PREVENTING AND CONTROLLING INFECTIOUS DISEASES IN THE WORKPLACE

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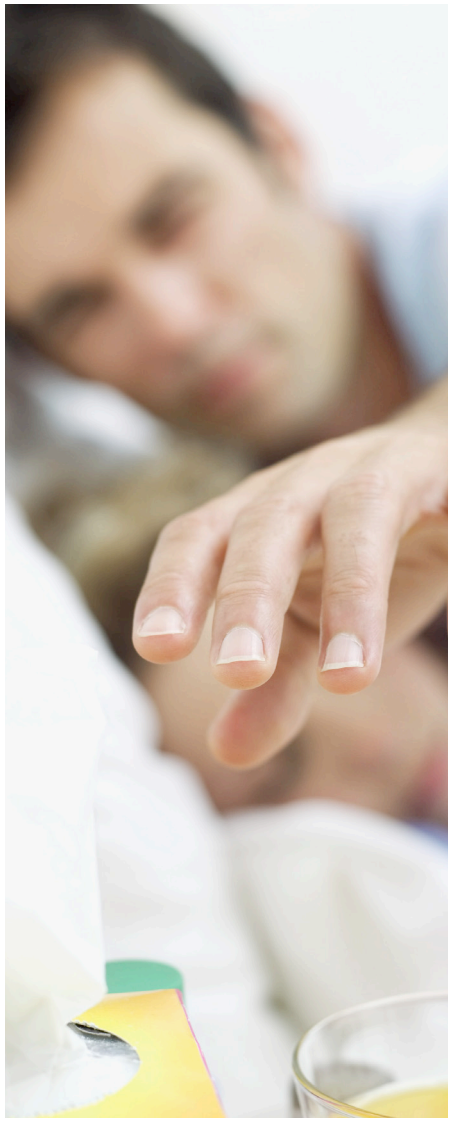
Introduction



Infectious diseases pose a serious threat to employee health and the economic well-being of employers.

In a matter of hours, one sick worker can pass an illness to hundreds, even thousands, of people. The world is getting smaller and people are traveling more freely to regions where infectious diseases are prevalent. Meanwhile, new threats continue to emerge.

Regrettably, one of the leading – and most easily preventable – reasons for rapid disease spread in the workplace is going to work ill. Workers without symptoms may not realize they are contagious, or they may feel ill but go to work anyway because they are under pressure to produce or do not get paid time off.

Other factors that can turn the workplace into an incubator for disease and bacteria include:

- Lack of management oversight
- Close quarters
- Insufficient engineering controls
- Inadequate cleaning techniques
- Poor personal hygiene habits

As the marketplace becomes increasingly global, so does the occurrence of new, virulent strains and the re-emergence of serious, familiar diseases. Contagious diseases such as the recently discovered Middle Eastern Respiratory Syndrome Coronavirus (MERS-CoV) and drug-resistant super bacteria like Methicillin-resistant staphylococcus aureus (MRSA) are menacing threats. Tuberculosis (TB), the human immunodeficiency virus (HIV) that causes acquired immune deficiency syndrome (AIDS), various strains of hepatitis, influenza, polio and even rubella (German measles) are also among potential killers worldwide.

When a large percentage of the workforce is exposed to an infectious disease and has to take time off because of possible contagion or sickness, or much worse, employees start to die from it, the impact on productivity and morale is immeasurable. At the University of Pittsburg Medical Center's Center for Health Security in Pennsylvania,

researchers have developed a cost calculator to help quantify the economic burdens imposed on society by infectious diseases.[1] Researchers say these costs are difficult to estimate because data sources are inconsistent and varied. The calculations require data on direct expenses associated with inpatient and outpatient care, as well as data on economic damages associated with lost productivity when wage earners become ill, are permanently lost to the workforce or are prevented from ever entering it.

If sickness spreads in the workplace or a healthcare facility and strikes down caregivers, the potential ramifications are particularly severe. While public health officials and policymakers worldwide help us keep abreast of threats, it's incumbent on employers and employees to understand routes of transmission and embrace a workplace culture that supports best practices in infectious disease prevention and control.

