An Illustrated Guide to Infection Control
Kathleen Motacki, MSN, RN, BC, Associate Clinical Professor at Saint Peter’s College School of Nursing, Jersey City, New Jersey. She is a referral liaison at Children’s Specialized Hospital, New Brunswick, New Jersey. She holds board certification in pediatric nursing from the American Nurses Credentialing Center (ANCC). She has recently been appointed to the ANCC Pediatric Content Expert Panel. She is Vice-President for Saint Peter’s College for Mu-Theta-at-Large Chapter, Sigma Theta Tau International Nursing Honor Society. Professor Motacki obtained her BSN and MSN from Kean University, Union, New Jersey. She has published a continuing nursing education series for contact hours, “Safe Patient Handling in Pediatrics” in the Journal of Pediatric Nursing. Her book publications include Nursing Delegation and Management of Patient Care Mosby/Elsevier, The Illustrated Guide to Safe Patient Handling and Movement, Springer Publishing. She has presented the Sigma Theta Tau International Nursing Honor Society Biennium and was the keynote speaker at the Founders Day for the New Jersey Consortium of Chapters. She is a nurse philanthropist, and her volunteer efforts include: Our Lady of Fatima Rehabilitation Center in Liberia, Africa; Children’s Specialized Hospital, New Brunswick, and the Sierra-Leone School of Nursing in Sierra-Leone Africa.

Neeta Bahal O’Mara, PharmD, BCPS, is a board-certified Pharmacotherapy Specialist and is licensed in New Jersey and Pennsylvania. She is presently employed as a consultant at Coldstream Consulting Company in Skillman, New Jersey, as a Clinical Pharmacist at Dialysis Clinic Inc. in North Brunswick, New Jersey, as a Drug Information Consultant at Pharmacist’s Letter/Prescriber’s Letter, Stockton, California, and as Associate Editor for Jones and Bartlett Learning for the Pocket Pharmacopoeia, Sudbury, Massachusetts. Her past experience was as a clinical pharmacist and family practice specialist at Methodist Hospital of Indiana in Indianapolis and Assistant Professor of Pharmacy Practice at Butler University, Indianapolis, Indiana. Dr. Bahal O’Mara was a Fellow in Pediatric Pharmacotherapy at the Wexner Institute for Pediatric Research / Ohio State University, Columbus, Ohio. She received her Doctor of Pharmacy from the Medical College of Virginia, Richmond, and her Bachelor of Science in Pharmacy from the Philadelphia College of Pharmacy and Science, Philadelphia, Pennsylvania.

Her professional affiliations include The American College of Clinical Pharmacy, the American Society of Hospital Pharmacists, the New Jersey Pharmaceutical Association, Rho Chi Pharmaceutical Honor Society, and the Kappa Epsilon Professional Pharmaceutical Fraternity. She has received many honors and awards, including Faculty of the Year from Family Practice Residency, Methodist Hospital. She has numerous areas of research experience, is widely published in peer-reviewed journals, and has authored several book chapters.

Toros Kapoian, MD, FAACP, is a Clinical Associate Professor of Medicine at the University of Medicine and Dentistry, Robert Wood Johnson Medical School in New Brunswick, New Jersey. He has specialty training in Kidney Transplantation and Clinical Hypertension. He serves as the Medical Director of the Kidney Center of New Jersey, Robert Wood Johnson University Hospital, and at the Dialysis Clinic, Inc. (DCI) facilities in North Brunswick and at Madison Center, where he also directs the Infection Control and Prevention Program. Dr. Kapoian is President of the Board of Trustees of the TransAtlantic Renal Council and serves on the Board of Trustees of the End Stage Renal Disease Network for New Jersey, Puerto Rico, and the Virgin Islands. He has expertise in both state and federal regulations pertaining to the care of patients with chronic kidney disease and teaches a structured approach to all aspects of quality assurance performance improvement, including infection control and prevention to nurses and health care providers alike.
An Illustrated Guide to Infection Control

Kathleen Motacki, MSN, RN, BC
Neeta Bahal O’Mara, PharmD, BCPS
Toros Kapoian, MD, FAACP
To my loving family:
   my husband, Robert;
   my son Robert;
   my lovely daughter, Lisa;
   my son John;
   and to Edward Motacki, my father-in-law;
   Irene Motacki, my mother-in-law;
   Ted Taterek, my uncle; and
   Brian Motacki, my brother-in-law.

