

CONTROL OF HEALTHCARE ASSOCIATED PATHOGENS: GUIDELINES AND EVIDENCE

Jane D. Siegel, MD

Professor of Pediatrics

University of Texas Southwestern Medical Center

Dallas

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HICPAC/CDC GUIDELINES

Guideline	Publication Year	
	Original	Revision
Guideline for prevention of UTIs	1982; 1983	
Guideline for prevention of nosocomial pneumonia	1994	2003
Recommendations for preventing the spread of vancomycin resistant enterococci in hospitals	1995	2003*
Guideline for isolation precautions in hospitals	1996	2006 ?
Interim guidelines for prevention and control of staphylococcal infection associated with reduced susceptibility vancomycin	1997	2003*
Guideline for prevention of intravascular device-related infect.	1997	2002
Immunization in healthcare workers	1997	
Guideline for infection control in healthcare personnel	1998	
Guideline for prevention of surgical site infection	1999	
Guideline for environmental infection control in healthcare facilities	(1985+)	2003
Guideline for sterilization and disinfection	2002§	?
Guideline for hand hygiene in healthcare setting	(1985+)	2002
Guidance on public reporting of healthcare-associated infections	2005	

* Will be included as part of the Revised Isolation Guideline

+ Originally part of Handwashing and Environmental Infection Control Guideline

§ Originally part of Isolation Guideline and other Guidelines

EVOLUTION OF CDC/HICPAC ISOLATION GUIDELINES

- **1970 & 1975** original directives from CDC
 - 7 isolation precaution categories
- **1983** revision
 - category-specific, disease-specific
- **1985-1988**: universal precautions (UP)
- **1987**: body substance isolation (BSI)
- **1992**: first HICPAC meeting
- **1996** revision (HICPAC)
 - standard, transmission-based precautions
- **2006** revision (HICPAC)
 - Work started in 2000
 - Publication anticipated 2006

WHY THE UPDATE?

- Respond to progressive expansion of **healthcare delivery** outside acute care hospitals and **increased complexity** of patient populations
- Update the **science on transmission** of infectious agents in healthcare settings and prevention based new experience since 1996
- Address infection control aspects of **emerging** infectious agents

WHY THE UPDATE?

- Recognition of importance of **organizational** characteristics and level of **adherence** to recommendations and that isolation is only one component of a prevention program
 - Data now available to guide evidence-based recommendations
- Continued increase in **MRSA, VRE**, and other **MDROs**: consolidate into one template and eliminate MDR pathogen-specific guidelines
- Reaffirm **standard precautions** (1996) as foundation for preventing transmission of infectious agents among pts. /HCWs in all settings

WHY SUCH A LONG PROCESS?

- **Work begun Fall, 2000**
- **Public comments: June-August 2004**
- **HICPAC “changing of the guard”
Fall, 2003**

**Guideline for Isolation
Precautions: Preventing
Transmission of Infectious
Agents in Healthcare Settings
2006**

Jane Siegel, Larry Strausbaugh, Marguerite Jackson, Emily Rhinehart, Linda Chiarello, and the Healthcare Infection Control Practices Advisory Committee (HICPAC)

ORGANIZATION OF GUIDELINE

- **Executive Summary**
- **Part I: Review of scientific data relevant to transmission of infectious agents in healthcare settings**
 - Concept of **empiric or syndromic** application of precautions in introduction
 - Sources of infectious agents
 - Modes of transmission
 - Emerging issues concerning droplet, **aerosol**, and airborne transmission
 - Using the lessons learned, e.g., SARS
 - **Emerging pathogens** with infection control implications
 - **Healthcare settings**
 - Special patient populations and therapies

ORGANIZATION OF GUIDELINE

- **Part II: Fundamental elements to prevent transmission**
 - **Healthcare system components**
 - **Administrative** measures
 - Roles of ICPs, bedside staff nurses
 - Clinical microbiology laboratory
 - Institutional **safety culture** and organizational characteristics
 - Adherence to recommended guidelines
 - **Surveillance**
 - **Education** of HCWs, patients, families, visitors
 - Identifying effective components of educational programs

ORGANIZATION OF GUIDELINE

- Hand hygiene
- PPE, including figure for donning and removing
- Safe work practices
- Patient placement
- Transport
- Environmental measures, equipment
- Textiles/laundry
- Solid waste
- Eating utensils
- **Adjunctive measures**
 - Chemoprophylaxis
 - Immunization
 - Management of visitors

ORGANIZATION OF GUIDELINE

- **Part III: HICPAC Precautions to prevent transmission**
 - Standard precautions
 - **Respiratory hygiene/cough etiquette**
 - Transmission-based precautions
 - Contact
 - Droplet
 - Airborne
 - Syndromic/empiric application of transmission-based precautions
 - Protective Environment

Part IV: RATED RECOMMENDATIONS IN “ACTIVE” VOICE

- Evidence-based recs; peer reviewed literature only to support recs.
- **CATEGORY I: “Everyone do it”**
 - **Category IA:** strongly recommended for implementation and strongly supported by well-designed experimental, clinical or epidemiologic studies
 - **Category IB:** strongly recommended for implementation and supported by some experimental, clinical or epidemiological studies and a strong theoretical rationale
 - **Category IC:** required by state or federal regulations, rules or standards (with or without supporting studies); JCAHO NOT a regulatory agency

RATED RECOMMENDATIONS (CONT'D.)