This white paper discusses exposure risks, the nature of contagious diseases, typical routes of transmission, and prevention and control programs that include mandated activities and consistent compliance with simple precautions such as:

- Washing/sanitizing hands
- Covering one's mouth when coughing or sneezing
- Staying home when ill
- Vaccination
- Wearing personal protective equipment such as masks, respirators and gloves

Understanding Infectious Disease Exposure Risks

In 2008, three months after returning home from South Africa, an American physical therapist developed severe gastrointestinal symptoms. She was treated for ulcerative colitis with five different drugs for more than a year; none improved her condition. Just before she was scheduled to have her colon removed, she developed chest heaviness and a fever. An X-ray revealed she had pneumonia. A month later, another X-ray revealed she had multidrug-resistant tuberculosis (MDR TB). After two years of treatment, the medicine finally worked. She kept her colon and she was free of TB.[2]

In another illustration, a serious viral respiratory illness became a global outbreak. Severe acute respiratory syndrome coronavirus (SARS-CoV) was first reported in Asia in February 2003. It spread to more than two dozen countries before it was contained. Within a period of a few months, this deadly outbreak infected more than 8,000 people and caused 774 deaths. Experts said SARS might not have become a worldwide problem if it had been better understood, effective infection prevention and exposure control measures had been introduced earlier in its development, and there was greater transparency. Brian Doberstyn, former director of the Division for Combating Communicable Diseases in the World Health Organization's Western Pacific Region, reported, "Some of the affected countries did not acknowledge openly and squarely the presence of SARS, downplayed its extent and attempted to prove that it was something else."[3]

Whether the setting is a manufacturing plant, a healthcare facility, a school, an office or a mode of public transportation, when an employee with an infectious disease exposes others, each exposed individual should be put under observation and/or tested for it. This creates challenges for employers and public health officials who are tasked with identifying exposed populations.

According to the World Health Organization (WHO), "infectious diseases are caused by pathogenic microorganisms such as bacteria, viruses, parasites or fungi; the diseases can be spread, directly or indirectly, from one person to another."[4]

Experts recommend answering some fundamental questions when evaluating work-related infectious disease exposure risks:[5]

1. Is an infectious agent present?
2. If present, what is its nature?
3. Is there a route of exposure for the agent, e.g., air, dust, water, food?
4. Did the agent get into or on the body?
5. If in the body, did the agent cause effects?

There are many other related factors to consider, starting with where and when to look. Components of an infection control study and intervention plan typically include:[6]

- Exposure routes and pathways
- Infectious dose
- Incubation
- Organism size, mass and density

- Lethality
- Treatment
- Communicability
- Controls related to systems and substances such as ventilation, filtration and irradiation (UV, IR, RF, microwave, heat, chemicals, gases)

Agents subject to sampling in healthcare settings and in other industry environments include those that are:[7]

- Patient-infectious, e.g., TB, varicella (chicken pox), rubeola (measles), SARS, MRSA and Vancomycin-resistant enterococci (VRE)
- Environmental-infectious, e.g., Legionella, fungi, aspergillus, staphylococcus
- Environmental-sensitizing, e.g., filamentous spore-forming agents, toxin-producing microbes, insect debris
- Airborne particulates

Understanding modes of transmission enables employers and employees to better understand how to prevent the spread of infection. According to the U.S. Occupational Safety and Health Administration (OSHA), the primary routes of infectious disease transmission in American healthcare settings are contact (direct and indirect), droplet and airborne.[8]

Direct/Indirect Contact

Direct contact involves the infectious agent being transmitted through physical contact (i.e., skin-to-skin). Indirect contact occurs when the infectious agent is transferred to an object or surface (e.g., door knob, table, computer or telephone). Examples of contact-transmissible agents include MRSA and VRE.[9]

