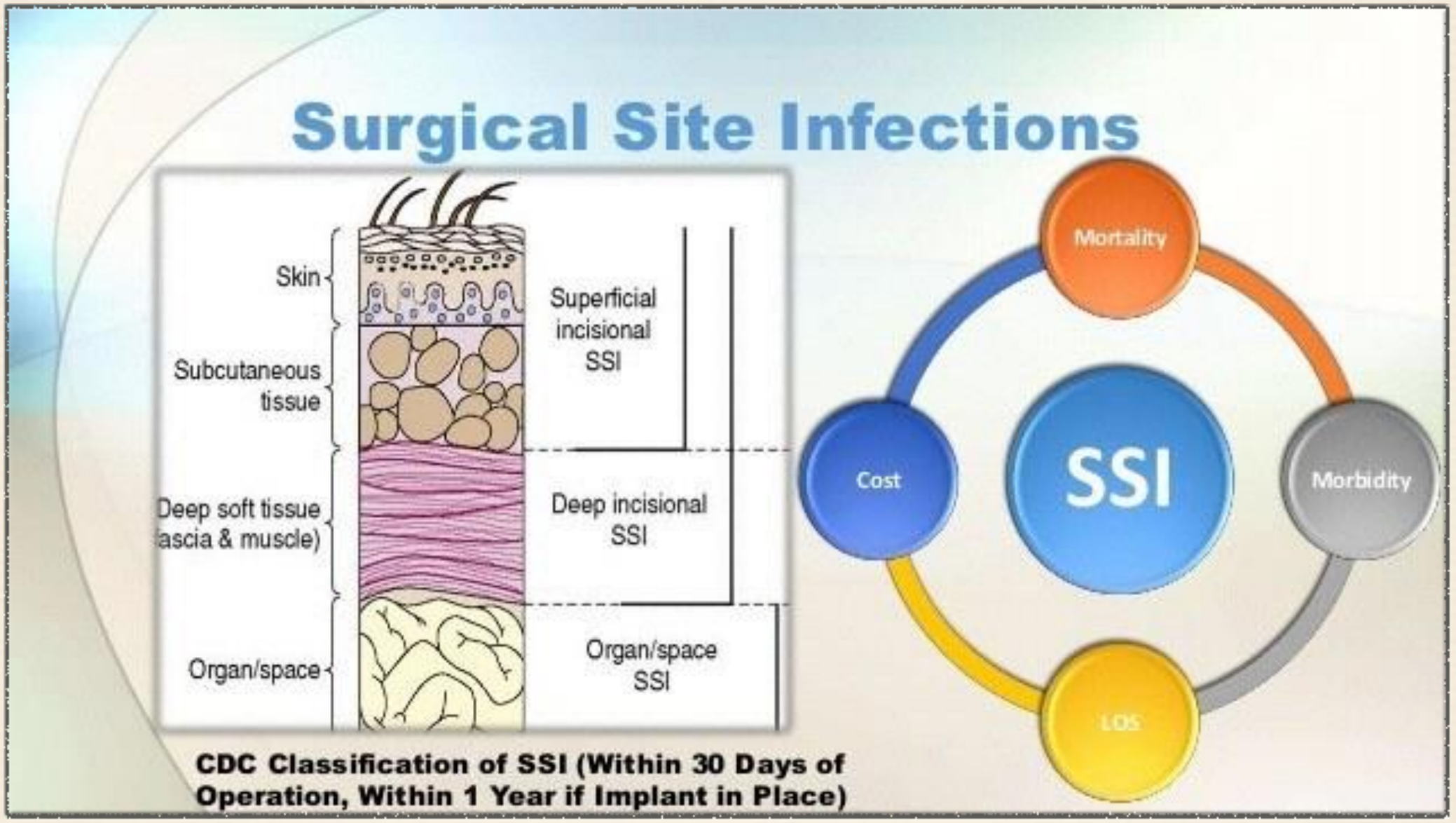

Surgical Site Infections
Skin
Subcutaneous tissue
Deep soft tissue
Organ/space
Superficial incisional SSI
Deep incisional SSI
Organ/space SSI
Mortality
Cost
SSI
Morbidity
LOS
CDC Classification of SSI (Within 30 Days of Operation, Within 1 Year if Implant in Place)

