Nosocomial Infections

7/25/18 Noon Conference

Dan Van Aartsen

PGY3 Internal Medicine

Learning Objectives

- Define Nosocomial Infections
- Identify common hospital acquired infections
- Know the common causes and understand basic pathophysiology of nosocomial infections
- Learn the fundamentals of ***prevention*** of hospital acquired infections and basic management

Definition – Nosocomial Infections

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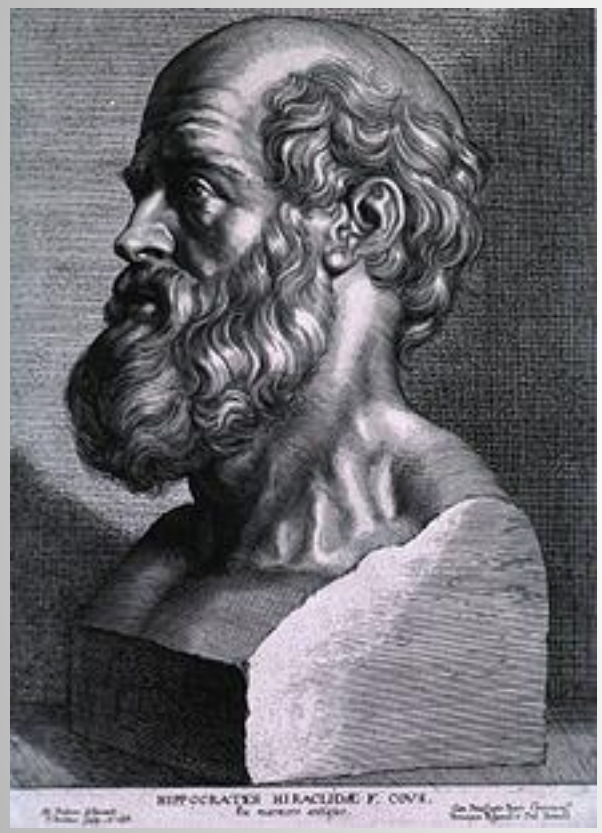

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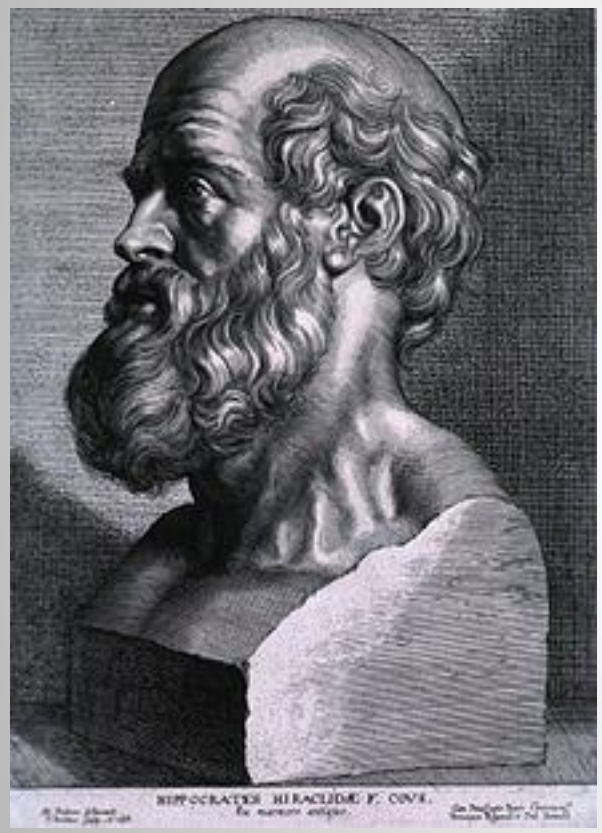

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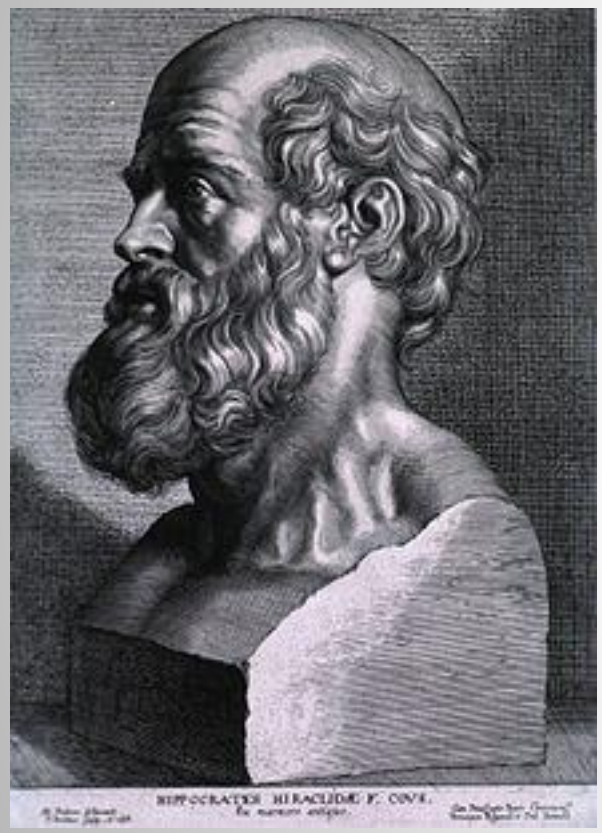

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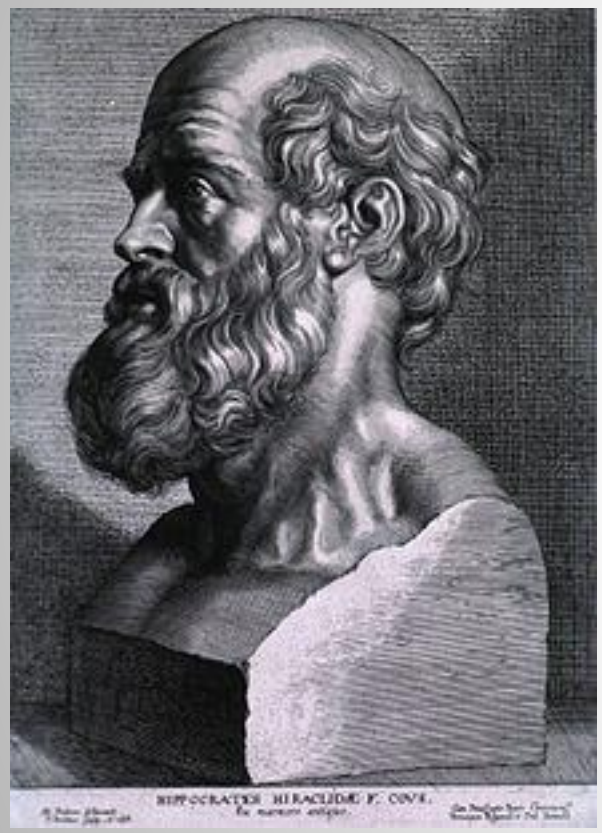

