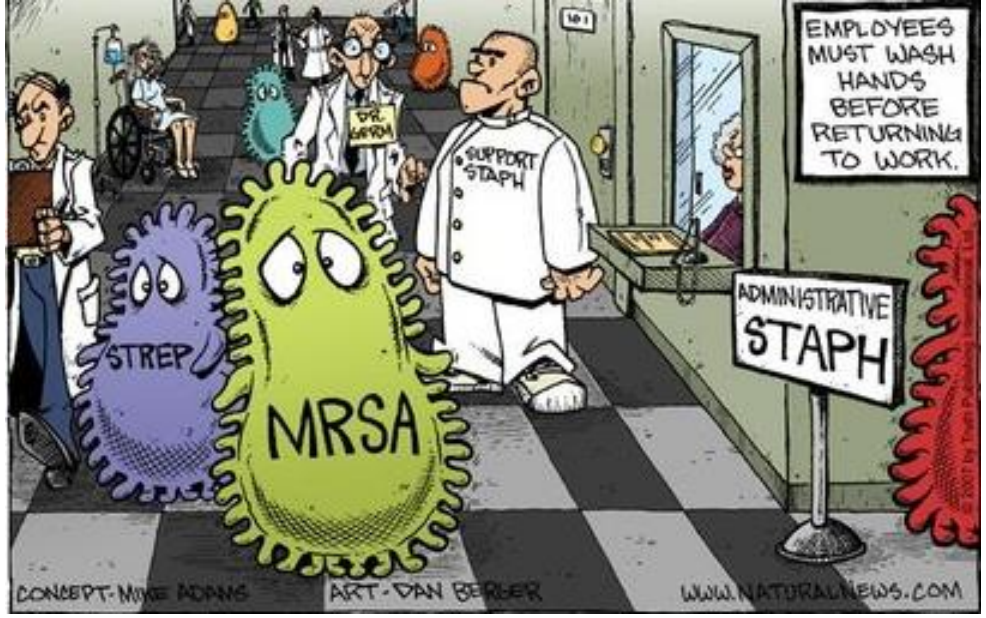

Meet the hospital bugs

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HEALTH CARE ASSOCIATED INFECTIONS

Objectives

- What are HAI?
- Why are they important?
- What are the common sites of infections?
- What are the common pathogens?
- What are the sources?
- How are they transmitted?
- How are they prevented?
- How are they monitored?
- What are device associated infections?

Health Care Associated Infections (HAI)

- **Infections acquired during the course of receiving treatment for other conditions while in a hospital or health care facility (and not present or incubating on admission- usually after 2 days of admission)**

- **An infection contracted by a patient or staff member**

- **Also known as**
  - **Nosocomial infections**
  - **Hospital acquired infections**

Who are at risk?

Patient

Healthcare worker

Community

Devices

A premature baby was progressing in the neonatal intensive care unit until she developed a bloodstream infection related to her umbilical catheter.

Post-op wound infections

The surgery goes well but patient later dies of a MRSA wound infection that developed after surgery.

Post- antibiotic treatment

A patient contracts *Clostridium difficile* after treatment for pneumonia. This is an infection which can relapse

Contaminated injectable materials

- **A patient with cancer now has to fight two diseases because she got Hepatitis C from an unsafe injection**

Morbidity and Mortality Weekly Report

Weekly September 26, 2003 / Vol. 52 / No. 38

Transmission of Hepatitis B and C Viruses in Outpatient Settings — New York, Oklahoma, and Nebraska, 2000–2002

How big is the problem?

- **About 8-15% patients acquire HAI in developing countries**
  - **Highest among ICU patients**
  - **SSI are the highest in developing countries**

- **Significant toll on human life**
  - **1.7 million infections**
  - **99,000 deaths annually**
- **Estimated that HAIs incur an estimated $28 to $33 billion in excess healthcare costs each year**

Estimated Annual Hospital Cost of HAI by Site of Infection

Major Site of Infection	Total infections	Hospital Cost per Infection (2002 $)	Total annual hospital cost (in millions $)	Deaths Per year
Surgical Site Infection	290,485	$25,546	7,421	13,088
Central line associated-Bloodstream Infection	248,678	$36,441	9,062	30,665
Ventilator-associated Pneumonia	250,205	$9,969	2,494	35,967
Catheter associated-Urinary Tract Infection	561,667	$1,006	565	8,205

Roberts RR, et al. *Clin Infect Dis* 2003;36:1424-32.

Ongoing Threat to Patient Safety

- **Outbreaks associated with unsafe injections and other breakdowns in basic infection control**

NEVADA | SECTION B Housing Authority board OKs rent increase for senior citizens

BUSINESS | SECTION D
FEELING THE PINCH OF THE FALLING DOLLAR

LAS VEGAS SUN
From Gehry's imagination to Lou Ruvo Brain Institute

FRIDAY

LAS VEGAS REVIEW-JOURNAL
www.reviewjournal.com

50 CENTS ONE DOLLAR NEVADA'S LARGEST NEWSPAPER ★★★★ MARCH 14, 2008

Lawyers: 100 fear infection

Health official: Data still being

By ANNETTE WELLS and BRIAN HAYNES
REVIEW-JOURNAL

More than 100 former pa-

PUBLIC HEALTH CRISIS

tices, according to several Las Vegas trial lawyers.

coming back higher than we expected."

sents about 25 such clients. Most of the positive tests were for hepatitis C.

The attorneys expect to see more positives in coming

officials say, at least six people contracted hepatitis C because of unsafe medical practices.