Table 1. Surgical Site Infection Criteria

Criterion	Surgical Site Infection (SSI)
	Superficial incisional SSI Must meet the following criteria:
	Infection occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date) **AND** involves only skin and subcutaneous tissue of the incision **AND** patient has at least ***one*** of the following: a. purulent drainage from the superficial incision. b. organisms identified from an aseptically-obtained specimen from the superficial incision or subcutaneous tissue by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST). c. superficial incision that is deliberately opened by a surgeon, attending physician** or other designee and culture or non-culture based testing is not performed. **AND** patient has at least ***one*** of the following signs or symptoms: pain or tenderness; localized swelling; erythema; or heat. A culture or non-culture based test that has a negative finding does not meet this criterion. d. diagnosis of a superficial incisional SSI by the surgeon or attending physician** or other designee.

Reporting Instructions for Superficial SSI	**<u>The following do not qualify as criteria for meeting the NHSN definition of superficial SSI:</u>** • Diagnosis/treatment of cellulitis (redness/warmth/swelling), by itself, does not meet criterion d for superficial incisional SSI. An incision that is draining or that has organisms identified by culture or non-culture based testing is not considered a cellulitis. • A stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration) • A localized stab wound or pin site infection. While it would be considered either a skin (SKIN) or soft tissue (ST) infection, depending on its depth, it is not reportable under this module. **Note:** A laparoscopic trocar site for an NHSN operative procedure is not considered a stab wound. • Circumcision is not an NHSN operative procedure. An infected circumcision site in newborns is classified as CIRC and is not reportable under this module. • An infected burn wound is classified as BURN and is not reportable under this module.

Criterion	Surgical Site Infection (SSI)
	Deep incisional SSI Must meet the following criteria: Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 2 **AND** involves deep soft tissues of the incision (e.g., fascial and muscle layers) **AND** patient has at least ***one*** of the following: a. purulent drainage from the deep incision. b. a deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, attending physician** or other designee and organism is identified by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST) or culture or non-culture based microbiologic testing method is not performed **AND** patient has at least ***one*** of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture or non-culture based test that has a negative finding does not meet this criterion. c. an abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test

	Organ/Space SSI Must meet the following criteria: Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 2
	AND infection involves any part of the body deeper than the fascial/muscle layers, that is opened or manipulated during the operative procedure **AND** patient has at least ***one*** of the following: a. purulent drainage from a drain that is placed into the organ/space (e.g., closed suction drainage system, open drain, T-tube drain, CT guided drainage) b. organisms are identified from an aseptically-obtained fluid or tissue in the organ/space by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST). c. an abscess or other evidence of infection involving the organ/space that is detected on gross anatomical or histopathologic exam, or imaging test

Perioperative Antimicrobial Prophylaxis

- Administration of antibiotics in patients with no signs of infection to reduce the risk of (SSIs) and related morbidity/mortality.

- Should cover the predominant flora of the operative site

- Effectiveness of antibiotics most dependent upon having tissue levels of the antibiotic at time of initial skin incision. **In prolonged surgery, antibiotics may need to be re-dosed.**

- **There has been no convincing data to document efficacy for post-operative administration of antibiotics as a prophylactic strategy.**

SURGICAL ANTIMICROBIAL PROPHYLAXIS

• *ftey principles:*

- Provide "right" drug: thus, target flora at surgical site, penetrate surgical incision site, and achieve minimal adverse events.

- Provide "right" dose at the "right" time: provide dose in the window before incision to allow penetration into tissues; consider higher dose for obese patients; Redose in prolonged procedures.

