

# Infection Prevention in the Interventional Settings

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# Financial Disclosure

Consulting Clients include:

- 3M
- AMN Healthcare
- BESmith
- The Compass Group
- Johns Hopkins Hospital

# Course Objectives

1. Describe the prevalence of SSIs in interventional populations.
2. List two SSI risk factors unique to the interventional population
3. Discuss two barriers to implementing successful prevention programs
1. Identify three opportunities for improvement in the interventional setting

# The Future is Here

## Cath Lab

- Cardiac Cath
- Angioplasty
- Pacemaker/ICD
- Stents
- EP Studies
- ASD/PFO closures
- Endovascular AAA
- IABP

## Interventional Radiology

- Biopsies
- Shunts
- Vascular Access
- Embolization
- Perc abcess drainage
- Stents
- Thrombolysis
- IVC Filters

# Evolution of the Cath Lab

1929- Cardiac Catheterization

1950- Pacemakers

1975- Implantable lithium batteries (10+ years)

1977 – Angioplasty (PTCA)

1987 – Stents

2001- ASD/PFO Closures

2004- Endovascular AAA

[PTCA.org](http://PTCA.org)

# Evolved from Diagnostics not the OR



[www.mercydesmoines.org/ images/subpages/Mercy](http://www.mercydesmoines.org/images/subpages/Mercy)



[www.cvm.ncsu.edu/vth/ images/cardiac\\_cath.jpg](http://www.cvm.ncsu.edu/vth/images/cardiac_cath.jpg)

# Interventional Radiology



# Interventional Radiology

- Evolved in the 1960's from basic radiographic procedures
- Diagnostic procedures are minimally invasive with little risk for infection
- Procedures with implantable devices have a higher risk for infection
- Hospitals are combining departments into Imaging Suites
  - Can be a political “hotbed”
  - Cath Lab, IR, Vascular

# Action Plan



<http://shannaro.files.wordpress.com/2009/04/explosion.jpg>



# Risk Factors

- Co-morbidities
- Invasive procedure
- Implantable devices (VCDs, stents, IVC filters)
- Cut Down vs. percutaneous access
- Groin access
- Poor aseptic technique

# Vascular Closure Devices -VCDs

- Sheaths may be left in post procedure
  - Early removal
- VCDs are permanent
  - Provide hemostasis post-procedure
  - Eliminate manual compression
  - Allow for early ambulation

# Complications

- Transient bacteremia post-procedure
  - (may seed an implant)
- Post-procedure hematomas/seromas
- Septic thrombophlebitis
- Pseudoaneurysm
- Infection/SSI
- Endocarditis
  - Lead removal
- Death

# Cath Lab Infection Rates

## Infection Rates

- Overall rate of .35%
- Pacemakers 1-6%
- NHSN .44% (15/3404)
  - Numbers too small for comparison (17 hosp.)

## Causative Organisms

- Gram Positives (skin flora)
- Gram Negatives more common in IR

# Diagnostic vs Surgical Procedures

- Diagnostic procedures are minimally invasive with little risk for infection
- Surgical procedures with implantable devices have a higher risk for infection

# Pivotal Argument

If you perform surgical procedures in interventional settings, you must comply with surgical standards... to a point

The sticking point:

Not all procedures are surgical

# Barriers to Compliance

- Many different procedures
  - Diagnostic & Surgical
- They work in isolation
- Physical environment- (doors, cables)
- Low infections rates
- They are not OR trained
  - Cardiologists and radiologists

# Reasons to Comply

- OSHA
- Central line placement bundle
- Double Standard
  - OR vs Interventional setting
- Surgical procedures
- Infection Rates

# Cath Lab Guidelines

Written before CVC Bundles became standard of care (2005)

- Section I: Patient Prep and Protection
- Section II: Lab Personnel-The Primary Operator and Staff
- Section III: Laboratory environment

# Focus Areas for Improvement

1. Physical environment
2. Hand Hygiene
3. Surgical Hand Antisepsis
4. Antibiotic Prophylaxis
5. Patient Skin Antisepsis
6. Aseptic Technique
  - Attire
  - Traffic Patterns
7. Dressings

