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# **NOSOCOMIAL INFECTIONS**

## **Diagnosis and Management**

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*(What I do for a living and how you can get  
a job like mine.)*

Gonzalo Bearman MD,MPH

Assistant Professor of Medicine

Associate Hospital Epidemiologist

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*Sufficient data now exist to prove that the mortality of hospital acquired infections represents a leading cause of death in the United States.*

Richard P. Wenzel, MD, M.Sc

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# Outline

- Epidemiology of nosocomial infections
    - Incidence
    - Morbidity and mortality
    - Excess cost
    - Overview of pathogenesis
  - 4 major nosocomial infections
    - VAP,UTI,SSI,BSI
  - Risk reduction strategies
    - Transmission based precautions
    - Hand hygiene
  - Surveillance
    - MRSA and VRE problem pathogens
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# NOSOCOMIAL INFECTIONS

- Infection in a hospitalized patient
  - Not present or incubating on admission
  - Hospital acquired infection
-

# Nosocomial Infections

- 5-10% of patients admitted to acute care hospitals acquire infections
  - 2 million patients/year
  - 1/4 of nosocomial infections occur in ICUs
  - 90,000 deaths/year
  - Attributable annual cost: \$4.5 – \$5.7 billion
    - Cost is largely borne by the healthcare facility not 3<sup>rd</sup> party payors

Weinstein RA. Emerg Infect Dis 1998;4:416-420.  
Jarvis WR. Emerg Infect Dis 2001;7:170-173.

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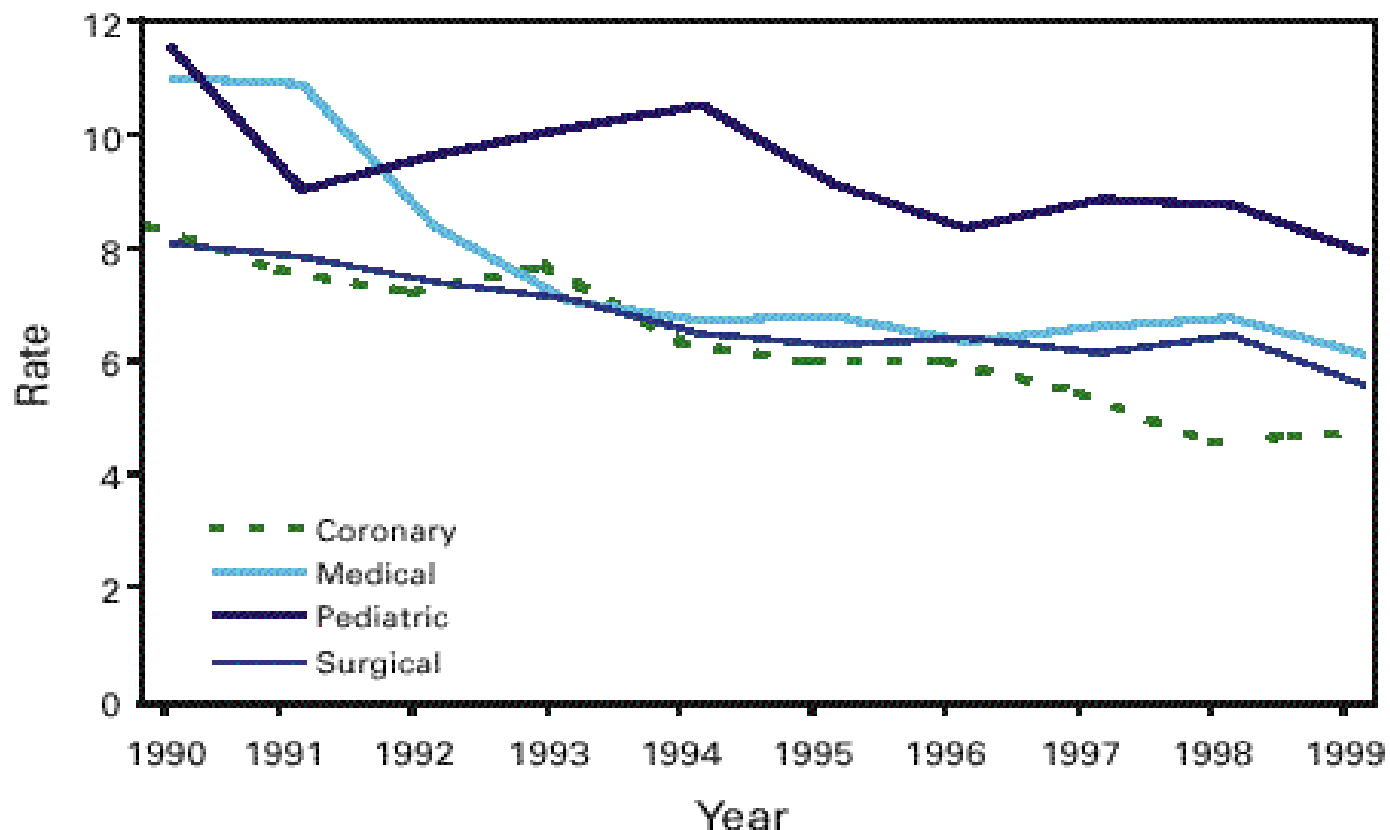
# NOSOCOMIAL INFECTIONS