- Provide "right" duration of drug: stop once incision closed or by 24 hours at the latest.

- **Prophylaxis targeting resistant organisms may be warranted in select situations (e.g., known colonization with organism)…. Role of ID Physician**

SSI might happen as a result of:-

Inappropriate choice (procedure specific).

Improper timing (pre-incision dose) or inadequate dose based on body mass index, procedures >3h, or increased blood loss.

Evidence based standards and guidelines

- All antibiotics should be administered IV between 30–60 min before incision; 2 hours (120 min) are allowed for the administration of IV vancomycin and IV fluoroquinolones.

- NEVER "split" doses: give the full dose at one time.

- Vancomycin should not routinely be used for antimicrobial prophylaxis and should be reserved for prophylaxis on patients with MRSA.

- Repeat dose of antibiotics should be given for the operations when {the duration of operation exceeds 3 h OR in the case of massive hemorrhage (>1.5-2 L of blood is lost in an adult)}.

- Do not give prophylactic antibiotics for more than 24 hour after surgery. —>For Cardiac Procedures discontinue within 48 hour.

- Patient who are on treatment courses of antibiotics at the time of surgery may not require additional prophylactic antibiotics.

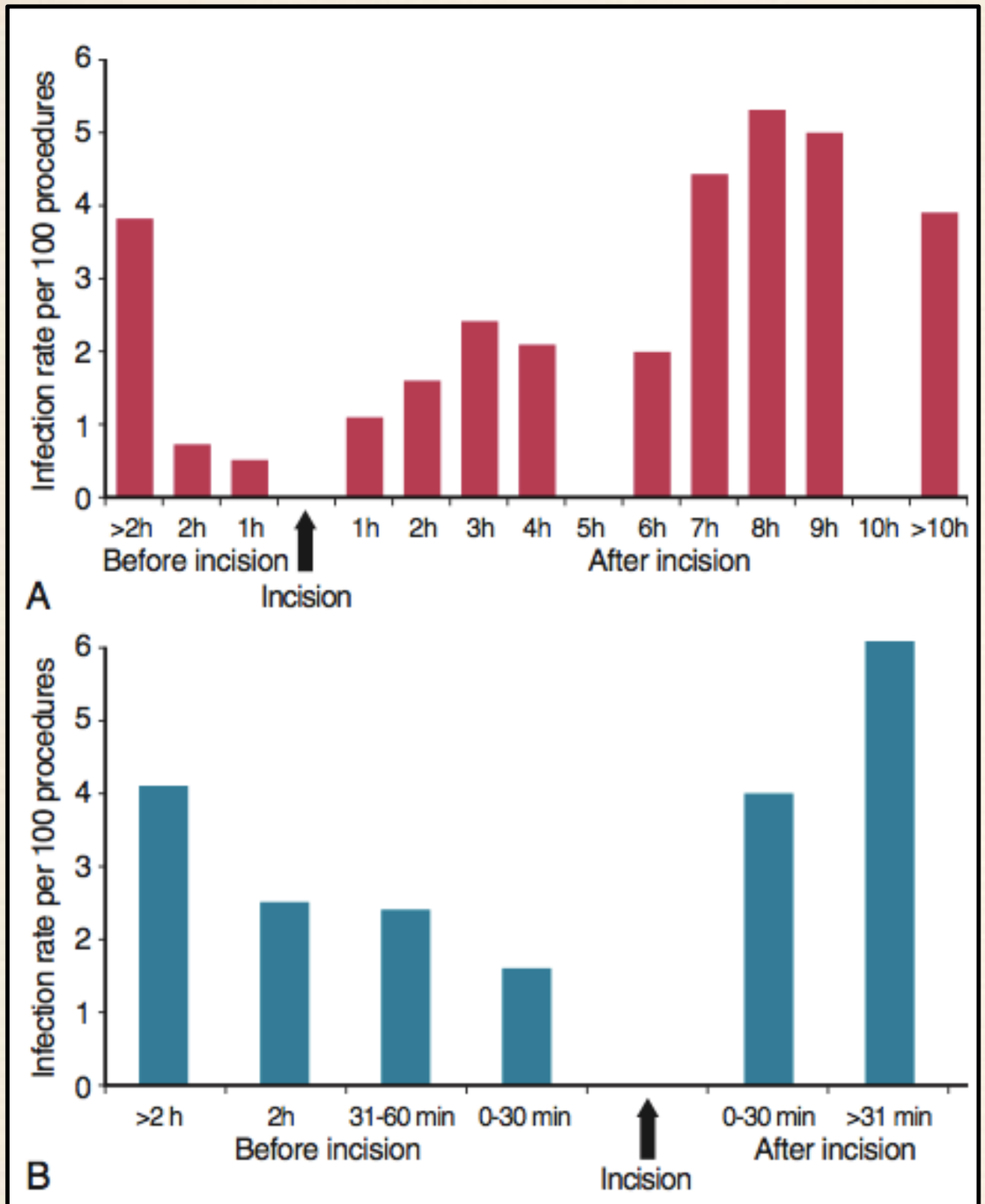


FIGURE 318-5 **Timing of administration and infection rate.** Rela-