# Physical Environment

- Cleanability
  - Dusty to to electrical equip.
  - High dusting of cords, monitors
  - Vents cleaned q month
- Doors –shut during case
- Traffic Patterns
- Dress Codes



# Cleaning

- Equipment – disinfect between use
  - Probes
    - Use sterile covers for sterile procedures
    - Clean with disinfectant after each patient
- Ultrasound gels
  - Single use for sterile procedures
- Room
  - post procedure
  - Not during case or in the presence of sterile set ups
  - Terminal clean at end of day

# Physical Environment

- Scrub Sinks- outside rooms
- Dirty Room- not scrub sinks



[www.cardinalglennon.com/ MedicalSpecialties/Ca.](http://www.cardinalglennon.com/MedicalSpecialties/Ca)

# Room Standards should include:

- Air Exchanges- 15 per hour/3 fresh air
  - Uninterrupted (is equipment blocking vents?)
- Positive Pressure
- Temp-70-75° F
- Humidity- 30-60%
- 400-600 sq.ft.

# Hand Hygiene

- During patient care
- Surgical skin antisepsis
  - Alcohol/CHG hand gels
  - Scrubbing
  - Should not take place in the room or near sterile supplies

# Antibiotic Prophylaxis

- Not routinely recommended for *diagnostic* procedures (except immunocompromised pts)
- Pacemakers and other implantables (PFO, ASD, VCDs)
- 30-60 min prior to procedure start
- Cephalosporins, not vancomycin
- Proper dosage for obese population ( $BMI \geq 30$ )

Chambers CE, et al. Infection Control guidelines for the cardiac catheterization laboratory. *Catheter Cardiovascular Interv* 2006;67:78-86.

Mangram, et al. The Hospital Infection Control Practices Advisory Committee (HIPAC). Guideline for the Prevention of Surgical Site Infection. *Infect Control Hosp Epidemiol* 1999;20:247-80.

Medical Letter. Treatment Guidelines from the Medical Letter: Antimicrobial Prophylaxis for Surgery. *Medical Letter* 2004; 2 (20): 27-32.

# Skin Antisepsis

- No specific recommendation for Cath Lab procedures (*only central line insertions*)
- Prewash prior to application
- Follow manufacturer's directions
  - CHG requires a 2 min scrub per groin
- Utilize proper aseptic technique during application & gloves to contain shedding

# Aseptic Technique

Principles were developed to reduce the risk of wound contamination.

$$\text{Risk of SSI} = \frac{\text{Dose of Bacterial Contamination} \times \text{Virulence}}{\text{Resistance of Host (patient)}}$$

Berry & Kohn's, Operating Room Technique, 11<sup>th</sup> ed., p. 254

# Causes of Wound Contamination

## 1. Exogenous sources

- Environment, lack of proper airflow, shedding by the Team

## 2. Endogenous sources

- Patient's own skin/hair
- Infection at a remote site

# The Number One Source

## People = Shedding

4000-10,000 particles per minute

(Berry & Kohn's, Operating Room Technique, 11<sup>th</sup> ed., p. 252)

Carried by wind currents to the sterile field which results in wound contamination.

1. Patient
2. Providers
3. Ancillary Personnel
4. Sales Reps
5. Students
6. Passersby



# Containment is the key

## Patient

- Pre-op Showers
- Nasal Decolonization
- Hat and clean gown/linen for patient
- Hair removal only when necessary
  - Clippers, not in the Cath Lab

## Interventional Team

- Hand Hygiene
- Proper aseptic technique
  - No covered set ups for surgical procedures
- ***Properly worn*** hats, masks, scrubs, jackets
  - Cath Lab guidelines “strongly recommend” due to OSHA
- Traffic patterns

# Hair containment is a challenge



[www.kaleidahealth.org/.../Masud\\_LabA\\_MFG.jpg](http://www.kaleidahealth.org/.../Masud_LabA_MFG.jpg)



[www.memorialhermann.org/uploadedImages/Locati..](http://www.memorialhermann.org/uploadedImages/Locati..)