Late Thursday, a source in the state Health and Hu-

HAI

- **Particularly related to:**
  - **Use of medical devices/ prosthesis**
  - **Complicated surgical procedures**
  - **Poor hand hygiene of healthcare workers**
  - **Antibiotic overuse**

Epidemiology of HAI

- Most common sites for nosocomial infections
  - Surgical incisions
  - Urinary tract (catheter-related) - CAUTI
  - Lower respiratory tract (ventilator associated)- VAP
  - Bloodstream (IV catheter/ lines related) - CRBSI

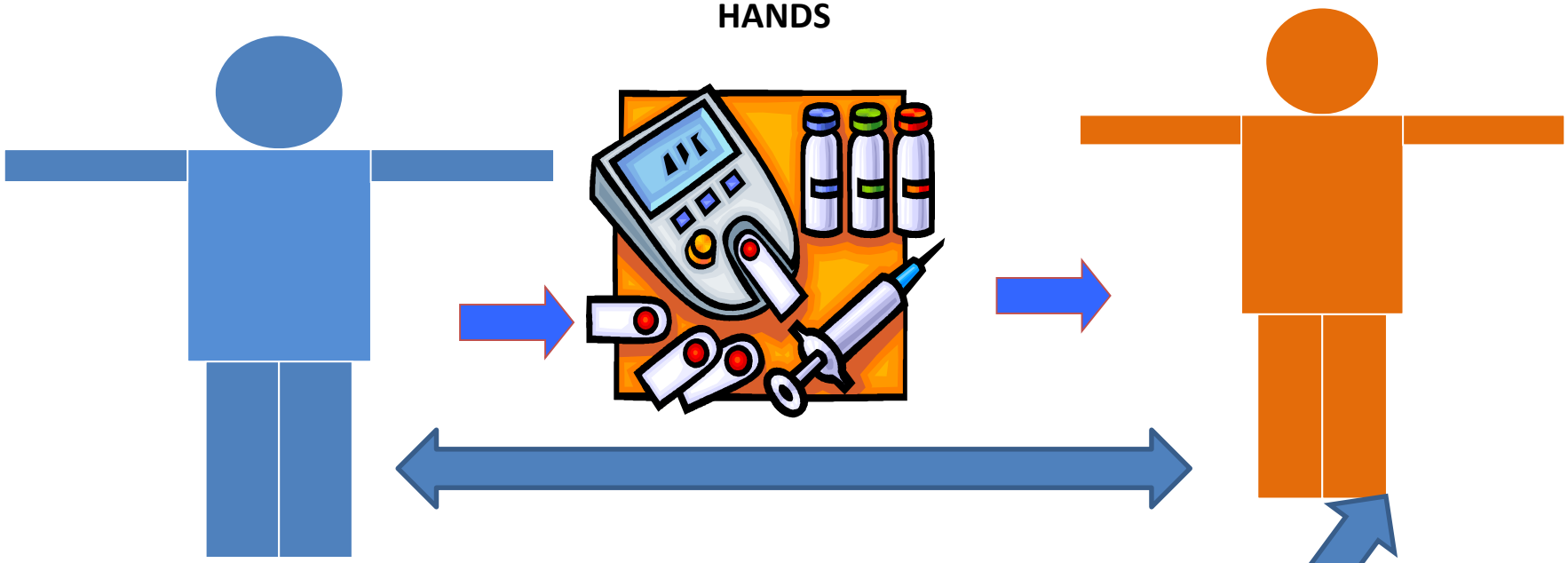



TRANSMISSION OF INFECTIONS

SOURCE
Staff/ Infectious person, e.g. chronic, acute

CONTAMINATED EQUIPMENT OR MEDICATION OR HANDS

CASE
Susceptible, non-immune person



- Contact
- Inhalation
- Inoculation
- Ingestion

Why?

- Lack of training/ knowledge in basic IC
- Lack of an IC infrastructure and poor IC practices
- Lack of motivation
- Inadequate facilities and techniques for hand hygiene
- Lack of isolation precautions
- Inadequate sterilization and disinfection practices and inadequate cleaning of hospital
- Inappropriate use of antibiotics

Why?

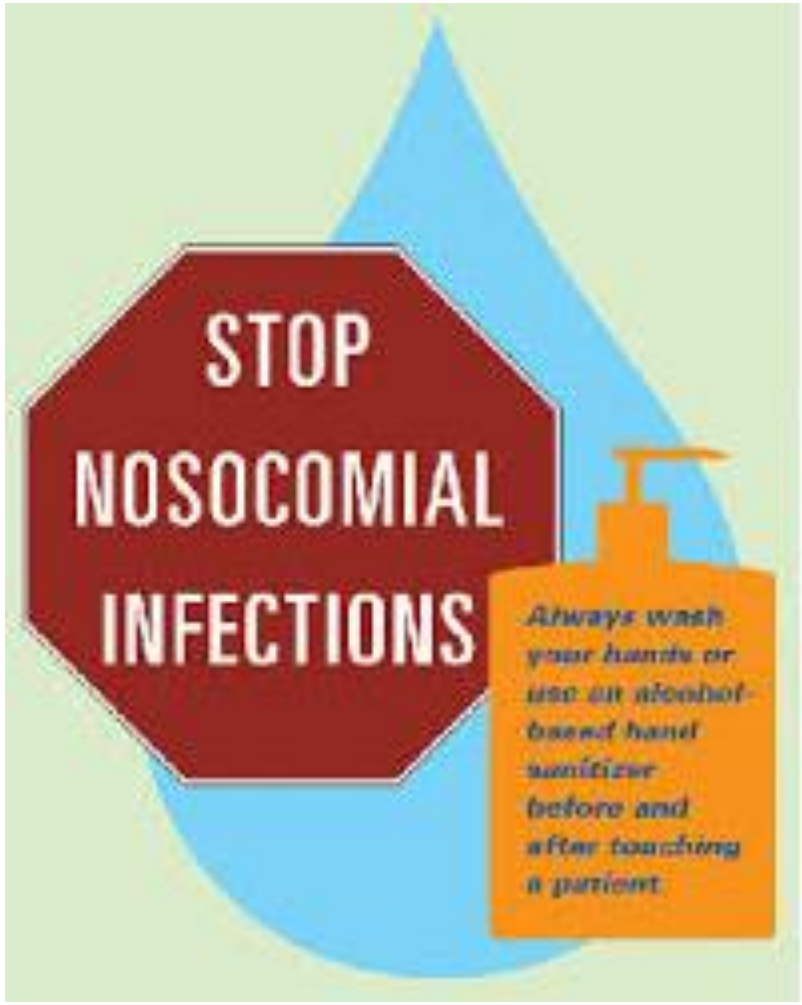
- Use of advanced and complex treatments
  - Invasive devices and procedures
    - Prosthetic devices
    - Urinary catheters
    - Mechanical ventilators
    - IV catheters/ cannulas
  - Complex surgical procedures
  - Intravenous fluids, and medications, total parenteral nutrition