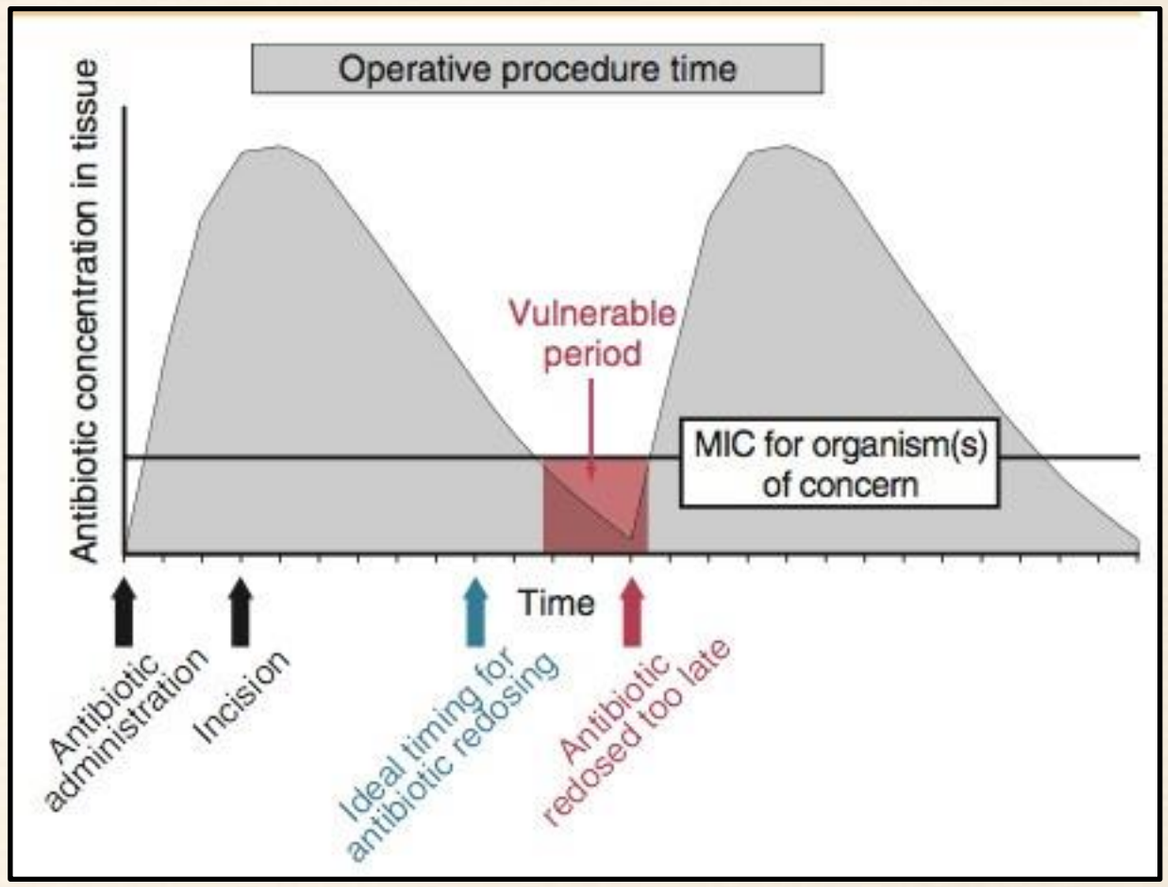


TABLE 318-5 Typical Microbiologic Flora and Recommended Antimicrobial Drugs for Surgical Prophylaxis for Commonly Performed Surgical Procedures in Adults

PROCEDURE	TYPICAL MICROBIOLOGIC FLORA*	RECOMMENDED ANTIMICROBIALS
Cardiac	*Staphylococcus aureus*, CoNS, (GNR less common)	
Coronary artery bypass		Cefazolin, cefuroxime
Cardiac device insertion (e.g., pacemaker)		Cefazolin, cefuroxime
Ventricular assist device placement		Cefazolin, cefuroxime
Thoracic	*S. aureus*, CoNS	Cefazolin, ampicillin-sulbactam
Gastroduodenal (involving entry into lumen of gastrointestinal tract or without entry into lumen in high-risk patients)	Coliform GNR, streptococci, staphylococci	Cefazolin
Biliary	GNR (less commonly, anaerobes and enterococci)	
Open		Cefazolin, cefoxitin, cefotetan, ceftriaxone, ampicillin-sulbactam
Laparoscopic, high risk		Cefazolin, cefoxitin, cefotetan, ceftriaxone, ampicillin-sulbactam
Appendectomy	GNR, anaerobes	Cefoxitin, cefotetan, cefazolin + metronidazole
Colorectal	GNR, anaerobes (especially *Bacteroides fragilis* and *Escherichia coli*)	Cefazolin + metronidazole, cefoxitin, cefotetan, ampicillin-sulbactam, ceftriaxone + metronidazole, ertapenem; IV agent used along with mechanical bowel preparation and oral antimicrobial (neomycin sulfate + erythromycin base or neomycin sulfate + metronidazole)