- **CATEGORY II:** *“Do it if you want if it will work in your setting; we think it’s a good idea”*
 - Suggested for implementation and supported by suggestive clinical or epidemiological studies or a theoretical rationale
- **NO REC:** *“No one knows what to do”*
 - **Unresolved issue.** Practices for which insufficient evidence or no consensus regarding efficacy exists

SCOPE

- **ALL** healthcare delivery settings
 - Acute care hospitals
 - Long-term care facilities
 - Ambulatory care centers
 - Home care services, infusion therapy companies
 - **“Healthcare-associated infections” (HAIs)**
- **Specialized populations NOT addressed**
 - Hemodialysis: MMWR 2001; 50 (RR-5)
 - HSCT: MMWR 2000; 49 (RR-10)
 - Tuberculosis: MMWR 2005; 54: RR-17
 - Dental Settings: MMWR 2003; 52 (RR-17)
 - Cystic fibrosis: ICHE 2003;24(5 Suppl):S6-52

MODES OF TRANSMISSION

- **Contact**
 - Direct, e.g., most respiratory, enteric viruses
 - Indirect: contamination of intermediate object, person
- **Droplet**: large particles $> 5 \mu\text{m}$ propelled ≤ 3 ft, deposited on respiratory mucosal surfaces
- **Airborne**: small particle residue ($\leq 5 \mu\text{m}$) of evaporated droplets remain suspended in the air, dispersed widely by air currents, inhaled by susceptible hosts
 - **Obligate, preferential, opportunistic**
(Roy CJ NEJM 2004; 350: 1710)
 - **Some derived from environment (*Aspergillus*)**
 - **Distinguish from *aerosolization* from infected organic material** (Cole EC. AJIC 1998; 26: 453)
 - **Droplet aerosols $< 100 \mu\text{m}$ can remain suspended in air**
 - **“Aerosol-generating procedures”**

INFECTIOUS AGENTS OF SPECIAL INFECTION CONTROL INTEREST FOR HEALTHCARE SETTINGS

- Agents that have emerged since 1996 guideline or agents that provide new information to inform methods to prevent transmission
 - Multi-drug resistant organisms (MDROs): MRSA, VRSA, VISA, VRE, GNBs (Appendix B)
 - *C. difficile* (McDonald LC NEJM 2005;353:2433)
 - Agents of bioterrorism
 - Prions (WHO recs. for sterilization instruments)
 - SARS: model for pandemic flu planning (Srinivasan A ICHE 2004; 25: 1020)
 - Monkeypox
 - Avian influenza A (Ungchusak K NEJM 2005; 352: 333)
 - Noroviruses
 - Hemorrhagic fever viruses

EPIDEMIOLOGICALLY IMPORTANT ORGANISMS: DEFINITION

- Propensity for transmission within healthcare facilities based on published reports and the occurrence of **temporal or geographic clusters of ≥ 2 patients**, (e.g., VRE, MRSA and MSSA, *C. difficile*, norovirus, RSV, influenza, rotavirus, *Enterobacter* spp; *Serratia* spp., group A streptococcus)
 - For certain pathogens, (e.g., **group A streptococcus**, *Legionella* sp., *Aspergillus* sp.), most experts consider a single case of healthcare-associated disease a trigger for investigation and enhanced control measures because of the devastating outcomes associated with these infections (CDC. Clin Infect Dis 2002; 35:950; Sabria M Am J Respir Med. 2003;2:235; MMWR 2004; 53: RR-3; Bille J Curr Opin Infect Dis. 2005;18:314)
 - For **susceptible bacteria** that are known to be associated with asymptomatic colonization, isolation from normally sterile body fluids in patients with significant clinical disease would be the trigger to consider as epidemiologically important, (e.g., MSSA).

EPIDEMIOLOGICALLY IMPORTANT ORGANISMS: DEFINITION

- Antimicrobial resistance implications
 - Resistance to first-line therapies (e.g., MRSA, VRE, VISA, VRSA, ESBL-producing organisms).
 - Common and uncommon microorganisms with **unusual patterns** of resistance within a facility, (e.g., the first isolate of *Burkholderia cepacia* complex or *Ralstonia* spp. in non-CF patients or a quinolone-resistant strain of *Pseudomonas aeruginosa* in a facility).
 - Difficult to treat because of **innate or acquired resistance** to multiple classes of antimicrobial agents (e.g., *Stenotrophomonas maltophilia*, *Acinetobacter*)
- Association with **serious clinical disease**, increased morbidity and mortality (e.g., MRSA and MSSA, group A streptococcus)
- A **newly discovered or reemerging** pathogen

HEALTHCARE SYSTEM COMPONENTS

- **Safety culture**, organizational characteristics
(Burke JP NEJM 2003; 348: 651; Lundstrom T AJIC 2002; 30:93)
- **ICP staffing, bedside nurse staffing**
(Haley RW Am J Epidemiol 1985;121:182-205; O'Boyle C AJIC 2002; 30: 321 Needleman J NEJM 2002; 346:1717; Jackson M AJIC 2002; 30: 199)
- **Adherence**
- **Clinical microbiology laboratory services**
(Peterson LR CID 2001; 32:605; Hacek DM Am J Clin Path 1999; 111: 647; Simor AE 2001; 22:459)
 - **Antimicrobial I.D., susceptibility testing, periodic susceptibility summary reports**
 - **Participation in multi-disciplinary teams**
 - **Surveillance cultures**
 - **Availability of molecular testing for outbreaks**
 - **Rapid diagnostic testing, e.g. viruses, *B. pertussis***

