TRANSMISSION-BASED PRECAUTIONS

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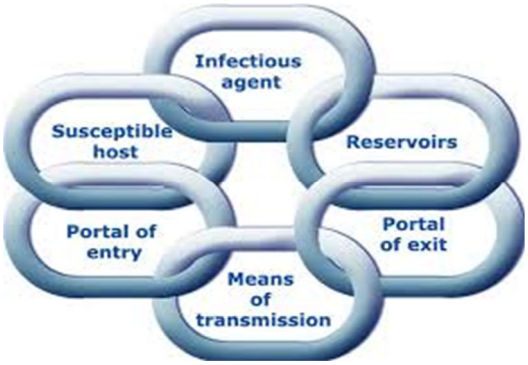
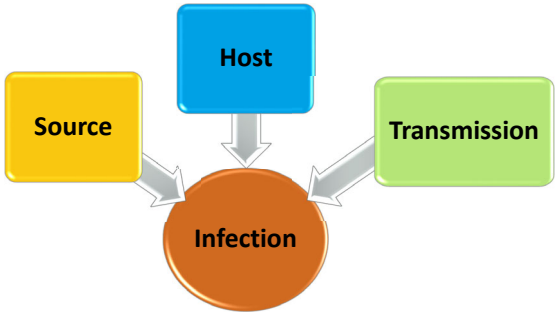
OBJECTIVES

- Identify the chain of infection and routes of disease transmission
- Understand the history of isolation precautions guidelines and updates to the SPICE isolation precaution signage
- Recognize the effectiveness of transmission-based precautions compliance
- Describe isolation for visitors and discontinuation guidance

CHAIN OF INFECTION



RATIONALE BEHIND TRANSMISSION-BASED PRECAUTIONS



SOURCES OF INFECTION

- Humans
  - Patients
  - Healthcare Personnel
  - Visitors/household members
- Environmental
- Common Vehicles
- Vectorborne

Host Factors

- Age
- Immobility
- Incontinence
- Dysphagia
- Chronic Diseases
- Poor Functional Status
- Medications
- Indwelling devices

ROUTES OF TRANSMISSION

- Direct Contact
- Indirect Contact
- Aerosol
- Droplet

DIRECT AND INDIRECT CONTACT TRANSMISSION

Direct Contact: skin to skin touching

Indirect Contact: inanimate surfaces

DROPLET AND AIRBORNE TRANSMISSION

Smallest droplets (<25 mm) evaporate leaving "**droplet nuclei**" of bacilli that can reach **alveoli** (e.g., **TB**).

Medium Droplets

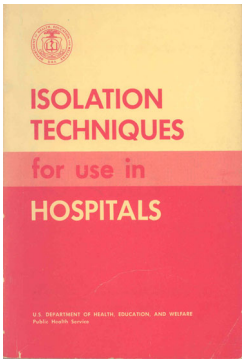
Medium-sized droplets: trapped & cleared in upper airway.

Largest droplets fall to ground in seconds; may persist in dust, but not an important cause of infection.

Largest Droplets

HISTORY OF INFECTION CONTROL PRECAUTIONS IN THE UNITED STATES

- 1970 CDC "Isolation Techniques for use in Hospitals", 1st Edition
- Six Categories of Isolation
- 1975 CDC "Isolation Techniques in Hospitals", 2ND Edition, color-coded category door signs



CDC 1975

HISTORY OF ISOLATION PRECAUTIONS

- 1983 CDC Isolation Precautions in Hospital

Category-based precautions (Airborne Isolation, Droplet and Contact) plus blood and body fluids precautions

- 1985 Introduced Universal Precautions all patients considered infectious regardless of testing
- 1987 Body Substance Isolation
  - focused on worker protection)
- 1996 CDC HICPAC Revised Isolation Guidelines
  - Introduced Standard Precautions and kept 3 categories of transmission-based precautions

