Infectious Diseases

Supplemental Reading Materials

(Word Count: 7378 – 36 Minutes)

The Supplementary Reading Materials for this training program consists of the following documents:

- ABCs of Hepatitis
- Facts About TB
- Guidelines for Hand Hygiene
- Sanitation Activities
- Scabies Treatment
- Urinary Tract Infections
# The ABCs of Hepatitis

<table>
<thead>
<tr>
<th><strong>HEPATITIS A</strong> is caused by the Hepatitis A virus (HAV)</th>
<th><strong>HEPATITIS B</strong> is caused by the Hepatitis B virus (HBV)</th>
<th><strong>HEPATITIS C</strong> is caused by the Hepatitis C virus (HCV)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. Statistics</strong></td>
<td><strong>Routes of Transmission</strong></td>
<td><strong>Persons at Risk</strong></td>
</tr>
<tr>
<td>• Estimated 25,000 new infections in 2007</td>
<td>Ingestion of fecal matter, even in microscopic amounts, from:</td>
<td>• Travelers to regions with intermediate or high rates of Hepatitis A</td>
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<td></td>
<td>• Close person-to-person contact with an infected person</td>
<td>• Sex contacts of infected persons</td>
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<td></td>
<td>• Sexual contact with an infected person</td>
<td>• Household members or caregivers of infected persons</td>
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<td></td>
<td>• Ingestion of contaminated food or drinks</td>
<td>• Men who have sex with men</td>
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<td></td>
<td></td>
<td>• Users of certain illegal drugs (injection and non-injection)</td>
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<td></td>
<td></td>
<td>• Persons with clotting-factor disorders</td>
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<td><strong>Acute Infection</strong></td>
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<td></td>
<td>Contact with infectious blood, semen, and other body fluids, primarily through:</td>
<td>• Infants born to infected mothers</td>
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<td></td>
<td>• Birth to an infected mother</td>
<td>• Sex partners of infected persons</td>
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<td></td>
<td>• Sexual contact with an infected person</td>
<td>• Persons with multiple sex partners</td>
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<td></td>
<td>• Sharing of contaminated needles, syringes or other injection drug equipment</td>
<td>• Persons with a sexually transmitted disease (STD)</td>
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<td></td>
<td>• Needlesticks or other sharp instrument injuries</td>
<td><strong>Serologic Tests for Acute Infection</strong></td>
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<tr>
<td></td>
<td></td>
<td>• IgM anti-HAV</td>
</tr>
<tr>
<td></td>
<td><strong>Incubation Period</strong></td>
<td><strong>Likelihood of Symptomatic Acute Infection</strong></td>
</tr>
<tr>
<td>15 to 50 days (average: 28 days)</td>
<td>• &lt; 10% of children &lt; 6 years have jaundice</td>
<td>• &lt; 1% of infants &lt; 1 year develop symptoms</td>
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<tr>
<td></td>
<td>45 to 160 days (average: 120 days)</td>
<td>• 40%–50% of children age 6–14 years have jaundice</td>
</tr>
<tr>
<td></td>
<td>14 to 180 days (average: 45 days)</td>
<td>• 70%–80% of persons &gt; 14 years have jaundice</td>
</tr>
<tr>
<td></td>
<td><strong>Symptoms of Acute Infection</strong></td>
<td><strong>Note:</strong> Symptoms appear in 5%–15% of newly infected adults who are immunosuppressed</td>
</tr>
<tr>
<td>• Loss of appetite  • Nausea</td>
<td><strong>Potential for Chronic Infection</strong></td>
<td></td>
</tr>
<tr>
<td>• Vomiting  • Abdominal pain  • Clay-colored bowel movements</td>
<td>None</td>
<td>• Among unimmunized persons, chronic infection occurs in &gt;90% of infants, 25%–50% of children aged 1–5 years, and 6%–10% of older children and adults</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td><strong>Acute Illness is uncommon. Those who do develop acute illness recover with no lasting liver damage.</strong></td>
<td>• 75%–85% of newly infected persons develop chronic infection</td>
</tr>
<tr>
<td>Most persons with acute disease recover with no lasting liver damage; rarely fatal</td>
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<td>• 15%–20% of newly infected persons clear the virus</td>
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<td>• 15%–25% of chronically infected persons develop chronic liver disease, including cirrhosis, liver failure, or liver cancer</td>
<td>• Estimated 3,000 persons in the United States die from HBV-related illness per year</td>
<td><strong>Estimated 1.2 million people die from HCV-related illness per year</strong></td>
</tr>
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<td>Serologic Tests for Acute Infection</td>
<td><strong>Potential for Chronic Infection</strong></td>
<td><strong>Exposure</strong></td>
</tr>
<tr>
<td>• IgM anti-HAV</td>
<td>None</td>
<td>• Travelers to regions with intermediate or high rates of Hepatitis A</td>
</tr>
<tr>
<td>• HBsAg in acute and chronic infection</td>
<td>• Sex contacts of infected persons</td>
<td>• Household members or caregivers of infected persons</td>
</tr>
<tr>
<td>• IgM anti-HBc is positive in acute infection only</td>
<td>• Men who have sex with men</td>
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<td><strong>Exposure</strong></td>
</tr>
<tr>
<td>• Nausea</td>
<td>• 5%–15% of children age 1-5 years develop symptoms</td>
<td>• Travelers to regions with intermediate or high rates of Hepatitis A</td>
</tr>
<tr>
<td>• Vomiting</td>
<td>• 30%–50% of persons &gt; 5 years develop symptoms</td>
<td>• Sex contacts of infected persons</td>
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<td><strong>Note:</strong> Symptoms appear in 5%–15% of newly infected adults who are immunosuppressed</td>
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<td><strong>Serologic Tests for Acute Infection</strong></td>
<td><strong>Potential for Chronic Infection</strong></td>
<td>• 60%–70% of chronically infected persons develop chronic liver disease</td>
</tr>
<tr>
<td>• IgM anti-HAV</td>
<td>None</td>
<td>• 5%–20% develop cirrhosis over a period of 20–30 years</td>
</tr>
<tr>
<td>• HBsAg in acute and chronic infection</td>
<td>• 1%–5% will die from cirrhosis or liver cancer</td>
<td>• 1%–5% will die from cirrhosis or liver cancer</td>
</tr>
<tr>
<td>• IgM anti-HBc is positive in acute infection only</td>
<td>• No serologic marker for acute infection</td>
<td>• Estimated 12,000 persons in the United States die from HCV-related illness per year</td>
</tr>
<tr>
<td>HEPATITIS A</td>
<td>HEPATITIS B</td>
<td>HEPATITIS C</td>
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</tr>
<tr>
<td><strong>Serologic Tests for Chronic Infection</strong></td>
<td><strong>Screening Recommendations for Chronic Infection</strong></td>
<td><strong>Testing is recommended for:</strong></td>
</tr>
<tr>
<td>• Not applicable—no chronic infection</td>
<td>Testing is recommended for:</td>
<td>• Current or former injection drug users</td>
</tr>
<tr>
<td></td>
<td>• Pregnant women</td>
<td>• Recipients of clotting factor concentrates before 1987</td>
</tr>
<tr>
<td></td>
<td>• Persons born in regions with intermediate or high rates of Hepatitis B (HBsAg prevalence of ≥2%)</td>
<td>• Recipients of blood transfusions or donated organs before July 1992</td>
</tr>
<tr>
<td></td>
<td>• U.S.-born persons not vaccinated as infants whose parents were born in regions with high rates of Hepatitis B (HBsAg prevalence of ≥ 8%)</td>
<td>• Long-term hemodialysis patients</td>
</tr>
<tr>
<td></td>
<td>• Infants born to HBsAg-positive mothers</td>
<td>• Persons with known exposures to HCV (e.g., healthcare workers after needlesticks, recipients of blood or organs from a donor who later tested positive for HCV)</td>
</tr>
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<td></td>
<td>• Household, needle-sharing, or sex contacts of HBsAg-positive persons</td>
<td>• HIV-infected persons</td>
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<tr>
<td></td>
<td>• Men who have sex with men</td>
<td>• Children born to infected mothers (do not test before age 18 mos.)</td>
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<tr>
<td></td>
<td>• Injection drug users</td>
<td>• Patients with signs or symptoms of liver disease (e.g., abnormal liver enzyme tests)</td>
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<td></td>
<td>• Patients with elevated liver enzymes (ALT/AST) of unknown etiology</td>
<td>• Donors of blood, plasma, organs, tissues, or semen</td>
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<td></td>
<td>• Hemodialysis patients</td>
<td>• Chronic: Regular monitoring for signs of liver disease progression; some patients are treated with antiviral drugs</td>
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<tr>
<td></td>
<td>• Persons needing immunosuppressive or cytotoxic therapy</td>
<td>• Acute: Antivirals and supportive treatment</td>
</tr>
<tr>
<td></td>
<td>• HIV-infected persons</td>
<td>• Chronic: Regular monitoring for signs of liver disease progression; some patients are treated with antiviral drugs</td>
</tr>
<tr>
<td></td>
<td>• Sources of blood or body fluids involved in potential HBV exposures (e.g., needlesticks)</td>
<td>• Acute: No medication available; best addressed through supportive treatment</td>
</tr>
<tr>
<td></td>
<td>• Donors of blood, plasma, organs, tissues, or semen</td>
<td>• Chronic: Regular monitoring for signs of liver disease progression; some patients are treated with antiviral drugs</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td><strong>Vaccination Recommendations</strong></td>
<td>There is no Hepatitis C vaccine.</td>
</tr>
<tr>
<td>• No medication available</td>
<td>Hepatitis A vaccine is recommended for:</td>
<td><strong>Vaccination Schedule</strong></td>
</tr>
<tr>
<td>• Best addressed through supportive treatment</td>
<td>• All children at age 1 year</td>
<td>2 doses given 6 months apart</td>
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</table>
What is TB?