   —Kathleen Motacki

To my loving family:
   Ed, Sean, Evan, and Neena.

   —Neeta Bahal O’Mara
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Contributors

Garletha Allen, RN, MSN, CNN  Nurse Manager, Dialysis Clinic, Inc., Monroe, New Jersey

Mary Jo Assi, MS, RN, APRN, BC, AHN-BC  Director: Advanced Practice Nursing, The Valley Hospital, Ridgewood, New Jersey

Kathleen A. Bivens, RN, CNN  Area Director of Nursing, Dialysis Clinic, Inc., North Brunswick, New Jersey

Lisa Bross Gajary, RN  Area Education Coordinator, Dialysis Clinic, Inc., North Brunswick, New Jersey

Kathleen Burke, PhD, RN  Assistant Dean in Charge of Nursing Programs, Professor of Nursing, Ramapo College of New Jersey, Mahwah, New Jersey

Beverly S. Karas-Irwin, MS, MSN, RN, NP-C  Director: Clinical Partnerships, Nursing Programs, The Valley Hospital, Ridgewood, New Jersey

Victor de la Cruz, RN  Vascular Access Coordinator, Dialysis Clinic, Inc., North Brunswick, New Jersey

Laura Kolmos, RN, HCS-D, COS-C  Medical Review Coder/Infection Control, Valley Home Care, Ridgewood, New Jersey

Patricia Mechan, PT, MPH, CCS  Consulting, Education & Clinical Services Manager, Guldmann, Inc., Belmont, Massachusetts

Lisa Marie Motacki, BA  Full-time Graduate Student, Caldwell College, Caldwell, New Jersey

Nicole A. Murad, RN, APN-C  Advanced Practice Nurse/Clinical Quality Specialist, Patient Care Services, The Valley Hospital, Ridgewood, New Jersey

Laura Murphy, RNC, MSN, WHNP-BC  Clinical Instructor at Valley Hospital (Ridgewood, New Jersey) for Ramapo College (Mahwah, New Jersey) Nursing Students; New York University Fertility Center, New York, New York; Greenwich Fertility and Invitro Fertilization Center, Greenwich, Connecticut
Reviewers

**Dean Ann Tritak, RN, EdD**  Dean of Nursing, Saint Peter’s College, School of Nursing, Jersey City, New Jersey

**Professor Lisa Garsman, MS, FNP, B-C**  Director, BSN Program, Saint Peter’s College, School of Nursing, Jersey City, New Jersey
Infection control is a topic of exceptional importance for nurses, patients, and hospital or health care facility staff. With antibiotic-resistant infections at high levels, the student and new practicing nurse must be well-educated on infection control. It is vitally important to keep our patients and our nursing personnel free from nosocomial infections. Not only must nurses know how to keep patients free from such infections, they must know how to protect themselves from them as well, especially in high-risk areas: from dialysis units to operating rooms and trauma units. This guidebook gives you the knowledge to do just that in a variety of settings.

In addition, because health care facilities are environments of ever-increasing legislation and regulation, there is the need for more, not less, data on infections, along with associated reports. Taken together with the effects of the economic downturn, it is clear that most of us are asked to do more with less and are expected to provide a high standard of care with near-zero rates of infection. Whether this equates with an increase in staffing hours, loss of valuable resources, or limitations on reimbursement, the challenge is real. Certainly, the so-called superbugs complicate issues in terms of antibiotic resistance. Their ability to spread to ill patients has caused hospital wards to close, and in certain instances, they have caused patient death. We have to think smarter and do better. Remaining at the cutting edge of infection control and prevention requires not only new products to decrease infection rates but also the knowledge, skills, and mindset to be proactive against infection on a daily basis.

