SPEAKERS

Marie Keim, BS, MT, CIC
- Director Epidemiology, Infection Control and Prevention, Reading Hospital
- 30+ Years Healthcare Experience
- 20+ years in Infection Prevention

Louis A. Meilink, Jr., AIA, ACHA, ACHE
- Principal at Ballinger
- 28+ Years Healthcare Experience
- Design + Planning of Surgical Suites for Top Academic Medical Centers, Regional and Community Hospitals

Dwight Smith, AIA, EDAC
- Senior Healthcare Planner, Ballinger
- 40+ Years Healthcare Experience
- 20+ Years Planning of Surgical Suites
LEARNING OBJECTIVES

In this session, you will learn...

- The current strategies for clean flow and where it should be applied
- How to differentiate between code minimum and best practices
- How the physical environment can affect the hospital’s bottom line
- What resources and tools are available
DEFINITIONS

CLEAN TECHNIQUE
The process used to prevent contamination with microorganisms. It prevents or reduces the risk of transmission of organisms from one person to another or from one place to another.

ASEPTIC TECHNIQUE
The purposeful prevention of contact and contamination of objects and areas with microorganisms e.g. sterile gloves/gowns, masks, drapes, skin prep, disinfection/sterilization instruments

SURGICAL ASEPSIS
Use of sterile technique to prevent the transfer of any organism from person to another or from one body site to another
DEFINITIONS

ANTISEPTIC
A substance used on skin or living tissue that inhibits the growth and development of microorganisms

DISINFECTANT
An item used on inanimate objects that destroys, neutralizes or inhibits microorganisms

IMU
Immediate Use Sterilization

SSI
Surgical Site Infection

SIR
Standard Incidence Ratio \[ SIR = \frac{\text{Observed \ # \ SSI}}{\text{Expected \ # \ SSI}} \]
CLEAN FLOW IN THE SURGICAL SUITE

UNRESTRICTED ZONE
Street clothes are permitted in this area and traffic is not limited.

SEMI-RESTRICTED ZONE
Traffic is limited to authorized personnel and patients. Personnel are required to wear surgical attire and cover all head and facial hair.

RESTRICTED ZONE
Surgical attire and hair coverings are required. Masks are required where open sterile supplies or scrubbed persons may be located.
ORGANIZATIONS

American College of Surgeons

Association for Professionals in Infection Control and Epidemiology

Association of PeriOperative Registered Nurses

Association for the Advancement of Medical Instrumentation

Facility Guidelines Institute

Infectious Disease Society of America

The Society for Healthcare Epidemiology of America
ASEPTIC TECHNIQUE TIMELINE

1846 Anesthesia first used in surgery
1840s

1847 Ignace Semmelweis: Hand-washing
1847 US Civil War

1850s

1850s

1846 Louis Pasteur: Germ Theory
1861

1865 Joseph Lister: Carbolic spray

1870s

1884 Gustav Neuber: Gowns, Caps
1886 Gustav Neuber: Asepsis Applications
1886

1890 William Halsted: Gloves
1890

1890s

1890s

1900s

1913 American College of Surgeons
1920s

1926 College of Surgeons' Standards
1929 Alexander Fleming: Penicillin

1929

1920s

1926

1947 Hill-Burton Act: USA Hospital Regs
1947

1947

1950s

1960s

1960 DHEW: General Standards for Hospital Construction
1960

1964 Wound Classification ACS
1964

1964

1970s

1974 Senic Project
1974

1976

1976

1980s

1985 Wound/ASA Predictive Model

1985
WHY CLEAN FLOW?
2010 VERSION

2.2-3.3.1.2 Location
(4) The surgical suite shall be divided into three designated areas—unrestricted, semi-restricted, and restricted—defined by the physical activities performed in each area.

2014 VERSION

2.2-3.3.1.1 (4)
The surgical suite shall be divided into two designated areas—semi-restricted and restricted—defined by the physical activities performed in each area.
2.2-3.3.7.2 Staff Changing areas and toilet facilities
These areas shall be designed to provide a one-way traffic pattern so that personnel entering from outside the surgical suite can change and move directly into the surgical suite.

2.2-3.3.7.2 Staff changing areas and toilet facilities
(1) A locker area with one or more private changing rooms or areas shall be provided for male and female staff working in the surgical suite.
2.2-3.3.6.13 Sterile processing room
When sterilization processes are conducted in the surgical suite, a sterile processing room shall be provided.

2.2-3.3.6.14 A substerile room.
If the functional program requires emergent sterilization, a room(a) for this purpose shall be provided in the surgery suite.

(1) This substerile room shall be either accessible from the operating room(s) it serves or shall be located inside the clean core if the clean core is directly accessible from the operating room(s). This room shall be able to be accessed without traveling through any operating rooms.
SURGICAL SITE INFECTIONS (SSI)  
RISK FACTORS

**ENDOGENOUS**
internally to the patient

**EXOGENOUS**
externally to the patient

**SKIN + HAIR**

**NASAL**

**ENVIRONMENT**

**INSTRUMENTS**

**STAFF**
RISK FACTORS

USP 797
“Squamous cells are normally shed from the human body at a rate of 10^6 or more per hour, and those skin particles are laden with microorganisms.”