Neurosurgery (craniotomy, CSF shunting, intrathecal pump implantation)	*S. aureus*, CoNS	Cefazolin
Cesarean section	*S. aureus*, streptococci, enterococci, vaginal anaerobes	Cefazolin
Hysterectomy (vaginal or abdominal)	*S. aureus*, streptococci, enterococci, vaginal anaerobes	Cefazolin, cefoxitin, cefotetan, ampicillin-sulbactam
Orthopedic	*S. aureus*, CoNS, streptococci, GNR (*Propionibacterium* spp. in shoulder procedures)	
Clean procedure of hand, knee, foot without implantation of foreign materials		None
Spinal procedures, hip fracture repair, internal fixation procedure, total joint arthroplasty		Cefazolin
Urologic	GNR *(E. coli),* rarely enterococci	
Lower tract instrumentation (includes transrectal prostate biopsy)		Fluoroquinolone, trimethoprim-sulfamethoxazole, cefazolin
Clean procedure (with or without entry into urinary tract		Cefazolin (single-dose aminoglycoside may be added for placement of prosthetic material)
Clean contaminated		Cefazolin + metronidazole, cefoxitin
Vascular	*S. aureus*, CoNS	Cefazolin

مستشفى جمعية المقاصد الخيرية الإسلامية – القدس

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PREOPERATIVE ANTIBIOTICS PROPHYLAXIS PROTOCOL

KEEP IT CLEAN

Preventing Surgical Site Infections

DR RABEE ADWAN. 2016

Less Is More... (Excess prophylactic antibiotic use either through poor selection or continuation postoperatively is a major driver of increased multidrug-resistant organism isolates)...