—Suresh K. Gupta, MD, F. CAP
Medical Director of Pathology and Laboratory Services
East Orange General Medical Center
East Orange, New Jersey
Clinical Assistant Professor of Laboratory Medicine and Pathology
UMDNJ Medical School
Newark, New Jersey

—Santosh Gupta, RN
Medical Coordinator
Franciscan Sisters,
Tenafly, New Jersey
An Illustrated Guide to Infection Control educates student nurses and new practicing nurses on effective infection control measures. Nursing textbooks, of course, cover infection control at the sophomore, junior, and senior levels. This book incorporates all of the levels of nursing into one book and includes basic infection control along with specialty area–specific infection control measures.

The book is designed for nursing students and beginning level RNs to help them develop a practical understanding of infection control issues as they relate to many different areas of health care. As a guide, the book is unique in that the contents cover infection control from basic handwashing to the exposure control plan, and everything in between. As health care providers we must act now to prevent hospital-acquired infections and decrease the number of infections in all health care settings. Thus, clinicians and educators who are experts in their fields have contributed to this book. The chapter writers discuss ways to protect patients, their families, visitors, volunteers, and health care providers from infection. Of course, superbugs also pose a great danger to patients, and we must be vigilant in our practices to prevent these hard-to-treat infections. The student nurse and beginning level nurse must be aware of the environment of care and as it relates to infection control. Indeed, infection control is everyone’s responsibility. The clinical areas of expertise discussed include: acute care, physician’s offices, labor and delivery, dialysis, and TB control, to name a few. There are pre-test and post-test questions for each chapter. The answers are included in the back of the book.

Infection control is everyone’s responsibility. Infection-control committees and education specialists are challenged daily to make health care facilities safe for the patient, families, employees, visitors, and volunteers.

We know that you will come away from reading this book with information that you will use on a daily basis in your practice settings.
I am indebted to Dr. Toros Kapoian and Dr. Neeta Bahal O’Mara for agreeing to take on this project with me and for their lead on the contents of this book. It is because of their clinical, writing, and editing expertise that this book was possible. Their knowledge and expertise has made this book an excellent and exceptional resource for student nurses and for clinicians in a wide variety of health care fields. Thank you to Valley Hospital for allowing us to use your facility for excellent photography and staff input, and to the Dialysis Clinic, Inc., North Brunswick, New Jersey, and to Valley Hospital, Ridgewood, New Jersey, and their employees, the chapter writers, for agreeing to participate in this important and unique project. It is because of the writers’ clinical expertise from Valley Hospital and Dialysis Clinic, Inc. that this book will be unique and current in a variety of different specialties. They have made the contents of this book an asset to student nurses and clinicians.

Thank you to the reviewers, Dr. Ann Tritak and Professor Lisa Garsman, from Saint Peter’s College, Jersey City, New Jersey; it was crucial to have this book peer-reviewed. Thank you Daniel Hedden for your excellent photography work and to John Motacki for your assistance as our “model,” allowing us to obtain excellent pictures. Thank you, Lisa Motacki, for your assistance with references and permissions, and to Dawn K. Harley, Trademark Paralegal and Permissions Coordinator Becton, Dickinson and Company. Thank you to the staff at Springer Publishing for your unending patience in bringing this publication to fruition: Elizabeth Stump, Assistant Editor; Diane Davis, Senior Production Editor; Rose Mary Piscitelli, Senior Production Editor; and Joanne Jay, Vice President, Production and Manufacturing; and to Laura Stewart, Project Manager, Apex Content Solutions.

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—Kathleen Motacki

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—Neeta Bahal O’Mara
Basic Infection Control

This chapter includes topics on hand hygiene, proper hand-washing techniques, and the use of alcohol-based hand sanitizers. The barriers to proper hand hygiene are reviewed. The content differentiates between standard, airborne, droplet, and contact precautions. The Centers for Disease Control and Prevention guidelines regarding basic infection control are reviewed. There is discussion on caring for the immune-compromised patient. Finally, standard precautions and transmission-based precautions are discussed.