## *hospital-acquired infections*

- Infections acquired in the hospital
    - infection was neither present nor incubating when admitted
    - 2 million infections in 1995 in USA
    - 90,000 deaths
    - may range from mild to serious (including death)
  - Although acquired in the hospital-may appear after discharge from hospital
  - some infections occur in outbreaks or clusters (10%)
    - but majority are *endemic*
  - can result from diagnostic or therapeutic procedures
    - catheters in bladder or blood vessel, surgery
    - correlate with length of stay
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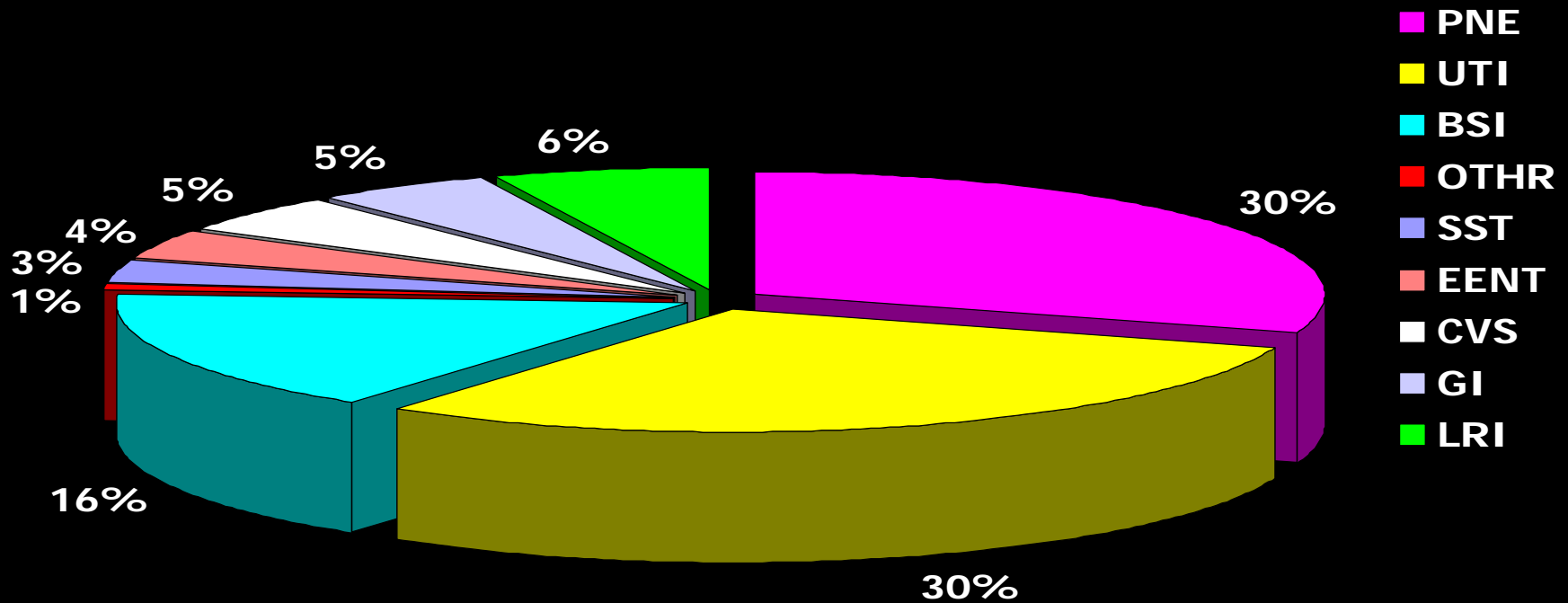
- Up to 45% of nosocomial infections occur in *Intensive Care Units* (ICU), although they contain only 8% of beds

FIGURE 1. Trends in bloodstream infection rates\*, by intensive care unit type and year — National Nosocomial Infection Surveillance System, United States, 1990–1999



\*Per 1000 days a central line was used.

# Major sites of infection in medical ICU



***n* = 13,592**

Nosocomial infections occur predominantly in Intensive Care Units



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# PATHOGENESIS OF NOSOCOMIAL INFECTIONS

- 3 ingredients
    - Susceptible host
    - Virulent organism
    - Portal (mode) of entry
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# PATHOGENESIS OF NOSOCOMIAL INFECTIONS

- Host defenses depressed by underlying disease or treatment, malnutrition, age
  - Anatomic barriers breached (IV's, foleys, vents etc.)
  - Exposure to virulent pathogens
    - many resistant to multiple antibiotics
-

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## Where do the microbes come from?

- patient's own flora
  - cross infection from medical personnel
  - cross infection from patient to patient
  - hospital environment- inanimate objects
    - air
    - dust
    - IV fluids & catheters
    - washbowls
    - bedpans
    - endoscopes
    - ventilators & respiratory equipment
    - water, disinfectants etc
-

# *The Inanimate Environment Can Facilitate Transmission*

**X** represents VRE culture positive sites



*- Contaminated surfaces increase cross-transmission -*

Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

# SOURCES OF PATHOGENS IN NI

- **Reactivation of latent infection:** TB, herpes viruses
  - Less common
- **Endogenous:** normal commensals of the skin, respiratory, GI, GU tract
  - common
- **Exogenous**
  - **Inanimate environment:** *Aspergillus* from hospital construction, *Legionella* from contaminated water
  - **Animate environment:** hospital staff, visitors, other patients
    - **Cross transmission-** common

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# MECHANISMS OF TRANSMISSION

- Contact: direct (person-person), indirect (transmission through an intermediate object-- contaminated instruments
    - *Cross transmission*
  - Airborne: organisms that have a true airborne phase as pattern of dissemination (TB, Varicella)
  - Common-vehicle: common animate vehicle as agent of transmission (ingested food or water, blood products, IV fluids)
  - Droplet: brief passage through the air when the source and patient are in close proximity
  - Arthropod: not reported in US
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# SITES OF NOSOCOMIAL INFECTIONS

- Urinary tract 40%
  - Pneumonia 20%
  - Surgical site 17%
  - Bloodstream (IV) 8%
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# Nosocomial Pneumonia

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# NOSOCOMIAL PNEUMONIA

- Lower respiratory tract infection
  - Develops during hospitalization
  - Not present or incubating at time of admission
  - Does not become manifest in the first 48-72 hours of admission
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# EPIDEMIOLOGY

- 13-18% of nosocomial infections
  - 6-10 episodes/1000 hospitalizations
  - Leading cause of death from NI
  - Economic consequences
    - prolongation of hospital stay 8-9 days
    - Costs \$1 billion/year
-

# Nosocomial Pneumonia

- Cumulative incidence = 1-3% per day of intubation
- Early onset (first 3-4 days of mechanical ventilation)
  - Antibiotic sensitive, community organisms (*S. pneumoniae*, *H. influenzae*, *S. aureus*)
- Late onset
  - Antibiotic resistant, nosocomial organisms (MRSA, *Ps. aeruginosa*, *Acinetobacter* spp, *Enterobacter* spp)

