



IMPROVING HEALTH CARE, IMPROVING LIVES™

Infection Prevention

Oklahoma Foundation for Medical Quality

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www.ofmq.com



IMPROVING QUALITY
.....
REDUCING INFECTION

HEALTHCARE-ASSOCIATED INFECTIONS

- Healthcare-Associated Infections are infections acquired by patients during the course of their treatment within a healthcare facility.
- HAIs affect nearly 2 million patients each year and contribute to nearly 90,000 deaths.¹
- Healthcare-Associated Infections are a reflection of our services in healthcare.



HEALTHCARE-ASSOCIATED INFECTIONS

- Patients with HAIs have a hospital stay that is sometimes 3 to 4 times longer than patients without an HAI.²
- HAIs increase the cost of healthcare, thus leading the decision by CMS to not pay for the cost of healthcare due to certain preventable conditions as a means of encouraging us to be better care givers.
- HAIs affect our workload. Patients with HAIs require more time, more attention, greater cost to healthcare, and lead to poor outcomes, and poor patient satisfaction.



PATHOGENS

- Pathogens that are our primary concern are:
- Multi-drug Resistant Organisms such as:
 - Methicillin Resistant Staphylococcus aureus (MRSA)
 - Vancomycin Resistant Enterococcus species(VRE)
 - Multi-drug Resistant GNR
- Clostridium difficile



PATHOGENS

- Methicillin-resistant *Staphylococcus aureus* (MRSA) has become one of the most prevalent pathogens in the United States. In hospitals, the most important reservoirs of MRSA are infected or colonized patients.³
- Worldwide, an estimated 2 billion people carry some form of *S. aureus*; of these, up to 53 million (2.7% of carriers) are thought to carry MRSA.⁴

Year	Early 1990s	Late 1990s	2003
MRSA%	20%	50%	59%

- In one study, MRSA survived more than 38 weeks on environmental surfaces such as door knobs, faucets, keyboards, telephones, and other surfaces.⁵



Management of Multidrug-Resistant Organisms in Healthcare Settings 2006. Jane D. Siegel, MD, Emily Rhinehart RN MPH CIC, Marguerite Jackson PHD, Linda Chiarelli, RN MS, The Healthcare Infection Control Practices Advisory Committee

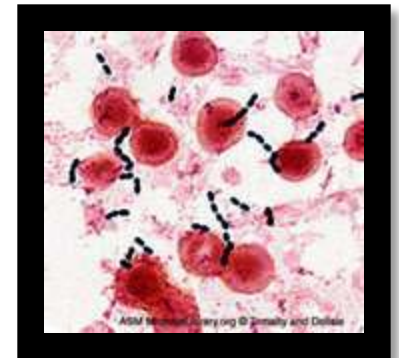


PATHOGENS

- Enterococcus species is a normal part of our intestinal flora. It is not normal for Enterococcus to become resistant to Vancomycin, which makes it very difficult to treat.

Year	1990	1997	2003
%VRE	<1%	15%	28.5%

- Information collected by the Centers for Disease Control and Prevention during 2006 and 2007 showed that Enterococci caused about 1 of every 8 infections in hospitals and about 30% of these are VRE.⁶



- Management of Multidrug-Resistant Organisms in Healthcare Settings 2006. Jane D. Siegel, MD, Emily Rhinehart RN MPH CIC, Marguerite Jackson PHD, Linda Chiarell, RN MS, The Healthcare Infection Control Practices Advisory Committee



PATHOGENS

According to The National Health Safety Network (NHSN) the definition of a multidrug-resistant Klebsiella species is gram negative organism that is resistant to ceftazidime or ceftriaxone, and multidrug –resistant Acinetobacter species is resistant to all least 3 antimicrobial class including Beta-lactams, aminoglycosides, carbapenems, and fluoroquinolones.

Year	1997	2003
% ESBL GNR	3.6 to 9.7%	20.6%
% MDRO Pseudomonas aeruginosa	23%	29.5%
% MDRO Acinetobacter species	53%	73%-95%



Countywide Antibigram: Number of Isolates Tested and Susceptible Percentages of Selected Pathogens*Southern Nevada Health District · Office of Epidemiology
University of CA at San Francisco – Parnassus Street-ALL;T84 Mt. Zion Medical Center - Divisedero Street
The Louisiana Antibigram IN VITRO ANTIBIOTIC SENSITIVITY PATTERNS 2003-2004
Duncan A. Friedman, ScB1 and Raoult C. Ratard, MD MPH 1, 2 1Louisiana State University School of Public Health and 2Louisiana Department of Health January 15, 2007



PREVENTING INFECTION

- Bacteria are a normal part of our environment, however, it is not normal for these bacteria to become resistant to antibiotics.



- We must keep these resistant bacteria from spreading to other people, and from spreading in our environment.
- Even non-resistant bacteria can cause infection if given access.