# Containment is the key



[www.gshvin.org/Media/CorePages/Cath-Op-1.jpg](http://www.gshvin.org/Media/CorePages/Cath-Op-1.jpg)



**Someone please help these people!**

[www.seormc.org/Cardiac/images/heartcathproc.jpg](http://www.seormc.org/Cardiac/images/heartcathproc.jpg)

# Dressings

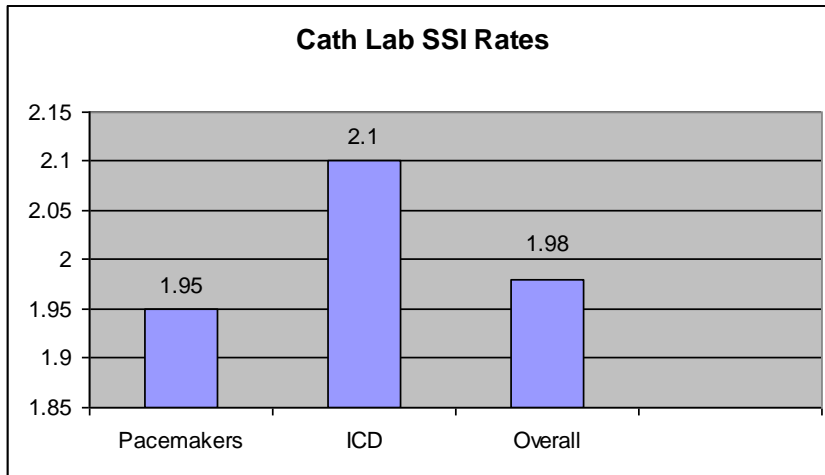
Optimal dressings are:

- Permeable to gas exchange, impermeable to microbes/contamination
- Create a moist healing environment (37° C)
- Stay in place
  - Change on day 2-3 unless drainage, dirty, or damaged
- Use proper aseptic technique when applying the dressings before the drapes are removed



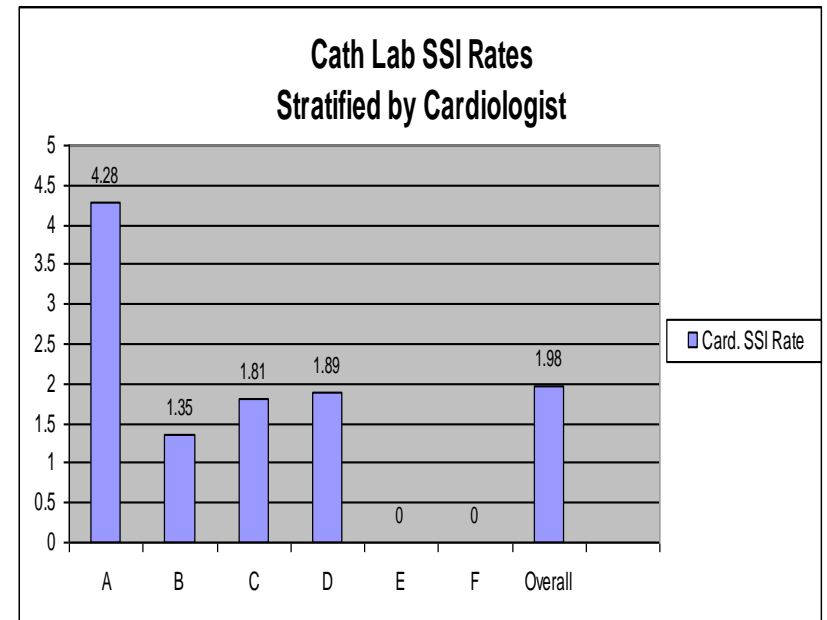
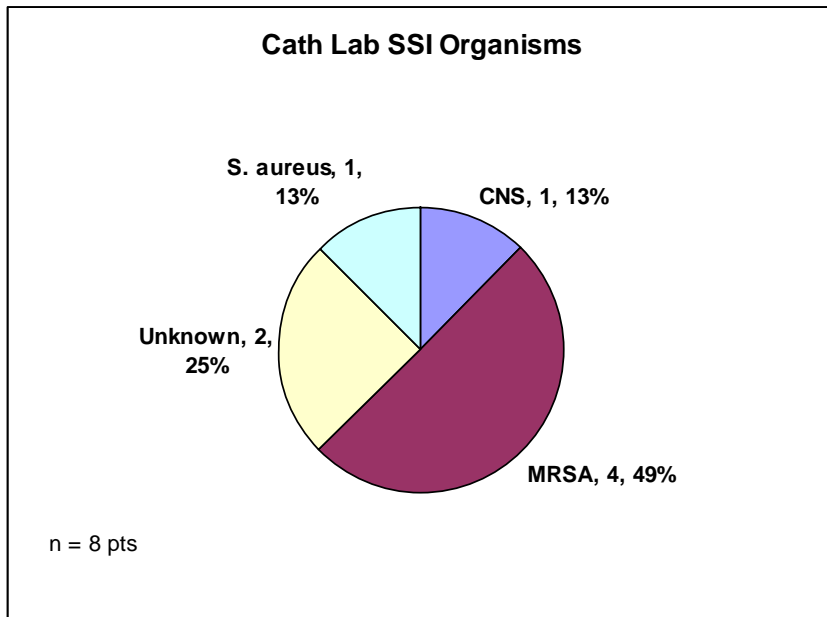
Sussman, C, Bates-Jensen, B. Wound Care: A Collaborative Practice Manual for Health Professionals 2006; (Chap11).