2006 MANAGEMENT OF RESISTANT ORGANISMS IN HEALTHCARE SETTINGS
2007 GUIDELINE FOR ISOLATION PRECAUTIONS: PREVENTING TRANSMISSION OF INFECTIOUS AGENTS IN HEALTHCARE SETTINGS

JANE D. SIEGEL, MD; EMILY RHINEHART, RN MPH CIC; MARGUERITE JACKSON, PHD; LINDA CHIARELLO, RN MS; THE HEALTHCARE INFECTION CONTROL PRACTICES ADVISORY COMMITTEE

- Inclusion of non-hospital settings
- Re-emphasis on Standard Precautions
  - Safe injection Practices
  - Respiratory hygiene practices
  - Use of mask during spinal procedures

KEY CONCEPTS

- Risk of transmission of infectious agents occurs in all settings
- Infections are transmitted from patient-to-patient via HCPs or medical equipment/devices
- Isolation precautions are only part of a comprehensive IP program
- Unidentified patients who are colonized or infected represent risk to other patients

FUNDAMENTAL ELEMENTS

- Administrative support
- Adequate Infection Prevention staffing
- Good communication with clinical microbiology lab and environmental services
- A comprehensive educational program for HCPs, patients, and visitors
- Infrastructure support for surveillance, outbreak tracking, and data management

HISTORY OF NC SPICE STANDARDIZED SIGNAGE

In 2008, NC SPICE in collaboration with NC APIC to create a uniform color-coded signage for:

- Airborne Isolation Precautions
- Contact Precautions
- Contact Enteric Precautions
- Droplet Precautions

WHY STANDARDIZE ISOLATION PRECAUTIONS SIGNAGE?

- Transmission based precautions prevents the spread of infections between patients and to staff
- Supports healthcare facilities to implement CDC guidelines
- Variation in signage makes care more difficult and puts patients and residents at risk.
- Increase compliance and consistency by healthcare providers and visitors.
- Use of SPICE signage is voluntary.

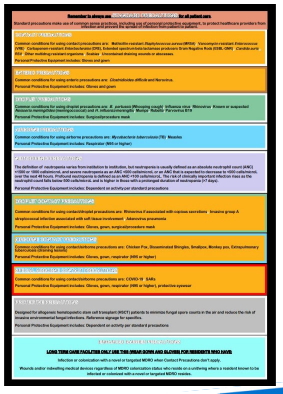
UPDATED AND NEW NC SPICE ISOLATION PRECAUTIONS SIGNAGE

- Signage to have simple, big easy to see pictures
- Signage to minimize reading
- Signage to not send family and visitors looking for nursing staff
- Provides family education and directions for protection
- Provides easy access to information for staff

NC STANDARDIZED ISOLATION SIGNAGE (PUBLISHED JANUARY 2022)

10 isolation precaution categories

- Standard Precautions (coral) NEW
- Contact precautions (orange)
- Enteric Precautions (orange with brown)
- Droplet Precautions (green)
- Airborne Precautions (blue)
- Neutropenic Precautions (purple) New
- Contact Droplet Precautions (green/orange) New
- Special Droplet Contact Precautions (red/green orange)
- Protective Precautions (gray)
- Enhanced Barrier Precautions (teal) **New**



https://spice.unc.edu/resources/nc-standardized-isolation-signage-published-january-2022/

STANDARD PRECAUTIONS

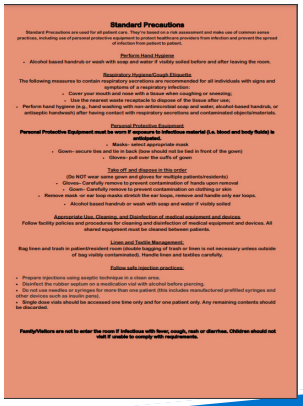
- **Hand hygiene**
- **Gown and glove if soiling likely**
- **Wear face covering if splashing is likely**
- **Clean and disinfecting medical equipment and devices between patients/residents**
- **Follow safe injection practices**