Tuberculosis (TB) is a disease caused by germs that are spread from person to person through the air. TB usually affects the lungs, but it can also affect other parts of the body, such as the brain, the kidneys, or the spine. A person with TB can die if they do not get treatment.

What Are the Symptoms of TB?

The general symptoms of TB disease include feelings of sickness or weakness, weight loss, fever, and night sweats. The symptoms of TB disease of the lungs also include coughing, chest pain, and the coughing up of blood. Symptoms of TB disease in other parts of the body depend on the area affected.

How is TB Spread?

*Mycobacterium tuberculosis* is spread by airborne particles, known as droplet nuclei, that can be generated when persons with pulmonary or laryngeal TB sneeze, cough, speak, or sing. These germs can stay in the air for several hours, depending on the environment. Persons who breathe in the air containing these TB germs can become infected; this is called latent TB infection. Persons who share the same airspace with persons with TB disease are at greatest risk for infection. Infection occurs when a susceptible person inhales droplet nuclei containing tubercle bacilli, and these bacilli become established in the alveoli of the lungs and spread throughout the body.

What is the Difference Between Latent TB Infection and TB Disease?

People with *latent TB infection* have TB germs in their bodies, but they are not sick because the germs are not active. These people do not have symptoms of TB disease, and they cannot spread the germs to others. However, they may develop TB disease in the future. They are often prescribed treatment to prevent them from developing TB disease.