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# PREDISPOSING FACTORS

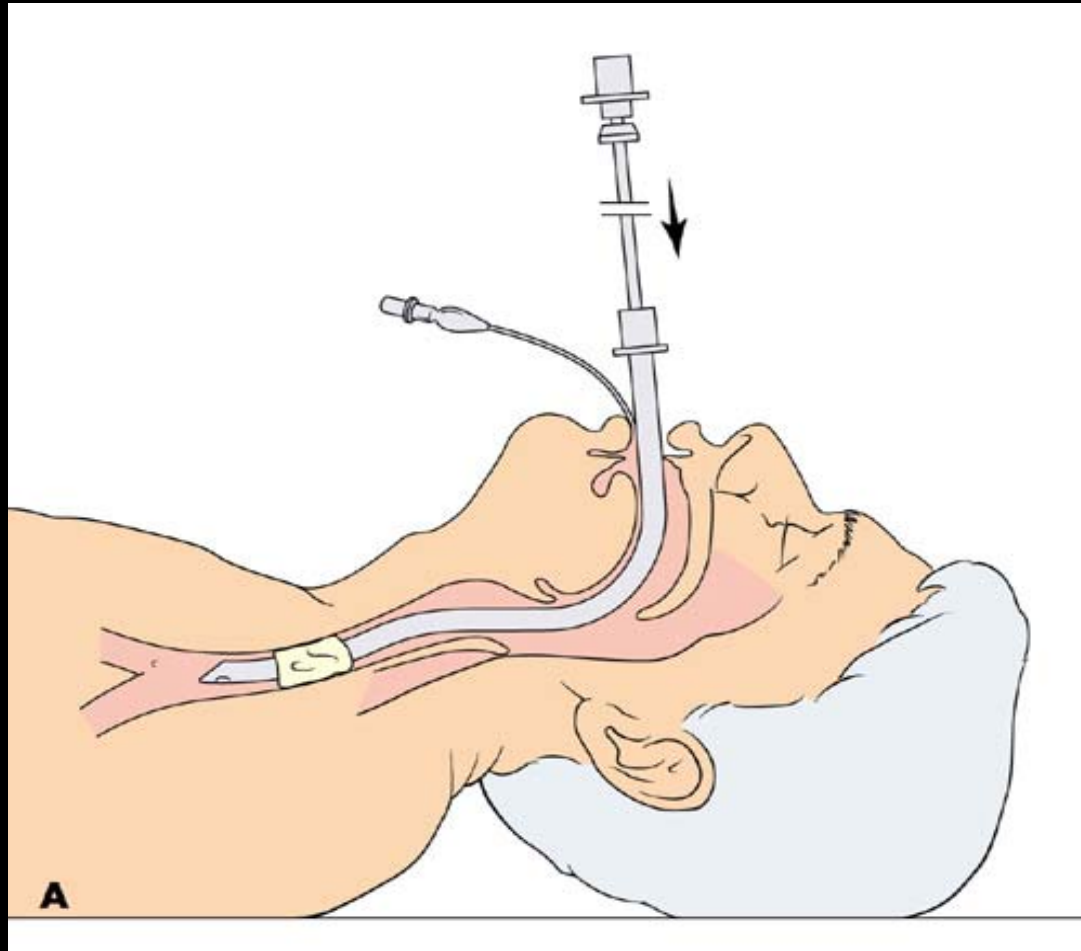
- Endotracheal intubation!!!!!!!!!!!!!!!
  - ICU
  - Antibiotics
  - Surgery
  - Chronic lung disease
  - Advanced age
  - immunosuppression
-

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# PATHOGENESIS

- Oropharyngeal colonization
    - upper airway colonization affected by host factors, antibiotic use, gram negative adherence
    - hospitalized pts have high rates of gram – colonization
  - Gastric colonization
    - increased gram – with high gastric pH
    - retrograde colonization of the oropharynx
-

# Endotracheal Intubation



# PATHOGENESIS

- Routes of invasion to LRT
  - Aspiration of oropharyngeal organisms (most common)
  - Ventilated patients: leakage of bacteria around cuff→upper airway colonization, tracheobronchitis
  - Inhalation of infected aerosols (less common)
  - Hematogenous

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# ETIOLOGY

- Early Onset (10%)- represent community acquired pathogens
    - *Strep pneumoniae*, *H. influenza*, *Moraxella catarrhalis*
  - Late onset (80%)- typical hospital flora
    - gram negative aerobes
    - *E. coli*, *Klebsiella*, *Pseudomonas*
    - *S. aureus*
-