Clostridium difficile

- Transmission is fecal – oral , which means that either the Clostridium difficile bacteria or the Clostridium difficile spore has to enter the mouth.
- Everyone who has Clostridium difficile infection has ingested Clostridium difficile.



PATHOGENS

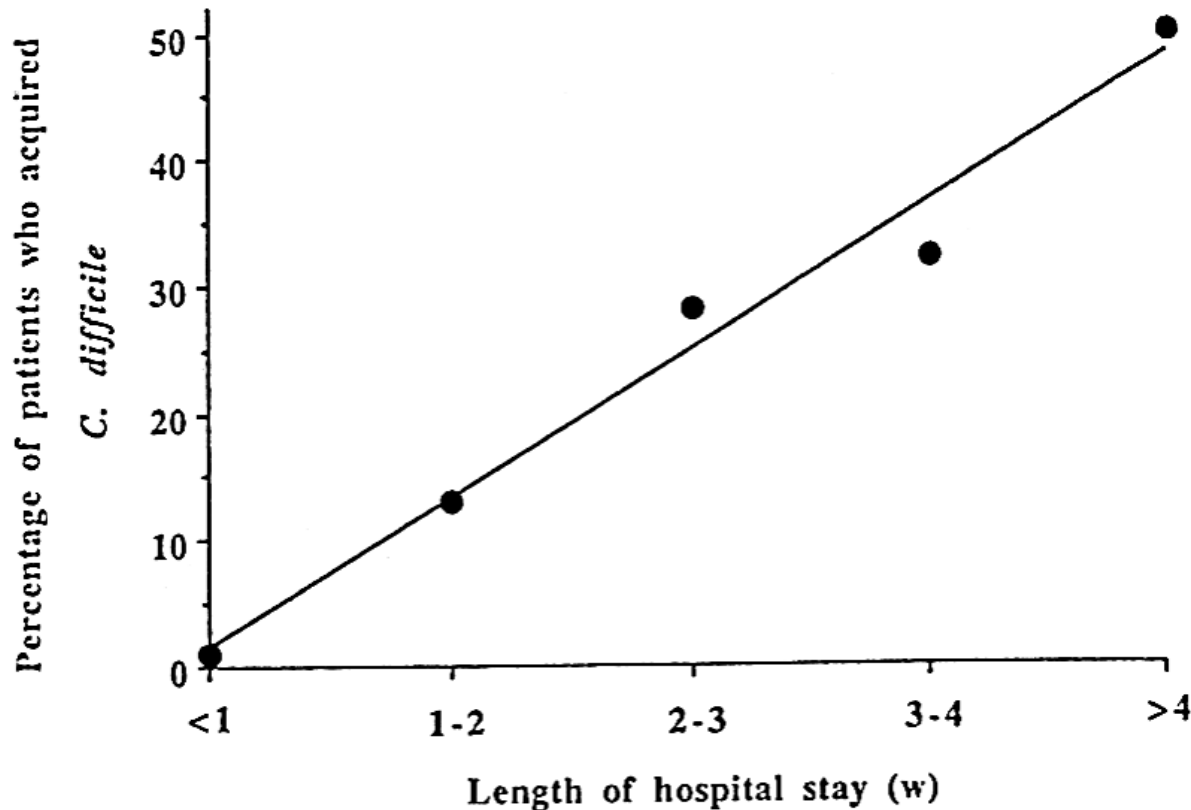


C diff patients were studied

- 93% had skin contamination
- Easily transferred by hands and gloves
- 60% had persistent skin contamination after clinical resolution
- Alcohol gel does not kill spores. Spores must be removed from our hands with soap and water.
- Rooms should be cleaned with a 1:10 bleach solution during outbreaks, and endemic situations.
- Bobulsky et al. CID 2008;46:447

Rate of C. Difficile in a Hospital

Rate of *C. Difficile* Acquisition in Hospital*



* S. Johnson & D. Gerding CID 1998;26:1027

13% Patients were found to be colonized after 1 week stay.

50% Patients were colonized after 4 week stay.



It's on the Hands

Environment or Personnel Hands?