Droplet

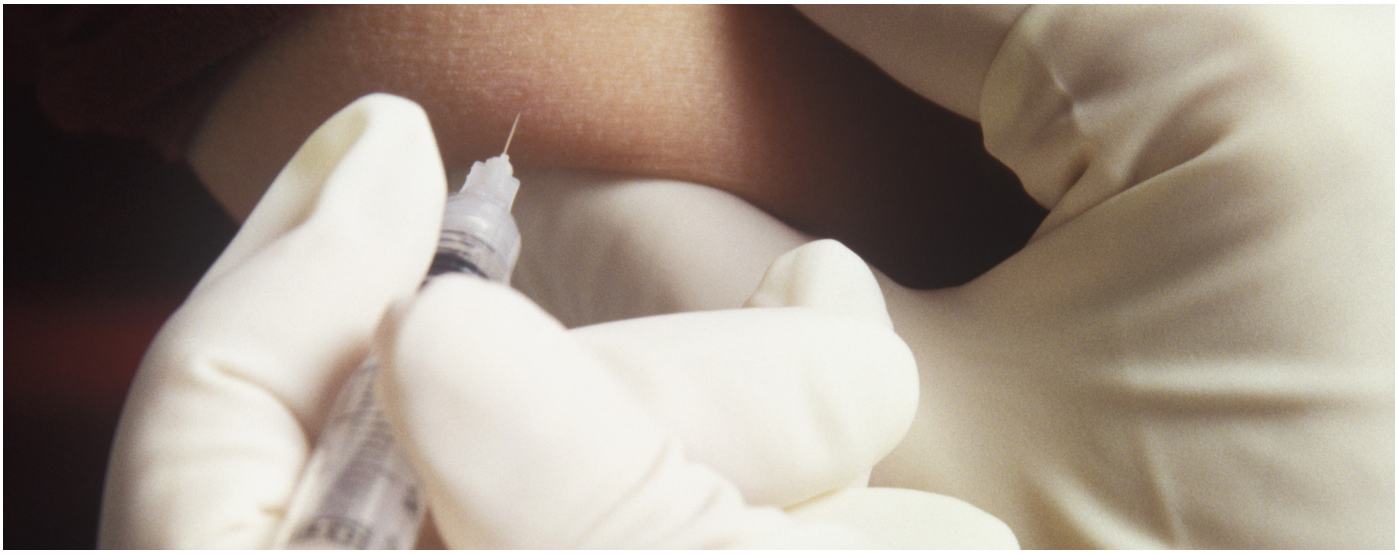
Droplets occur when an infected person coughs, sneezes or talks and the droplets come into contact with the eyes, nose or mouth of a susceptible individual. Droplets remain in the air a relatively short period of time. Droplet-borne infections include the influenza virus and pertussis.[10] Influenza, for example, is highly contagious and can be spread as early as one day before symptoms develop and five to seven days after becoming sick. It is also noteworthy that people with flu can spread it to others from up to six feet away. [11]

Airborne

Airborne transmission occurs when infectious agents can remain suspended in the air for extended periods of time. The pathogen may be inhaled by a susceptible person and enter the respiratory tract, causing potential infection. Airborne transmission can only occur when the infectious agent is capable of surviving and retaining its infectious state for an extended period of time. TB and rubella are examples of agents transmissible by air.[12]

Other Transmission Routes

The WHO also cites other routes of transmission including fecal-oral, sexual,



vector-born, blood, unclean wound and vertical (i.e., mother-to-child). For example, the norovirus that has garnered international media attention for afflicting cruise ship passengers is a highly contagious infectious agent that causes serious health problems.[13] It is one of the most common causes of infectious diarrhea and vomiting, is easily spread and difficult to eradicate. There is no one specific way to kill the norovirus and re-infection is possible. It can be easily acquired by:

- Not washing hands after using the toilet
- Touching an infected area
- Touching or consuming contaminated food
- Inhaling the airborne virus after an afflicted person vomits

Bloodborne Pathogens

Exposure to infectious blood and other bodily fluids represent a major area of contagious disease exposure risk for employers and employees. According to the U.S. National Institute for Occupational Safety and Health (NIOSH), exposures to blood and other body fluids occur across a wide variety of occupations. Healthcare and rehabilitation workers, emergency response and public safety personnel, school and housekeeping staff and other types of workers can be exposed to blood through needlestick and other sharps injuries, and mucous membrane and skin exposures. The pathogens of primary concern are HIV, hepatitis B virus (HBV) and hepatitis C virus (HCV).[14]

Researchers have attempted to assess the magnitude of potential work-related bloodborne pathogen (BBP) exposures in the U.S. since the 1990s. In 2004, one analysis of hospital-based data estimated 385,000 needlestick and other sharps injuries per year. A study published in 2007 found an estimated 78,100 potential work-related exposures to BBP treated in hospital emergency departments annually in the U.S. While hospitals accounted for 75 percent of these exposures, 11 other industries had a substantial number of exposures. Hospitals had the highest exposure rate (11.3/1,000 full-time equivalents), followed by nursing homes (2.8) and residential care facilities without nursing.[15]