People with TB disease are sick from TB germs that are active, meaning that they are multiplying and destroying tissue in their body. They usually have symptoms of TB disease. People with TB disease of the lungs or throat are capable of spreading germs to others. They are prescribed drugs that can treat TB disease.
FACTS ABOUT TB

TUBERCULOSIS — YES! IT’S STILL A PROBLEM!

- Worldwide, nine million new tuberculosis (TB) cases occur each year and there are 2 million TB-related deaths.
- In the United States, after several decades of decline, TB cases increased 20 percent between 1985 and 1992. Reasons for the increase included:
  - Deterioration of the TB public health care infrastructure;
  - The HIV epidemic;
  - Immigration of persons from areas with a high prevalence of TB; and
  - Transmission of TB in high-risk environments, such as correctional facilities, homeless shelters, hospitals, and nursing homes.
- During the resurgence of TB, outbreaks of multidrug-resistant TB (MDR TB) occurred in hospitals and prisons, resulting in high death rates and transmission to health care workers.

RECENT TRENDS in TB

How many cases of tuberculosis (TB) were reported in the United States in 2011?

A total of 10,528 TB cases (a rate of 3.4 cases per 100,000 persons) were reported in the United States in 2011. Both the number of TB cases reported and the case rate decreased; this represents a 5.8% and 6.4% decline, respectively, compared to 2010. The number of reported TB cases in 2011 was the lowest recorded since national reporting began in 1953.

Is the rate of TB declining in the United States?

Yes. Since the 1992 TB resurgence peak in the United States, the number of TB cases reported annually has decreased.
How do the TB rates compare between U.S.-born persons and foreign-born persons living in the United States?

In 2011, a total of 62% of reported TB cases in the United States occurred in foreign-born persons. The case rate among foreign-born persons (17.2 cases per 100,000) in 2011 was approximately 11.5 times higher than among U.S.-born persons (1.5 cases per 100,000).

* Ratio calculation is based on unrounded data values

How many people died from TB in the United States?

There were 529 deaths from TB in 2009, the most recent year for which these data are available. Compared to 2008 data, when 590 deaths from TB occurred, this represents a 10% decrease in TB deaths.

What are the rates of TB for different racial and ethnic populations†?

- American Indians or Alaska Natives: 5.6 cases per 100,000 persons
- Asians: 20.9 cases per 100,000 persons
- Blacks or African Americans: 6.3 cases per 100,000 persons
- Native Hawaiians and other Pacific Islanders: 15.9 cases per 100,000 persons
- Hispanics or Latinos: 5.8 cases per 100,000 persons
- Whites: 0.8 cases per 100,000 persons

† For this report, persons identified as white, black, Asian, American Indian/Alaska Native, native Hawaiian or other Pacific Islander, or of multiple races are all non-Hispanic. Persons identified as Hispanic may be of any race.

Is multidrug-resistant tuberculosis (MDR TB) on the rise?

Since 1993, when the TB surveillance system was expanded to include drug-susceptibility results, reported multidrug-resistant (MDR) TB* cases have decreased in the United States. Among TB cases in the United States with initial drug-susceptibility testing results who did not have prior treatment, the percentage of primary MDR TB cases changed slightly from 1.2% (89 cases) in 2010 to 1.3% (98 cases) in 2011.

Since 1997, the percentage of U.S.-born patients with primary MDR TB has remained below 1.0%. However, of the total number of reported primary MDR TB cases, the proportion occurring in foreign-born persons increased from 25.3% (103 of 407) in 1993 to 82.7% (81 of 98) in 2011.

* Primary multidrug-resistant TB (MDR TB) is defined as no previous history of TB disease and is resistant to at least isoniazid and rifampin, the two best first-line TB treatment drugs.
POPULATIONS AT RISK FOR TUBERCULOSIS

Groups at Higher Risk for TB Exposure or Infection

Persons who are at higher risk for exposure to or infection with *M. tuberculosis* include:
- Close contacts of persons known or suspected to have TB disease;
- Foreign-born persons, including children, from areas that have a high TB prevalence;
- Residents and employees of high-risk congregate settings;
- Some medically underserved, low-income populations as defined locally;
- High-risk racial or ethnic minority populations, defined locally as having an increased prevalence of TB;
- Infants, children, and adolescents exposed to adults in high-risk categories;
- Persons who inject illicit drugs; any other locally identified high-risk substance users; and
- Health care workers who serve high-risk clients.

Groups at Higher Risk for Developing TB Disease Once Infected

Persons who are at higher risk of developing TB disease once infected with *M. tuberculosis* include persons with:
- HIV infection;
- Recent infection with *M. tuberculosis* (within the past 2 years), particularly infants and very young children;
- Medical conditions known to increase the risk for disease if infection occurs;
- Current use of injecting illicit drugs; other groups of high-risk substance users; and
- History of inadequately treated TB disease.

HIV infection is the strongest known risk factor associated with the progression from latent TB infection to TB disease.

The spread of TB in health care settings can be minimized by implementing CDC recommendations for preventing TB transmission in these settings.

The early detection, airborne infection isolation, and treatment of disease in persons with infectious TB are essential to controlling transmission. TB should be suspected in all persons with symptoms consistent with TB (e.g., cough, fever, night sweats, chills, fatigue, weight loss, or loss of appetite), especially those with confirmed or suspected HIV infection and undiagnosed pulmonary disease. Precautions should be taken to prevent airborne transmission of infection until TB is diagnosed and treated or ruled out.
Remember! The key to preventing LTBI and death and disability from TB disease is to consider the possibility of TB in high-risk groups, make the diagnosis as quickly as possible, and initiate effective, directly observed drug therapy for persons found to have TB. Think TB!