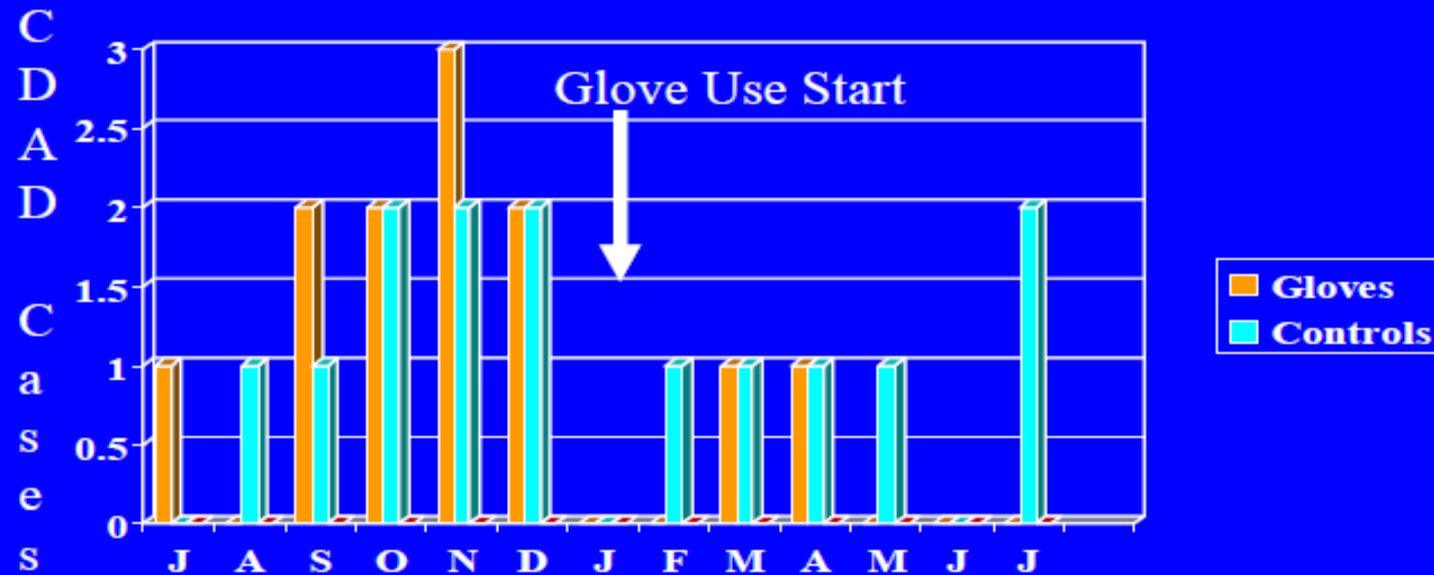
- An index *C. difficile* case who was shedding the epidemic REA type B1 strain from a colostomy shared a 4-bed room. **Secondary cases of *C. difficile* acquisition on the ward occurred in 6 patients who were cared for by the same surgical team as cared for the index case.** None of the secondary cases occurred in roommates of the index case.

Johnson et al Lancet 1990;336:97-10



Strict Glove Use Reduces C. difficile

Effect of Glove Wearing by Personnel on Two Wards vs. Two Control Wards



Baseline Period

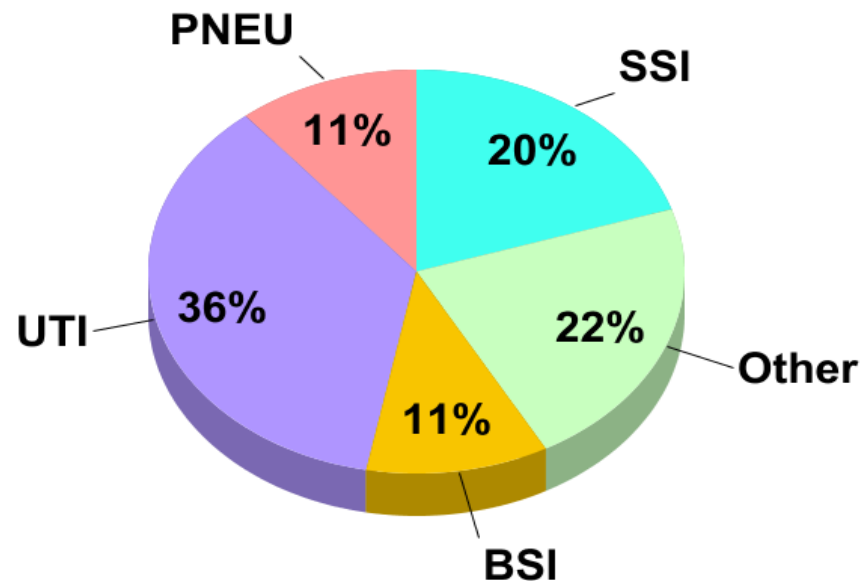
Glove Intervention

Ref: Johnson et al Am J Med 1990;88:137



CAUTI

- Catheter Associated Urinary Tract Infections account for 36% of all Healthcare Associated Infections.