Healthcare-associated Infections

Healthcare-associated or nosocomial infections (HAIs) collectively represent a major threat to patients, and by association, to their caregivers. Ironically, these newly acquired infections can be worse than the initial reason for hospitalization. At any given time, an estimated 1.4 million people worldwide develop infectious complications associated with medical treatment.[16] In the U.S., HAIs accounted for an estimated 1.7 million infections and 99,000 deaths in 2002.[17]

The direct medical cost of HAIs in U.S. hospitals is estimated to range from $28.4 billion after adjusting for inflation for urban consumers to $45 billion after adjusting for inpatient hospital services. Meanwhile, the benefits of prevention range from $5.7 billion (20 percent of preventable infections) to $31.5 billion (70 percent of preventable infections).[18]

Infants and patients with suppressed immune systems are at particular risk of exposure to HAIs. In a 2004 case, for example, workers at a children's hospital in Texas noticed six newborns had signs of pertussis (whooping cough), a highly contagious respiratory disease caused by the bacterium Bordetella pertussis. It is known for uncontrollable, violent coughing that makes it difficult to breathe. Pertussis can be fatal, especially in babies. In this instance, a nurse exposed 113 newborns, 11 of whom were later diagnosed with pertussis, an infection rate of 9.7 percent. The nurse had been vaccinated as a child but her immunity had declined. Her husband reportedly had pertussis symptoms after returning from a trip a few weeks before she developed symptoms. The families of all infants who were born at the hospital between May 31 and July 17 had to be contacted and screened for respiratory symptoms.[19]

Hepatitis

Viral hepatitis affects hundreds of millions of people worldwide and kills nearly 1.4 million people per year, but it continues to be relatively unacknowledged as a health threat in many parts of the world. Viral hepatitis is the leading cause of liver cancer and the most common reason for liver transplantation. An estimated 4.4 million Americans are living with chronic hepatitis; most do not know they are infected.[20]

There are five major types of viral hepatitis lettered A through E. Of these, the most commonly occurring are A, B and C. Both chronic hepatitis B or C can be present without any symptoms, and left untreated can lead to life-threatening conditions such as cirrhosis, bleeding, ascites, liver cancer and liver failure. Signs of infection include:

- Flu-like symptoms
- Fatigue
- Nausea
- Jaundice (hepatitis B)
- Aching muscles and joints
- Stomach ache
- Loss of appetite (hepatitis C)
- Diarrhea/dark urine/bright stools

Hepatitis B typically spreads through contact with blood, semen or other body fluids from an infected person to an unprotected non-infected person. Globally, 500,000 to 700,000 people die from hepatitis B each year. Hepatitis C primarily spreads through blood-to-blood contact. Unlike hepatitis B, hepatitis C frequently stays in the body longer than six months, becoming chronic. Worldwide, there are approximately 170 million people with chronic hepatitis C. [21]

Hepatitis A virus is usually spread from person to person by putting something in the mouth that has been in contact with contaminated stool (fecal-oral). For this reason, the virus is more easily spread in areas where there are poor sanitary conditions or where good personal hygiene is not observed. Hepatitis A virus may also be spread by consuming food or drink that has been handled by an infected person. Waterborne outbreaks are infrequent and are usually associated with sewage contamination or inadequately treated water. Casual contact, as in the office, factory or school setting, does not spread the virus.[22]

Influenza

Seasonal influenza is a contagious, viral infection that can affect the nose, throat, bronchi and lungs. It can cause mild to severe illness and can last for around a week. It is characterized by the sudden onset of familiar symptoms such as:

- High fever
- Aching muscles
- Headache
- Fatigue
- Cough
- Sore throat
- Runny nose

There are two main types of seasonal influenza: Types A and B. Each year an average of 5-20 percent of the U.S. population get the flu and more than 200,000 are hospitalized due to complications of the virus. The flu is unpredictable and the severity can vary from one season to the next. According to the U.S. Centers for Disease Control and Prevention (CDC) the degree of seriousness can depend on:[23]

- What flu viruses are spreading
- How much flu vaccine is available
- When vaccine is available
- How many people get vaccinated
- How well the flu vaccine is matched to flu viruses causing illness

This infectious agent can cause serious workplace problems leading to high levels of absenteeism and productivity losses. Clinics and hospitals can be overrun with large numbers of cases of the virus. People of all age groups can be seriously affected by the virus. Populations at highest risk are older adults, young children and immune-compromised individuals.