OBJECTIVES

1. Explain the importance of hand hygiene.
2. Describe proper hand-washing technique.
3. Discuss the use of alcohol-based hand sanitizers.
4. List some of the barriers to proper hand hygiene.
5. Differentiate between standard, airborne, droplet, and contact precautions.

PRE-TEST QUESTIONS

1-1. Appropriate hand hygiene can:
   a. Increase the risk of mortality
   b. Increase the rate of nosocomial infections
   c. Prevent the transmission of microorganisms
   d. Increase costs of health care–associated infections

1-2. Hands must always be washed with soap and water:
   a. When the hands are visibly dirty
   b. After contact with a patient’s intact skin
   c. Before caring for patients with severe neutropenia or other forms of severe immunosuppression
   d. Before removing gloves
1-3. Which of the following is TRUE regarding hand washing?
   a. The water should be hot
   b. Hands and forearm should be kept higher than elbows during washing
   c. Hands should be washed for a minimum of 60 seconds
   d. Hands should be dried thoroughly from fingers to wrists and forearms with paper towel, single-use cloth, or warm air dryer

1-4. Which of the following is TRUE regarding the use of alcohol-based hand gels?
   a. Apply an ample amount of product to completely cover both hands
   b. Rub hands together, covering all surfaces of hands and fingers with antiseptic
   c. Rub hands together for several minutes until alcohol is dry
   d. If gloves are to be used, put gloves on while hands are still wet from the gel

1-5. Which of the following infectious precautions should be applied to a foreign-born national who is currently incarcerated and is being evaluated in the emergency department for fever, weight loss, pleuritic chest pain, and cough productive of bloody secretions of more than 3 weeks duration?
   a. Standard precautions
   b. Contact precautions
   c. Droplet precautions
   d. Airborne precautions

Hand hygiene is the single most effective way to prevent infections and disease transmission. It reduces the risks of microorganism transmission to patients while reducing the potential for health care worker (HCW) colonization or infection caused by organisms acquired from the patient. Hand hygiene reduces morbidity, mortality, and costs associated with health care–associated infections (HAI). Hand hygiene should be performed before and after patient care, whenever there may be contact with environmental surfaces that may be contaminated with blood or body fluids or are in the immediate vicinity of patients, before leaving or returning to a clinical area, after glove removal, and after performing personal hygiene such as applying make-up, blowing your nose, or using the bathroom (The Centers for Disease Control and Prevention [CDC], 2002).

The CDC guidelines for hand hygiene in *Health-Care Settings* (2002) recommend the following indications for hand washing and hand antisepsis:

1. When hands are visibly dirty or contaminated with proteinaceous material or are visibly soiled with blood or other body fluids, wash hands with either an antimicrobial or non-antimicrobial soap and water.
2. If hands are not visibly soiled, use either an antimicrobial soap and water or alcohol-based hand rub for routinely decontaminating hands in all other clinical situations such as:
   a. Before having direct contact with patients
   b. Before donning sterile gloves when inserting a central intravascular catheter
c. Before inserting indwelling urinary catheters, peripheral vascular catheters, or other invasive devices that do not require a surgical procedure
d. After contact with a patient’s intact skin (e.g., when taking a pulse or blood pressure, and lifting a patient)
e. After contact with body fluids or excretions, mucous membranes, nonintact skin, and wound dressings if hands are not visibly soiled
f. If moving from a contaminated-body site to a clean-body site during patient care
g. After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient
h. After removing gloves
3. Before eating and after performing acts of personal hygiene such as using a restroom, applying make-up, or blowing your nose, wash hands with either an antimicrobial or non-antimicrobial soap and water.
4. Wash hands with either an antimicrobial or non-antimicrobial soap and water if exposure to Bacillus anthracis or Clostridium difficile is suspected or proven.
a. 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.