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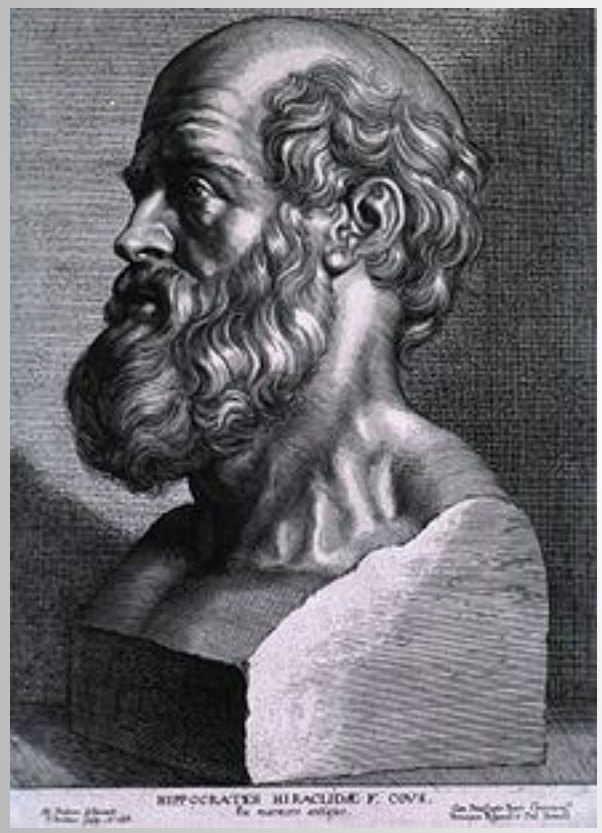

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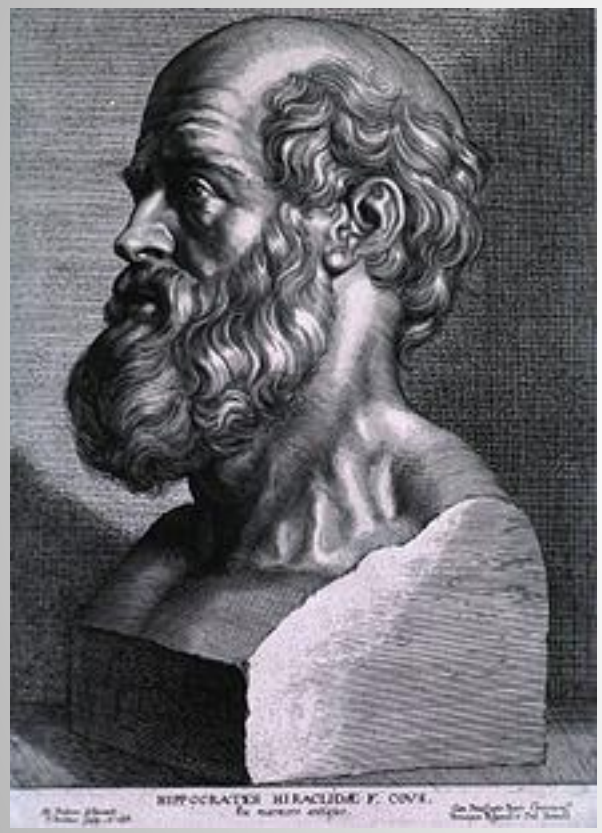

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  - This can be important! Some treatment guidelines are based on community-acquired vs. hospital acquired

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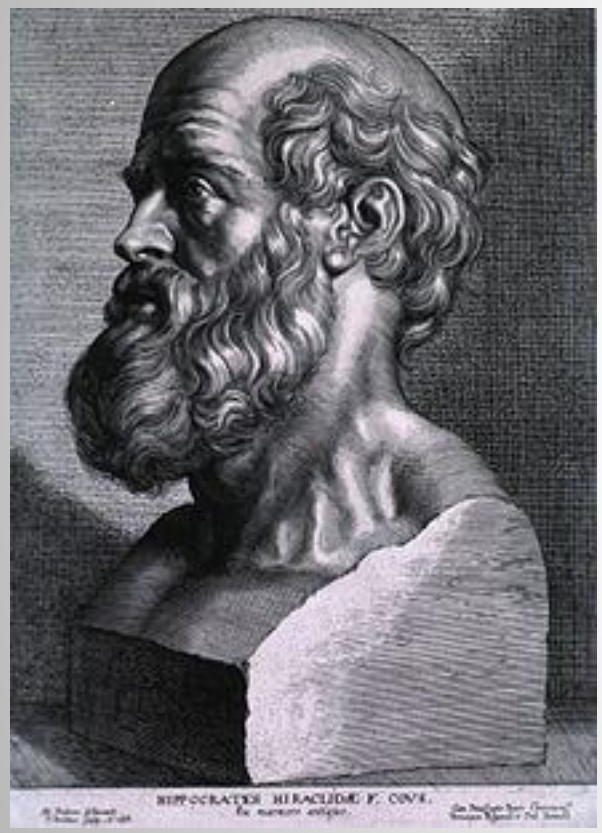

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  - "An infection occurring in a patient during the process of care in a hospital or other health care facility which was not present or incubating at the time of admission." (WHO)

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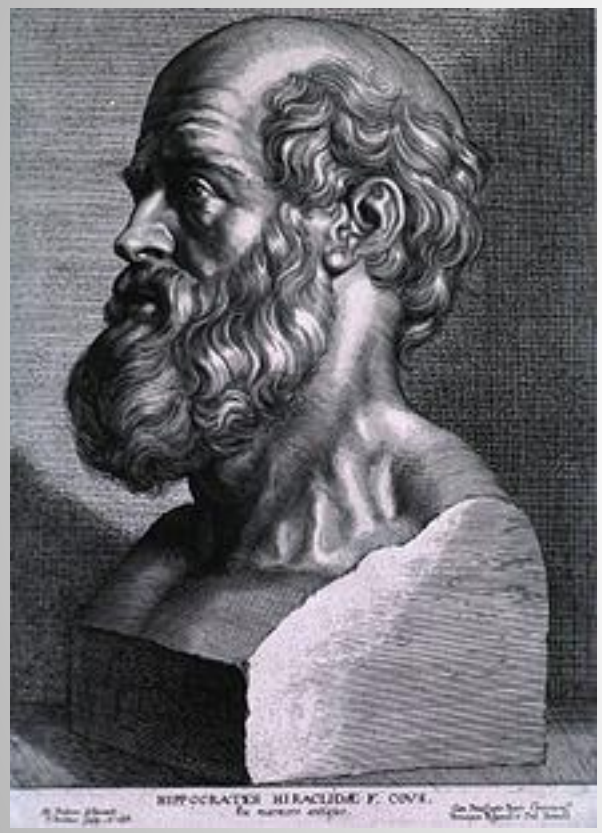

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  - "…This includes infections acquired in the hospital, but appearing after discharge, and also occupational infections among staff of the facility."