CDC 1999
Sterile dressings should be used for incisions that have been closed primarily for the first 24-48 hours postoperatively

SHEA 2014, AJIC 2012
Minimize OR traffic
SSI RISKS + PREVENTION MEASURES

BEFORE SURGERY
MRSA history/ decolonization, nutrition, CHG bathing

IMMEDIATELY BEFORE SURGERY
Antibiotic prophylaxis, clip hair if removal is required, hand hygiene, incision site prep e.g. CHG

DURING SURGERY
Glycemic (glucose) control, normothermia, change gloves if dirty to clean area, limit door openings, room temperature and humidity, scrubs attire, hand hygiene, sterile equipment. Microbial load is directly proportional to the number of people in the room.

AFTER SURGERY
Decolonization treatment, glucose monitoring
THE RESTRICTED ZONE
CLEAN CORE CONCEPT

SCRUB

OPERATING ROOM

STERILE FIELD

CLEAN CORE
ENVIRONMENTAL CONTROLS: THE DESIGNER’S TOOLS

AIR QUALITY

Diagram showing airflow with supply air entering through diffusers, contaminating air being directed, and return grilles.
ENVIRONMENTAL CONTROLS THE DESIGNER’S TOOLS
STAFF CONTACT
ENVIRONMENTAL CONTROLS
THE DESIGNER’S TOOLS
OPERATING ROOM ZONING
ENVIRONMENTAL CONTROLS THE DESIGNER’S TOOLS
STAFF FLOW
CASE STUDIES

- UNIVERSITY OF MARYLAND MEDICAL CENTER SHOCK TRAUMA CENTER
- NYU LANGONE MEDICAL CENTER AMBULATORY CARE CENTER
- READING HOSPITAL 7TH AVENUE BUILDING
- NEW YORK PRESBYTERIAN DAVID H. KOCH CENTER
New Construction / Renovation
Trauma Inpatient
18,000 SF New / 9,500 SF Renovation
10 New Operating Rooms
20 Existing Operating Rooms
24/7 Operation
• Adaptive Reuse
• Ophthalmology / ENT Outpatient
• 15,000 SF Renovation
• 4 New Operating Rooms
• 8-10 Hours per Day / 5 Days per Week
- New Construction
- General Inpatient and Outpatient
- 75,000 SF New Construction
- 24 New Operating Rooms
- 24/7 Operation

**Diagram:**
- **UNRESTRICTED**
- **SEMI-RESTRICTED**
- **RESTRICTED**
- **PACU**
- **P/R**

**Legend:**
- **PATIENT FLOW**
- **STAFF FLOW**
- **INSTRUMENT/SUPPLY FLOW**
NEW YORK PRESBYTERIAN

- New Construction
- 145,000 SF New Construction
- 29 New operating / procedure rooms
- 8-10 Hours / Day / 5 days a week operation
- Ambulatory Surgery / IR / Endoscopy Outpatient
NEW YORK PRESBYTERIAN
1. Maximize clinical program area on the department floor

2. Central Sterile and Shared Staff Lockers and Lounge on Level 7 serve Interventional Radiology, Ambulatory Surgery, and Endoscopy:
   - Maximizes clinical program on departmental floors

3. Provide restricted staff / clean circulation between lockers and departments (2 elevators, 1 stair)

4. Provide the flexibility to more easily accommodate new technology and procedures in the diagnostic and treatment areas as patient care processes evolve.
   - 700 sf target for Interventional Procedure Rooms
   - 600 sf Operating Rooms
   - Same Handed Operating Rooms
   - Stacked Floors
In 1992 SENIC Report- Study of the Efficacy of Nosocomial Infection Control

In 2002 four states (Illinois, Pennsylvania, Missouri, Florida) - HAIs

In 2009 there were 300,000 reported SSI at an annual cost of $10 Billion

In 2010 the Affordable Care Act required National public reporting of selected inpatient Healthcare Associated Infections (HAI)

In 2012 hospitals were required to report designated SSIs, followed up in 2013 by pay for performance incentive

Full CMS reimbursements requires reporting and achievement of HAI goals

- HAIs reporting requirements and goals vary
- Federal Fiscal Year reimbursement
- Inpatient Prospective Payment System (IPPS)
- Value Based Purchasing (VBP)
CONCLUSIONS

CLEAN FLOW: FACT

- Clean flow or clean technique is a viable strategy to improve patient outcomes
- Clean flow should be an multidisciplinary protocol used in combination with endogenous processes
- Success of clean flow will only be as good as its weakest link
- A single protocol will not be applicable to every situation and must be tailored to fit
- More evidenced-based studies are needed
- Maximizing clean flow processes will have a direct impact on patient safety and the bottom line
RECOMMENDATIONS

BEST PRACTICES:

In approaching new construction or renovation all organizations should establish a multidisciplinary team to:

- Focus on opportunities to control airflow and turbulence
- Establish instrument movement to always flow from dirty to clean
- Stock equipment and supplies properly (location and quantity) to reduce staff movement and need for IMU
- Use proper room zoning to protect the sterile environment
- Remove unessential staff from the operating room
QUESTIONS?