Microorganisms associated with HAI are found both within skin and soft tissue infections (SSI) as well as normal looking, intact patient skin. Given that people shed more than one million skin cells each day, both the patient and their immediate environment (room, furniture, bed, linens, gowns, etc.) are potential sources for the transmission of HAIs. This can occur if an HCW’s hands become contaminated with microorganisms that are able to survive, and if their hands are not decontaminated and they touch another patient or item in the patient’s vicinity (CDC, 2002).

Sequence of events for the transmission of health care–associated pathogens via the hands of HCWs:

- Organisms present on the patient’s skin, or that have been shed onto inanimate objects in close proximity to the patient, must be transferred to the hands of HCWs.
- These organisms must then be capable of surviving for at least several minutes on the hands of personnel.
- Next, hand washing or hand antisepsis by the worker must be inadequate or omitted entirely, or the agent used for hand hygiene must be inappropriate.
- Finally, the contaminated hands of the caregiver must come in direct contact with another patient, or with an inanimate object that will come into direct contact with the patient.

Hand washing is a vigorous, brief rubbing together of all surfaces of the hands lathered in soap, followed by rinsing under a stream of water. Hand washing may be accomplished with the use of plain soap, antimicrobial soap, or an antiseptic
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hand wash and is always indicated when hands are visibly soiled or when performing a surgical scrub. Hand hygiene may involve an alcohol-based hand rub also known as a waterless antiseptic agent. The majority of alcohol-based hand antiseptics contain isopropanol, ethanol, n-propanol, or a combination of two of these products. Alcohol-based hand rubs for HCWs are available as low viscosity rinses, gels, and foams. Alcohol-based hand sanitizers should not be used whenever contamination with spore-producing organisms are suspected, such as *Bacillus anthracis* (see Chapter 17: Bioterrorism) or *Clostridium difficile*.

Despite the well-established benefits of hand hygiene, adherence to this recommended practice remains low. The techniques for hand washing and the use of hand gel are straightforward unless the donning of a surgical gown is involved. Other factors, such as nail hygiene and jewelry, may influence the benefits of hand decontamination. Long fingernails, artificial nails, and chipped nail polish have been associated with high concentrations of microorganisms, which remain present even after careful hand washing or the use of surgical scrubs. Long fingernails and artificial nails have been implicated in the transmission of gram-negative bacilli and yeast. Therefore, fingernails should be kept trim, and nail polish or artificial nails should not be worn. Similarly, the skin underneath rings also has higher concentrations of microorganisms compared with the skin of fingers without rings. However, it is not clear if jewelry results in increased transmission of HAIs.

**BASIC INFECTION CONTROL**

**Technique for Hand Washing**

1. Wet hands first with water.
2. Apply an amount of product recommended by the manufacturer to hands.
3. Rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers (Figure 1.1).
4. Rinse hands with water.
5. Dry thoroughly with a disposable towel.
   a. Wet hands harbor more microorganisms than dry ones.
6. Use towel to turn off the faucet (Figure 1.2).
7. Avoid using hot water because repeated exposure to hot water may increase the risk of dermatitis.
8. Do not touch any part of the sink. If you do, wash again.
9. Lotion or barrier cream can be applied if needed. (Adapted from CDC, 2002)

**Technique for Applying Alcohol-Based Hand Rub**

1. Apply product to palm of one hand (Figure 1.3). (Follow the manufacturer’s recommendations regarding the volume of product to use.)
2. Rub hands together.
3. Ensure that all surfaces of hands and fingers are covered.
FIGURE 1.1
Technique for hand washing

FIGURE 1.2
Handwashing steps

Start

Wet hands with water

Lather with soap for 15 to 20 seconds

Scrub backs of hands, wrists, between fingers, and under fingernails

Finish

Rinse hand with water

Dry hands thoroughly with a disposable towel

Turn off the tap with the disposable towel
4. Continue rubbing until hands are dry.
5. Lotion or barrier cream can be applied if needed. (Adapted from CDC, 2002)