Sources:

TB Facts for Healthcare Workers, 2006, CDC
Guidelines for Hand Hygiene in Health-Care Settings:  
Excerpts from the Recommendations of the Healthcare Infection Control  
Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene  
Task Force.  
MMWR 2002;51(No. RR-16)

Methods Used To Promote Improved Hand Hygiene

Hand-hygiene promotion has been challenging for over 150 years. In-service education, information leaflets, workshops and lectures, automated dispensers, and performance feedback on hand-hygiene adherence rates have been associated with transient improvement (291,294–296,306,314). Several strategies for promotion of hand hygiene in hospitals have been published (11, 12, 67, 74, 75, 78, 274, 281, 283, 306, 312, 317, 326, 393, 396). These strategies require education, motivation, or system change. Certain strategies are based on epidemiologic evidence, others on the authors’ and other investigators’ experience and review of current knowledge. Some strategies may be unnecessary in certain circumstances, but may be helpful in others. In particular, changing the hand-hygiene agent could be beneficial in institutions or hospital wards with a high workload and a high demand for hand hygiene when alcohol-based hand rubs are not available (11,73,78,328). However, a change in the recommended hand-hygiene agent could be deleterious if introduced during winter, at a time of higher hand-skin irritability, and if not accompanied by the provision of skin-care products (e.g., protective creams and lotions). Additional specific elements should be considered for inclusion in educational and motivational programs (See Figure 1).

Several strategies that could potentially be associated with successful promotion of hand hygiene require a system change. Hand-hygiene adherence and promotion involve factors at both the individual and system level. Enhancing individual and institutional attitudes regarding the feasibility of making changes (self-efficacy), obtaining active participation of personnel at both levels, and promoting an institutional safety climate represent challenges that exceed the current perception of the role of infection-control professionals.

Whether increased education, individual reinforcement technique, appropriate rewarding, administrative sanction, enhanced self-participation, active involvement of a larger number of organizational leaders, enhanced perception of health threat, self-efficacy, and perceived social pressure (12,317,329,330), or combinations of these factors can improve health care workers (HCWs’) adherence with hand hygiene needs further investigation. Ultimately, adherence to recommended hand hygiene practices should become part of a culture of patient safety where a set of interdependent quality elements interact to achieve a shared objective (331).
FIGURE 1: Elements of Health-Care Worker Educational and Motivational Programs

Rationale for hand hygiene
- Potential risks of transmission of microorganisms to patients
- Potential risks of health-care worker colonization or infection caused by organisms acquired from the patient
- Morbidity, mortality, and costs associated with health-care–associated infections

Indications for hand hygiene
- Contact with a patient’s intact skin (e.g., taking a pulse or blood pressure, performing physical examinations, lifting the patient in bed) (25,26,45,48,51,53)
- Contact with environmental surfaces in the immediate vicinity of patients (46,51,53,54)
- After glove removal (50,58,71)

Techniques for hand hygiene
- Amount of hand-hygiene solution
- Duration of hand-hygiene procedure
- Selection of hand-hygiene agents:
  - Alcohol-based hand rubs are the most efficacious agents for reducing the number of bacteria on the hands of personnel. Antiseptic soaps and detergents are the next most effective, and non-antimicrobial soaps are the least effective (1,398).
  - Soap and water are recommended for visibly soil hands.
  - Alcohol-based hand rubs are recommended for routine decontamination of hands for all clinical indications (except when hands are visibly soiled) and as one of the options for surgical hand hygiene.

Methods to maintain hand skin health
- Lotions and creams can prevent or minimize skin dryness and irritation caused by irritant contact dermatitis
- Acceptable lotions or creams to use
- Recommended schedule for applying lotions or creams

Expectations of patient care managers/administrators
- Written statements regarding the value of, and support for, adherence to recommended hand-hygiene practices
- Role models demonstrating adherence to recommended hand hygiene practices (399)

Indications for, and limitations of, glove use
- Hand contamination may occur as a result of small, undetected holes in examination gloves (321,361)
- Contamination may occur during glove removal (50)
- Wearing gloves does not replace the need for hand hygiene (58)
- Failure to remove gloves after caring for a patient may lead to transmission of microorganisms from one patient to another (373).
Efficacy of Promotion and Impact of Improved Hand Hygiene

Evidence supports the belief that improved hand hygiene can reduce health-care associated infection rates. Failure to perform appropriate hand hygiene is considered the leading cause of health-care associated infections and spread of multi-resistant organisms and has been recognized as a substantial contributor to outbreaks. Of nine hospital-based studies of the impact of hand hygiene on the risk of health-care associated infections (48,69–75,296), the majority demonstrated a temporal relationship between improved hand-hygiene practices and reduced infection rates. In one of these studies, endemic MRSA in a neonatal intensive care unit was eliminated 7 months after introduction of a new hand antiseptic (1% triclosan); all other infection-control measures remained in place, including the practice of conducting weekly active surveillance by obtaining cultures (72).