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- Three landmark events ignited the field of infection control…

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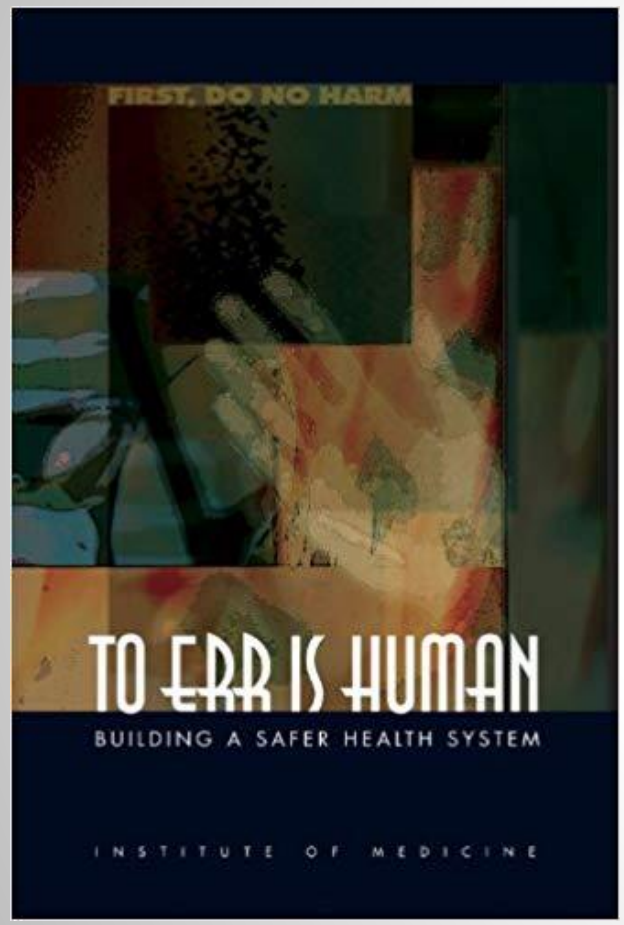

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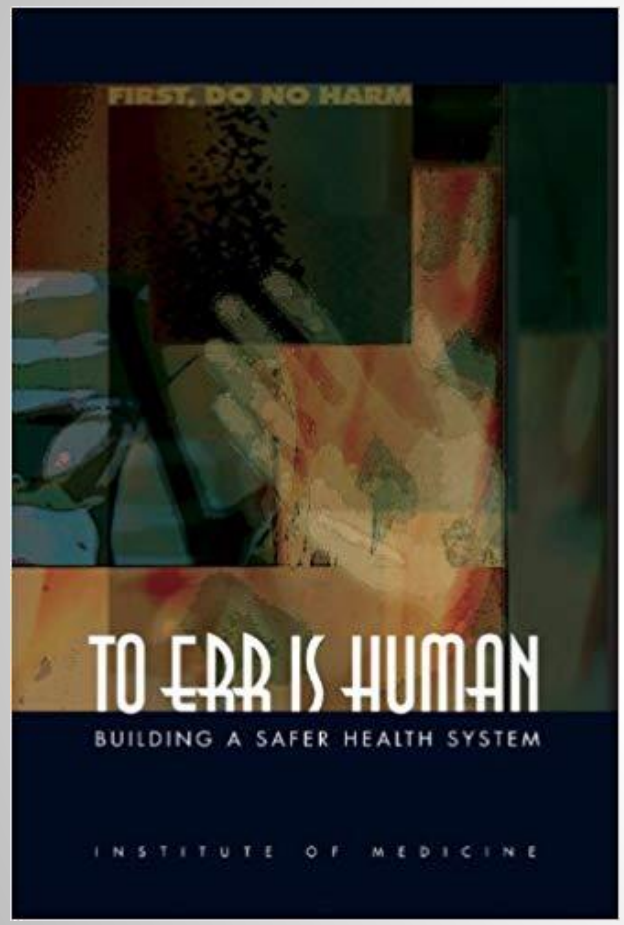

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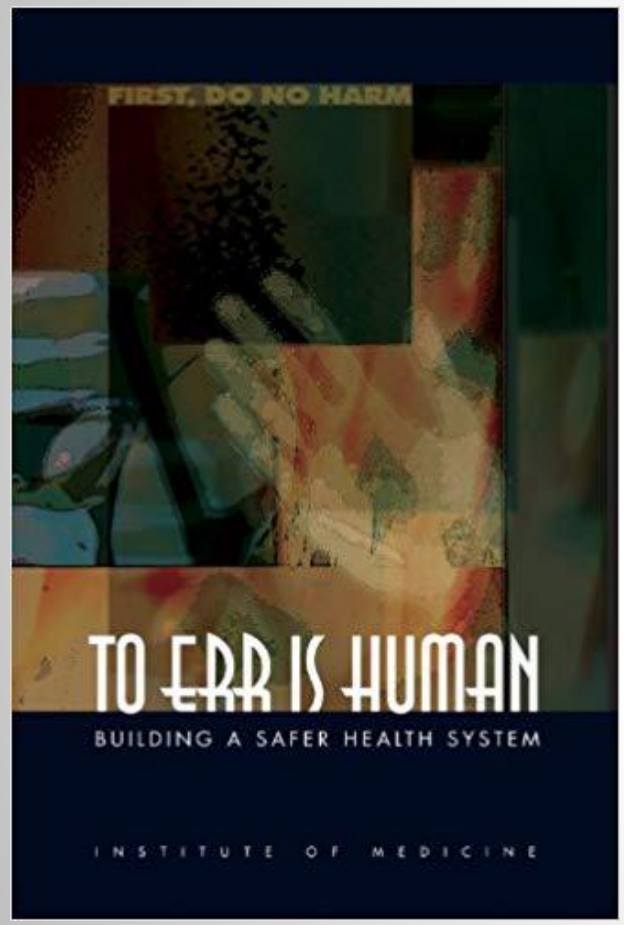

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  - Focused on preventable medical errors of all types, but popularized the concept of *preventable* hospital-acquired infections

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Chicago Tribune CHICAGOLAND

SUNDAY, JULY 21, 2002 $1.75 City and Suburbs/$2 Elsewhere

Deaths cloud Illinois firm's skydive record

Critics question safety, location

By Maurice Possley and Jon Hilkevitch
Tribune staff reporters

OTTAWA, Ill.—As the sport's top official looked on, three skydivers under high-performance parachutes lined up their approach to a tiny swimming pond late last Sunday afternoon at Skydive Chicago.

They were "pond swooping," a crowd-pleasing stunt where a skydiver skims across the water, much like a water-skier, and then walks ashore. There was little room for error, with a dock jutting into the water on one side, a swimming platform in the center and trees all around.

The first two made it, but Ronald Passmore Jr., 33, a skydiver with more than 1,300 jumps, was in trouble. He made a dangerous low turn, slammed the water chest first and was killed.