FUNDAMENTAL ELEMENTS: ADMINISTRATIVE MEASURES RESPONSIBILITIES OF ICPs 2005

- Surveillance, infection prevention at **facilities affiliated** with the primary acute care hospitals
- Oversight of **employee health services** related to infection prevention, e.g. exposure to infectious agents, tuberculosis screening, influenza vaccination, respiratory protection fit testing, smallpox vaccine administration
- **Preparedness planning** for annual influenza outbreaks, pandemic influenza, SARS, bioweapons attacks
- **Adherence monitoring** for selected infection control practices

RESPONSIBILITIES OF ICPS 2005

- Oversight of risk assessment and implementation of prevention measures associated with **construction** and renovation
- Prevention of transmission of **MDROs**
- Mandatory **public reporting** of HAIs as state laws are enacted
- Increased **communication** with the public and with local public health departments concerning infection control-related issues
- Participation in local and multi-center **performance improvement, research projects**

BEDSIDE NURSE STAFFING

- Include prevention of healthcare-associated infections (HAI) as one determinant of bedside nurse staffing levels and composition, especially in high risk units (Jackson M AJIC 2002 [rev]; Needleman J NEJM 2002 [UTI])

Category IB

- **Burn units:** Arnow P J Trauma 1982 (MRSA); Mayhall CG J Infect Dis 1979 (*Enterobacter cloacae*)
- **Nursery, NICU:** Goldman DA J Infect Dis 1981; Haley RW J Infect Dis 1982(MSSA), J Infect Dis 1995 (MRSA); Harbarth S ICHE 1999 (*Enterobacter cloacae*)
- **Pediatrics:** CVICU: Archibald LK PIDJ 1997 (*Serratia marcescens*); Gen. Peds: Stegenga J ICHE 2002 (viral gastro)
- **Adult ICUs:** SICU: Fridkin SK ICHE 1996; Robert J ICHE 2000 (pool nurse); ICU: Alonso-Echanove J ICHE 2003 (BSIs, float nurses); Vicca AF J Hosp Infect 1999 (MRSA)
- **LTCFs:** Loeb MB Am J Epidemiol 2003 (MRSA)

FUNDAMENTAL ELEMENTS: ADMINISTRATIVE MEASURES, ICP STAFFING

- Incorporate preventing transmission into patient safety
Category IB/IC
- Make prevention and control of transmission an institutional priority *Category IB/IC*
 - Provide adequate administrative support – human and fiscal resources for IC program
- Assure that individuals with training in infection control are employed by or are available by contract to all healthcare organizations for qualified management of the infection control process *Category IB*
- **Determine specific ICP FTE needs according to the scope of the infection control program, complexity of the healthcare system, characteristics of the patient population, unique or urgent needs of the facility and community** *Category IB*

ADMINISTRATIVE MEASURES

- **Include IC in operational decisions** *Category IB/IC*
 - Facility design
 - Selection of medical equipment and supplies
 - Maintenance planning
 - Bedside staffing levels and composition
- **Assure clinical laboratory support** *Category IB*
- **Screen visitors to high-risk areas for signs, symptoms of infectious diseases** *Category IB*
- **Monitor effectiveness of transmission prevention programs and provide feedback to staff** *Category IB*
- **Monitor recommended performance indicators for hand hygiene and isolation precautions** *Category IB*

FUNDAMENTAL ELEMENTS: ESSENTIAL ELEMENTS OF SURVEILLANCE

(Pottinger JM. ICHE 1997; 18:513)

- Standardized **definitions**
- Identification of **patient populations at risk** for infection
- **Statistical analysis** (e.g. risk-adjustment, calculation of rates using appropriate denominators, **trend analysis** using methods such as statistical process control charts)
- **Feedback** to the primary caregivers
- **Implement and evaluate** effectiveness of infection prevention interventions

HAND HYGIENE: NAILS

- Do not wear artificial fingernails or extenders when having direct contact with patients at high risk for infection (e.g., those in ICUs or operating rooms). *Category IA*
 - **Colonization:** Fisher P Infection Control 1985; Edel E, Nursing Research 1998; Hedderwick S, ICHE 2000; McNeil S, Clin Infect Dis 2001
 - **Transmission:** Passaro DJ J Infect Dis 1997; Foca M NEJM 2000; Moolenaar RL ICHE 2000; Parry MF Clin Infect Dis 2001; Gupta A ICHE 2004; Boszczowski I PIDJ 2005

HAND HYGIENE: NAILS, JEWELRY

- Develop an organizational policy to guide the extent to which anything other than natural nails will be allowed on healthcare personnel with direct patient contact outside of the specified groups (Saiman L ICHE 2003; Saiman L AJIC 2002).

Category II

- *No recommendation can be made regarding wearing rings in healthcare settings. Unresolved issue*

– **Colonization:** Trick WE Clin Infect Dis 2003; Salisbury DM AJIC 1997; Jacobson G Nurs Res 1985; Hoffman PN Br Med J 1985

HICPAC/CDC CATEGORIES OF PRECAUTIONS: STANDARD PRECAUTIONS (FOR HCWs)

- **Hand hygiene**
- **PPE**
 - **Gloves, mask eye protection, face shield, gown**
- **Soiled patient care equipment**
- **Environmental control**
- **Textiles and laundry**
- **Needles and other sharps**
- **Patient resuscitation**
- **Patient placement**

NEW CATEGORIES OF STANDARD PRECAUTIONS : FOR HCWs AND PATIENTS

- **RESPIRATORY HYGIENE/COUGH ETIQUETTE**
- **SAFE INJECTION PRACTICES**
- **INFECTION CONTROL PRACTICES FOR
SPECIAL LUMBAR PUNCTURE PROCEDUES**

Stop the spread of germs that can make you and others sick.