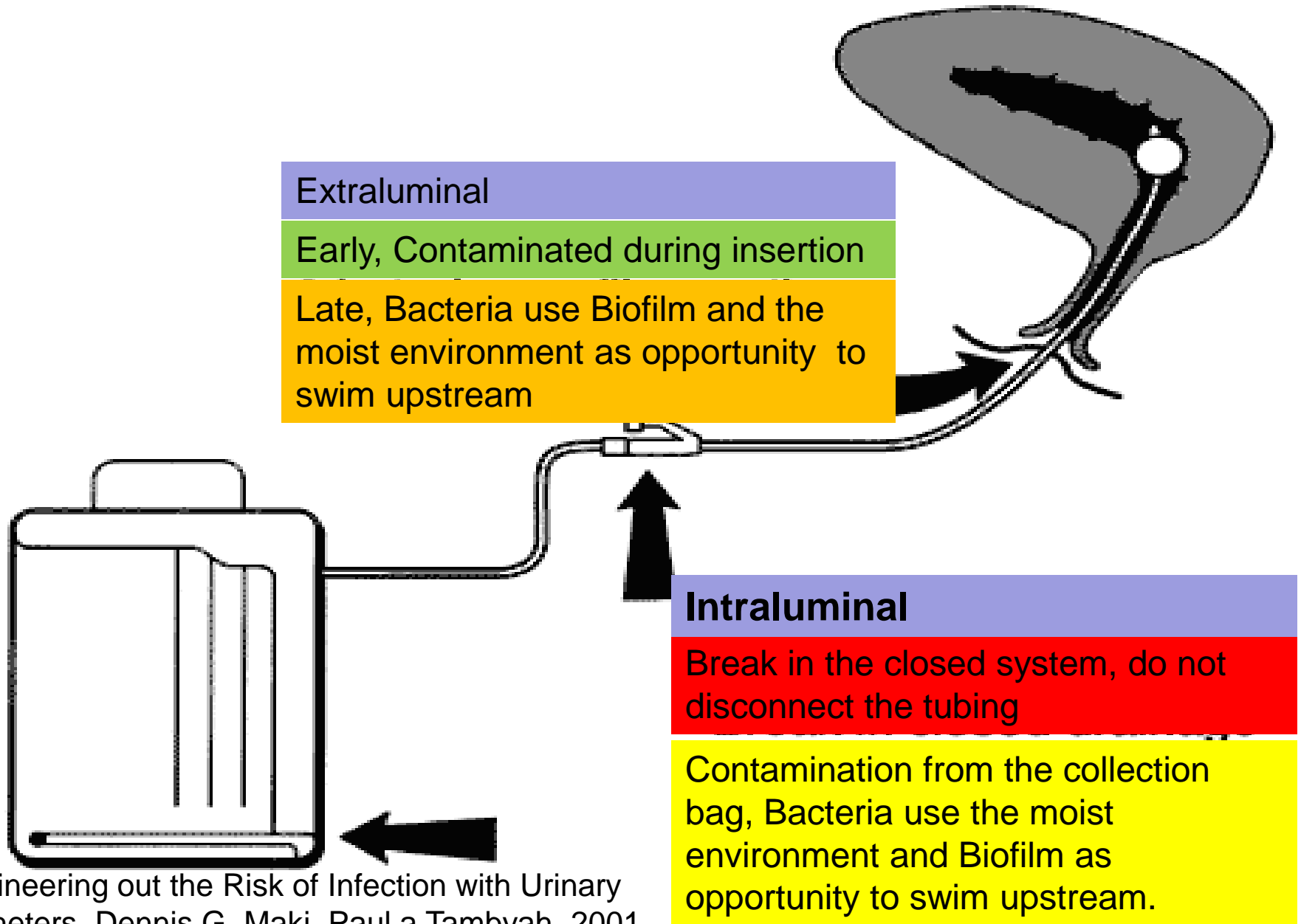
Reduce Inappropriate Use

Inappropriate urinary catheter use in acute care hospitals has been reported to range from 21% to greater than 50%.

- **Appropriate Use Would be:**
 - Urinary retention or bladder outlet obstruction
 - Accurate measurements of urinary output
 - Patients undergoing urologic/genitourinary surgery
 - To assist in healing of open sacral/perineal wounds in incontinent patients
 - Patient requires prolonged immobilization



Pathogenesis of CA-UTI



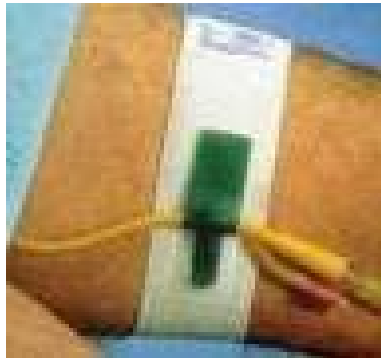
Keep it Clean

- Hand Hygiene and Strict Glove Use
- Aseptic Technique
- Every Surface in a Patient's Room is Contaminated including the Patient!!!