HAI: Pathogens

- **Reservoir**
  - Skin: *Staphylococcus aureus*
  - Contaminated equipment /environment/water: gram-negative organisms (e.g., *Klebsiella* spp*., E. coli, Pseudomonas aeruginosa, Acinetobacter* spp.)

- **Mostly by antimicrobial resistant bacteria**
  - *Staphylococcus aureus /* MRSA
  - Enterococci (Vancomycin resistant)
  - Extended-spectrum β lactamase producing coliforms - ESBL(*E. coli, Klebsiella)* spp.)
  - Multidrug resistance Acinetobacter, Pseudomonas
  - Nosocomial transmission of community acquired, multidrug-resistant organisms
    - M. tuberculosis, Salmonella ,Shigella spp.

Prevention of HAI



Prevention of HAI Outline

- **Infection control**
  - **Standard precautions, additional precautions**
  - **Hand washing**
  - **Patient isolation**
  - **Barrier nursing**
  - **Aseptic techniques**
  - **PPE**
  - **Screening and decolonization- pre-op, staff**
  - **Sterilization and disinfection**
  - **Waste management**
  - **Surveillance**
  - **Reporting and notification**
  - **Education and training (staff, pt)**

Standard precautions

WHO recommendation

World Health Organization

1. Hand Hygiene
2. Gloves
3. Face protection
4. Gowns
5. Prevention of sharp injuries
6. Respiratory hygiene
7. Environmental cleaning
8. Linen
9. Waste disposal
10. Patient care equipment

Health-care facility recommendations for standard precautions

KEY ELEMENTS AT A GLANCE

1. **Hand hygiene**[1]

Summary technique:

- Hand washing (40–60 sec): wet hands and apply soap; rub all surfaces; rinse hands and dry thoroughly with a single use towel; use towel to turn off faucet.
- Hand rubbing (20–30 sec): apply enough product to cover all areas of the hands; rub hands until dry.

Summary indications:

- Before and after any direct patient contact and between patients, whether or not gloves are worn.
- Immediately after gloves are removed.
- Before handling an invasive device.
- After touching blood, body fluids, secretions, excretions, non-intact skin, and contaminated items, even if gloves are worn.
- During patient care, when moving from a contaminated to a clean body site of the patient.
- After contact with inanimate objects in the immediate vicinity of the patient.

2. **Gloves**

- Wear when touching blood, body fluids, secretions, excretions, mucous membranes, nonintact skin.
- Change between tasks and procedures on the same patient after contact with potentially infectious material.
- Remove after use, before touching non-contaminated items and surfaces, and before going to another patient. Perform hand hygiene immediately after removal.

3. **Facial protection (eyes, nose, and mouth)**

- Wear (1) a surgical or procedure mask and eye protection (eye visor, goggles) or (2) a face shield to protect mucous membranes of the eyes, nose, and mouth during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions.

4. **Gown**

- Wear to protect skin and prevent soiling of clothing during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, or excretions.
- Remove soiled gown as soon as possible, and perform hand hygiene.

5. **Prevention of needle stick and injuries from other sharp instruments**[2]

Use care when:

- Handling needles, scalpels, and other sharp instruments or devices.
- Cleaning used instruments.
- Disposing of used needles and other sharp instruments.

6. **Respiratory hygiene and cough etiquette**

Persons with respiratory symptoms should apply source control measures:

- Cover their nose and mouth when coughing/sneezing with tissue or mask, dispose of used tissues and masks, and perform hand hygiene after contact with respiratory secretions.

Health-care facilities should:

- Place acute febrile respiratory symptomatic patients at least 1 metre (3 feet) away from others in common waiting areas, if possible.
- Post visual alerts at the entrance to health-care facilities instructing persons with respiratory symptoms to practise respiratory hygiene/cough etiquette.
- Consider making hand hygiene resources, tissues and masks available in common areas and areas used for the evaluation of patients with respiratory illnesses.

7. **Environmental cleaning**

- Use adequate procedures for the routine cleaning and disinfection of environmental and other frequently touched surfaces.

8. **Linens**

Handle, transport, and process used linen in a manner which:

- Prevents skin and mucous membrane exposures and contamination of clothing.
- Avoids transfer of pathogens to other patients and or the environment.

9. **Waste disposal**

- Ensure safe waste management.
- Treat waste contaminated with blood, body fluids, secretions and excretions as clinical waste, in accordance with local regulations.
- Human tissues and laboratory waste that is directly associated with specimen processing should also be treated as clinical waste.
- Discard single use items properly.

10. **Patient care equipment**

- Handle equipment soiled with blood, body fluids, secretions, and excretions in a manner that prevents skin and mucous membrane exposures, contamination of clothing, and transfer of pathogens to other patients or the environment.
- Clean, disinfect, and reprocess reusable equipment appropriately before use with another patient.