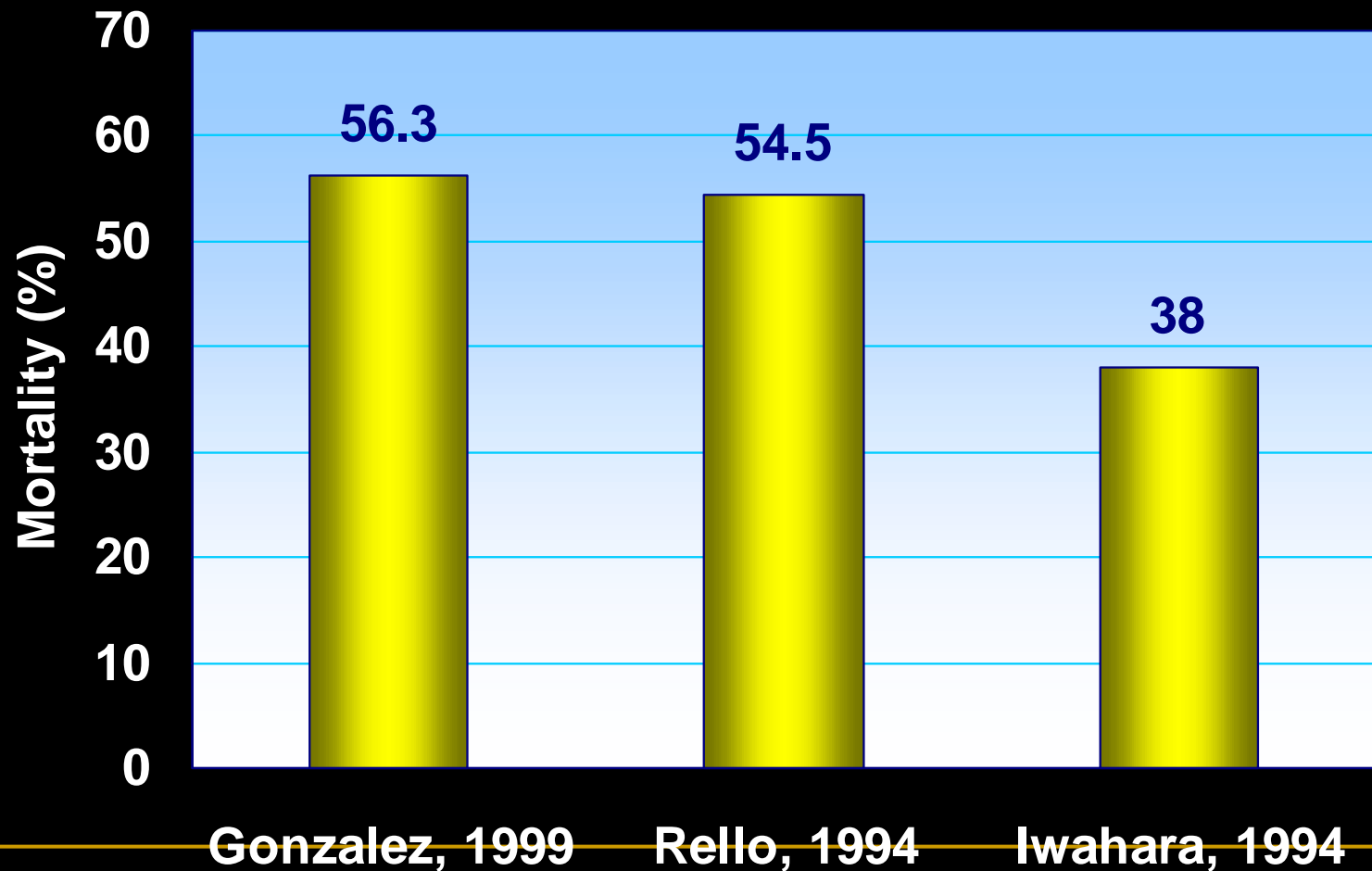


# Multiresistant bacteria are a problem in VAP

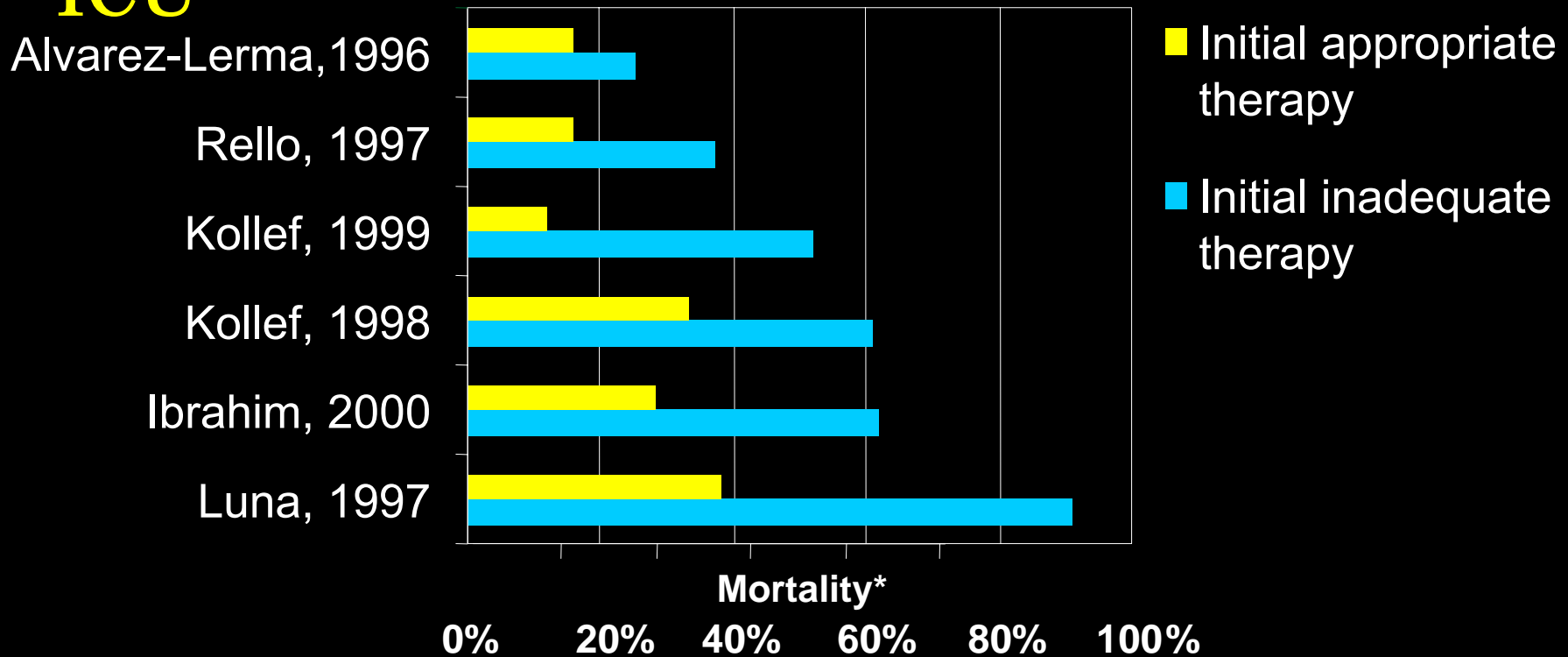
Organism	% of all isolates
<i>P. aeruginosa</i>	31.7
MRSA	11.8
<i>A. baumannii</i>	11.8
<i>H. influenzae</i>	8.4
<i>S. pneumoniae</i>	7.7
MSSA	3.1

**(n = 321 isolates from 290 episodes)**

# MRSA Pneumonia: Infection-Related Mortality



# Mortality Associated With Initial Inadequate Therapy In Critically Ill Patients With Serious Infections in the ICU



\*Mortality refers to crude or infection-related mortality

Alvarez-Lerma F et al. *Intensive Care Med* 1996;22:387-394.

Ibrahim EH et al. *Chest* 2000;118L146-155.

Kollef MH et al. *Chest* 1999; 115:462-474

Kollef MH et al. *Chest* 1998;113:412-420.

Luna CM et al. *Chest* 1997;111:676-685.

Rello J et al. *Am J Resp Crit Care Med* 1997;156:196-200.