Prevent Pistoning

- Secure the foley tubing to the thigh

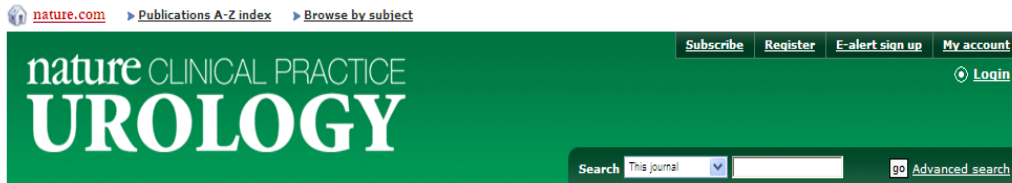


Drain Foley bag

- Drain Foley bag before 2/3 full
- Drain Foley bag into a clean container



Avoid Biofilm



Home > Archive > Vol 5 No 11 > Review > Full text > Figure 2

FIGURE 2 Examples of crystalline biofilms on blocked catheters taken from patients.

From the following article:

Bacterial biofilms in patients with indwelling urinary catheters
David J Strickler
Nature Clinical Practice Urology (2008) 5, 598-608
doi:10.1038/ncpuro1231

[back to article](#)

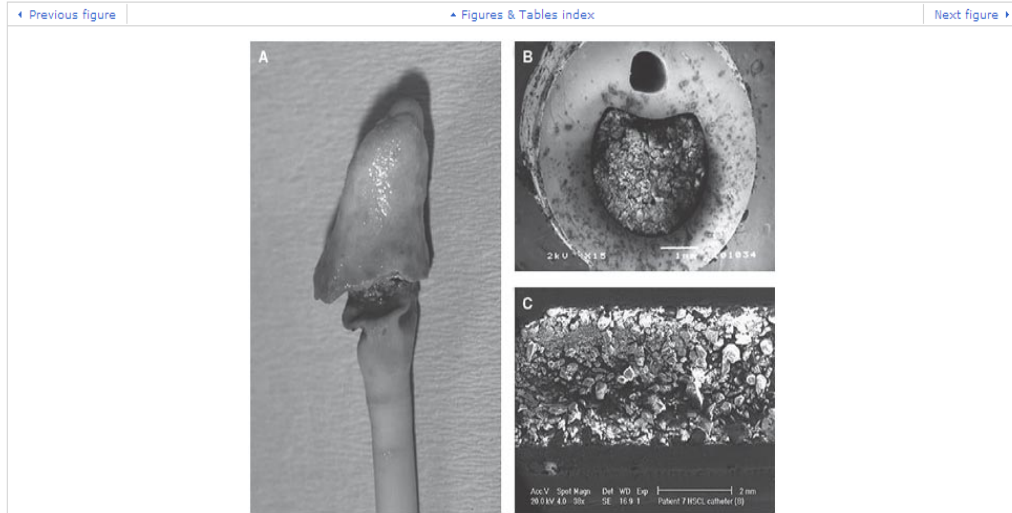


Figure 2. Examples of crystalline biofilms on blocked catheters taken from patients.

(A) This image shows a catheter that had been indwelling suprapubically for 6 months. It was removed surgically. Crystalline material completely covered the eyelet and balloon of the hydrogel-coated latex catheter. Image kindly supplied by Professor Roger Feneley. (B) A

Change the Foley
once Biofilm
appears.



Keep it Clean

- Keep the Foley bag below the bladder and off the floor! The floor is 100% contaminated!



Bacteria are spread by contact



PREVENTING INFECTION

- Not only do we need to control the spread of these organisms, but we also want to prevent other patients from acquiring these organisms.
- Once colonized, 30-60% of patients become infected.



Cosgrove SE et al. Clin Infect Dis 2003; 36:53-59.



HAND HYGIENE

- The most important way to prevent Healthcare-Associated Infections is to practice Hand Hygiene.
- There are two ways to practice Hand Hygiene.
 - Soap and Water
 - Alcohol Foam or Gel



HAND HYGIENE

- **Hand hygiene should be practiced immediately before and after every patient contact,**
- **Before and after performing an invasive procedure, or manipulating an invasive device.**
- **After touching a contaminated surface.**
- **After removing gloves.**
- **After touching items or surfaces in the immediate patient care environment, even if you didn't touch the patient**



HAND HYGIENE

- Hands should be washed with soap and water when:
 - Before and after you use the restroom
 - Whenever your hands are visibly soiled
 - Whenever you have handled stool
 - Whenever the patient has *Clostridium difficile* regardless of what you have done for the patient
- **Guideline for Hand Hygiene in Health-Care Settings Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force**
Prepared by John M. Boyce, M.D.¹Didier Pittet, M.D.²¹*Hospital of Saint Raphael New Haven, Connecticut* ²*University of Geneva Geneva, Switzerland*



HAND HYGIENE

Whenever you wash your hands with soap and water....

- Turn on the water
- Grab some soap
- Friction for 15 seconds
- Dry with paper towel
- Turn off the faucet with your paper towel





HAND HYGIENE

Why then would we choose soap and water instead of alcohol gel???

- Alcohol gel kills bacteria but does not remove them from our hands
- Alcohol gel does not kill the spores associated with *Clostridium difficile*
- Soap and water is necessary to actually remove bacteria and bacterial spores from our hands.





But I didn't touch the patient...