Passmore's death, the sixth at

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Some critics say Skydive Chicago's fatality rate in 12 months—eight times higher than the national average—suggests an atmosphere that fails to adequately emphasize safety. Since 1993, 13 skydiving deaths have occurred at Skydive Chicago, which is run by Roger Nelson.

At the same time, skydivers, pilots and air traffic controllers report that skydiving operations in the busy flight route into O'Hare International and Midway Airports have caused near misses between commercial jets and the jump planes disgorging divers into dense cloudbanks.

"Skydiving in Chicago is an accident waiting to happen," one pilot declared in a report to federal authorities of a near miss in 2000.

After Passmore's death, Nelson said he banned "pond swooping" at the busy drop zone here. And Chris Needels, the executive director of United States Parachute Association who wit-

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  - Brought mainstream attention to HAI and forced action within the health care community

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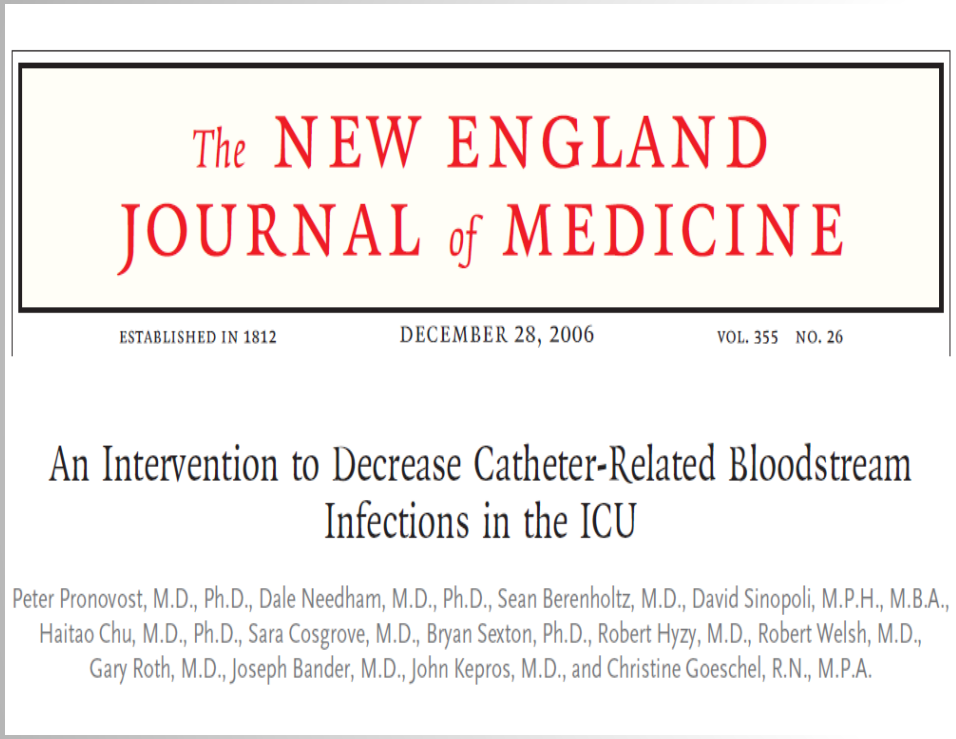

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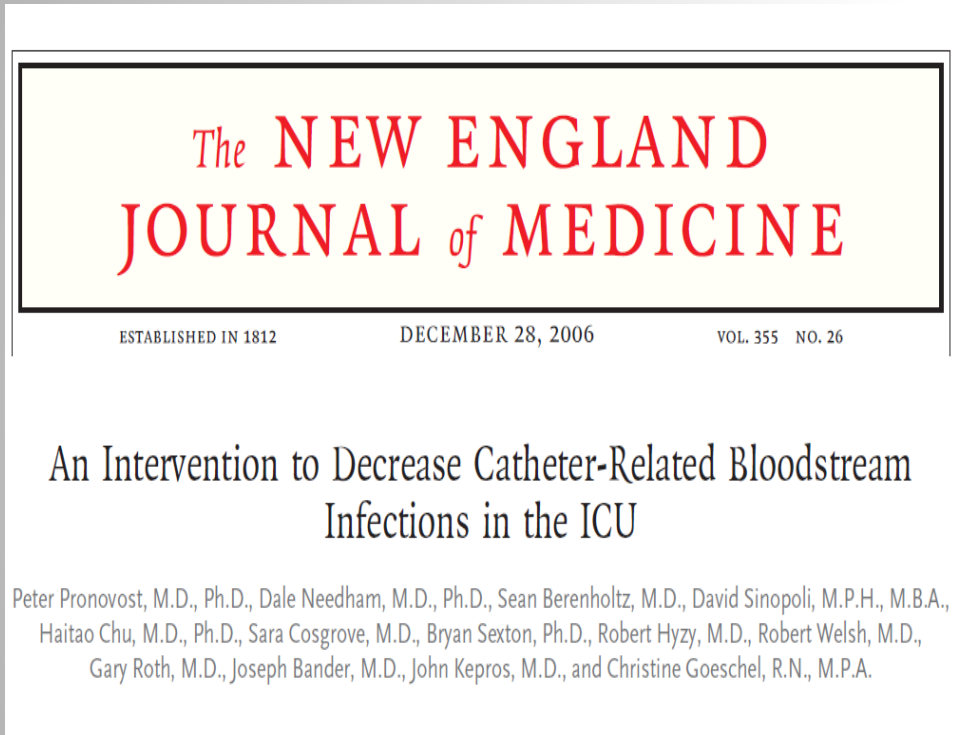

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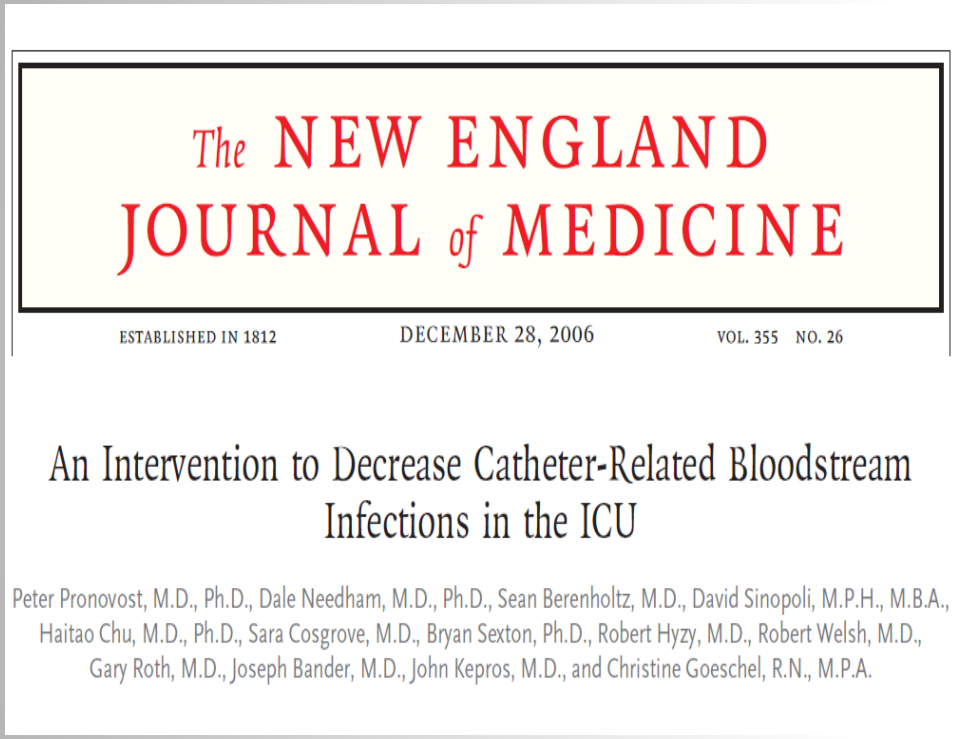