Under influenza Type A, a plethora of subtypes have caused high rates of infection and mortality. Avian and swine flu, both Type A, are among the subtypes that have caused serious problems around the world.

Infectious Disease Prevention and Control Measures

According to the WHO, infection prevention and control measures "aim to ensure the protection of those who might be vulnerable to acquiring an infection both in the general community and while receiving care due to health problems, in a range of settings. The basic principle of infection prevention and control is hygiene." Meanwhile, the mission of the WHO Infection Prevention and Control in Health Care initiative is to "assist Member States in reducing dissemination of infections associated with healthcare, by assisting with the assessment, planning, implementation and evaluation of national infection control policies. The ultimate goal is to assist Member States to endorse quality promotion of health care which is safe for patients, health care workers, others in the health care setting and the environment, and to accomplish these goals in a cost-effective manner."[24]

Combined, infection prevention and exposure control programs strive to thwart the spread of infectious diseases that are highly transmissible and can occur anywhere. Infection prevention and control is a discipline. To help prevent worst-case scenarios, it's essential for employers and employees to follow infection prevention and control plans that incorporate standard precautions.

Standard precautions are based on the principle that all blood, body fluids, secretions and excretions except sweat, non-intact skin and mucous membranes may contain transmissible infectious agents. They are meant to reduce the transmission of bloodborne pathogens and other disease from recognized and unrecognized sources. Standard precautions include hand hygiene, gloves, gown, mask, eye protection, total face shield, respiratory hygiene/cough etiquette and safe injection practices.

In healthcare settings, prevention is typically focused on patients:

- At high risk of infection
- With already acquired infections
- (And personnel) exposed to communicable diseases, contaminated equipment or hazardous reagents
- In certain areas of the hospital or in certain rooms
- In ambulatory settings, nursing homes or long-term care facilities

In the healthcare industry, respiratory hygiene took a step forward during the SARS-CoV outbreak in 2003. The transmission of this disease in emergency departments by patients and their family members emphasized the need for infection control upon every initial encounter with an ill patient. This approach is equally applicable in other

types of industries.

Because droplets from a cough or sneeze can be propelled through the air and land on the mouth or nose of people in close proximity, respiratory hygiene includes:

- Source control measures e.g., covering the mouth and nose with a tissue when coughing or sneezing and prompt disposal of used tissues
- Hand hygiene after contact with respiratory secretions
- Staff education and reminders
- Posted signs
- Spatial separation (ideally, greater than three feet)

In many instances surgical masks or respirators are used to help reduce the spread of disease via airborne or droplet contamination.

Studies show transmission of healthcare-associated pathogens most often occurs via the contaminated hands of healthcare workers. Accordingly, hand hygiene i.e., hand-washing with soap and water or use of waterless, alcohol-based hand sanitizers has long been considered one of the best ways to prevent the spread infection. Because compliance with recommended hand hygiene practices remains a challenge, persistence and management commitment is required.[25]

Exposure Control Plan

An exposure control plan that protects workers from exposures to blood and other body fluids is meant to be a living document and designed to be a source of information for answering BBP-related questions and ensuring total exposure control plan activities are in place.[26]

OSHA's Occupational Exposure Control plan falls within the Bloodborne Pathogen (BBP) Standard, 29 CFR 1910.1030(c)(1). Key plan components include:

- Exposure determination
- Schedule and method of implementation for:
  - Methods of compliance
  - HIV and HBV research laboratories and production facilities
  - Hepatitis B vaccination and post-exposure evaluation and follow-up
  - Communication of hazards to employees
- Recordkeeping of this standard
- A copy of the exposure control plan accessible to employees

The plan must be reviewed and updated at least annually. It should reflect new and modified tasks and procedures affecting employees and jobs with occupational exposure. Review and update of such plans also must:

- Reflect changes in technology that eliminate or reduce exposure to BBP
- Annually document consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure

A response plan also must be solicited from non-managerial employees responsible for direct patient care who are potentially exposed to injuries from contaminated sharps and who are involved in the identification, evaluation and selection of effective engineering and work practice controls. These activities must be documented in the exposure control plan.