- **WHY SHOULD I PRACTICE HAND HYGIENE?**
 - Bacteria can survive for Days, Weeks, and sometimes Months on patient care equipment and other surfaces.
 - Surfaces in the patient care environment – including bed rails, IV pumps, and even computer keyboards – are often contaminated with bacteria.
 - It's important to practice hand hygiene after you leave the room, even if you only touched patient care equipment or other surfaces.

42% of nurses' gloves were MRSA positive after touching surfaces in an MRSA patient's room without touching the patient.⁷





LOTIONS

- With all that Hand Hygiene, comes dry hands.
- All lotions that are shared must have a pump dispenser.
- All lotions should be replaced frequently – bacteria love the fats and oils found in hand lotion
- Special lotions are a private supply and should be kept in your locker and not shared. To share lotion, is to share bacteria.



STANDARD PRECAUTIONS

- Standard Precautions means that we treat all people, and all blood and body fluids, as potentially infectious. In a healthcare setting, we always practice Standard Precautions.
- When we practice Standard Precautions, we use
 - Gloves
 - And practice Hand Hygiene



STANDARD PRECAUTIONS

- Standard Precautions should be used by healthcare personnel caring for patients ***regardless of the patient's diagnosis and whether or not the patient is known to have a communicable infection. In other words, Standard Precautions should be used for all patients, all the time.***



Sharps Safety



- Dispose of used sharps immediately in sharps container
- Replace sharps containers when $\frac{3}{4}$ full
- Do not recap needles
- Approximately 40% of all sharps injuries occur because sharps were not disposed of immediately.⁸

Sharps Safety

- All needles and syringes are single use only!!!
- Single use vials are to be used once and then discarded.
- Outbreaks of Hepatitis B have been attributed to non-compliance to the single use rule!⁹



Sterile Water

- Sterile Water not tap reduces VAPs (Ventilator Associated Pneumonias)!
- All devices used for suctioning trachs should be rinsed with sterile water, and not tap water. ¹⁰
- All sterile water must be dated upon opening and tossed after 24 hours.





Personal Protective Equipment

- **Personal protective equipment (PPE) should be worn when exposure to blood, body fluids, excretions, secretions (except sweat), mucous membranes, or non-intact skin is anticipated.**
- **PPE includes:**
 - **Gloves – when hand contamination is anticipated.**
 - **Masks and eye protection – when splashes may occur.**
 - **Gowns – when soiling of clothes may occur.**





Isolation Gowns

- **65% of HCWs contaminated their uniforms or gowns during routine care of patients with MRSA**
- **> 25% of the time HCW's clean hands became recontaminated after contact with their contaminated clothing**
- **Gowns prevented contamination of clothing underneath the gown**

Boyce, Infect Control Hosp Epidemiol 1997;18:622.

Boyce, SHEA 1998, Abstract #S74



Gowns and Gloves

Do not wear gloves or gowns in the hallway. If you need more supplies, you have to remove the gown and gloves, and practice Hand Hygiene as you leave the room.



- **2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Jane D Seigel, MD, Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee**

CONTACT PRECAUTIONS



CONTACT PRECAUTIONS



Visitors must report to Nursing Station before entering.



Perform hand hygiene before entering and before leaving room.



Wear gloves when entering room or cubicle, and when touching patient's intact skin, surfaces, or articles in close proximity



Wear gown when entering room or cubicle and whenever anticipating that clothing will touch patient items or potentially contaminated environmental surfaces.



Use patient-dedicated or single-use disposable shared equipment or clean and disinfect shared equipment (BP cuff, thermometers) between patients.

PRECAUCIONES DE CONTACTO

Los visitantes deben presentarse primero al puesto de enfermería antes de entrar. Lávese las manos. Póngase guantes al entrar al cuarto.



CONTACT PRECAUTIONS

- **Contact Precautions are followed when a patient has a MDRO, which would be one of the pathogens that we mentioned earlier, or if the patient has a Clostridium difficile infection.**
- **When we practice Contact Precautions, we use**
 - **Gloves**
 - **Gowns, if our clothing is going to touch the patient, or the patient's environment**
 - **And practice Hand Hygiene**

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Jane D Seigel, MD, Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee



DROPLET PRECAUTIONS



DROPLET PRECAUTIONS



Visitors must report to Nursing Station before entering.

-  Perform hand hygiene before entering and before leaving room
-  Wear mask when entering room
Visitors and health care workers
-  Dietary may not enter
No debe entrar el dietista

PRECAUCIONES DE GOTAS DIMINUTAS

Los visitantes deben presentarse primero al puesto de enfermeria antes de entrar. Lávese las manos. Póngase mascara al entrar al cuarto. No debe entrar el dietista.