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# DIAGNOSIS AND TREATMENT

- Clinical diagnosis
    - fever, change in  $O_2$ , change in sputum, CXR
  - Microbiologic Confirmation
    - Suctioned Sputum sample
    - Bronchoscopy with bronchoalveolar lavage
  - Empiric antibiotic- clinical acumen
    - Rx based on previous cultures, usual hospital flora and susceptibilities
    - sputum gram stain
    - colonization vs. infection
-

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# PREVENTION

- Pulmonary toilet
    - Change position q 2 hours
      - Elevate head to 30-45 degrees
    - Deep breathing, incentive spirometry
    - Frequent suctioning
    - Bronchoscopy to remove mucous plugging
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# Nosocomial Urinary Tract Infections

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# URINARY TRACT INFECTIONS

- Most common site of NI (40%)
  - Affects 1/20 (5%) of admissions
  - 80% related to urinary catheters
  - Associated with 2/3 of cases of nosocomial gram negative bacteremias
  - Costs to health care system up to \$1.8 billion
-

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# Nosocomial Urinary Tract Infections

- 25% of hospitalized patients will have a urinary catheter for part of their stay
- 20-25 million urinary catheters sold per year in the US
- Incidence of nosocomial UTI is ~5% per catheterized day
- *Virtually all patients develop bacteriuria* by 30 days of catheterization
- Of patients who develop bacteriuria, 3% will develop bacteremia
- Vast majority of catheter-associated UTIs are silent, but these comprise the largest pool of antibiotic-resistant pathogens in the hospital



# PATHOGENESIS

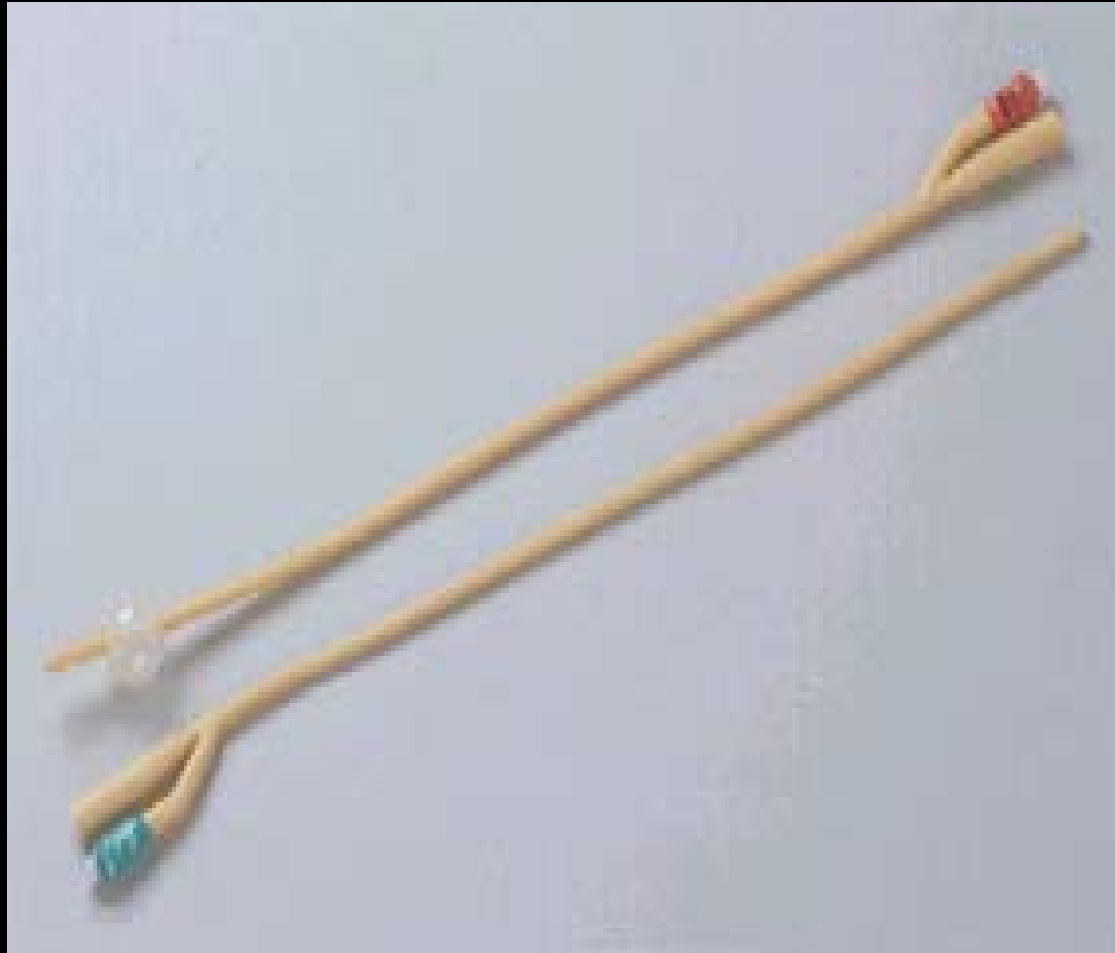
- Source of uropathogens
  - Endogenous- most common
    - catheter insertion
    - retrograde movement up the urethra (70-80%)
    - patient's own enteric flora (*E.coli*)
  - Exogenous
    - cross contamination of drainage systems
    - may cause clusters of UTI's

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# PATHOGENESIS

- Major risk factors: 1) pathogenic bacteria in periurethral area 2) indwelling urinary catheter
  - Bacterial factors: properties which favor attachment to uroepithelium, catheters
  - Growth in biofilm
  - Inner catheter surface
  - Bladder trauma decreases local host defenses
-

# Urinary (Foley) Catheter



## **ETIOLOGIC AGENTS: catheter associated UTI**

<b>Bacteria</b>	<b>% Distribution</b>
<b>E. coli</b>	<b>32</b>
<b>Proteus spp</b>	<b>14</b>
<b>Enterococcus</b>	<b>12</b>
<b>Klebsiella</b>	<b>9</b>
<b>Pseudomonas</b>	<b>9</b>
<b>Enterobacter</b>	<b>4</b>
<b>Candida</b>	<b>4</b>
<b>Serratia</b>	<b>1</b>
<b>Other</b>	<b>15</b>

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# TREATMENT

- Is this a UTI vs asymptomatic bacteruria?
    - Use clinical judgement
      - urine WBC- pyuria
      - bacterial colony counts  $> 10^3$
      - clinical signs/symptoms
  - No antibiotic treatment for bacteruria
    - resolves with catheter removal
  - 7-10 days of therapy for UTI
  - Empiric therapy typically initiated pending microbiologic results
-

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# Risk Factors for Nosocomial UTIs

- Female gender
  - Diabetes mellitus
  - Renal insufficiency
  - Duration of catheterization
  - Insertion of catheter late in hospitalization
  - Presence of ureteral stent
  - Using catheter to measure urine output
  - Disconnection of catheter from drainage tube
  - Retrograde flow of urine from drainage bag
-

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# Prevention of Nosocomial UTIs

- Avoid catheter when possible & discontinue **ASAP- MOST IMPORTANT**
  - Aseptic insertion by trained HCWs
  - Maintain closed system of drainage
  - Ensure dependent drainage
  - Minimize manipulation of the system
  - Silver coated catheters
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# Surgical Site Infections