	Operation type	Pathogens		Primary antibiotic prophylaxis recommended	Alternative	Duration of prophylaxis	Redoes interval
Thoracic Surgery	Thoracic (noncardiac) procedures: lobecotomy, pneumonectomy, lung resection, thoractomy	*Staphylococcus aureus* *S. epidermidis* Streptococci, enteric gram-negative bacilli	Adult Dose	**Cefazolin** < 120 kg: 2 g IV then 500 mg to 1 g every 6-8 ≥ 120 kg: 3 g IV 500 mg to 1 g every 6-8 **OR** **Cefuroxime** 1.5 g IV then 750 mg q 8 hrs.	**Clindamycin** 900 mg IV then 600 mg every 8 hrs **OR** **Vancomycin** 15 mg/kg IV then 1 g every 12 h (max: 2g)	For up to 48 hrs post-op	Cefazolin every 4 hrs Cefuroxime every 4 hrs Clindamycin every 6 hrs Vancomycin every 12 hrs.
	Thoracic (noncardiac) Pectus excavatum		Pediatric Dose	**Cefazolin** < 120 kg: 30 mg/kg IV then 30 mg/kg q 8hrs (max: 2 g) ≥ 120 kg: Refer to adult dosing * **Cefazolin** 30 mg/250 mL pump priming solution **OR** **Cefuroxime** 50 mg/kg IV then q 8hrs (max:1.5g) Children >12 years and Adolescents: Refer to adult dosing	**Clindamycin** 10 mg/kg IV then q 8hrs (max: 900 mg) **OR** **Vancomycin** 15 mg/kg IV then q 12 hrs (maximum 2g); no drug added to priming solution		
		Multidrug resistant organism		***Consult Infectious Diseases Specialis***			

*Approaches that **should not** be considered a routine part of SSI prevention*

1.Do not routinely use vancomycin for antimicrobial prophylaxis.

- Reserve vancomycin for specific clinical circumstances, such as a proven outbreak of SSI due to MRSA; high endemic rates of SSI due to MRSA.

2.Do not routinely delay surgery to provide parenteral nutrition.

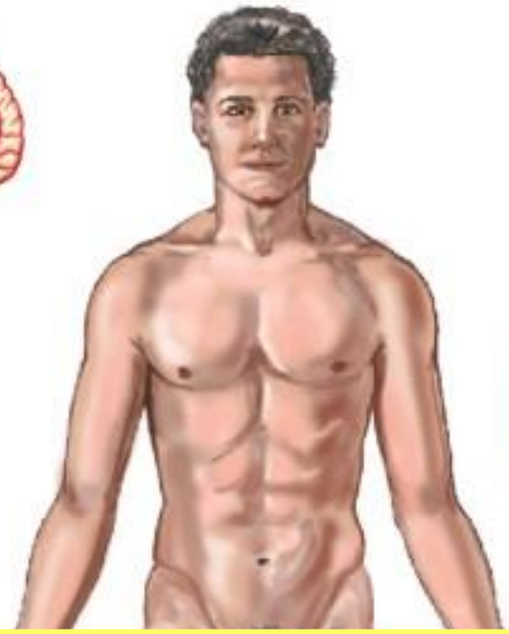
3.Do not routinely use antiseptic-impregnated sutures as a strategy to prevent SSIs.(Ref)

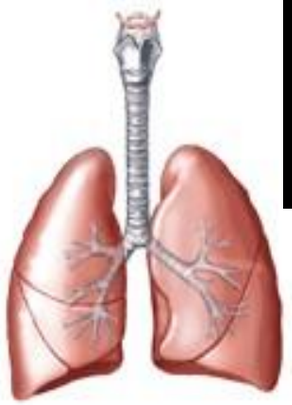
4.Do not routinely use antiseptic drapes as a strategy to prevent SSIs

Deliaert AE, Van den Kerckhove E, Tuinder S, et al. The effect of triclosan-coated sutures in wound healing: a double blind randomised prospective pilot study. J Plast Reconstr Aesthet Surg. 2009; 62(6):771–773.