Cover your Cough



It is best to cover your mouth and nose with a tissue when you cough or sneeze.



When you do not have tissues and you will not be holding a child, sneeze into your upper sleeve not your hands.



You may be asked to put on a surgical mask to protect others.

Put your used tissue in the waste basket.



Clean your Hands

Clean your Hands after coughing or sneezing. Wash with soap and water or clean with alcohol-based hand cleaner.



Detenga la propagación de gérmenes que le enferman a usted y a otras personas.

Cubra su tos



Lo mejor es cubrirse la boca y la nariz con un pañuelo desechable cuando usted tosa o estornude.



Cuando no tenga pañuelos desechables y no vaya a cargar a un niño, estornude sobre la parte superior de su manga, no en sus manos.



Es posible que se le pida que use una mascarilla quirúrgica para proteger a otras personas a su alrededor.

Deshágase de su pañuelo desechable en el cesto de basura.



Asee sus manos

Asee sus manos después de toser o estornudar. Lávelas con agua y jabón o límpielas con un producto limpiador que contenga alcohol.



RESPIRATORY HYGIENE/COUGH ETIQUETTE

- **Educate** staff on the importance of source control measures to contain respiratory secretions and prevent droplet and fomite transmission of respiratory pathogens (Macartney KK Pediatrics 2000; Hall CB Clin Infect Dis 2000; Lau JT Emerg Infect Dis 2004; Varia M CMAJ 2003; Briss PA Am J Preventive Medicine 2000). *Category IB*
- Provide **resources and instructions** for performing **hand hygiene** in or near waiting areas in ambulatory and inpatient settings; provide conveniently located dispensers of alcohol-based hand rubs and, where sinks are available, supplies for handwashing (MMWR 2002; 51: RR-16; Roberts L Pediatrics 2000 [DCC]; White C AJIC 2003 [univ. dorm]; Ryan MA Am J Prev Med 2001 [military]). *Category IA*

RESPIRATORY HYGIENE/COUGH ETIQUETTE

- During periods of increased rates of respiratory infections in the community, **offer masks to coughing patients** and other symptomatic persons who accompany ill patients with suspected respiratory tract infection upon entry **into common waiting areas** (Thomas C Guys Hosp Rep 1961; Downie AW Bull World Health Organ 1965; MMWR 1994; 43: RR-13; Capps JA JAMA 1918; Riley RL Am J Med 1974)
- Encourage patients to maintain **spatial separation**, ideally a distance of **≥ 3 feet**, from others in common waiting areas (Bridges CB Clin Infect Dis 2003; Feigin RD NEJM 1982; Hamburger M Am J Med 1948; Musher DM NEJM 2003; Saiman L ICHE 2003). **Category IB**

SAFE INJECTION PRACTICES: NOTHING NEW

- **Re-iterate due to several reports of preventable transmission of HBV, HCV in ambulatory settings**
(MMWR 2003;52:901; Williams I CID 2004;38:1592)
- **Elements**
 - **No recapping; one handed method if absolutely necessary**
 - **Disposal in puncture resistant containers**
 - **Sterile, single-use, disposable needle and syringe for each injection given**
 - **Prevention of contamination of injection equipment and medication**
 - **Use needle-free safety devices when available**
 - **Use of single-dose vials is preferred over multiple-dose vials, especially when medications will be administered to multiple patients.**
 - **Do not use bags or bottles of intravenous solution as a common source of supply for multiple patients** (deOliveira A Ann Intern Med 2005;142:898)

INFECTION CONTROL PRACTICES FOR SPECIAL LUMBAR PUNCTURE PROCEDURES

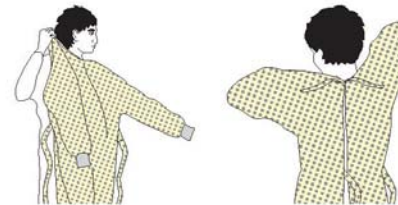
- Bacterial meningitis following myelography, epidural anesthesia, intrathecal chemotherapy reported since 1982 and recent cases investigated by CDC
 - Clinical course, CSF indices indicative of meningitis
 - Streptococci characteristic of oral flora isolated from blood and/or CSF (Couzigou C. J Hosp Infect 2003;53:313; Trautmann M. Eur J Clin Microbiol Infect Dis. 2002;21:43; Baer ET CID 2000;31:519; Black SR CID 2000;31:522)
 - Injected material sterile
 - Masks prevent droplet dispersal (Philips BJ. Br J Anesthes 1992;69:407)
- Recommendation
 - Wear a surgical mask when placing a catheter or injecting material into the spinal canal or subdural space (i.e., during myelograms, lumbar puncture and spinal or epidural anesthesia). *Category IB*

SEQUENCE FOR **DONNING** PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required; e.g., Standard and Contact, Droplet or Airborne Infection Isolation.

1. GOWN

- Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist



2. MASK OR RESPIRATOR

- Secure ties or elastic bands at middle of head and neck
- Fit flexible band to nose bridge
- Fit snug to face and below chin
- Fit-check respirator



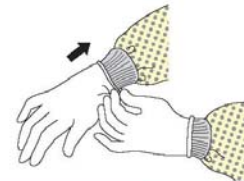
3. GOGGLES OR FACE SHIELD

- Place over face and eyes and adjust to fit



4. GLOVES

- Extend to cover wrist of isolation gown



USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

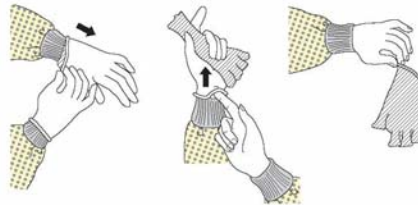
- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

SEQUENCE FOR REMOVING PERSONAL PROTECTIVE EQUIPMENT (PPE)

Except for respirator, remove PPE at doorway or in anteroom.
Remove respirator after leaving patient room and closing door.