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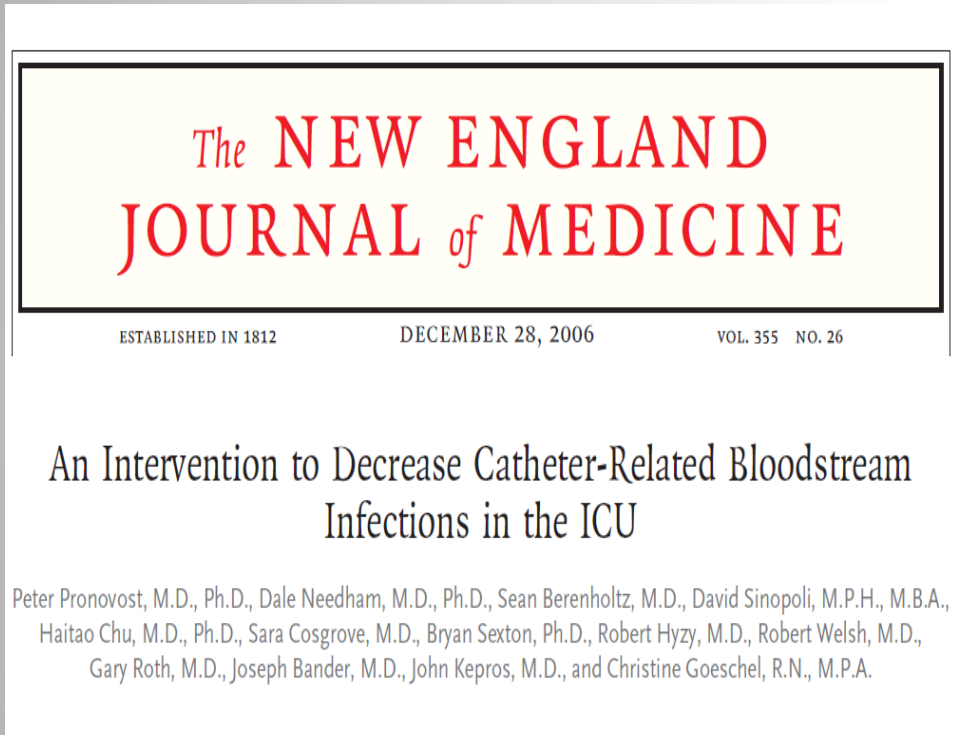

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  - Paradigm shift from infection *control* to infection *prevention*

Healthcare-Associated Infections

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- The most commonly seen healthcare-associated infections?

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- Catheter-Associated Urinary Tract Infections

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- Others: Surgical site infections, hospital-acquired hepatitis, herpesvirus, transfusion- and transplant-related infections, etc

Healthcare-Associated Infections

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    - **And don't check unless there's symptoms**

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  - Discontinue catheter as soon as it is not required
  - Consider alternatives to indwelling catheters, (eg condom catheter, intermittent catheterization, suprapubic catheterization)

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- Antibiotics – take into account risk factors for resistance
  - Prior urine cultures
  - Prior antibiotic use
  - Health care exposure
  - Prevalence of resistance

CAUTI - Management

- Much wider range of pathogens cause CAUTI than simple UTI
  - More frequently resistant to antimicrobials
  - *E. coli*, other Enterobacteriacae, *Pseudomonas*, CONS, enterococcus, *Candida*
- Antibiotics – take into account risk factors for resistance
  - Prior urine cultures
  - Prior antibiotic use
  - Health care exposure
  - Prevalence of resistance
- No great evidence for duration of antibiotics; 7-14 days is considered appropriate depending on severity

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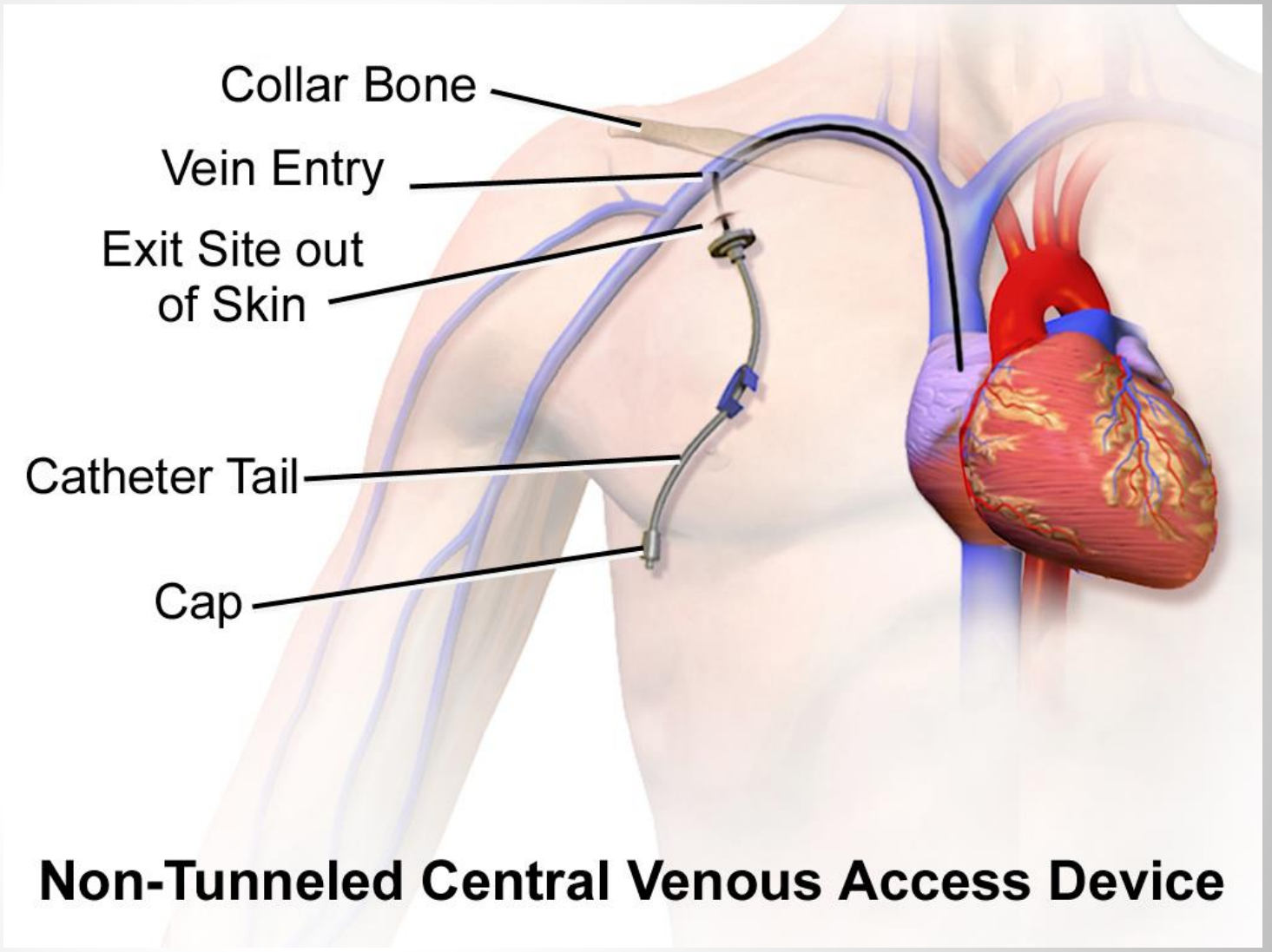
- No great evidence for duration of antibiotics; 7-14 days is considered appropriate depending on severity
  - Typically can be PO if tolerated