CNS:
<10%

Sternal Bone[1]:
57%
Heart Valve[4]:
12%



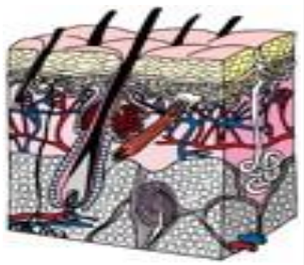


Epithelial
lining fluid[3]:
18%

Lung tissue[2]:
17%–24%

Vancomycin Penetration

Bone[5]:
7%–13%



Fat[4]:
14%
Muscle[4]:
9%

1. Massias L et al. *Antimicrob Agents Chemother*. 1992;36:2539-2541;
2. 2. Cruciani M et al. *J Antimicrob Chemother.* 1996;38:865-869.
3. 3. Lamer C et al. *Antimicrob Agents Chemother.* 1993;37:281-286;
4. 4. Daschner FD et al. *J Antimicrob Chemother*. 1987;19:359-362;
5. 5. Graziani AL et al. *Antimicrob Agents Chemother*. 1988;32:1320-1322.

PREVENTION IS PRIMARY!!

Protect patients…protect healthcare personnel…

promote quality healthcare!

“Infectious Diseases Unit”

Emerging Challenges

Challenges in detecting SSIs

- Lack of standardized methods for post-discharge/outpatient surveillance
  - Increased number of outpatient surgeries
  - Shorter postoperative inpatient stays

Antimicrobial Prophylaxis

- Increasing trend toward resistant organisms may undermine the effectiveness of existing recommendations for antimicrobial prophylaxis

Measurement: Surgical Care Improvement Project Process Measures

Quality Indicator	Numerator	Denominator
Appropriate antibiotic choice	Number of patients who received the appropriate prophylactic antibiotic	All patients for whom prophylactic antibiotics are indicated
Appropriate timing of prophylactic antibiotics	Number of patients who received the prophylactic antibiotic within 1hr prior to incision (2hr: Vancomycin or Fluoroquinolones)	All patients for whom prophylactic antibiotics are indicated
Appropriate discontinuation of antibiotics	Number of patients who received prophylactic antibiotics and had them discontinued in 24 h (48h cardiac)	All patients who received prophylactic antibiotics

Fry DE. Surgical Site Infections and the Surgical Care Improvement Project (SCIP): Evolution of National Quality Measures. Surg Infect 2008;9(6):579-84.

Measurement: Surgical Care Improvement Project (SCIP)
Process Measures (continued)

Quality Indicator	Numerator	Denominator
Appropriate hair removal	Number of patients who did not have hair removed or who had hair removed with clippers	All surgical patients
Normothermia	Number of patients with postoperative temperature ≥36.0°C	All surgical patients
Glucose control	Number of cardiac surgery patients with glucose control at 6AM POD1 and POD2 (operation = POD0)	Patients undergoing cardiac surgery

Fry DE. Surgical Site Infections and the Surgical Care Improvement Project (SCIP): Evolution of National Quality Measures. Surg Infect 2008;9(6):579-84.

Measurement: Outcome Measures

SSI Rate

- $\frac{\text{\# Patients with SSI after selected operations}}{\text{Total \# of selected operations performed}} \times 100$

Management

1. Open and drain the incision
2. Debride Necrotic tissue
3. Remove Foreign body
4. Antimicrobial Management as needed
5. Manage the Open wound.

Summary

- Surgical site infections (SSIs) continues to be a major source of morbidity, economic cost, and even mortality in surgical patient.

- Prevention of SSI require a multifaceted approach targeting pre-, intra-, and postoperative factors.

- Increasing shift of surgical procedures to outpatient settings and decrease in postoperative length of stay complicate surveillance efforts.