1. GLOVES

- Outside of gloves is contaminated!
- Grasp outside of glove with opposite gloved hand; peel off
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist
- Peel glove off over first glove
- Discard gloves in waste container



2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield is contaminated!
- To remove, handle by head band or ear pieces
- Place in designated receptacle for reprocessing or in waste container



3. GOWN

- Gown front and sleeves are contaminated!
- Unfasten ties
- Pull away from neck and shoulders, touching inside of gown only
- Turn gown inside out
- Fold or roll into a bundle and discard



4. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated — DO NOT TOUCH!
- Grasp bottom, then top ties or elastics and remove
- Discard in waste container



PERFORM HAND HYGIENE IMMEDIATELY AFTER REMOVING ALL PPE

HICPAC/CDC CATEGORIES: TRANSMISSION-BASED PRECAUTIONS

- **Contact precautions**

- Patient placement

Category II

- **Single pt. room** preferred; prioritize for single room based on presence of conditions that facilitate transmission
- **Cohort** in one room patients with same pathogen, but maintain separation > 3 feet, change protective attire, use hand hygiene between different patients

- Don gowns and gloves upon room entry

Category IB

- **Droplet precautions**

- Don surgical mask upon room entry

Category IB

- **Face protection** for SARS (*Category IB*) and avian influenza (*Category II*)

- N95 or higher for aerosol-generating procedures for SARS, influenza, Avian influenza (?) HFV

Category IB

TRANSMISSION-BASED PRECAUTIONS: AIRBORNE PRECAUTIONS

- **Indications**
 - Tuberculosis, measles, chickenpox, disseminated zoster *Category IA/IC*
 - Smallpox
 - HFV, SARS, avian influenza (? Droplet with N95 for aerosol-generating procedures) *Category II/IC*
- **Engineering specifications**
 - Per Environmental Guideline (MMWR 2003; 52 [RR-10]), TB guideline

AIRBORNE PRECAUTIONS:

- **Nose, mouth protection**
 - **N95 or higher**
 - **Tuberculosis *Category IB/IC***
 - **Smallpox, VHF, SARS, avian influenza *Category II/IC***
 - **Type of protection (mask vs. respirator) for measles, chickenpox: *No recommendation***
 - **Measles, chickenpox: in all or only non-immune who must have contact with patient?**
- **Are respirators indicated for entry into AIRs for all infections placed in AIRs?**

HICPAC/CDC CATEGORIES: PROTECTIVE ENVIRONMENT

- **Engineering, environmental controls, NOT gowns, gloves, masks on HCWs**
- **Indication**
 - **Allogeneic HSCT** *Category IB*
 - **Other patients at risk of aspergillosis, e.g. neutropenic oncology patients, solid organ transplants** *No recommendation*
- **Specifications as in Environmental Guideline**
(MMWR 2003; 52 [RR-10])

RESPIRATORY SYNCYTIAL VIRUS (RSV)

- Contact plus Standard Precautions
- Use mask according to Standard Precautions
 - Transmission:
 - Cuddlers > touchers > sitters (Hall CB J Pediatr 1981)
 - **Adherence** to Standard plus Contact Precautions most important determinant of transmission (Hall CB CID 2000;31:590; LeClair J NEJM 1987; 317:321; Madge P Lancet 1992; 340:1079).

C. DIFFICILE

- Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g, *C. difficile* or *Bacillus anthracis*) is anticipated. The physical action of washing and rinsing hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores (Weber DJ JAMA 2003; MMWR 2002; 51: RR-16).
Category II
- Do not share electronic thermometers (Brooks S ICHE 1998; Jernigan JA ICHE 1998). Appendix A