Another study reported an MRSA outbreak involving 22 infants in a neonatal unit (73). Despite intensive efforts, the outbreak could not be controlled until a new antiseptic was added (i.e., 0.3% triclosan); all previously used control measures remained in place, including gloves and gowns, cohorting, and obtaining cultures for active surveillance. The effectiveness of a longstanding, hospital-wide program to promote hand hygiene at the University of Geneva hospitals was recently reported (74). Overall adherence to hand hygiene guidelines during routine patient care was monitored during hospital wide observational surveys. These surveys were conducted biannually during December 1994–December 1997, before and during implementation of a hand-hygiene campaign that specifically emphasized the practice of bedside, alcohol-based hand disinfection. Individual-sized bottles of hand-rub solution were distributed to all wards, and custom made holders were mounted on all beds to facilitate access to hand disinfection. HCWs were also encouraged to carry bottles in their pockets, and in 1996, a newly designed flat (instead of round) bottle was made available to further facilitate pocket carriage. The promotional strategy was multimodal and involved a multidisciplinary team of HCWs, the use of wall posters, the promotion of antiseptic hand rubs located at bedsides throughout the institution, and regular performance feedback to all HCWs (see http://www.hopisafe.ch for further details on methodology). Health-care–associated infection rates, attack rates of MRSA cross-transmission, and consumption of hand-rub disinfectant were measured. Adherence to recommended hand-hygiene practices improved progressively from 48% in 1994 to 66% in 1997 (p < 0.001). Whereas recourse to hand washing with soap and water remained stable, frequency of hand disinfection markedly increased during the study period (p < 0.001), and the consumption of alcohol-based hand-rub solution increased from 3.5 to 15.4 liters per 1,000 patient-days during 1993–1998 (p < 0.001). The increased frequency of hand disinfection was unchanged after adjustment for known risk factors of poor adherence. During the same period, both overall health-care–associated infection and MRSA transmission rates decreased (both p < 0.05). The observed reduction in MRSA transmission may have been affected by both improved hand-hygiene adherence and the simultaneous implementation of active surveillance cultures for detecting and isolating patients colonized with MRSA (332). The experience from the University of Geneva hospitals constitutes the first report of a hand-hygiene campaign with a sustained improvement over several years. An additional multimodal program also
yielded sustained improvements in hand-hygiene practices over an extended period (75); the majority of studies have been limited to a 6- to 9-month observation period.

Although these studies were not designed to assess the independent contribution of hand hygiene on the prevention of health-care associated infections, the results indicate that improved hand-hygiene practices reduce the risk of transmission of pathogenic microorganisms. The beneficial effects of hand-hygiene promotion on the risk of cross-transmission also have been reported in surveys conducted in schools and day care centers (333–338), as well as in a community setting (339–341).

**Other Policies Related to Hand Hygiene**

**Fingernails and Artificial Nails**
Studies have documented that subungual areas of the hand harbor high concentrations of bacteria, most frequently coagulase-negative staphylococci, gram-negative rods (including *Pseudomonas* spp.), Corynebacteria, and yeasts (14,342,343). Freshly applied nail polish does not increase the number of bacteria recovered from periungual skin, but chipped nail polish may support the growth of larger numbers of organisms on fingernails (344,345). Even after careful handwashing or the use of surgical scrubs, personnel often harbor substantial numbers of potential pathogens in the subungual spaces (346–348).

Whether artificial nails contribute to transmission of healthcare–associated infections is unknown. However, HCWs who wear artificial nails are more likely to harbor gram-negative pathogens on their fingertips than are those who have natural nails, both before and after handwashing (347–349). Whether the length of natural or artificial nails is a substantial risk factor is unknown, because the majority of bacterial growth occurs along the proximal 1 mm of the nail adjacent to subungual skin (345,347,348). Recently, an outbreak of *P. aeruginosa* in a neonatal intensive care unit was attributed to two nurses (one with long natural nails and one with long artificial nails) who carried the implicated strains of *Pseudomonas* spp. on their hands (350). Patients were substantially more likely than controls to have been cared for by the two nurses during the exposure period, indicating that colonization of long or artificial nails with *Pseudomonas* spp. may have contributed to causing the outbreak. Personnel wearing artificial nails also have been epidemiologically implicated in several other outbreaks of infection caused by gram-negative bacilli and yeast (351–353). Although these studies provide evidence that wearing artificial nails poses an infection hazard, additional studies are warranted.

**Gloving Policies**
CDC has recommended that HCWs wear gloves to 1) reduce the risk of personnel acquiring infections from patients, 2) prevent health-care worker flora from being transmitted to patients, and 3) reduce transient contamination of the hands of personnel by flora that can be transmitted from one patient to another (354). Before the
emergence of the acquired immunodeficiency syndrome (AIDS) epidemic, gloves were worn primarily by personnel caring for patients colonized or infected with certain pathogens or by personnel exposed to patients with a high risk of hepatitis B. Since 1987, a dramatic increase in glove use has occurred in an effort to prevent transmission of HIV and other bloodborne pathogens from patients to HCWs (355). The Occupational Safety and Health Administration (OSHA) mandates that gloves be worn during all patient-care activities that may involve exposure to blood or body fluids that may be contaminated with blood (356). The effectiveness of gloves in preventing contamination of HCWs’ hands has been confirmed in several clinical studies (45,51,58). One study found that HCWs who wore gloves during patient contact contaminated their hands with an average of only 3 CFUs per minute of patient care, compared with 16 CFUs per minute for those not wearing gloves (51). Two other studies, involving personnel caring for patients with C. difficile or VRE, revealed that wearing gloves prevented hand contamination among the majority of personnel having direct contact with patients (45,58). Wearing gloves also prevented personnel from acquiring VRE on their hands when touching contaminated environmental surfaces (58). Preventing heavy contamination of the hands is considered important, because hand washing or hand antisepsis may not remove all potential pathogens when hands are heavily contaminated (25,111).

Several studies provide evidence that wearing gloves can help reduce transmission of pathogens in health-care settings. In a prospective controlled trial that required personnel to routinely wear vinyl gloves when handling any body substances, the incidence of C. difficile diarrhea among patients decreased from 7.7 cases/1,000 patient discharges before the intervention to 1.5 cases/1,000 discharges during the intervention (226). The prevalence of asymptomatic C. difficile carriage also decreased substantially on “glove” wards, but not on control wards. In intensive-care units where VRE or MRSA have been epidemic, requiring all HCWs to wear gloves to care for all patients in the unit (i.e., universal glove use) likely has helped control outbreaks (357,358).

The influence of glove use on the hand-hygiene habits of personnel is not clear. Several studies found that personnel who wore gloves were less likely to wash their hands upon leaving a patient’s room (290,320). In contrast, two other studies found that personnel who wore gloves were substantially more likely to wash their hands after patient care (87,301).