**Technique for Surgical Scrub**

1. Remove rings, watches, and bracelets before beginning the surgical hand scrub.
2. Don face mask, surgical shoe covers, and other personal protective equipment (PPE) as required.
3. Open brush, and place opened package on sink.
4. Do not touch sink with any part of the body.
5. Wet hands and arms.
6. Surgical prewash:
   a. Apply antiseptic soap, thoroughly lather, and wash the hands and arms to 2 inches above the elbows.
7. Thoroughly rinse hands and arms, keeping hands and wrists higher than the elbows.
8. Brush Method for Scrubbing:
   a. Treat your fingers, hands, and arms as four-sided objects, and scrub each section separately.
   b. Remove debris from underneath fingernails using a nail cleaner under running water.
   c. Pick up the scrub brush.
   d. Wet the scrub brush, and work up a lather.
   e. Scrub hands and forearms for the length of time recommended by the manufacturer, usually 2–6 minutes. (Long scrub times, e.g., 10 minutes, are not necessary.)
f. Scrub the first hand.
   i. Start at the little finger-side or thumb-side of the hand and scrub the four sides of each digit.
   ii. Scrub the palm, sides of the hand, back of the hand, and the web space between the thumb and index finger.

g. Scrub your arm in sections of three or four between the wrist and elbow.

h. Switch hands and repeat.

i. Thoroughly rinse hands and arms, keeping hands and wrists higher than the elbows.

j. Dry hands and arms using a sterile towel starting with fingers and hands and ending with arms and elbows. (Adapted from CDC, 2002, and Academy of Health Sciences, Department of Nursing Science, Operating Room Branch)

Technique for Using an Alcohol-Based Surgical Hand Scrub

1. Ensure the product has persistent antimicrobial activity.
2. Follow the manufacturer’s directions for use (DFU).
3. Prewash hands and forearms with a non-antimicrobial soap.
4. Thoroughly rinse hands and forearms.
5. Dry hands and forearms completely.
6. Apply the alcohol-based product as recommended.
7. Allow hands and forearms to dry thoroughly before donning sterile gloves.

Observed barriers to hand washing include male sex and physician status, while hand irritation, insufficient time, and lack of resources are among those self-reported barriers. Education and motivation programs for HCWs may be beneficial.

FACTORS INFLUENCING HAND-HYGIENE PRACTICES

The following is adapted from “Improving Compliance With Hand Hygiene in Hospitals,” by D. Pittet, 2000. Infect Control Hosp Epidemiol, 21, 381–386.

Observed Risk Factors to Poor Adherence to Hand-Hygiene Practices

- Physician rather than nurse
- Nursing assistant rather than nurse
- Male sex
- Working in an intensive-care unit
- Working during the week rather than weekend
- Wearing gowns/gloves
- Automated sink
- Activities with high risk of cross-transmission
- High number of opportunities for hand hygiene per hour of patient care
Self-Reported Factors for Poor Adherence with Hand Hygiene

- Hand-washing agents cause irritation and dryness
- Sinks are inconveniently located or in insufficient number
- Lack of soap and paper towels
- Too busy/insufficient time
- Understaffing/overcrowding
- Patient needs take priority
- Hand hygiene interferes with patient relationship
- Low risk of acquiring infection from patients
- Belief that gloves obviate the need for hand hygiene
- Lack of knowledge of guidelines
- Forgetfulness
- No role model from colleagues or superiors
- Skepticism about the value of hand hygiene
- Disagreement with recommendations

“The CDC recommends that HCWs wear gloves to reduce the risk of personnel acquiring infections from patients, prevent HCW flora from being transmitted to patients, and reduce transient contamination of HCW hands by flora that can be transmitted from one patient to another” (CDC, 2002). When sterile gloves are needed, without the need for a sterile gown, the open gloving technique is used. In other situations, sterile gloves and gown are necessary. In this case, the sterile technique for gowning and closed gloving should be followed to prevent contamination and infection.