C. DIFFICILE

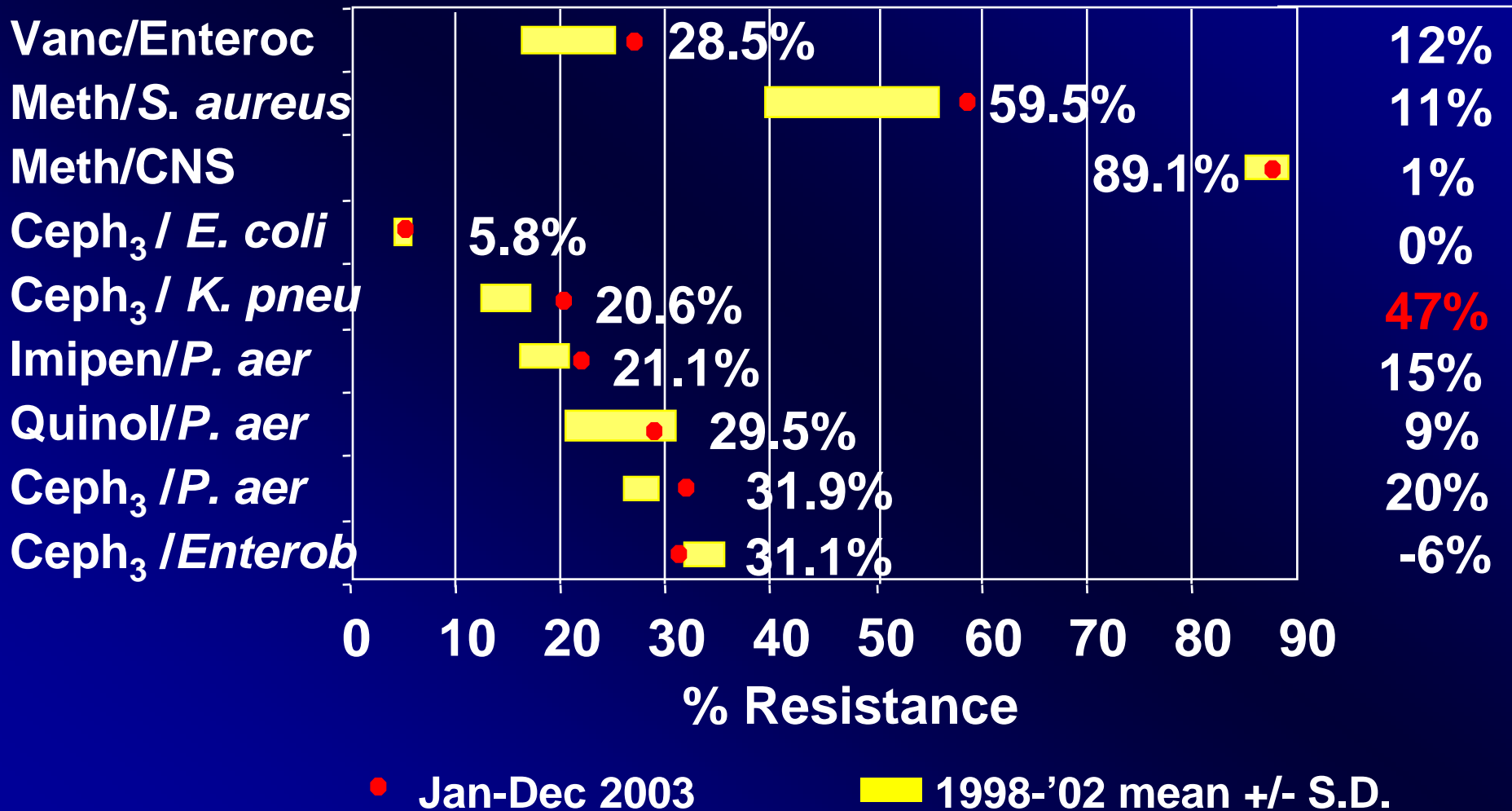
- Use **EPA-approved disinfectants** that have microbiocidal (i.e., killing) activity against the pathogens most likely to contaminate the patient-care environment (Rutala WA Clin Infect Dis 2004; Ansari SA Rev Infect Dis 1991; Kaatz GW Am J Epidemiol 1988; Mayfield JL Clin Infect Dis 2000; Wilcox MH J Hosp Infect 2003; Duizer E Appl Environ Microbiol 2004; Doultree JC J Hosp Infect 1999; Barker J J Hosp Infect 2004; MMWR 2003; 53: RR-10). *Category IB/IC*
 - Review the efficacy of in-use disinfectants when there is evidence of transmission of infectious agents that may indicate resistance to the in-use product (e.g., rotavirus, *C. difficile*, norovirus) and change to a more effective disinfectant as indicated (Wilcox MH J Hosp Infect 2003; Wu HM ICHE 2005; Gulati BR J Food Prot 2001). *Category II*

Note: No EPA-registered disinfectant claims *C. difficile* spore inactivation, but unbuffered and phosphate buffered bleach solutions (5000 ppm) decrease contamination and lower rates of *C. diff* disease

AMR PATHOGENS: NNIS ICU'S

2003 vs 1998-'02

%↑ RESIST
'03 vs. '98-'02



MRSA, VRE AND OTHER MDROs: DEFINITIONS

- MDRO
 - In general, bacteria (excluding *M. tuberculosis*) that are resistant to one or more classes of antimicrobial agents and usually are resistant to all but one or two commercially available antimicrobial agents (e.g., MRSA, VRE, extended spectrum beta-lactamase [ESBL]-producing or intrinsically resistant gram-negative bacilli)

MRSA, VRE AND OTHER MDROs: DEFINITIONS

- Quasi-experimental study design
 - Studies that aim to evaluate interventions but do not use randomization as part of the study design, also referred to as “nonrandomized, pre-post-intervention” study designs. These studies aim to demonstrate causality between an intervention and an outcome but cannot achieve the level of credibility obtained through a randomized, controlled trial. In hospitals and public health settings, randomized control trials often cannot be implemented due to ethical, practical and urgency reasons; therefore, quasi-experimental design studies are commonly used. However, even if an intervention appears to be effective statistically, the question can be raised as to the possibility of alternative explanations for the result (Harris AD CID 2004).

MDROs

- MRSA, VISA, VRSA, VRE, MDR-GNB (ESBLs)
 - Progressive increase in U.S. through the '90s
 - ? Rate of increase MRSA, VRE leveling off in NNIS report 2003; others increasing more rapidly
- Prevalence variation:
 - Geographic, institutional, patient care unit, temporal
- Impact variation:
 - Colonization, infection, treatment, LOS, morbidity, mortality, cost
 - Differences in infection rates by setting
- Relationship to antimicrobial exposure, especially for GNBs
- Silent transmission, colonization pressure, virulence factors, influence of CO-MRSA on nosocomial transmission