The following caveats regarding use of gloves by HCWs must be considered. Personnel should be informed that gloves do not provide complete protection against hand contamination. Bacterial flora colonizing patients may be recovered from the hands of <30% of HCWs who wear gloves during patient contact (50,58). Further, wearing gloves does not provide complete protection against acquisition of infections caused by hepatitis B virus and herpes simplex virus (359,360). In such instances, pathogens presumably gain access to the caregiver’s hands via small defects in gloves or by contamination of the hands during glove removal (50,321,359,361).
Gloves used by HCWs are usually made of natural rubber latex and synthetic nonlatex materials (e.g., vinyl, nitrile, and neoprene [polymers and copolymers of chloroprene]). Because of the increasing prevalence of latex sensitivity among HCWs and patients, FDA has approved several powdered and powder-free latex gloves with reduced protein contents, as well as synthetic gloves that can be made available by health-care institutions for use by latex-sensitive employees. In published studies, the barrier integrity of gloves varies on the basis of type and quality of glove material, intensity of use, length of time used, manufacturer, whether gloves were tested before or after use, and method used to detect glove leaks (359,361–366). In published studies, vinyl gloves have had defects more frequently than latex gloves, the difference in defect frequency being greatest after use (359,361,364,367). However, intact vinyl gloves provide protection comparable to that of latex gloves (359). Limited studies indicate that nitrile gloves have leakage rates that approximate those of latex gloves (368–371). Having more than one type of glove available is desirable, because it allows personnel to select the type that best suits their patient-care activities. Although recent studies indicate that improvements have been made in the quality of gloves (366), hands should be decontaminated or washed after removing gloves (8,50,58,321,361). Gloves should not be washed or reused (321,361). Use of petroleum-based hand lotions or creams may adversely affect the integrity of latex gloves (372). After use of powdered gloves, certain alcohol hand rubs may interact with residual powder on the hands of personnel, resulting in a gritty feeling on the hands. In facilities where powdered gloves are commonly used, various alcohol-based hand rubs should be tested after removal of powdered gloves to avoid selecting a product that causes this undesirable reaction. Personnel should be reminded that failure to remove gloves between patients may contribute to transmission of organisms (358,373).

**Jewelry**

Several studies have demonstrated that skin underneath rings is more heavily colonized than comparable areas of skin on fingers without rings (374–376). One study found that 40% of nurses harbored gram-negative bacilli (e.g., *E. cloacae*, *Klebsiella*, and *Acinetobacter*) on skin under rings and that certain nurses carried the same organism under their rings for several months (375). In a more recent study involving >60 intensive care unit nurses, multivariable analysis revealed that rings were the only substantial risk factor for carriage of gram-negative bacilli and *S. aureus* and that the concentration of organisms recovered correlated with the number of rings worn (377). Whether the wearing of rings results in greater transmission of pathogens is unknown. Two studies determined that mean bacterial colony counts on hands after handwashing were similar among persons wearing rings and those not wearing rings (376,378). Further studies are needed to establish if wearing rings results in greater transmission of pathogens in healthcare settings.

**Part II. Recommendations Categories**

These recommendations are designed to improve hand hygiene practices of HCWs and to reduce transmission of pathogenic microorganisms to patients and personnel in healthcare settings. This guideline and its recommendations are not intended for use in
food processing or food-service establishments, and are not meant to replace guidance provided by FDA’s Model Food Code.

As in previous CDC/HICPAC guidelines, each recommendation is categorized on the basis of existing scientific data, theoretical rationale, applicability, and economic impact. The CDC/HICPAC system for categorizing recommendations is as follows:

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 certain experimental, clinical, or epidemiologic studies and a strong theoretical rationale.
Category IC. Required for implementation, as mandated by federal or state regulation or standard.
Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
No recommendation. Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exist.

Recommendations

1. Indications for hand washing and hand antisepsis

A. When hands are visibly dirty or contaminated with proteinaceous material or are visibly soiled with blood or other body fluids, wash hands with either a non-antimicrobial soap and water or an antimicrobial soap and water (IA) (66).

B. If hands are not visibly soiled, use an alcohol-based hand rub for routinely decontaminating hands in all other clinical situations described in items 1C–J (IA) (74,93,166,169,283,294,312,398). Alternatively, wash hands with an antimicrobial soap and water in all clinical situations described in items 1C–J (IB) (69-71,74).

C. Decontaminate hands before having direct contact with patients (IB) (68,400).

D. Decontaminate hands before donning sterile gloves when inserting a central intravascular catheter (IB) (401,402).

E. Decontaminate hands before inserting indwelling urinary catheters, peripheral vascular catheters, or other invasive devices that do not require a surgical procedure (IB) (25,403).

F. Decontaminate hands after contact with a patient’s intact skin (e.g., when taking a pulse or blood pressure, and lifting a patient) (IB) (25,45,48,68).

G. Decontaminate hands after contact with body fluids or excretions, mucous membranes, nonintact skin, and wound dressings if hands are not visibly soiled (IA) (400).
H. Decontaminate hands if moving from a contaminated-body site to a clean-body site during patient care (II) (25,53).

I. Decontaminate hands after contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient (II) (46,53,54).

J. Decontaminate hands after removing gloves (IB) (50,58,321).

K. Before eating and after using a restroom, wash hands with a non-antimicrobial soap and water or with an antimicrobial soap and water (IB) (404-409).

L. Antimicrobial-impregnated wipes (i.e., towelettes) may be considered as an alternative to washing hands with non-antimicrobial soap and water. Because they are not as effective as alcohol-based hand rubs or washing hands with an antimicrobial soap and water for reducing bacterial counts on the hands of HCWs, they are not a substitute for using an alcohol-based hand rub or antimicrobial soap (IB) (160,161).

M. Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if exposure to Bacillus anthracis is suspected or proven. 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 (II) (120,172, 224,225).