Technique for Open Gloving

1. Remove all jewelry from hands.
2. Perform appropriate hand hygiene.
3. Peel apart outer glove wrapping, and carefully remove inner package.
4. Place inner package on a clean, flat surface.
5. Open package without touching gloves.
6. Grasp the cuff edge with the thumb and first two fingers of one hand (Figure 1.4).
7. Line up the thumb side of the glove with the thumb side of the other hand.
8. Touch only the glove’s inside surface.
9. Slip the glove over the fingers and thumb.
10. Ensure that the cuff edge does not fold over.
11. With the gloved hand, slip the first two fingers underneath second glove’s cuff.
12. Slip second glove over the ungloved hand.
13. Ensure that the gloved hand does not touch any exposed skin.
14. Adjust the gloves to ensure a tight fit over the fingers and thumb.

Doffing Gloves

15. Grasp one glove at the wrist/cuff level without touching exposed skin.
16. Remove glove, turning it inside out, then discard.
17. Take first two fingers of bare hand and tuck inside the remaining glove without touching outside of glove.
18. Remove glove, turning it inside out, then discard.

**Technique for Gowning and Closed Gloving**

The following is adapted from Academy of Health Sciences, Department of Nursing Science, Operating Room Branch.

**Gowning**

1. Remove rings, watches, and bracelets before beginning the surgical hand scrub.
2. Don face mask, surgical shoe covers, and other personal protective equipment (PPE) as required (Figure 1.5).
3. Perform appropriate hand hygiene.
4. Circulating nurse opens sterile gown and glove packages.
5. Grasp the gown from the inside of the neck and lift it from the sterile field.
6. Step back and allow the gown to unfold without touching the sterile field.
7. Locate the arm holes and gently insert both hands into the gown simultaneously, leaving your hands within the sleeves.
8. The circulating nurse brings the gown over the shoulders and secures the back of the gown.
9. Have circulating nurse securely tie back of gown at neck and waist. (If gown is a wrap-around style, sterile flap to cover gown is not touched until the nurse has gloved.)

**Closed Gloving**

10. With hands covered by gown sleeves, open the sterile glove package.
11. Pinch the bottom of the glove through the gown, and lift it out of the package.
12. With palm up, place the palm of the glove over the gowned hand.
13. The fingers of the glove will point toward your elbow.
14. Grasp the glove by the cuff using the other gowned hand, and stretch the glove over the gown cuff while working your fingers out of the gown cuff and into the glove.
15. Unroll the glove cuff so that it covers the stockinette sleeve cuff.
16. Never touch the outside of the gown with the bare hands.
17. Repeat steps 11 through 16 and glove the other hand.
18. Adjust the gloves to ensure a tight fit over the fingers and thumb.

**Tying the Gown**

19. Grasp the top portion of the cardboard tab of the waist tie, and hand it to the circulating nurse.
20. Turn and grasp the waist tie, and secure it to the front of the gown.

**INFECTION PRECAUTIONS**

In addition to hand hygiene, standard precautions and transmission-based precautions are used in infection control and prevention. Standard precautions are intended to be applied to the care of all patients in all health care settings, even if the HCW comes in contact with blood, body fluids, secretions, and excretions regardless of the suspected or confirmed presence of an infectious agent (Brevis Corporation, 2007). Standard precautions include the use of hand hygiene, PPE, and respiratory hygiene. Standard precautions help to reduce the risk of transmission of microorganisms from recognized and unrecognized sources of infection in hospitals. Standard precautions are applied to all patients regardless of diagnosis or infection status. The CDC’s standard precautions incorporate all requirements of the Occupational Safety & Health Administration (OSHA) bloodborne pathogens standard. Transmission-based precautions are designed for patients suspected of or documented with highly transmissible or epidemiologically important pathogens for which additional precautions beyond standard precautions are needed. The three types of transmission-based precautions are airborne precautions, droplet precautions, and contact precautions.

**Droplet Precautions**

Droplet precautions are recommended for patients known or suspected to be infected with pathogens transmitted by respiratory droplets that are generated
by a patient who is coughing, sneezing, or talking. Respiratory droplets carrying infectious organisms travel directly from the infected person to the mucosal surfaces of the recipient generally over short distances. The maximum distance for droplet transmission is currently unresolved but had been agreed to be a distance of 3 feet or less around the patient. However, more recent studies suggest transmission may occur with distances between 6 and 10 feet. Droplet size, another area for consideration, has traditionally been defined as having particles that are larger than 5 micrometers in size (Siegel, Rhinehart, Jackson, Chiarello, & the Healthcare Infection Control Practices Advisory Committee [HICPAC]). In an acute care facility, these patients should be placed in a single room. Anyone who enters the room should wear a mask. However, eye protection is not necessary. These patients should only be transported outside of their rooms when medically necessary (Brevis Corporation, 2007).