MDRO LESSONS FROM THE LITERATURE

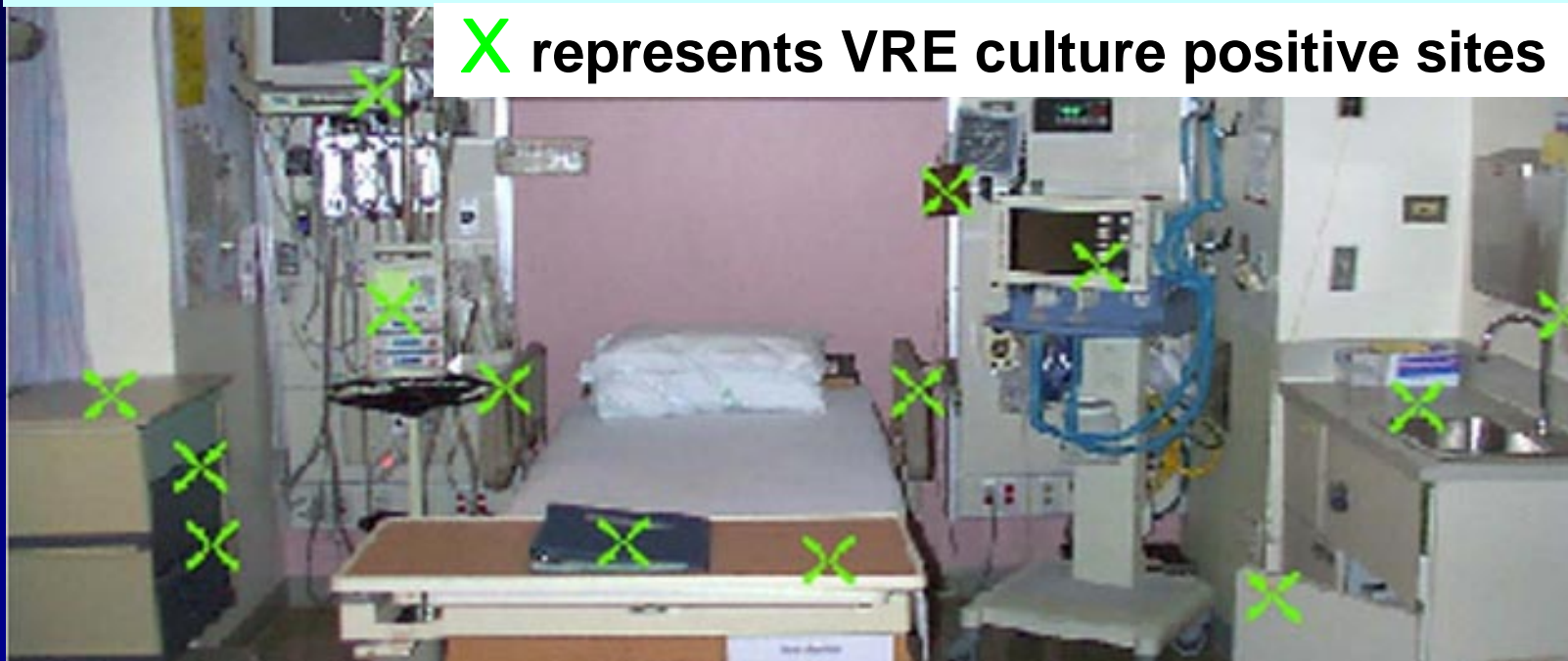
- > 100 reports in English literature reviewed
- Quasi-experimental study design with variability in methods, limited duration of F/U in most
- 67% reports of perceived outbreaks
- Reduced case rates or eradication reported in most: VRE (78%), MRSA (94%), MDR-GNB (93%)
- Median of 7-8 control measures utilized concurrently or sequentially per study; cannot define value of each intervention
 - Administrative
 - Education
 - Antimicrobials
 - Surveillance
 - I. C. Precautions
 - Environmental measures
 - Decolonization

MDROs: CONSIDERATIONS

- **Increased morbidity, mortality, LOS** (Blot SI Arch Intern Med 2002; Cosgrove SE CID 2003; Reed SD ICHE 2005; Cosgrove SE ICHE 2005; Salgado CD ICHE 2003; Qavi A ICHE 2005; Stone PW ICHE 2003; Carmeli Y Arch intern Med 2002)
- **Shifting patterns**
 - ? Role of CA-MRSA (Saiman L Clin Infect Dis 2003; Healy CM Clin Infect Dis 2004; Eckhardt C ICHE 2003)
- **Active Surveillance Cultures**
 - Sensitivity, specificity, timeliness (D'Agata EM Clin Infect Dis 2002; Huletsky A Clin Infect Dis. 2005)
 - Role of performing ASC without communicating results (Nijssen S CID 2005)
- Role of community **collaboratives** (Ostrowsky BE NEJM 2001; Evans R Medinfo 2004; Gerber SI ICHE 2006; 27:139)
- ? Advantage of focusing on bundled practices to **prevent infections** more effective than widespread surveillance (Berenholtz SM Crit Care Med 2004; IHI campaign)

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.