N. No recommendation can be made regarding the routine use of nonalcohol-based hand rubs for hand hygiene in health-care settings. Unresolved issue.

2. Hand-hygiene technique

A. When decontaminating hands with an alcohol-based hand rub, apply product to palm of one hand and rub hands together, covering all surfaces of hands and fingers, until hands are dry (IB) (288,410). Follow the manufacturer’s recommendations regarding the volume of product to use.

B. When washing hands with soap and water, wet hands first with water, apply an amount of product recommended by the manufacturer to hands, and rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers. Rinse hands with water and dry thoroughly with a disposable towel. Use towel to turn off the faucet (IB) (90-92,94,411). Avoid using hot water, because repeated exposure to hot water may increase the risk of dermatitis (IB) (254,255).

C. Liquid, bar, leaflet or powdered forms of plain soap are acceptable when washing hands with a nonantimicrobial soap and water. When bar soap is used, soap racks that facilitate drainage and small bars of soap should be used (II) (412-415).
D. Multiple-use cloth towels of the hanging or roll type are not recommended for use in health-care settings (II) (137,300).

3. Surgical hand antisepsis

A. Remove rings, watches, and bracelets before beginning the surgical hand scrub (II) (375,378,416).

B. Remove debris from underneath fingernails using a nail cleaner under running water (II) (14,417).

C. Surgical hand antisepsis using either an antimicrobial soap or an alcohol-based hand rub with persistent activity is recommended before donning sterile gloves when performing surgical procedures (IB) (115,159,232,234,237,418).

D. When performing surgical hand antisepsis using an antimicrobial soap, 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 (IB) (117,156,205,207,238-241).

E. When using an alcohol-based surgical hand-scrub product with persistent activity, follow the manufacturer’s instructions. Before applying the alcohol solution, prewash hands and forearms with a non-antimicrobial soap and dry hands and forearms completely. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves (IB) (159,237).

4. Selection of hand-hygiene agents

A. Provide personnel with efficacious hand-hygiene products that have low irritancy potential, particularly when these products are used multiple times per shift (IB) (90,92,98,166,249). This recommendation applies to products used for hand antisepsis before and after patient care in clinical areas and to products used for surgical hand antisepsis by surgical personnel.

B. To maximize acceptance of hand-hygiene products by HCWs, solicit input from these employees regarding the feel, fragrance, and skin tolerance of any products under consideration. The cost of hand hygiene products should not be the primary factor influencing product selection (IB) (92,93,166,274,276-278).

C. When selecting non-antimicrobial soaps, antimicrobial soaps, or alcohol-based hand rubs, solicit information from manufacturers regarding any known interactions between products used to clean hands, skin care products, and the types of gloves used in the institution (II) (174,372).
D. Before making purchasing decisions, evaluate the dispenser systems of various product manufacturers or distributors to ensure that dispensers function adequately and deliver an appropriate volume of product (II) (286).

E. Do not add soap to a partially empty soap dispenser. This practice of “topping off” dispensers can lead to bacterial contamination of soap (IA) (187,419).

5. Skin care
   A. Provide HCWs with hand lotions or creams to minimize the occurrence of irritant contact dermatitis associated with hand antisepsis or hand washing (IA) (272,273).

   B. Solicit information from manufacturers regarding any effects that hand lotions, creams, or alcohol-based hand antiseptics may have on the persistent effects of antimicrobial soaps being used in the institution (IB) (174,420,421).

6. Other Aspects of Hand Hygiene

   A. Do not wear artificial fingernails or extenders when having direct contact with patients at high risk (e.g., those in intensive-care units or operating rooms) (IA) (350–353).

   B. Keep natural nails tips less than 1/4-inch long (II) (350).

   C. Wear gloves when contact with blood or other potentially infectious materials, mucous membranes, and non intact skin could occur (IC) (356).

   D. Remove gloves after caring for a patient. Do not wear the same pair of gloves for the care of more than one patient, and do not wash gloves between uses with different patients (IB) (50,58,321,373).

   E. Change gloves during patient care if moving from a contaminated body site to a clean body site (II) (50,51,58).

   F. No recommendation can be made regarding wearing rings in health-care settings. Unresolved issue.

7. Health-care worker educational and motivational programs

   A. As part of an overall program to improve hand hygiene practices of HCWs, educate personnel regarding the types of patient-care activities that can result in hand contamination and the advantages and disadvantages of various methods used to clean their hands (II) (74,292,295,299).

   B. Monitor HCWs’ adherence with recommended hand-hygiene practices and provide personnel with information regarding their performance (IA) (74,276,292,295,299,306,310).
C. Encourage patients and their families to remind HCWs to decontaminate their hands (II) (394,422).

8. Administrative measures

A. Make improved hand-hygiene adherence an institutional priority and provide appropriate administrative support and financial resources (IB) (74,75).

B. Implement a multidisciplinary program designed to improve adherence of health personnel to recommended hand-hygiene practices (IB) (74,75).

C. As part of a multidisciplinary program to improve hand-hygiene adherence, provide HCWs with a readily accessible alcohol-based hand-rub product (IA) (74,166,283,294,312).

D. To improve hand-hygiene adherence among personnel who work in areas in which high workloads and high intensity of patient care are anticipated, make an alcohol-based hand rub available at the entrance to the patient’s room or at the bedside, in other convenient locations, and in individual pocket-sized containers to be carried by HCWs (IA) (11,74,166,283,284,312,318,423).

E. Store supplies of alcohol-based hand rubs in cabinets or areas approved for flammable materials (IC).

Part III. Performance Indicators

The following performance indicators are recommended for measuring improvements in HCWs' hand-hygiene adherence:

A. Periodically monitor and record adherence as the number of hand-hygiene episodes performed by personnel/number of hand-hygiene opportunities, by ward or by service. Provide feedback to personnel regarding their performance.