STANDARD PRECAUTIONS

- **Preferred use of ABHR**

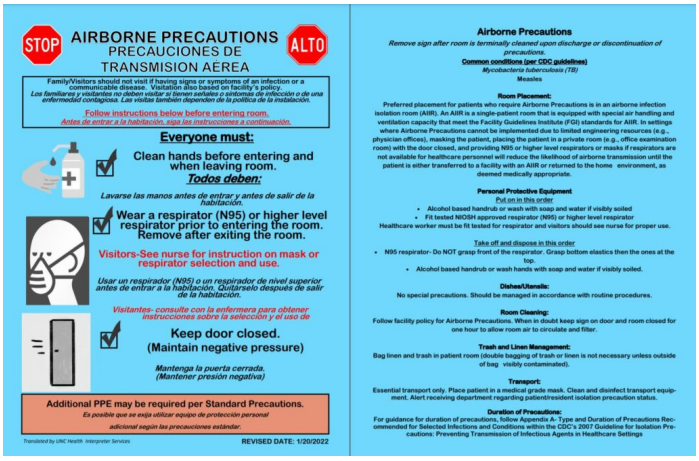
Follow safe infection practices:

- **Prepare injections in a clean area,**
- **Disinfect the rubber septum on medication vial with alcohol before piecing,**
- **Use needles or syringes for only one patient/resident this includes manufactured prefilled syringes such as insulin pens**
- **Single dose vials accessed one time**



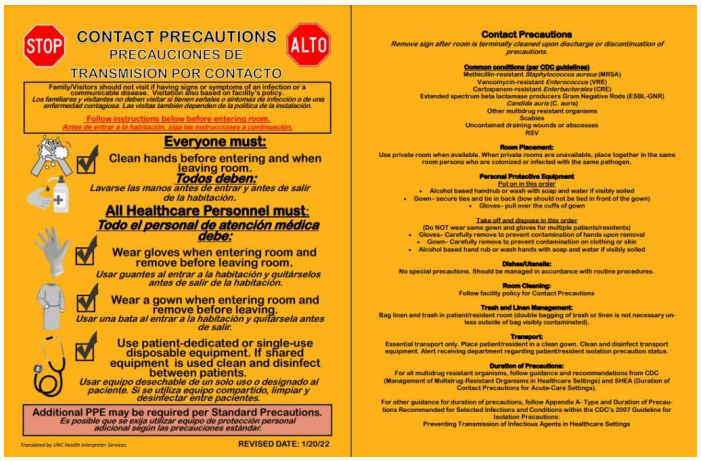
UNIVERSAL RECOMMENDATIONS FOR ISOLATION PRECAUTIONS

- **Hand Hygiene- ABHR preferred**
- **Dishes and Utensils: No special precautions**
- **Trash and Linen Management: No special trash or linen handling unless outside of bag visibly contaminated**
- **Personnel protective equipment: single use only.**
- **Duration of Precautions: Follow Appendix A-CDC 2007 Isolation Guidelines**
- **Visitation: Should not enter if feeling ill. Visitation also based on facility's policy.**



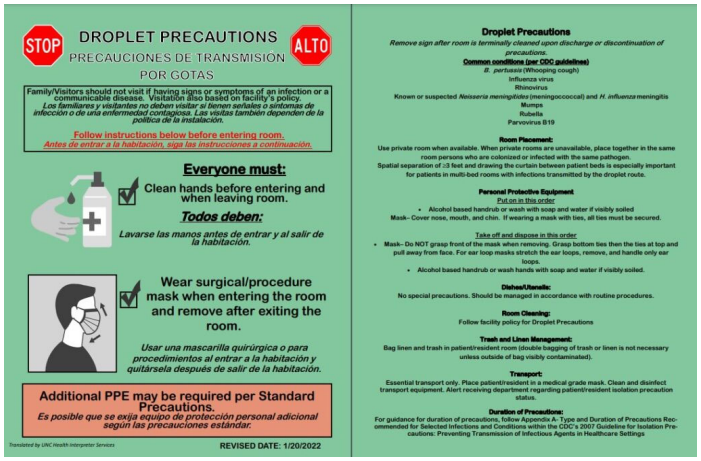
AIRBORNE PRECAUTIONS

- **Common conditions: tuberculosis, measles**
- **N95 or higher respirator**
- **Direct visitors to nurse's station before entering**
- **Private room required**
- **Preferred Airborne Isolation Room (AIIR)**
- **Keep door closed to maintain negative pressure**
- **Upon discharge allow at least one hour for air to circulate**