[1] For more details, see: WHO Guidelines on Hand Hygiene in Health Care (Advanced draft), at: http://www.who.int/patientsafety/information_centre/ghhad_download/en/index.html.
[2] The SIGN Alliance at: http://www.who.int/injection_safety/sign/en/

World Health Organization • CH-1211 Geneva-27 • Switzerland • www.who.int/csr

Prevention of HAI Outline

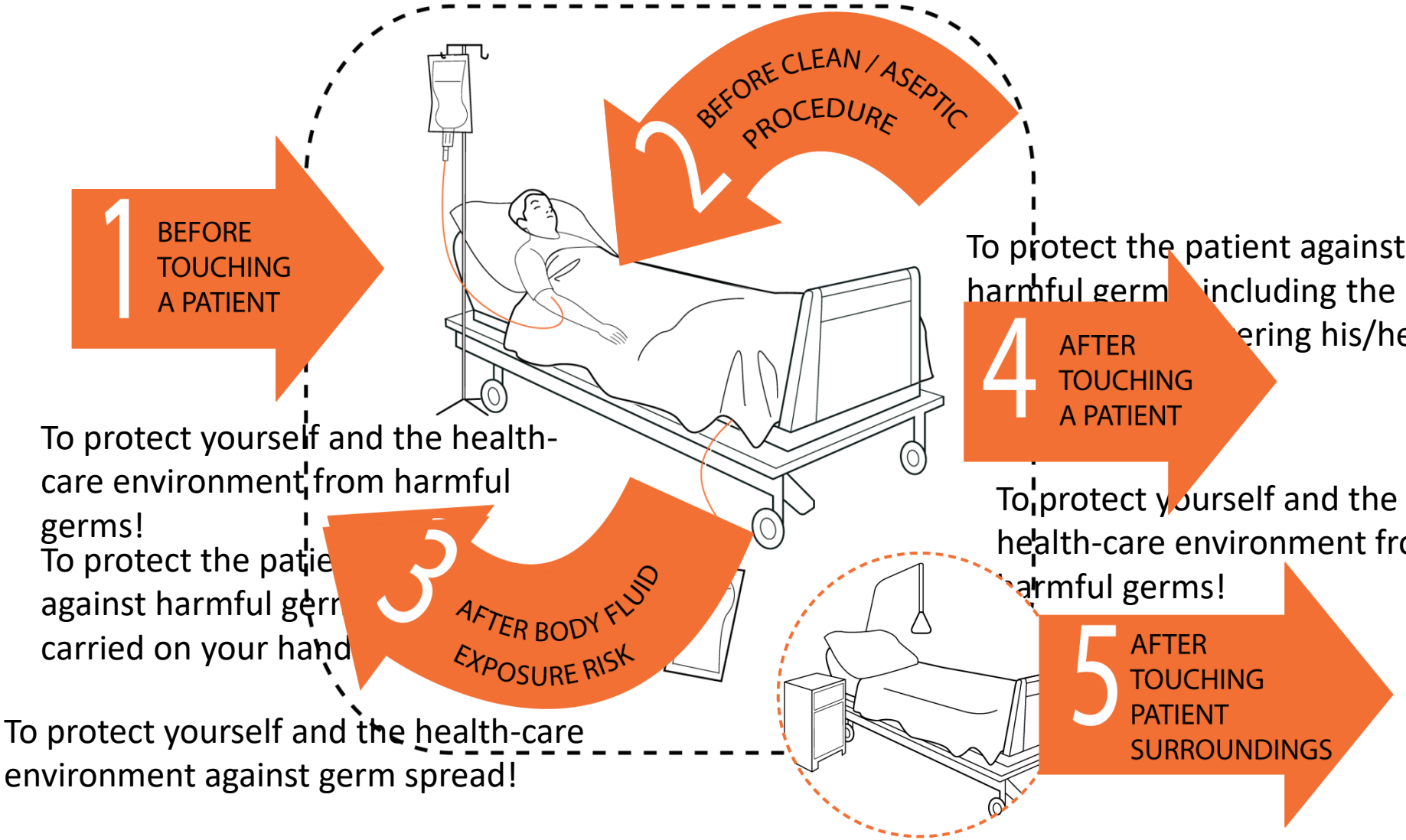
- **Infection control in health care worker**
  - **Staff vaccination**
  - **Management of staff exposed to infections**
- **Rational prescribing of Antibiotics**
- **Minimize devices**
- **Minimize hospital stay**
- **Policies and guidelines**
- **Audits, surveillance and feedback**

Hand washing

- Hands are the most common vehicle for microbial transmission
  - Reduces number of potential infectious agents on the hands
  - reduce the incidence of infectious agents in healthcare facilities

- Stepwise technique
- Wash all part of the hands with running water and soap and then dry
- Ensure availability of facilities – sink, water, soap, single-use towels, alcohol hand rub, poster
- Keep your finger nails short and natural

Your 5 Moments for Hand Hygiene



How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the handwash (steps 2-7): 15-20 seconds

Duration of the entire procedure: 40-60 seconds

0 Wet hands with water;

1 Apply enough soap to cover all hand surfaces;

2 Rub hands palm to palm;

3 Right palm over left dorsum with interlaced fingers and vice versa;

4 Palm to palm with fingers interlaced;

5 Backs of fingers to opposing palms with fingers interlocked;

6 Rotational rubbing of left thumb clasped in right palm and vice versa;

7 Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;