B. Monitor the volume of alcohol-based hand rub (or detergent used for handwashing or hand antisepsis) used per 1,000 patient-days.

C. Monitor adherence to policies dealing with wearing of artificial nails.

D. When outbreaks of infection occur, assess the adequacy of health-care worker hand hygiene.

For the complete study, visit: http://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf
SELECTED REFERENCE LIST:


10 Tips for Preventing the Spread of Infection

Some diseases have become resistant to the antibiotics we use. As a result, controlling diseases and preventing infections from spreading are more crucial than ever, and doing so begins with measures every individual can take. Here are "10 tips" to remember.

1. Wash your hands frequently—especially before preparing food, before eating, and after using the restroom. Insist that your health care providers wash their hands and use gloves, especially before any invasive treatment or procedure.

2. Don't insist that your physician give you antibiotics if you don't need them. Antibiotics are only effective for diseases caused by bacteria.

3. Take prescribed antibiotics exactly as instructed; do not stop taking them without checking with your physician, even if the medicine makes you feel better—or worse.

4. Keep your immunizations—and those of your children—up to date.

5. Don't send your child to a day care center or to a school with symptoms of an infection—such as vomiting, diarrhea, and/or fever.

6. Follow safe sexual practices.

7. Do not use I.V. drugs; if you do, do not share needles.

8. Don't share personal items—such as razor blades, tooth brushes, combs, and hairbrushes—and don't eat or drink from others' plates or glasses.

9. Keep kitchen surfaces clean, especially when preparing meat, chicken, and fish; disinfect kitchen surfaces.

10. Keep hot foods hot and cold foods cold, especially when they will be left out for a long time.
Scabies is a contagious skin rash caused by mites. Mites are very tiny, sometimes microscopic, insects from the arachnid class (spiders).

**Directions:** Follow these procedures if scabies is diagnosed or suspected.

1. Wash all bedding, including bedding previously washed, in very hot water and lindane or other product that kills mites. Also wash the shelves where bedding has been stored.

2. Wash all towels, washcloths, and other items in hot water and lindane. Do not replace these items in closets or laundry carts until they have also been washed with the disinfectant.

3. Mop all floors, and wash all shelves, counters, and other surfaces in the facility with hot water and lindane. Rinse thoroughly.

4. Wash all resident clothing in hot water, laundry detergent, and disinfectant.

5. Have all personnel wash their clothing in disinfectant.

6. Vacuum all carpets thoroughly. Remove dust bags outside of the facility and dispose of them.

Occasionally, this process will need to be repeated to rid the facility completely of mites. In some cases, the facility will need to repeat this process occasionally throughout the year.
Introduction

A urinary tract infection, or UTI, is an infection that can happen anywhere along the urinary tract. Urinary tract infections have different names, depending on what part of the urinary tract is infected.

- Bladder -- an infection in the bladder is also called cystitis or a bladder infection.
- Kidneys -- an infection of one or both kidneys is called pyelonephritis or a kidney infection.
- Ureters -- the tubes that take urine from each kidney to the bladder are only rarely the site of infection.
- Urethra -- an infection of the tube that empties urine from the bladder to the outside is called urethritis.

Causes

Urinary tract infections are caused by germs, usually bacteria that enter the urethra and then the bladder. This can lead to infection, most commonly in the bladder itself, which can spread to the kidneys.

Most of the time, your body can get rid of these bacteria. However, certain conditions increase the risk of having UTIs.

Women tend to get them more often because their urethra is shorter and closer to the anus than in men. Because of this, women are more likely to get an infection after sexual activity or when using a diaphragm for birth control. Menopause also increases the risk of a UTI.

The following also increase a person’s chances of developing a UTI:

- Diabetes
- Advanced age (especially people with illnesses common in older adults, such as Alzheimer’s disease and delirium)
- Problems emptying your bladder completely (urinary retention)
- Use of a urinary catheter
- Bowel incontinence
- Enlarged prostate, narrowed urethra, or anything that blocks the flow of urine
Kidney stones
- Staying still (immobile) for a long period of time (for example, while recovering from a hip fracture)
- Pregnancy
- Surgery or other procedure involving the urinary tract

Symptoms

The symptoms of a bladder infection include:

- Cloudy or bloody urine, which may have a foul or strong odor
- Low fever (not everyone will have a fever)
- Pain or burning with urination
- Pressure or cramping in the lower abdomen (usually middle) or back
- Strong need to urinate often, even right after the bladder has been emptied

If the infection spreads to the kidneys, symptoms may include:

- Chills and shaking or night sweats
- Fatigue and a general ill feeling
- Fever above 101 degrees Fahrenheit
- Flank (side), back, or groin pain
- Flushed, warm, or reddened skin
- Mental changes or confusion (in the elderly, these symptoms often are the only signs of a UTI)
- Nausea and vomiting
- Severe abdominal pain (sometimes)

Special Considerations for Older Adults

Older adults are at highest risk to develop UTIs. They are more vulnerable to UTIs for many reasons, including:

- A suppressed immune system
- Weaker bladder muscles (which leads to increased residual urine, less efficient bladder emptying, and incontinence)
- An enlarged prostate (which can obstruct urinary flow and increase urine stagnation)
- Use of catheters
- Medication conditions, such as diabetes, dementia, and dehydration

Older adults with a UTI are sometimes misdiagnosed with Alzheimer’s disease, because a UTI can cause dementia-like symptoms. Also, many older adults with a serious infection don’t exhibit a fever due the inability of the immune system to respond
to the infection. As the bacteria in the urine spread to the blood stream, confusion and other cognitive difficulties can be the result. Sudden onset of confusion or a change in resident behavior could signal a possible UTI.