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# SURGICAL SITE INFECTIONS

- 325,000/year (3<sup>rd</sup> most common)
- Incisional infections
  - Infection at surgical site
  - Within 30 days of surgery
  - Involves skin, subcutaneous tissue, or muscle above fascia
  - Accompanied by:
    - Purulent drainage
    - Dehiscence of wound
    - Organism isolated from drainage
    - Fever, erythema and tenderness at the surgical site

## SSI: Superficial



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# SURGICAL SITE INFECTIONS

- Deep surgical wound infection
    - Occurs beneath incision where operation took place
    - Within 30 days after surgery if no implant, 1 year if implant
    - Infection appears to be related to surgery
    - Occurs at or beneath fascia with:
      - Purulent drainage
      - Wound dehiscence
      - Abscess or evidence of infection by direct exam
      - Clinical diagnosis
-

# SSI: Deep



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# SURGICAL SITE INFECTIONS

- Risk of infection dependent upon:
    - Contamination level of wound
    - Length of time tissues are exposed
    - Host resistance
-

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# SURGICAL SITE INFECTIONS

- Clean wound
    - \* elective, primarily closed, undrained
    - \* nontraumatic, uninfected
  - Clean-Contaminated wound
    - \* GI, resp, GU tracts entered in a controlled manner
    - \* oropharynx, vagina, biliary tract entered
  - Contaminated wound
    - \* open, fresh, traumatic wounds
    - \* gross spillage from GI tract
    - \* infected urine, bile
-

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# SURGICAL SITE INFECTIONS

- Dirty wound
    - Traumatic
    - Retained devitalized tissue
    - Foreign bodies
    - Fecal contamination
    - Delayed treatment
-

# SURGICAL SITE INFECTIONS

WOUND CLASS	% OF OPERATIONS	SWI RATE (%)
Clean	58	3.3
Clean-contaminated	36	10.8
Contaminated	4	16.3
Dirty-infected	2	28.6



# PATHOGENS ASSOCIATED WITH SWI

Pathogen	% of Isolates
<i>S. aureus</i>	17
Enterococci	13
Coag - Staph	12
<i>E. coli</i>	10
<i>P. aeruginosa</i>	8
<i>Enterobacter</i>	8
<i>P. mirabilis</i>	4
<i>K. pneumoniae</i>	3
Streptococci	3

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# RISK FACTORS

- Age (extremes)
  - Sex
    - \* ♀ post cardiac surgery
  - Underlying disease
    - \* obesity (fat layer < 3 cm 6.2%; >3.5 cm 20%)
    - \* malnutrition
    - \* malignancy
    - \* remote infection
-

# RISK FACTORS

- Duration of pre-op hospitalization
  - \* increase in endogenous reservoir
  - \* adverse effect on host resistance
- Pre-op hair removal
  - \* esp if time before surgery > 12 hours
  - \* shaving>>clipping>depilatories
- Duration of operation
  - \*increased bacterial contamination
  - \* tissue damage
  - \* suppression of host defenses
  - \* personnel fatigue

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# SWI PREVENTION

- Limit pre-op hospitalization
  - Stabilize underlying diseases
  - Avoid hair removal by shaving
    - Clipping of skin is preferred
  - Skin decolonization
    - Chlorhexidine
    - Intranasal Mupirocin for *S.aureus* carriers
  - Impermeable drapes
    - Maximum sterile barrier precautions
-

# PROPHYLACTIC PREOPERATIVE ANTIBIOTICS

- Indicated for clean-contaminated, contaminated ops
- High risk or devastating effect of infection
- Dirty wounds already infected (therapy)
- Administer at appropriate time (tissue levels)
  - 30-60 minutes prior to skin incision
- Surgery site
  - Stomach, duodenum
  - Colon, rectum
  - Vaginal hysterectomy
  - Obstructed biliary tract
  - Head and neck
  - Insertion of prosthetic joints, heart valves
  - neurosurgery

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# Nosocomial Bloodstream Infections

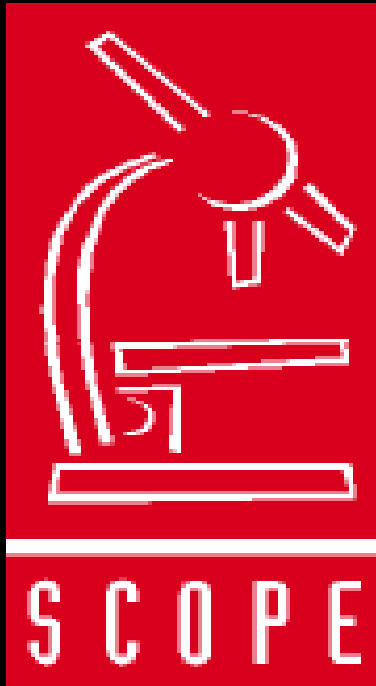
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# NOSOCOMIAL BACTEREMIA

- 4<sup>th</sup> most frequent site of NI
  - Attributable mortality 20%
  - Primary
    - \* IV access devices
    - \* gram positives (*S. aureus*, CNS)
  - Secondary
    - \* dissemination from a distant site
    - \* gram negatives
-

# Nosocomial Bloodstream Infections, 1995-2002



N= 20,978

Rank	Pathogen	Percent
1	Coagulase-negative Staph	31.3%
2	<i>S. aureus</i>	20.2%
3	Enterococci	9.4%
4	<i>Candida</i> spp	9.0%
5	<i>E. coli</i>	5.6%
6	<i>Klebsiella</i> spp	4.8%
7	<i>Pseudomonas aeruginosa</i>	4.3%
8	<i>Enterobacter</i> spp	3.9%
9	<i>Serratia</i> spp	1.7%
10	<i>Acinetobacter</i> spp	1.3%



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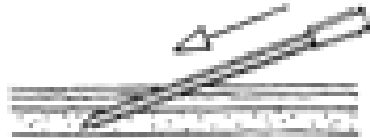
# PATHOGENESIS

- Direct inoculation
    - \* during catheter insertion
  - Retrograde migration
    - \* skin→subcutaneous tunnel→fibrin sheath at vein
  - Contamination
    - \* hub-catheter junction
    - \* infusate
-