MULTI-DRUG RESISTANT ORGANISMS: A TALE OF TWO GUIDELINES

(Strausbaugh LJ. CID 2006; 3/15/06)

- SHEA Guideline for Preventing Nosocomial Transmission of Multidrug-Resistant Strains of *Staphylococcus aureus* and *Enterococcus*
 - Muto Ca, Jernigan JA, Ostrowsky BE, Richet HM, Jarvis WR, Farr BM. ICHE 2003; 24: 362
- Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2006
 - Siegel JD, Straubach LJ, Jackson M, Rhinehart E, Chiarello L, and HICPAC.
www.premierinc.com/all/safety/resources/guidelines/dc_guidelines.jsp

MDROs

SHEA

- Appointed authors, no public comment period, approved by BOD
- MRSA, VISA, VRSA, VRE
- Hospitals
- Evidence ratings: HICPAC for each rec.
- Administrative: few
- Education target: HCWs
- Judicious antimicrob. use: less emphasis; avoid treating colonization

HICPAC

- Invited authors, HICPAC sponsor, DHQP staff member, public comments
- MRSA, VISA, VRSA, VRE plus GNBs (ESBLs, intrinsic)
- Hospitals, LTCFs, ambulatory, home care
- Evidence ratings: HICPAC for a “package”
- Administrative: many
- Education target: HCWs, patients, families, visitors
- Judicious use antimicrob use: rec. to track, trend, provide feedback; do not treat colonization

MDROs

SHEA

- Surveillance: computer alert system for re-entry
- **ASC: all pts. at risk of carrying MRSA, VRE; repeat weekly**
- HCW cultures if epi-linked
- Rec. adherence monitoring to IC precautions
- Standard Precautions: no sp. rec.
- **PPE: mask upon entry; empiric use univ.glove ± gowns; acknowledge setting modif.**
- Cohorting rec.

HICPAC

- Computer alert; track and trend by population, location
- **ASC: targeted measure to define problem MDRO burden and for intensified control; interval for repeat varies**
- HCW cultures if epi-linked
- Rec. adherence monitoring to IC precautions
- Standard Precautions: foundation; detailed description
- **PPE: mask per droplet prec; no rec. for univ.glove ± gown; setting-sp. modif.**
- **Preference for single pt. rms; cohorting rec.**

HICPAC MEMBERS DURING MOST OF ISOLATION GUIDELINE REVISION PROCESS 2000-2003

Bob Weinstein, MD (Chair)

Jane Siegel, MD (Co-Chair)

Ray Chinn, MD

Al DeMaria, MD

Elaine L. Larson, RN, PhD

Ramon Moncada, MD

Bill Rutala, PhD

Bill Scheckler, M.D.

Beth Stover, RN, CIC

Marj Underwood, RN,

BSN, CIC

Michele Pearson, MD (Executive Secretary)

Liaisons: APIC, SHEA, AORN, AHCA, FDA, CMS, ACET

CURRENT HICPAC MEMBERS 2005

PJ Brennan, MD (Chair)

Vicki Brinsko, RN, BA

Patch Dellinger, MD

Nancy Foster, BA

Steve Gordon, MD

Lizzie Harrell, PhD

Carol O'Boyle, PhD, RN

Dennis Perrotta, PhD, CIC

Harriet Pitt, MS, CIC, RN

Nalini Singh, MD, MPH

Phil Smith, MD

Kurt Stevenson, MD, MPH

Patty Simone, MD (Executive Secretary)

Liaisons: APIC, SHEA, AORN, AHCA, FDA, CMS, ACET,
ACOEM, JCAHO, AHRQ, NIH



OTHER SPECIALIZED INFECTION CONTROL GUIDELINES

- Recommendations for Preventing Transmission of Infections among Chronic Hemodialysis Patients (MMWR 2001; 50: RR-5)
- Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities 2005 (MMWR 2005; 54: RR-17)
(www.cdc.gov/nchstp/tb/Federal_Register/default.html)
- Guidelines for Infection Control in Dental Health-Care Settings (Kohn WG MMWR 2003; 52(RR-17))
- Infection Control Recommendations for Patients with Cystic Fibrosis (Saiman L ICHE 2003; 24(5 Suppl):S6-52)
- Guidelines for Preventing Opportunistic Infections Among HSCT Recipients in 2000 (MMWR 2000; 49: RR-10)

CYSTIC FIBROSIS: *B. CEPACIA, P. AERUGINOSA*

CF Infection Control Guideline (Saiman L ICHE 2003)

- Assume all CF patients could have transmissible pathogens in respiratory secretions (Burns JL Clin Infect Dis 1998; McMenamin JD Chest 2000). *Category IA*
- Many *Category IA/IB* recommendations for transmission-based precautions, environmental and equipment disinfection based on
 - Evidence for patient-to-patient **transmission** in healthcare, social settings and among siblings of
 - *B. cepacia* (LiPuma J Clin Chest Med 1998; Smith DL J Clin Microbiol 1993; Pegues DA Arch Pediatr Adolesc Med 1994; Biddick R FEMS Microbiol Lett 2003; Pegues DA J Pediatr 1994; Govan JR Lancet 1993; Tablan OC Chest 1987)
 - *P. aeruginosa* (Speert DP J Hosp Infect 1987; Wolz C Epidemiol Infect 1989; Ojeniyi B Pediatr Pulmonol 2000; Pedersen SS J Antimicrob Chemother 1986; Cheng K Lancet 1996; Jones AM Lancet 2001; McCallum SJ Lancet 2001)

CYSTIC FIBROSIS: *B. CEPACIA, P. AERUGINOSA*

- Evidence that preventive infection control measures are effective in CF population
 - *P. aeruginosa*: Griffiths AL Am J Respir Crit Care Med. 2005
 - *B. cepacia*
 - Routine infection control measures, (e.g., hand hygiene, disinfection of surfaces, equipment, eliminate sharing rooms or socializing in hospital and outside of hospital, segregation in clinics, disband CF summer camps (Thomassen MJ Am Rev Resp Dis 1986; Chen JS J Pediatr 2001; Fung SK Can Infect Dis J 1998; Paul ML J Hosp Infect 1998; Pegues DA Epidemiol Infect 1996; MMWR 1993; 42:456)