8 Rinse hands with water;

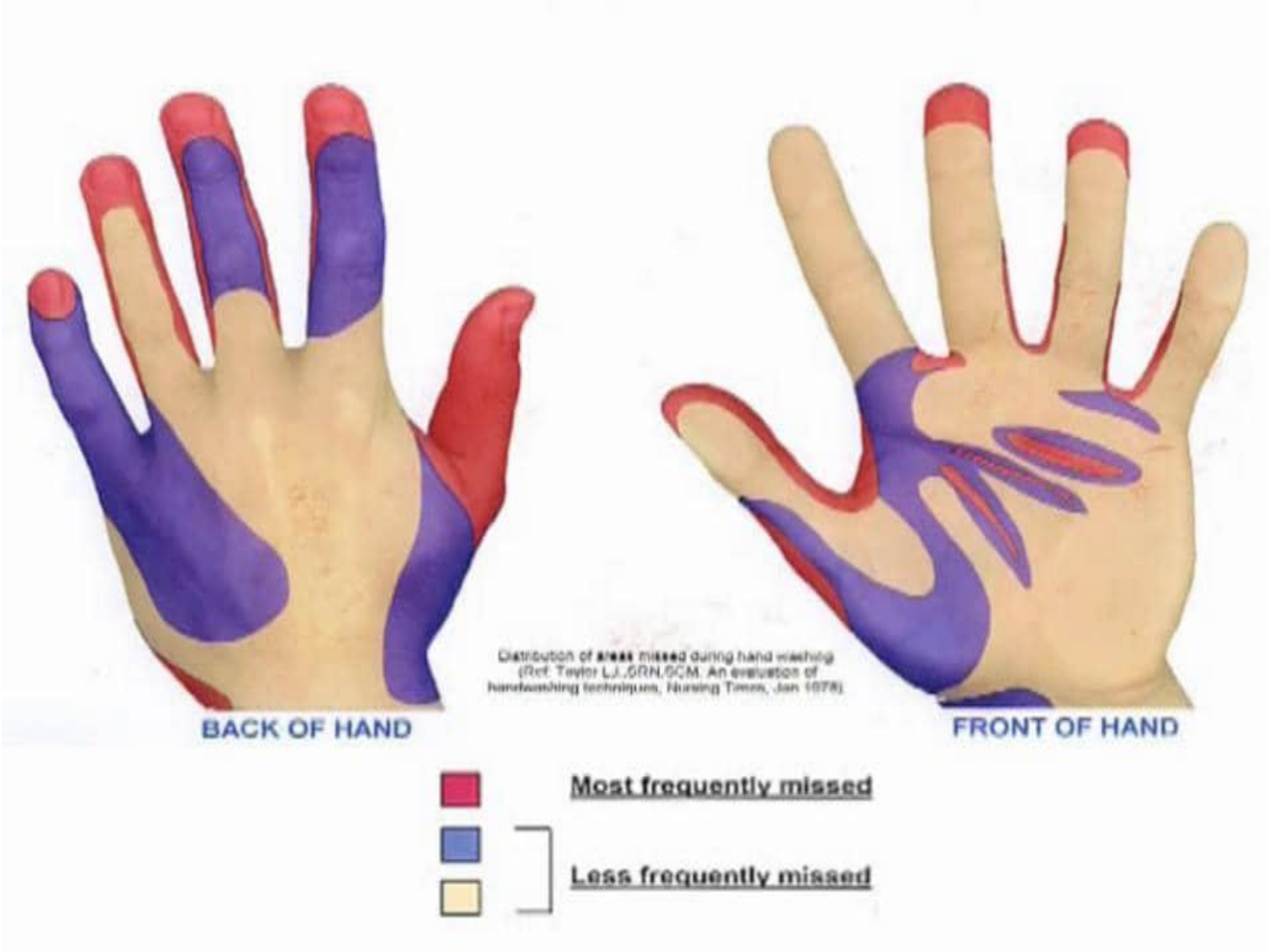
9 Dry hands thoroughly with a single use towel;

10 Use towel to turn off faucet;

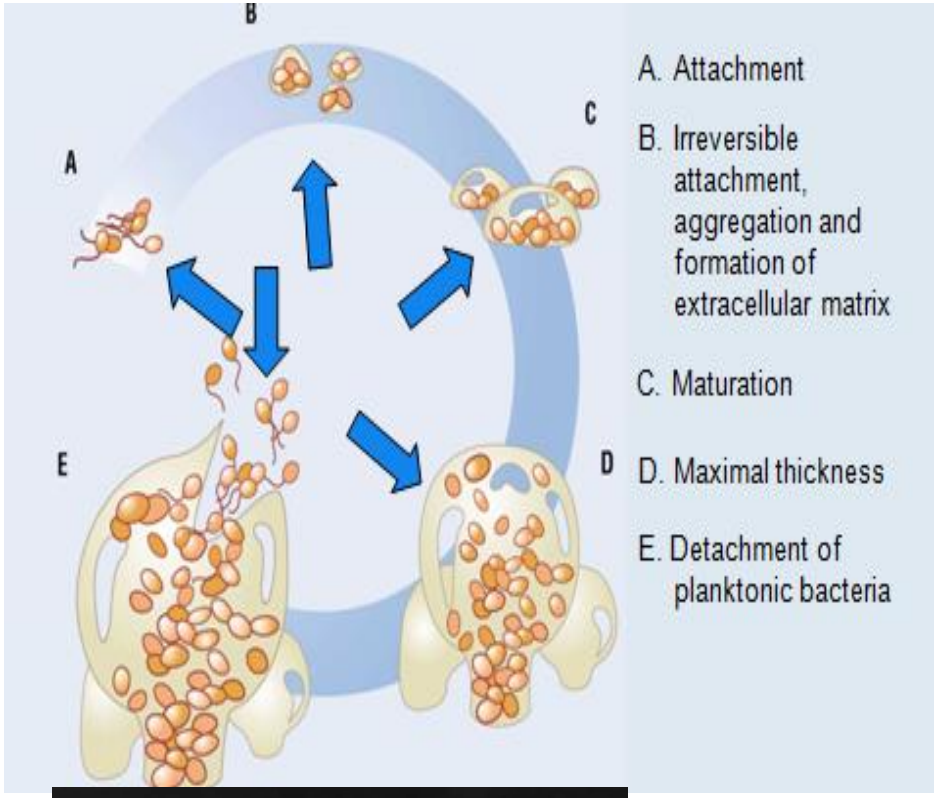
11 Your hands are now safe.