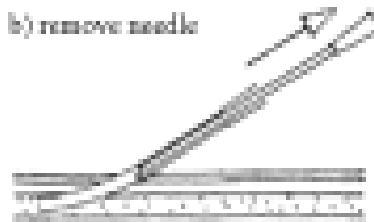
# IV Catheter Insertion

## A. Catheter over needle

a) insert into vein



b) remove needle

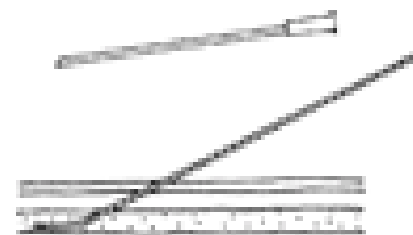


## B. Catheter over guidewire (Seldinger technique)

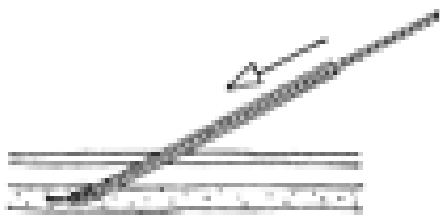
a) insert wire through needle in vein



b) remove needle



c) pass catheter over wire

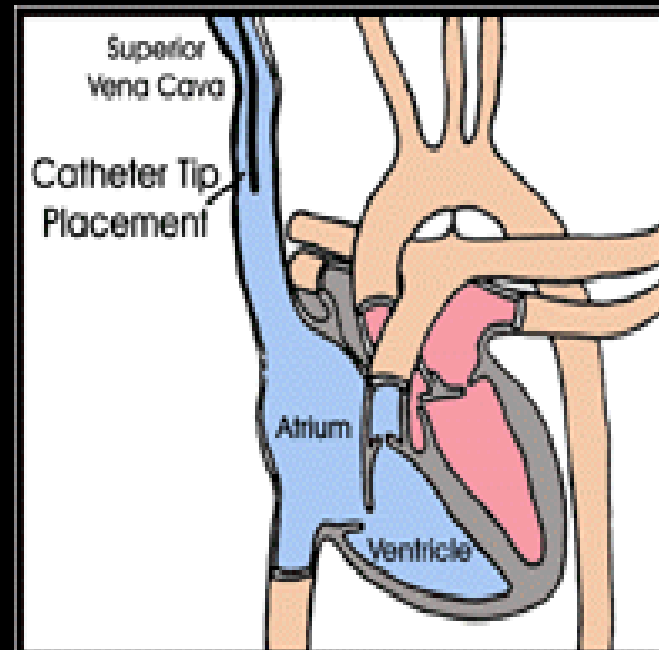


d) remove wire



*Different methods of insertion.*

**Fig 1**



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# RISK FACTORS

- Age  $\leq 1$  year  $\geq 60$  years
  - Granulocytopenia
  - Immunosuppression
  - Loss of skin integrity (e.g. burns, psoriasis)
  - Severity of underlying illness
  - Presence of distant infection
-

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# RISK FACTORS: HOSPITAL RELATED

- Type of catheter: plastic > steel
  - Location: central > peripheral;
    - Central
      - femoral > IJ > subclavian
  - Placement: cutdown > percutaneous
  - duration: at least 72 hrs > less than 72 hrs
  - Emergent > elective
  - Skill: others > IV team
-

# Nosocomial Bloodstream Infections

- 12-25% attributable mortality
- Risk for bloodstream infection:

	BSI per 1,000 catheter/days
Subclavian or internal jugular CVC	5-7
Hickman/Broviac (cuffed, tunneled)	1
PICC	0.2 - 2.2

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# Risk Factors for Nosocomial BSIs

- Heavy skin colonization at the insertion site
  - Internal jugular or femoral vein sites
  - Duration of placement
  - Contamination of the catheter hub
-

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# Prevention of Nosocomial BSIs

- **Limit duration of use of intravascular catheters**
    - No advantage to changing catheters routinely
  - **Maximal barrier precautions for insertion**
    - Sterile gloves, gown, mask, cap, full-size drape
    - Moderately strong supporting evidence
  - **Chlorhexidine prep for catheter insertion**
    - Significantly decreases catheter colonization; less clear evidence for BSI
    - Disadvantages: possibility of skin sensitivity to chlorhexidine, potential for chlorhexidine resistance
-

# Shifting Vantage Points on Nosocomial Infections

Many infections are inevitable, although some can be prevented



Each infection is potentially preventable unless proven otherwise



# VCU Medical Center

Virginia Commonwealth University

## Epidemiology and Infection Control

- [Staff](#)
- [Functions](#)
- [Policies](#)
- [Presentations](#)
- [Links](#)
- [Contact us](#)
- [Info on Infectious Diseases](#)

### Mission



- To prevent transmission of pathogenic microorganisms to patients, visitors, and hospital personnel via an evidence-based approach
- To serve as a resource for patient management via 24-hour coverage by nurse- and physician-epidemiologists
- To establish endemic rates of nosocomial infections
- To quickly detect and terminate outbreaks of nosocomial infections
- To educate healthcare & other workers on the prevention of infection
- To create new knowledge in infection control
- To be viewed as a national leader in infection control

Contact information:  
 Epidemiology and Infection Control Unit  
 1201 East Marshall Street  
 A.D. Williams Clinic, 6th Floor, Room 6-602  
 PO Box 980019  
 Richmond, Virginia 23298  
 Phone: (804) 828-2121

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# VCU Hospital Epidemiology and Infection Control

- Owing to the morbidity and mortality associated with nosocomial infections, medical facilities have infection control programs
    - Our Mission:
      - To prevent transmission of pathogenic microorganisms to patients, visitors, and hospital personnel via an evidence-based approach
      - To serve as a resource for patient management via 24-hour coverage by nurse- and physician-epidemiologists
      - To establish endemic rates of nosocomial infections
      - To quickly detect and terminate outbreaks of nosocomial infections
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      - To create new knowledge in infection control
-

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**Hospital Epidemiology 101:**  
prevention, control and management  
of nosocomial infections

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# RESERVOIRS OF INFECTION

- Personnel
    - \* hands
    - \* other skin (scalp)
    - \* nares- associated with S.aureus colonization
  - Patient
    - \* most important source
    - \* normal flora of skin, mucosal surfaces
  - Environment
    - \*contaminated antiseptics, dressings, instruments
-

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# PREDISPOSING FACTORS

- Host factors
    - advanced age, obesity, malnutrition, smoking
  - Prior surgery
  - Severity of underlying disease(s)
  - Immunosuppression
  - Drugs
    - antibiotics, sedatives, H2 blockers, steroids
  - Invasive devices
-

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# RISK FACTORS FOR INFECTION