CLABSI



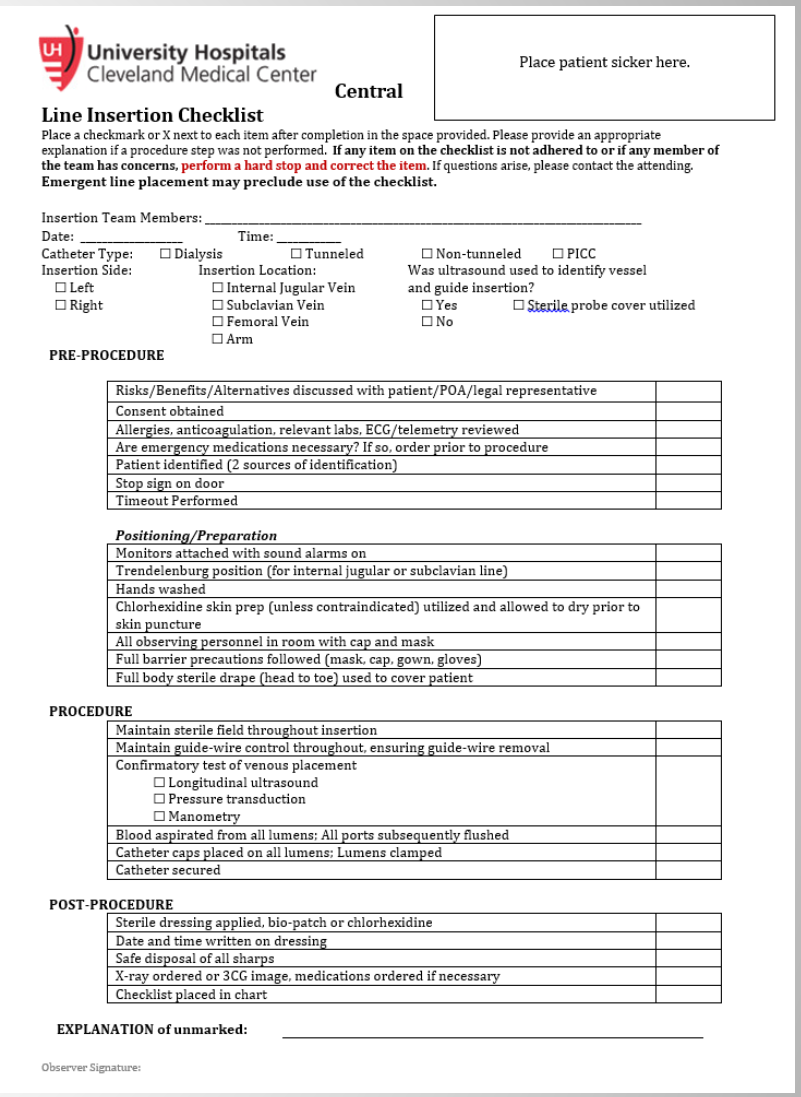
Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". WikiJournal of Medicine 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436. -

CLABSI

- “CLABSI” only includes central lines, but infections can be also be associated with peripheral IVs
  - tunneled lines, PICCs, ports, etc
- Suspect when bloodstream infection occurs with no other apparent source
- ***Staph aureus****,* CONS, *Candida* bacteremia in the absence of other sources should raise suspicion
  - Increasingly multi-drug resistant gram negative bacteria

CLABSI – Prevention

- Many “Bundles” have been shown to reduce CLABSI rates
  - Standardized procedures, checklists, educational training, maximal sterile barriers
- MICU initiative to reduce CLABSI
- (remove lines when they’re not needed!!)



University Hospitals Cleveland Medical Center **Central**

Place patient sicker here.

Line Insertion Checklist

Place a checkmark or X next to each item after completion in the space provided. Please provide an appropriate explanation if a procedure step was not performed. **If any item on the checklist is not adhered to or if any member of the team has concerns, perform a hard stop and correct the item.** If questions arise, please contact the attending. **Emergent line placement may preclude use of the checklist.**

Insertion Team Members: _____

Date: _____ Time: _____

Catheter Type: ☐ Dialysis ☐ Tunneled ☐ Non-tunneled ☐ PICC

Insertion Side: ☐ Left ☐ Right

Insertion Location: ☐ Internal Jugular Vein ☐ Subclavian Vein ☐ Femoral Vein ☐ Arm

Was ultrasound used to identify vessel and guide insertion? ☐ Yes ☐ No ☐ Sterile probe cover utilized

PRE-PROCEDURE

Risks/Benefits/Alternatives discussed with patient/POA/legal representative	
Consent obtained	
Allergies, anticoagulation, relevant labs, ECG/telemetry reviewed	
Are emergency medications necessary? If so, order prior to procedure	
Patient identified (2 sources of identification)	
Stop sign on door	
Timeout Performed	

Positioning/Preparation

Monitors attached with sound alarms on	
Trendelenburg position (for internal jugular or subclavian line)	
Hands washed	
Chlorhexidine skin prep (unless contraindicated) utilized and allowed to dry prior to skin puncture	
All observing personnel in room with cap and mask	
Full barrier precautions followed (mask, cap, gown, gloves)	
Full body sterile drape (head to toe) used to cover patient	