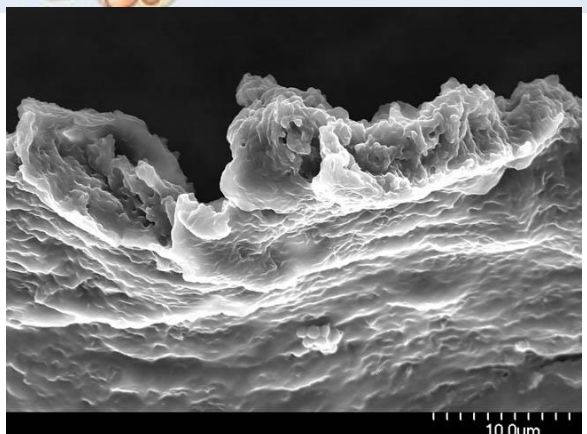
World Health Organization | Patient Safety — A World Alliance for Safer Health Care | **SAVE LIVES** Clean **Your** Hands

Missed areas in hand washing



Device Associated Infections





- Impairment of normal host defences
  - Bypass skin/ mucosa/ cillia
  - Traumatize skin/ mucous mem
  - Disrupt valvular functions
- Serve as a direct conduit
- Biofilm formation
  - Deposition of conditioning film (fibrin etc)
  - Attachment of m.o and colonization
  - Multiply → secrete matrix
  - Detachment→ free (planktonic) → infection
- Easy access to hospital bugs

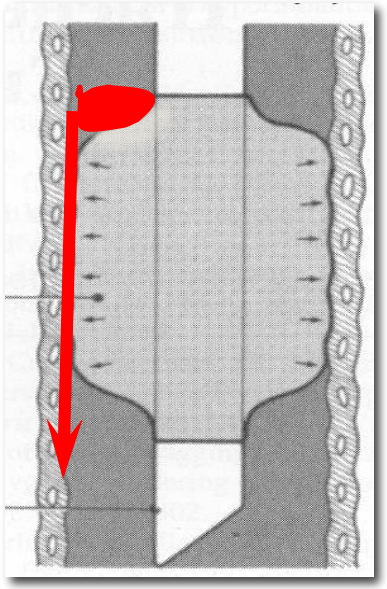
Ventilator associated pneumonia (VAP)

- A pneumonia that occurs in a patient 48hours after intubation and mechanical ventilation.
- Commonest HAI in ICUs
- Common pathogens
  - Resistant Pseudomonas
  - S. aureus/ MRSA
  - Acinetobacter
  - Resistant coliforms
- Operational definitions for diagnosis
  - Clinical Pulmonary Infection Score (CPIS)
    - Temp, WBC, Oxygenation, tracheal secretions, CXR, progression of infiltrate
  - Microbiological
    - Quantitative cultures of BAL ,ET, PSB, Blood, Pleural fluid
  - Radiological

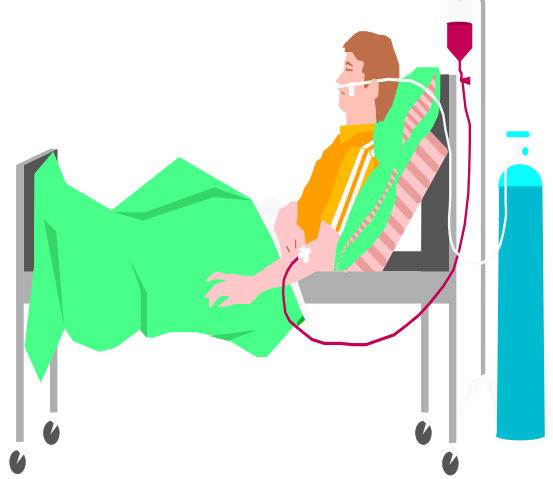
Risk Factors

- Intubation

- Micro or macro aspiration of oropharyngeal pathogens
  - Leakage of secretions containing bacteria around the ET cuff
- Sedation
- Contaminated equipment/hands



Prevention



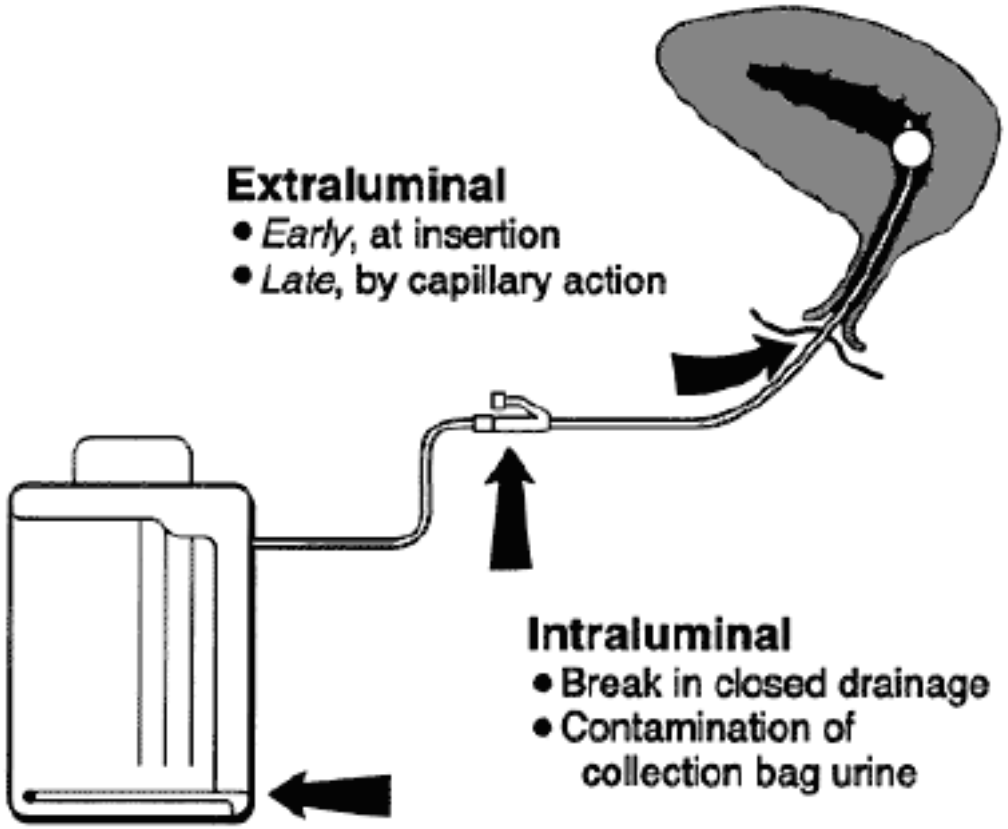
- VAP bundle
  - Elevation of the head of the bed (HOB) at 30º
  - Daily sedation vacations and assessment of readiness to extubate
  - Daily oral care with chlorhexidine