Public Health Service Guidelines

An updated U.S. Public Health Service report published in September 2013 revises recommendations for the management of healthcare personnel who are exposed to blood and/or other body fluids that might contain HIV.[27] Recommendations contained in the report include:

1. Administer post-exposure prophylaxis (PEP) when occupational exposures to HIV occur.
2. Determine HIV status of the exposure source patient, if possible, to guide need for HIV PEP.
3. Start PEP medication regimens as soon as possible after occupational exposure to HIV and continue for four weeks.
4. PEP medication regimens should contain three or more antiretroviral drugs for all occupational exposures to HIV. This is a new recommendation.
5. Expert consultation for any occupational exposures to HIV and at a minimum for specific situations.
6. Close follow-up of exposed personnel including counseling, baseline and follow-up HIV testing, and monitoring for drug toxicity; follow-up appointments should begin within 72 hours of an HIV exposure.
7. If a newer fourth-generation combination HIV p24 antigen-HIV antibody test is utilized for follow-up HIV testing of exposed HCP, HIV testing may be concluded four months after exposure; if a newer testing platform is not available, follow-up HIV testing is typically concluded six months after an HIV exposure. This is also a new recommendation.

Vaccination

Vaccines are biological preparations that improve immunity to a particular disease. They are often made from a weak or dead form of a microbe, its toxins or a surface protein. The vaccine stimulates the immune system to produce antibodies, exactly as it would if someone were exposed to the disease. After being vaccinated, the agent stimulates the body's immune system to recognize the foreign agent, destroy it and remember it so the disease can be recognized and killed in the future.[28] Infectious disease exposure risks can be greatly reduced, even eradicated, with safe and effective vaccines. The incidence rates of infectious diseases including polio, measles and rubella have been greatly reduced thanks to vaccinations. Other vaccines that have been developed target hepatitis A and B, influenza, swine flu (H1N1), Lyme disease, measles, pertussis, rabies and TB.

The CDC recommends that everyone at least six months of age receive an annual flu vaccination. According to the WHO, influenza vaccine can prevent 70 to 90 percent of influenza-specific illness in healthy adults, and it reduces severe illnesses and complications by up to 60 percent and deaths by 80 percent. The seasonal flu vaccine works by

protecting against virus strains that are expected to pose a threat in the upcoming flu season. Typically, the vaccine is a trivalent vaccine made to protect against three different flu viruses; quadrivalent vaccine protects against four viruses. Vaccination compliance is considered by many to be a critical component of any prevention plan, particularly in healthcare organizations and where other vulnerable populations are present.

Conclusion and Summary

To prevent and control the spread of infectious diseases in the workplace and healthcare settings, preparedness is critical. It could mean the difference between one person getting sick and having an infectious disease afflict a large working or patient population.

To better prepare your organization for a potential infectious disease outbreak, it's important to:

- Begin planning now
- Be vigilant
- Be proactive
- Plan for success

Protection is the key, and if an outbreak occurs, it's essential to understand what needs to be done to minimize further spread of the disease. New and more virulent diseases pose a serious threat and do not respond to ambivalence. Viruses are mutating and becoming drug-resistant, creating challenges for researchers who are searching for scientific solutions. With an effective infection control prevention and control plan in place, you can be assured that your employees are better protected and the likelihood of lost productivity due to illness will be greatly diminished.

How UL Workplace Health and Safety Can Assist

Occupational Health Manager (OHM) is UL's solution to help you meet your employee health management needs. From medical surveillance to vaccination compliance to case and return-to-work management, OHM gives you the tools you need to streamline clinic workflows and satisfy compliance requirements. To learn more about how you can keep workers safe, healthy and on the job, contact the authors of this paper, Langdon Dement, environment, health and safety (EHS) advisor, at Langdon.Dement@ul.com, and Karen O'Hara, managing editor and communications specialist, at Karen.Ohara@ul.com

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