HD 5225 Rev. 12/06



DROPLET PRECAUTIONS

- **Droplet precautions are followed whenever the patient has meningitis or respiratory symptoms that might be contagious, such as a cold or the flu.**
- **When we follow Droplet precautions, we always use**
 - **Gloves**
 - **Surgical Mask**
 - **Gowns if our clothing is going to come into contact with the patient or the patient's environment.**
 - **And practice Hand Hygiene**



- **2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Jane D Seigel, MD, Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee**



DROPLET PRECAUTIONS

- The viruses that cause the flu and colds survive on surfaces for 6-8 hours¹¹.
- They need to come into contact with our mucous membranes in order to make us sick
- Frequently we infect ourselves by touching our faces without washing our hands first
- The CDC now recommends that we sneeze into our elbow.



AIRBORNE PRECAUTIONS



AIRBORNE INFECTION ISOLATION PRECAUTIONS

Visitors must report to Nursing Station before entering.



Perform hand hygiene before entering
and before leaving room



Wear N95 respirator when entering
room
Visitors see nurse for instruction on proper use.



Keep door closed



Dietary may not enter
No debe entrar el dietista

PRECAUCIONES AMBIENTALES

*Los visitantes deben presentarse primero al puesto de enfermería
antes de entrar. Lávese las manos. Póngase máscara N95 con filtro al
entrar al cuarto. Mantenga la puerta cerrada. No debe entrar el dietista.*



AIRBORNE PRECAUTIONS

- Airborne Precautions are followed whenever we suspect a patient has TB.
- Airborne Precautions require that :
 - The patient be in a negative airflow room.
 - The door to the room always be shut.
 - A N-95 mask always be worn, even if just peeking in the door
 - Gloves
 - And Hand Hygiene
- When transporting the patient, the patient wears the mask in the hallway, not the transporter.
- 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Jane D Seigel, MD, Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee





DISINFECTION AS A MEANS OF PREVENTION

The effectiveness of the product is important.

- Phenols are not always effective and are toxic to newborns and should not be used in the nursery
- Most hospitals use a quaternary ammonium product for cleaning and disinfecting patient rooms.
- CDC recommendations are 1:10 dilution of bleach for the cleaning of discharge rooms where patients were positive for *Clostridium difficile* during cases of outbreak or endemic infections.



DISINFECTION AS A MEANS OF PREVENTION

- Disinfectants must be diluted and used exactly according to manufacturer's instructions
 - Improperly diluted disinfectants do not work better, and leave a film.
 - Improperly diluted disinfectants sometimes harbor MDROs, becoming a source of infection itself, rather than a killing solution.
 - Solutions must be changed daily.
 - Solutions must be left to air dry. When you wipe to dry, the solution has not been left in place long enough to properly disinfect the surface.

Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. William A. Rutala, PhD, MPH, David J. Weber, MD, MPH, and the Healthcare Infection Control Practices Advisory Committee (HICPAC)





DISINFECTION AS A MEANS OF PREVENTION

- Environmental services personnel should follow isolation precautions, and practice hand hygiene, and change gloves between rooms.
- Replace floor mopping solution once for every 3 patient rooms, and change mop heads every time the mopping solution is changed. Some facilities have begun to change mop heads between all patient rooms.
- Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. William A. Rutala, PhD, MPH, David J. Weber, MD, MPH, and the Healthcare Infection Control Practices Advisory Committee (HICPAC)