- Increased reservoir of microorganisms
  - Increased likelihood of transmission
  - Increased inoculum size
  - Lowered host resistance
-

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# STRATEGIES TO REDUCE NI

- Modify host.
    - Risk factors such as age, underlying disease are difficult to change.
  - Reduce patient exposure to pathogens
    - Important!
  - Reduce the number and virulence of nosocomial pathogens
    - Important!
-

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# REDUCTION IN BACTERIAL VIRULENCE

- Specific bacterial virulence factors ( toxin production, enzyme production) difficult to change
  - Antibiotic resistance
    - Directly related to antibiotic use
      - Decreases in use result in improved susceptibility
      - Antimicrobial control programs
-



# EXPOSURE REDUCTION

- Aseptic technique during patient care
- Handwashing
- Proper isolation of patients known or suspected of harboring infectious diseases



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# ISOLATION PRECAUTIONS

- Past

- no specific provisions
- spread of smallpox, TB, and other highly infectious diseases

fever hospitals established in England in 19<sup>th</sup>  
century

- Modern era

- CDC's system of categorical isolation precautions based on transmission
-

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# UNIVERSAL PRECAUTIONS

- Assume that all blood/body fluids carry blood borne pathogens like HBV and HIV
  - Protection with barrier devices like gloves, gowns, mask, eye protection when anticipating exposure to B/BF
  - Take special care when handling and disposing of sharps, needles
-

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# CDC ISOLATION PRECAUTIONS

- Enteric: known or suspected infectious diarrhea, gastroenteritis
  - Strict: viral hemorrhagic fever, plague, smallpox
  - Contact: prevent transmissions of important pathogens not transmitted by droplets (HSV, highly resistant bacteria e.g., VRE, MRSA)
  - Respiratory (droplet): prevent transmission over short distances through the air (meningococcal disease, mumps, pertussis, influenza)
  - AFB: similar to respiratory but includes removal of airborne contaminants (negative air pressure, filters)
-

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# Barrier Precautions for Resistant Organisms

- Gowns, gloves for patient contact
  - Dedicated noncritical equipment
  - Effectiveness not clearly established yet  
are considered the standard of care
  - Push by some for surveillance cultures to  
detect colonization with MRSA & VRE
-

# Interrupting the transmission of infection from source to susceptible host

## *Control airborne transmission*

- Airborne isolation measures
- ventilation systems - *Legionella, Aspergillus*
- ultra clean air in OR- HEPA filtered air
- airflow designed to go out of (not to) "clean" patient area
- masks

## *Isolate patients- contact isolation*

- protective isolation (to protect susceptible patient)
- source isolation (to protect others from patient's infection)

## *Reduce cross transmission*

- use aseptic techniques throughout hospital
- particular care when handling dressings, secretions & excretions
- ~~hand hygiene with antiseptic soap or waterless hand hygiene~~  
agent

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# Hand Hygiene is the single most effective intervention to reduce the cross transmission of nosocomial infections

## *Handwashing*

- must be "bacteriologically effective"
  - wash hands before any procedure in which gloves and forceps are necessary
  - after contact with infected patient or one colonised with multi-resistant bacteria
  - after touching infective material
  - use soap and water (preferably disinfectant soap)
  - more prolonged and thorough scrub before surgery
-



# Impact of Hand Hygiene on Hospital Infections

<u>Year</u>	<u>Author</u>	<u>Setting</u>	<u>Impact on Infection Rates</u>
1977	Casewell	adult ICU	<i>Klebsiella</i> decreased
1982	Maki	adult ICU	decreased
1984	Massanari	adult ICU	decreased
1990	Simmons	adult ICU	no effect
1992	Doebbeling	adult ICU	decreased with one another hand hygiene
	versus product		
1994	Webster	NICU	MRSA eliminated
1995	Zafar	nursery	MRSA eliminated
1999	Pittet	hospital	MRSA decreased

ICU = intensive care unit; NICU = neonatal ICU

MRSA = methicillin-resistant *Staphylococcus aureus*



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# New Technologies

- Hand hygiene- waterless antiseptic solutions
  - Antiseptic impregnated central venous catheters
  - Antiseptic/silver impregnated urinary catheters
    - Closed system foley/urinary catheters
  - Chlorhexidine gluconate for the patient skin antisepsis
    - CVC placement
    - Peripheral IV placement
    - Phlebotomy
-

# Alcohol Based Hand Sanitizers

- CDC/SHEA hand antiseptic agents of choice
  - Recommended by CDC based on strong experimental, clinical, epidemiologic and microbiologic data
  - Antimicrobial superiority
    - Greater microbicidal effect
    - Prolonged residual effect
  - Ease of use and application



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# New policies and initiatives

- Promotion of hand hygiene and waterless agents
  - Comprehensive policy for the insertion and care of invasive central venous catheters
  - Policy and education for the indication, placement and use of urinary catheters
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# *Surveillance*

## *Surveillance Aims*

- establish endemic infection rates
  - identify outbreaks
  - convince medical personnel to adopt preventative practices
  - evaluating control measures
  - satisfying regulators
  - defending malpractice claims
  - reducing infection rates in hospital
  - link to specific device, procedure, site
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## **MRSA (methicillin resistant *S.aureus*)**

- appeared in 1980s
  - some epidemic strains
  - carriers not necessarily ill
  - reduce transmission by detecting and treating all infected and colonised patients
  - infection control procedures
    - esp handwashing and patient contact isolation
  - drug of choice is vancomycin
  - recent reports of a vancomycin resistant strains of *S.aureus*
  - Certain to be an increasingly difficult management problem*
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## VRE (vancomycin resistant enterococci)

- *Enterococcus faecalis* and *E. faecium*
  - normal inhabitants of bowel
  - can cause UTI and wound infections in seriously ill patients
  - enterococci now becoming more resistant to many antibiotics
  - this includes vancomycin
    - therefore a serious clinical problem
  - cross infection via contaminated equipment documented
    - Thermometers
  - Patients with VRE are placed on contact isolation
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*Sufficient data now exist to prove that the mortality of hospital acquired infections represents a leading cause of death in the United States.*

Richard P. Wenzel, MD, M.Sc

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# **So if you are still interested in becoming a hospital epidemiologist....**

- Graduate from medical school
  - Complete an internship/residency in Internal medicine.-3 years
  - Complete an In Infectious Diseases Fellowship- 2 or 3 years
  - MPH degree with epidemiology focus- 2years
  - .....once you complete the above, call me!
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