PROCEDURE

Maintain sterile field throughout insertion	
Maintain guide-wire control throughout, ensuring guide-wire removal	
Confirmatory test of venous placement ☐ Longitudinal ultrasound ☐ Pressure transduction ☐ Manometry	
Blood aspirated from all lumens: All ports subsequently flushed	
Catheter caps placed on all lumens: Lumens clamped	
Catheter secured	

POST-PROCEDURE

Sterile dressing applied, bio-patch or chlorhexidine	
Date and time written on dressing	
Safe disposal of all sharps	
X-ray ordered or 3CG image, medications ordered if necessary	
Checklist placed in chart	

EXPLANATION of unmarked: _____

Observer Signature:

CLABSI - Management

- Remove the line!
  - Possible exceptions include CONS, +/- enterococcus and GNBs if stable
- Obtain catheter cultures (but only if infection is suspected)
- Also get peripheral cultures
- If CONS grow – keep checking
- Antibiotics
  - Vancomycin (high MRSA rates)
  - Empiric Gram negative coverage IF critically ill, neutropenic, femoral catheter, or known GN infection
    - Tailor to patient and local susceptibilities (here - Zosyn)
  - Also cover *Candida* species if femoral line is suspected source

HCAP/HAP/Nosocomial PNA, VAP

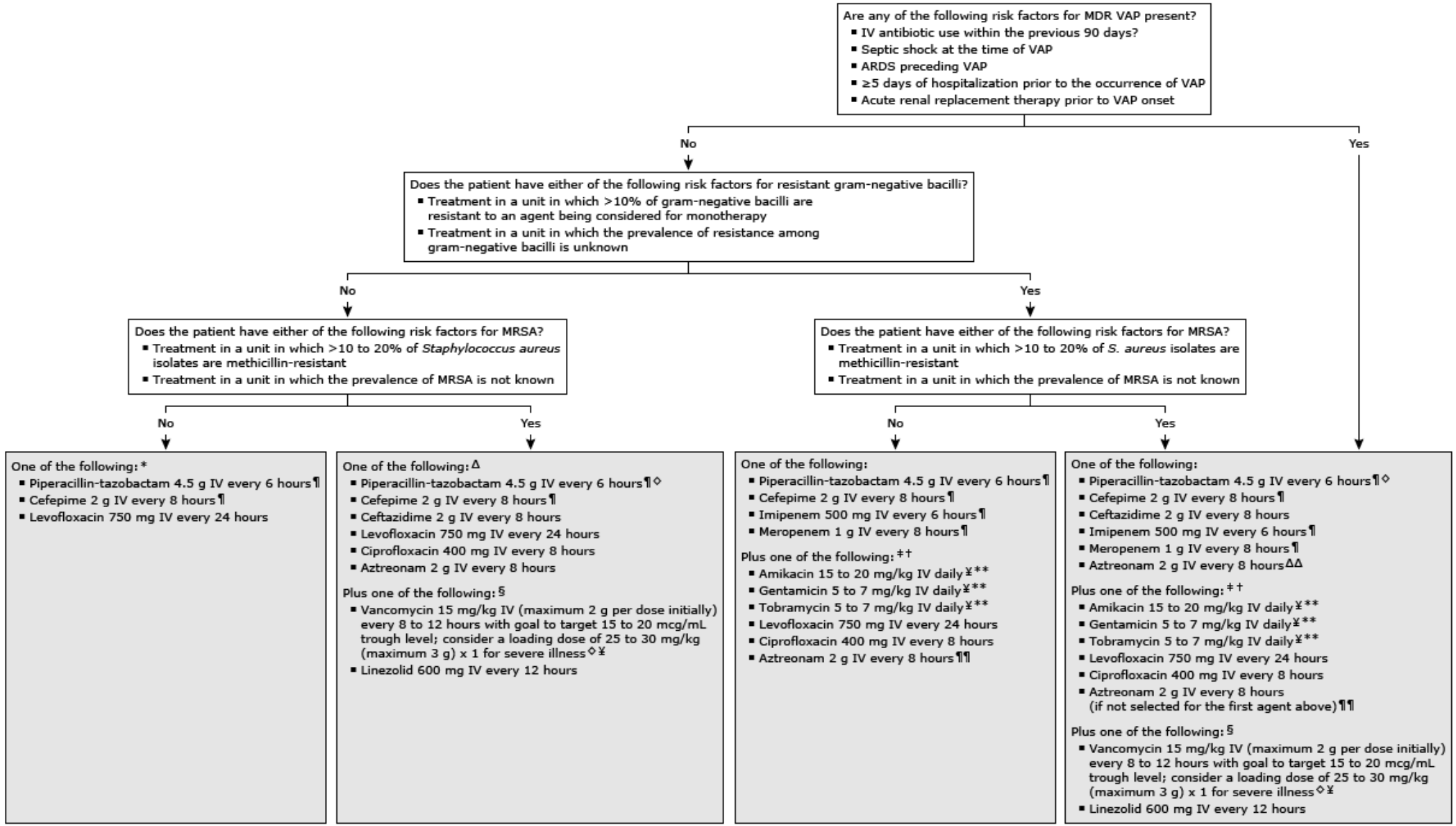
HAP/VAP

- HAP = pneumonia that occurs ≥48 hours after admission
- VAP = pneumonia that occurs ≥48 hours after intubation
- Suspect in patients with new infiltrates, increasing O2 or ventilator requirements, fevers, chills, etc
- MRSA, *Pseudomonas, Acinetobacter*, *Klebsiella*
- Resistance is common
  - Risk factors for MDR organisms: recent antibiotics, prolonged hospitalization, poor functional status, hemodialysis, severe illness

HAP/VAP - Management

- Establish microbiologic diagnosis!
  - Blood and respiratory cultures indicated in all patients
  - Consider Pneumococcal and *Legionella* urine ag testing
  - Viruses can account for up to 1/3 of severe pneumonia – even hospital acquired
  - Deep respiratory cultures may be necessary
- Antibiotics
  - Depends MRSA and MDR risk factors – empiric coverage may entail simple broad spectrum respiratory fluorquinoline up to double antipseudomonal + MRSA coverage

The recommendations in this algorithm are generally in keeping with the 2016 IDSA/ATS guidelines for the management of HAP and VAP. These regimens are intended for the initial treatment of patients in whom the microbiologic cause has not yet been identified. The doses below are intended for patients with normal renal function; dosing will need to be adjusted for patients with renal dysfunction. Empiric treatment choices should be influenced by the local distribution of pathogens causing VAP and their antimicrobial susceptibility patterns (ideally using an antibiogram that is specific to the hospital's ICU population). Antimicrobial selection should also be based upon the patient's risk factors for MDR pathogens, including recent antibiotic therapy, the presence of underlying diseases, and available culture data (including prior microbiology data). Additional considerations include potential toxicities, potential drug interactions, cost, availability, and clinician familiarity with the medications. Once the results of pretherapy cultures are available, therapy should be narrowed based upon the susceptibility pattern of the pathogens identified and the potential toxicities of the regimens.