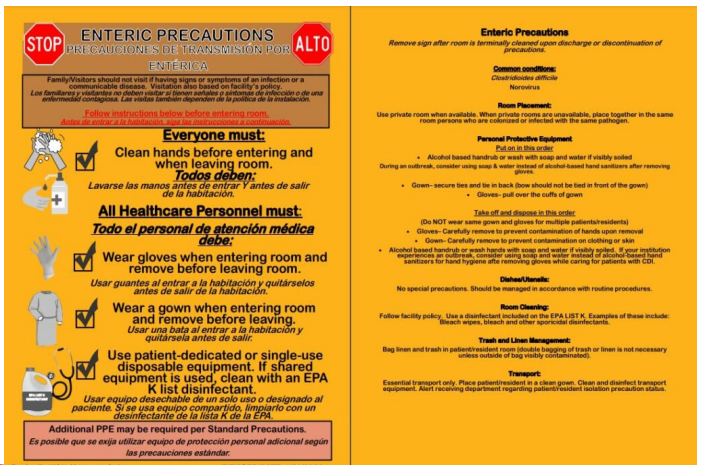
CONTACT PRECAUTIONS

- Common conditions: MRSA, VRE, CRE, ESBL-GNR, Candida auris, Scabies, uncontained draining wounds or abscesses
- Private room if available
- Don gown and gloves
- Disposable or dedicated equipment
- Transport patients in a fresh gown



DROPLET PRECAUTIONS

- Common conditions: pertussis, Influenza, Rhinovirus, Neisseria meningitides, Mumps, Rubella, Parvovirus B19
- Surgical or procedure mask upon entering the room
- Private room when available
- Transport patient in a medical grade mask.



ENTERIC PRECAUTIONS

- Common conditions: Clostridioides difficile, Norovirus, Rotovirus
- USE ABHR for routine care. During an outbreak, HCP should consider using soap & water routinely
- Private room if possible
- Gown and gloves
- Disposable or dedicated equipment
- Use EPA agent from the K list of disinfectants: Dilute Bleach , sporicidal disinfectants.

DROPLET CONTACT PRECAUTIONS

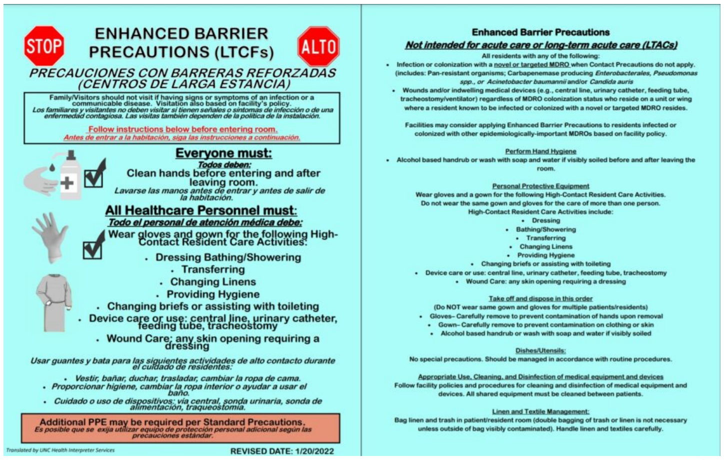
- Common conditions: Rhinovirus if associated with copious secretions, Invasive group A streptococcal infection associated with soft tissue involvement Certain coronaviruses RSV (infants and young children)
- Private room when available or keep >3 spatial separation
- Surgical or procedure mask when entering room
- Gown and gloves on room entry and remove when leaving room
- Essential transport with patient/resident in a medical grade mask and clean gown