**Airborne Precautions**

Airborne precautions are recommended for patients known or suspected to be infected with infectious agents transmitted person-to-person by the airborne route. This occurs when droplet particles that are small in size, usually smaller than 5 micrometers in diameter, remain suspended in air and are therefore able to travel over longer distances. As such, face-to-face contact is not necessary for infectious transmission. Given the small size of the droplet particles, a surgical mask is insufficient protection in these cases (Siegel et al., 2007). For example, patients with *Mycobacterium tuberculosis* or chicken pox should be subject to airborne precautions. These include placement in an isolation room, use of fit-tested National Institute for Occupational Safety and Health (NIOSH)-approved N95 or higher respirators (disposable particulate respirators that filter at least 95% of airborne particles but is not resistant to oil) and the limitation of patient transport outside of the patient’s room (Brevis Corporation, 2007).

**Contact Precautions**

Contact precautions are recommended for patients with known or suspected infections or evidence of syndromes that represent an increased risk for contact transmission. In this type of precaution, gloves and gowns should be worn upon entry into the patient’s room. Disposable noncritical patient-care equipment or the use of patient-dedicated equipment should be used, when possible (Brevis Corporation, 2007).

**IMMUNOCOMPROMISED PATIENTS**

Immunocompromised patients vary in their susceptibility to nosocomial infections, depending on the severity and duration of immunosuppression. They generally are at increased risk for bacterial, fungal, parasitic, and viral infections
from both endogenous and exogenous sources. The use of standard precautions for all patients and transmission-based precautions for specified patients, as recommended in this guideline, should reduce the acquisition by these patients of institutionally acquired bacteria from other patients and environments.

It is beyond the scope of this guideline to address the various measures that may be used for immunocompromised patients to delay or prevent acquisition of potential pathogens during temporary periods of neutropenia. Rather, the primary objective of this guideline is to prevent transmission of pathogens from infected or colonized patients in hospitals.

POST-TEST QUESTIONS

1-1. Appropriate hand hygiene can:
   a. Increase the risk of mortality
   b. Increase the rate of nosocomial infections
   c. Prevent the transmission of microorganisms
   d. Increase costs of health care–associated infections

1-2. Hands must be washed with soap and water:
   a. When the hands are visibly dirty
   b. After contact with a patient’s intact skin
   c. Before caring for patients with severe neutropenia or other forms of severe immunosuppression
   d. After removing gloves

1-3. Which of the following is TRUE regarding hand washing?
   a. The water should be hot.
   b. Hands and forearm should be kept higher than elbows during washing.
   c. Hands should be washed for a minimum of 60 seconds.
   d. Hands should be dried thoroughly from fingers to wrists and forearms with paper towel, single-use cloth, or warm air dryer.

1-4. Which of the following is TRUE regarding the use of alcohol-based hand gels?
   a. Apply an ample amount of product to completely cover both hands.
   b. Rub hands together, covering all surfaces of hands and fingers with antiseptic.
   c. Rub hands together for several minutes until alcohol is dry.
   d. If gloves are to be used, put gloves on while hands are still wet from the gel.

1-5. Which of the following infectious precautions should be applied to a foreign-born national who is currently incarcerated and is being evaluated in the emergency department for fever, weight loss, pleuritic chest pain, and cough productive of bloody secretions of more than 3 weeks duration?
   a. Standard precautions
   b. Contact precautions
   c. Droplet precautions
   d. Airborne precautions
References


Web Sites

http://eclipse.cps.k12.va.us/Schools/DCC/nurse3.html
http://www.handwashingforlife.com/files/images/2-apply-purell.jpg
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