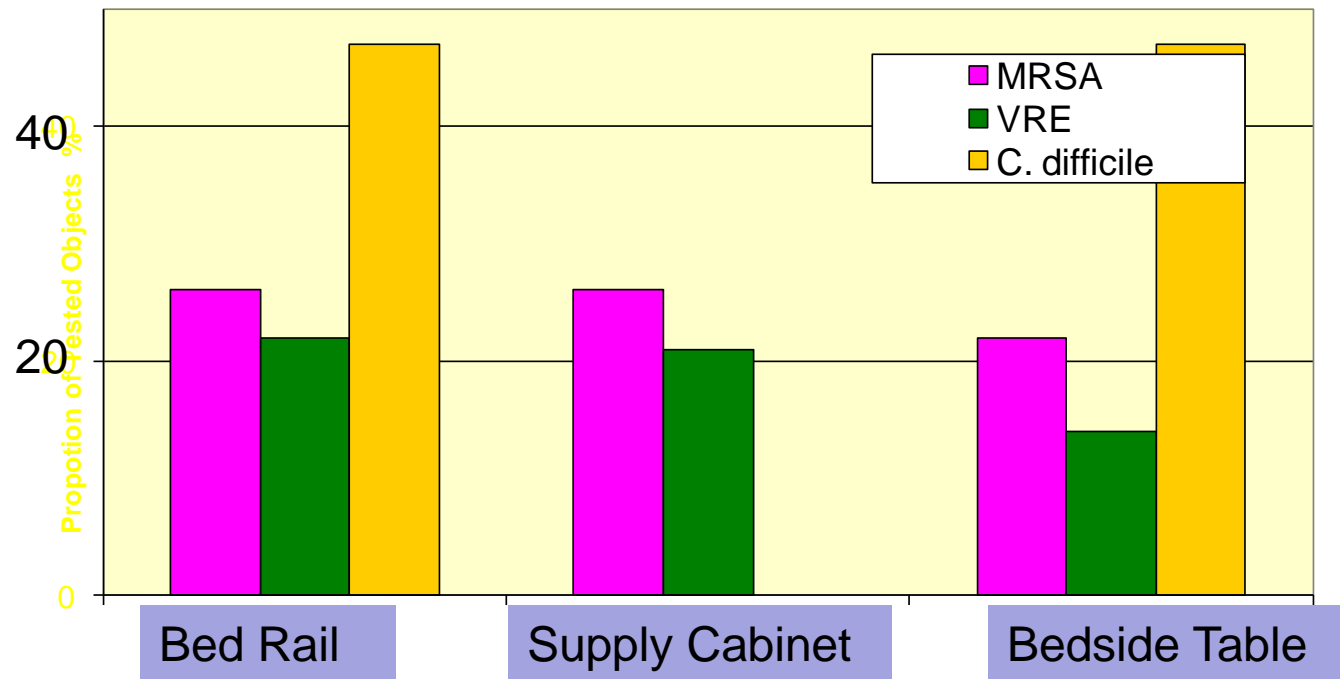
DISINFECTION AS A MEANS OF PREVENTION

- Help all staff understand the importance of clean environments.
- Studies have shown that an incoming patients are highly likely to acquire infections caused by the same infectious organisms as caused the previous patients infection.
- Organisms such *Clostridium difficile*, MRSA, and VRE can be isolated from surfaces and are viable days, weeks, and sometimes months and are transferred via hands.¹²





Bacteria Commonly Found in the Environment



*Adopted from – Speck SHEA Abstract 167,
Baltimore, April 2007*



How long can a organism live if we do not clean with a disinfectant?

- *C. difficile* > 5 months¹³
- Staph aureus 5 months
- VRE 4 months
- Acinetobacter 5 months
- Viruses 2-8 hours¹⁴

DISINFECTION AS A MEANS OF PREVENTION

- Environmental Cleaning is divided into two parts, the cleaning and disinfection of low-touch and high-touch areas. The cleaning of both is included in a terminal clean, which occurs upon the discharge of the patient.
- High touch areas should be cleaned and disinfected twice per day in ICUs and rooms with critically ill patients and daily for all other patients.
- Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. William A. Rutala, PhD, MPH, David J. Weber, MD, MPH, and the Healthcare Infection Control Practices Advisory Committee (HICPAC)





DISINFECTION AS A MEANS OF PREVENTION

- High touch areas include:
 - Doors, door jams, and door knobs
 - Telephones
 - Bed rails, headboard, and footboards
 - Over the Bed tables
 - Bed side tables
 - Toilets, sinks, faucet handles
 - O2 wall plate
 - IV pumps
 - Monitors
 - Ventilators
 - Computers, keyboards
 - Patient Charts



APIC Guide to the Elimination of Clostridium difficile in Healthcare Settings, 2008.



TO SHARE OR NOT TO SHARE

- All equipment that is shared or moved from one patient's room to another must to disinfected between patients.
- Have dedicated equipment whenever possible. Examples are:
 - Stethoscope
 - BP cuff
 - Thermometer



X REPRESENTS VRE POSITIVE CULTURE SITES



Transmission~ 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.



FINGERNAILS

Natural nail tips should be kept to $\frac{1}{4}$ inch in length.

Artificial nails are not permitted for health care workers with responsibilities for direct patient contact, preparation of food or medical supplies.



Guideline for Hand Hygiene in Health-Care Settings

Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force Prepared by John M. Boyce, M.D.¹ Didier Pittet, M.D.²

¹Hospital of Saint Raphael New Haven, Connecticut ²University of Geneva Geneva, Switzerland



IN CLOSING

- BE A ROLE MODEL AT YOUR FACILITY.
- Colleagues, trainees, and other staff watch what you do:
 - Research has shown that the actions of clinicians influence the behavior of others.
 - Show your colleagues that hand hygiene is an important part of quality care.
- Your patients watch you too:
 - Your actions send a powerful message.
 - Show your patients that you are serious about their health.

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<http://www.cdc.gov/about/stateofcdc/pdf/SOCD2005.pdf>
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4. The Changing Epidemiology of *Staphylococcus aureus*? Henry F. Chambers University of California San Francisco and San Francisco General Hospital, San Francisco, California, USA
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9. **Shared Medical Equipment Results in Hepatitis B Outbreaks in Healthcare Settings Barbara Boughton Medscape News, April 8, 2008**
10. **APIC Text 2009, Chapter 105**
11. **CDC.gov, 2009 H1N1 Flu ("Swine Flu") and You**
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