SPECIAL DROPLET CONTACT PRECAUTIONS

- Common conditions: SARS, SAR-CoV-2 (COVID-19)
- ~~AIIR- single-patient room with special air handling and ventilation capacity that meet the Facility Guidelines Institute (FGI) standards.~~ Exception is for AGPS
- Private room with door closed unless fall risk.
- Fit tested N95 or higher respirator
- Protective eyewear
- Essential transport only with patient-resident wearing a medical grade mask
- ~~Upon discharge allow at least one hour for air to circulate~~

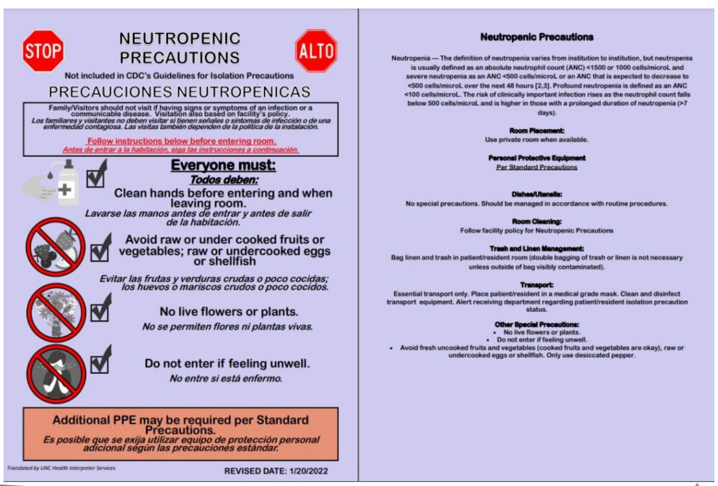
AIRBORNE CONTACT PRECAUTIONS

- Common conditions: Chicken Pox Disseminated Shingles Smallpox Monkey pox Extrapulmonary tuberculosis (draining lesions)
- AIIR- single-patient room with special air handling and ventilation capacity that meet the Facility Guidelines Institute (FGI) standards.
- N95 or higher respirator
- Essential transport only with patient-resident wearing a medical grade mask
- Upon discharge allow at least one hour for air to circulate



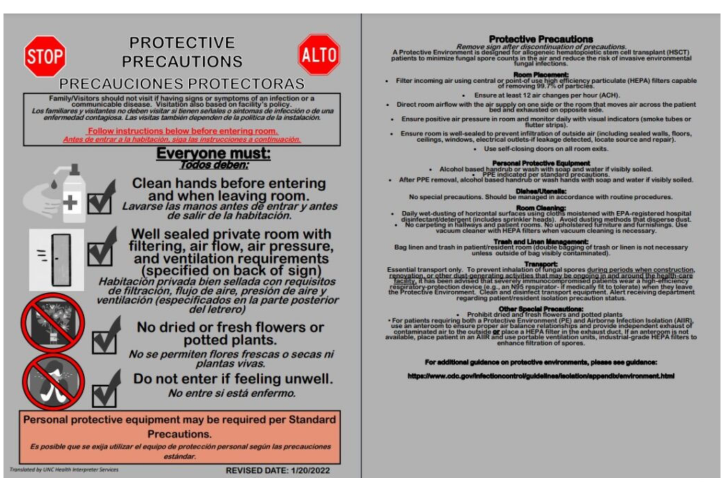
ENHANCED BARRIER PRECAUTIONS (LCTFS)

- Infection or colonization with a novel or targeted MDRO when Contact Precautions don't apply.
- Wounds and/or indwelling medical devices regardless of MDRO colonization status who reside on a unit/wing where a resident known to be infected or colonized with a novel or targeted MDRO resides.
- Wear gloves and gown for **High Contact Resident Care Activities**: Dressing Bathing/Showering Transferring Changing Linens Providing Hygiene Changing briefs or assisting with toileting Device care or use: central line, urinary catheter, feeding tube, tracheostomy Wound Care: any skin opening requiring a dressing