  - Continuous removal of sub-glottic secretions
  - Maintain cuff pressure >20cm H_2O
  - Change breathing circuits when visibly soiled/ malfunctioning
  - Control antibiotic use
  - Sterilization and disinfection/ equipment care

CAUTI

- Catheter Associated UTI
  - A UTI where an indwelling urinary catheter was in place for >2 calendar days on the date of event
  - If an indwelling urinary catheter was in place for > 2 calendar days and then removed, the date of event for the UTI must be the day of discontinuation or the next day for the UTI to be catheter-associated.

Pathogenesis



- Endogenous
  - Periurethral/ vaginal/ rectal flora
- Exogenous
  - Contaminated hands/ equipment

Common pathogens

- E. coli
- Other coliforms – Klebsiella, Proteus, Enterobacter
- Pseudomonas
- Enterococci

Prevention of CAUTI

- **Stick to basics**

I. Appropriate Urinary Catheter Use
   - Only for correct indications
   - Remove as soon as possible

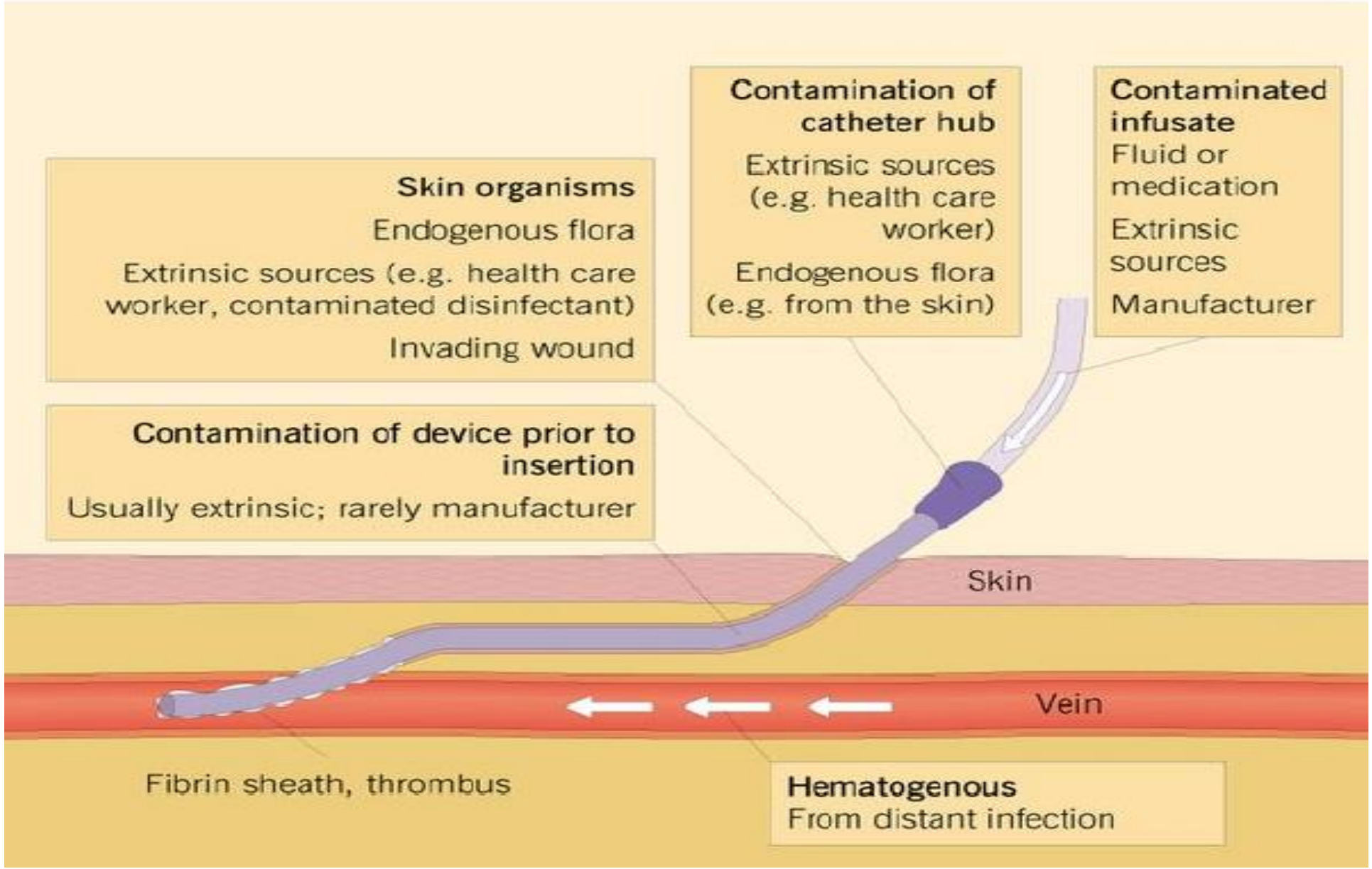
II. Proper Techniques for Urinary Catheter Insertion
   - Aseptic technique
   - Hand washing
   - Only by a trained person

III. Proper Techniques for Urinary Catheter Maintenance
   - Maintain a closed drainage system
   - Maintain unobstructed urine flow
   - Standard precautions when handling