Prevention of HAI

- “Standard Precautions”
  - **HAND HYGIENE HAND HYGIENE HAND HYGIENE**
  - Gloves when touching blood, body fluids, secretions, etc,
  - Injection safely
- Sterile technique
- Avoid unnecessary medical devices
- Remove unneeded medical devices
- Isolation Precautions

Isolation

- Who, why, when, how??

Isolation

- Who, why, when, how??
- 7 types of transmission based precautions at UH:
  - Contact
  - Contact plus
  - Airborne
  - Droplet
  - Protective
  - Special Alert Precautions
  - Special precautions: Droplet/Contact (peds only)
  - Combos of above

Isolation

- Contact
  - Gown/gloves
  - MRSA
  - Highly resistant organisms
  - HSV, disseminated or severe
  - Major wounds not contained by dressing
  - Others, eg head lice, viral conjunctivitis, etc

Isolation

- Contact
- Contact plus
  - Gown/gloves **+ hand-washing**
  - **C diff**
  - (also norovirus, cryptosporidium)

Isolation

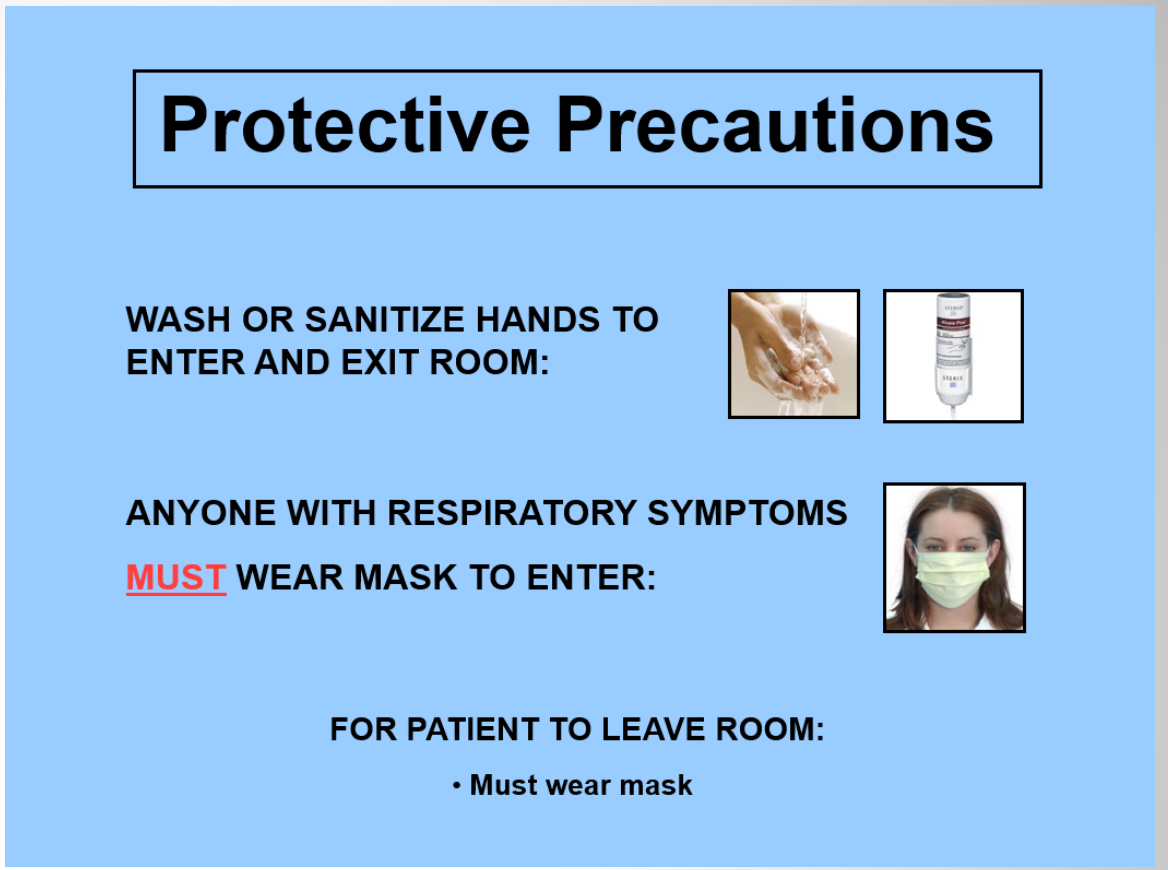
- Contact
- Contact plus
- Airborne
  - **N-95 Respirator**
  - TB, Avian flu, others

Isolation

- Contact
- Contact plus
- Airborne
- Droplet
  - **Mask**
  - Influenza, H flu, bacterial meningitis

Isolation

- Contact
- Contact plus
- Airborne
- Droplet
- Protective
  - For **neutropenic patients**
  - **Mask –** only if respiratory symptoms
  - For patient protection, not prevention of transmission



Isolation

- Contact
- Contact plus
- Airborne
- Droplet
- Protective
- Special Alert Precautions
  - Localized zoster shingles in an *immunocompetent* patient
  - Only providers with immunity can care for patient

Isolation

- Contact
- Contact plus
- Airborne
- Droplet
- Protective
- Special Alert Precautions
- Special precautions: Droplet/Contact (peds only)

Isolation

- Contact
- Contact plus
- Airborne
- Droplet
- Protective
- Special Alert Precautions
- Special precautions: Droplet/Contact (peds only)
- Many combos of above

Isolation

- Questions on Isolation? See UH Isolation policies (on intranet)

Viral Hemorrhagic Fevers (due to Lassa, Ebola, Marburg, Crimean-Congo fever viruses)	Contact and Airborne	Airborne Isolation requires negative pressure; HCW must wear N-95 respirator. Single patient room. Appropriate waste handling. Largest viral load in final stages of illness when hemorrhage may occur; additional PPE, including double gloves, leg and shoe covers may be used. Face and eye protection required. See www.cdc.gov for most current recommendations. Use "High Alert Precautions" sign (brown)
VRE (Vancomycin Resistant Enterococcus); NOT labelled as highly resistant. See also MDRO.	Standard	
Viral Respiratory Diseases (Adult)	Standard	
West Nile – See Arthropodborne viral encephalides		
Whooping cough – See Pertussis		
Wound infections **Major – no dressing or not contained by dressing** Minor – contained by dressing	Contact Standard	Duration of illness
Yersinia – See Gastroenteritis		
Zika	Standard	
Zygomycosis (phycomycosis, mucormycosis)	Standard	Not transmitted person to person

Learning Objectives

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- Define Nosocomial Infections

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- Identify common hospital acquired infections

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- Define Nosocomial Infections
- Identify common hospital acquired infections
- Know the common causes and understand basic pathophysiology of nosocomial infections

Learning Objectives

- Define Nosocomial Infections
- Identify common hospital acquired infections
- Know the common causes and understand basic pathophysiology of nosocomial infections
- Learn the fundamentals of ***prevention*** of hospital acquired infections and basic management

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Thanks!