NEUTROPENIC PRECAUTIONS

- **Absolute neutrophil count (ANC) < 1500 or AMC expected to decrease to <500 over next 48 hours**
- **Private room if available**
- **Routine room cleaning**
- **Avoid raw or undercooked fruits, eggs, vegetables, or shellfish or cracked pepper**
- **No live flowers or plants**
- **No entry if ill**
- **Surgical mask if leaving room**



PROTECTIVE PRECAUTIONS

- **Designed for (HSCT)**
- **Private room**
- **HEPA filters (99.7%)**
- **>/= 12 AER**
- **Positive air pressure with monitoring**
- **Self-sealing room exits.**
- **Dust reduction cleaning**
- **No dried or fresh flowers or potted plants**
- **Do not enter if feeling unwell.**
- **Essential transport only wearing N95 respirator**

SYNDROMIC AND EMPIRIC APPLICATION OF TRANSMISSION-BASED PRECAUTIONS

- Diagnosis requires lab confirmation
- Culture-based lab test require 2 or more days
- Precautions should be implemented while awaiting results
  - Based on clinical presentation and likely pathogen
- Reduces transmission opportunities

Clinical Syndrome or Condition	Potential Pathogens	Empiric Precautions (always includes Standard Precautions
Diarrhea		
Acute diarrhea with infectious cause in incontinent or diapered patient	Enteric Pathogens	Contact Precautions
Rash or Exanthems, generalized, unknown etiology		
Petechial/Ecchmotic w/ fever	Neisseria meningitides	Droplet Precautions for 1st 24hrs of antimicrobial tx.
Vesicular	Varicella-zoster, herpes simplex, vaccinia viruses	Airborne plus Contact precautions
Respiratory Infections		
Cough/fever/upper lobe infiltrate	Tb, Respiratory Viruses, S. aureus	Airborne Precautions plus contact
Skin or Wound Infection		
Abscess or draining wound that cannot be covered	Staphylococcus aureus, group A streptococcus	Contact Precautions Add Droplet for the first 24 hours of antimicrobial therapy if group A strep disease suspected

SIGN ADDITIONS AND REVISIONS SUMMARY

FRONT/BACK POCKET CARD: (PRINTS A 2-PAGE DOCUMENT TO BE TRIMMED/LAMINATED)

HTTPS://SPICE.UNC.EDU/RESOURCES/NC-STANDARDIZED-ISOLATION-SIGNAGE/

DO ALL MDROS REQUIRE TRANSMISSION-BASED PRECAUTIONS?

- Epidemiologic significant pathogens - MDROs judged by the IPCP, based on local, state, regional, or national recommendations to be of clinical and epidemiologic significance.
- Contact Precautions recommended in settings with evidence of ongoing transmission, acute-care settings with increased risk for transmission or wounds that cannot be contained by dressings.
- Contact state health department for guidance regarding new or emerging MDRO.

2007 CDC HICPAC Isolation-Precautions Guidelines

MDR-GNR COLONIZATION PERSISTENCE

Table 3. Duration of colonization with multidrug-resistant gram-negative bacteria (MDRGNB).

MDRGNB	No. of isolates	Duration of colonization, median days (range)
All species	52	144 (41–349)
Proteus mirabilis	15	161 (50–279)
Klebsiella pneumoniae	12	132 (70–349)
Escherichia coli	8	178 (50–259)
Proteus stuartii	7	121 (50–322)
Morganella morganii	5	103 (41–328)
Citrobacter species	4	76 (41–168)
Enterobacter cloacae	1	133

ROLES OF ACTIVE SURVEILLANCE- TIER 2 CDC RECOMMENDATIONS

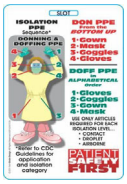
- (Tier 2 recommendations)
- Targeted surveillance of high-risk patients:
  - Useful during outbreaks and when incidence of an MDR-GNR is rising or not declining despite routine control efforts
- Point prevalence surveys during outbreaks:
  - Define reservoir and guide control efforts
  - Determine if on-going surveillance cultures needed

HOW EFFECTIVE ARE CONTACT PRECAUTIONS?