CRBSI

- Catheter related blood stream infection
  - Sepsis following intravascular device insertion
    - Peripheral
    - PICC
    - Central
    - Pulmonary artery
    - Totally implantable
  - The most common pathogens
    - S. aureus/ MRSA
    - CONS
    - Enterococci/ VRE
    - Resistant Coliforms

POTENTIAL ROUTES OF INFECTION



From: Mermel L, Rhode Island Hospital

Diagnosis of CRBSI

- Definitive diagnosis
  - Paired blood cultures (quantitative/ semi-quantitative)
    - peripheral blood culture +
    - Blood drawn through the catheter (> 3 fold)

      or
    - Catheter tip culture(> 15 cfu)
    - + for same organism

Paired Blood Cultures

Peripheral vein

+

From the catheter

or

Culture of the catheter tip (distal 5 cm)

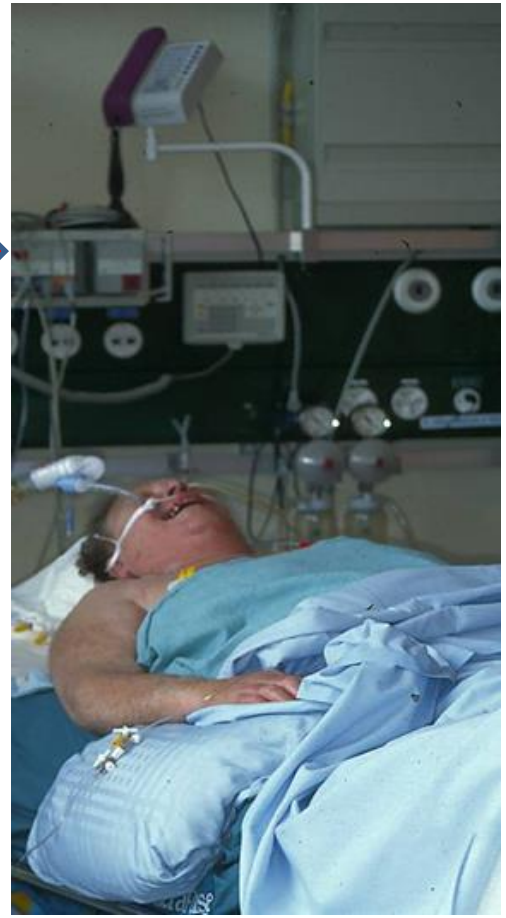
Prevention of CVC-BSI

Insertion

- Hand hygiene
- Maximum sterile barrier
- skin antisepsis
- Avoid femoral

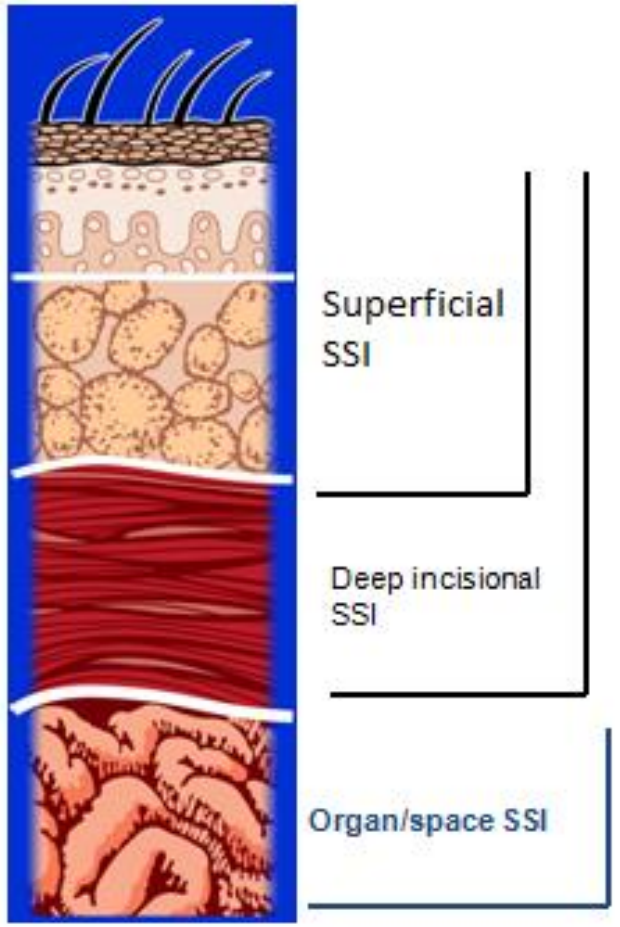
Maintenance

- Daily inspection
- Scrub the hub
- Standard precautions
- Replace at correct intervals



Surgical site infections

- Infection occur within 30 -90 day post-op
- 2%-5% of patients undergoing surgery
- 3 % mortality
  - Superficial
    - Involve only s/c space
  - Deep
    - Deep layer of soft tissue
  - Organ space
    - Deep SSI+ any organ/ space



Pus +
+ culture
Local signs and sym – pain, tender, swelling, erythema, abscess
Diagnosis by surgeon

Prevention

1. Pre-op

- Pre-op skin prep
- Pre-op hand scrub
- Pre-op pt prep
  - Do not shave hair
- Identify and treat remote infections before elective operation
- AB prophylaxis
- Nasal screen and decolonize only *Staphylococcus*

2. Post-op

- Maintain immediate postoperative normothermia
- Surgical Wound Dressing
- Control blood glucose level
- Discontinue antibiotics within 24hrs after surgery

Summary

- **Iatrogenic/medical errors**
- **Caused by resistant bacteria**
- **Increased incidence with interventions/ devices**
- **Cause**
  - **morbidity**
  - **mortality**
  - **increase hospital stay**
  - **cost**
- **Can be prevented by strict infection control measures**

Any Questions?

Thank you

NOTICE

Before you touch me, please wash your hands!