# Cath Lab SSI Case Study



<b>Proc.</b>	<b># of Infect.</b>	<b>Total # Cases</b>	<b>SSI Rate</b>
Pacers	6	308	1.95
ICD	2	95	2.10
<b>Overall</b>	<b>8</b>	<b>403</b>	<b>1.98</b>

# Organisms



# Analysis

1. All known organisms were common skin organisms
2. Antibiotic Prophylaxis
  - Vancomycin with no documented PCN allergies.
  - 5/8 pts were given their prophylaxis on time.
  - 1 pt obese, BMI >30 and required cefazolin 2 gms.
  - 1 pt underdosed with 750mg of vancomycin.
3. 50% of pts experienced hyperglycemia
  - >120mgs/dl on the operative day or on readmit.
  - 2 pts undiagnosed diabetics.
4. 1 pt w/steristrip closure

# Recommendations

1. Antibiotic Prophylaxis
2. Perioperative management of hyperglycemia
3. Skin Antisepsis
  - A Pre-op Showering program with CHG
  - Aseptic technique and following directions
4. Closure/Dressings
  - Always suture skin prior to steri-strips
  - Replace conventional gauze/tape dressings

# Aseptic Technique

- Physical layout of the Cath Lab creates inappropriate traffic patterns.
- Review of AORN standards and principles of aseptic technique for all Team Members
- Patient safety
- Environmental Service support
  - Daily terminal cleaning
  - Carpeting in the Control Room and wooden shuttered doors must be replaced.

# Facilitating Process Improvements

- Partnering not policing
  - Use OR resources but beware
- Teach don't preach
- Share data whenever available

# Summary

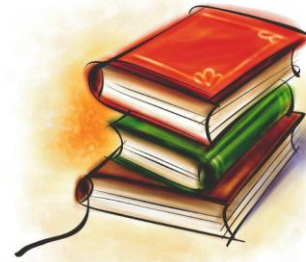
- Infection Preventionists must engage with these departments
- The outcomes related to infections can be devastating to patients
- The Joint Commission is focusing on these areas
- The teaching opportunities are endless

# Four Key Questions:

1. Is this a sterile procedure?
2. Is there an implantable device?
3. Are there infections associated with the procedure?
4. Is this a hill to die on?



# Resources



AORN Association of periOperative Registered Nurses (AORN).  
Recommended Practices for Perioperative Nursing: Practices for a Safe  
Environment of Care. Perioperative Standards and Recommended  
Practices: Denver, CO; 2010 ed. p. 217.

Aureden, KL. Cardiac Catheterization and Electrophysiology. APIC Text of  
Infection Control and Epidemiology 2009 (3<sup>rd</sup> edition), Chapter 46.  
Washington, DC: APIC.

Chambers CE, et al. Infection Control guidelines for the cardiac  
catheterization laboratory. *Catheter Cardiovascular Interv* 2005;67:78-86.

Halpenny, D, Torreggiani, WC. Interventional Radiology. APIC Text of  
Infection Control and Epidemiology 2009 (3<sup>rd</sup> edition), Chapter 65.  
Washington, DC: APIC.

# Questions?

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