- Unknown
- Ineffective "MRSA" if adherence is poor (20-30%)
  - Afif W, et al. Am J Infect Control 2002;30:430-433
  - Cromer AL, et al. Am J Infect Control 2004;32:451-5
- Most data from outbreak settings
- Given extent of environmental contamination with some MDR-GNRs, barrier precautions make theoretical sense.

DOFFING AND DUFFING EFFECTIVENESS

1.Donning PPE: protocol deviation in 27% EVD; 50% CP
Doffing PPE: protocol deviation in100% EVD; 67% CP
Fluorescence detected: for EVD 44% EVD; 28% CP
Kwon JH, et al. Assessment of HCWs Protocol Deviations and Self-Contamination During Personal Protective Equipment Donning and Doffing. ICHE. September 2017.



2. HCP contaminated almost 80% of the PPE simulations.
Kang, et al. Use of personal protective equipment among health care personnel: Results of clinical observations and simulations. **(2017)**

3. Mannequin simulated BBF with UV-fluorescent tracers
Poller B, et al. A fluorescence-based simulation exercise for training HCW in the use of personal protective equipment, Journal of Hospital Infection 2018,

4. HCP (ICU) 39% error doffing, 36% MDRO contaminated
Di Fiore et al, Improper Removal of Personal Protective Equipment Contaminates HCWs ICHE, March 2018.

UPDATE ON RECOMMENDATIONS FOR PRECAUTIONS FOR VISITORS

- Use guided by specific pathogen, underlying infectious condition and endemicity of the organism in hospital and community

SHEA EXPERT GUIDANCE

Isolation Precautions for Visitors

L. Silvia Munoz-Price, MD, PhD;[1] David B. Banach, MD, MPH, MS;[2] Gonzalo Bearman, MD, MPH;[3] Jane M. Gould, MD;[4] Surbhi Leekha, MBBS;[5] Daniel J. Morgan, MD, MS;[6] Tara N. Palmore, MD;[7] Mark E. Rupp, MD;[8] David J. Weber, MD, MPH;[9] Timothy L. Wiemken, PhD[10]

Infection Control & Hospital Epidemiology / FirstView Article / April 2015, pp 1 - 12

ISOLATION PRECAUTIONS FOR VISITORS

- All visitors comply with hand hygiene before and after visiting
- Endemic situations with MRSA and VRE
  - No Contact Precautions for visitors in routine circumstances
  - Visitors visiting multiple patients should use Contact Precautions

Infection Control & Hospital Epidemiology / FirstView Article / April 2015, pp 1 - 12

DISCONTINUING CONTACT PRECAUTIONS

- Disease specific recommendations in Appendix A of CDC Isolation-Precautions Guidelines
  - Type and duration of precautions
- Remain in effect for limited period of time (i.e. while the risk for transmission persist or for the duration of illness)
- New SHEA Expert Guidance 2018

Ref. SHEA Duration of Contact Precautions. ICHE. 2018 by The Society for Healthcare Epidemiology of America. All rights reserved. DOI: 10.1017/ice.2017.245

DISCONTINUATION OF CP FOR MRSA

Establish policy for previously MRSA colonized or infected.

- **Off antibiotics effective against MRSA ≥ 72 hrs (3 weeks for dialysis)**
- **Optimal number of surveillance cultures unclear**
  - **Optimal culture site unclear, anterior nares common**

SUMMARY

- Chain of Infection
- Routes of disease transmission
- NC SPICE revised the standardized isolation precautions signage

https://spice.unc.edu/resources/nc-standardized-isolation-signage/

- Effectiveness of TBP
- Visitor guidance
- TBP discontinuation for MRDO

QUESTIONS

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