

Guide to Infection Prevention in Emergency Medical Services



About APIC

APIC's mission is to create a safer world through prevention of infection. The association's more than 14,000 members direct infection prevention programs that save lives and improve the bottom line for hospitals and other healthcare facilities. APIC advances its mission through patient safety, implementation science, competencies and certification, advocacy, and data standardization.

About the Implementation Guide series

APIC Implementation Guides help infection preventionists apply current scientific knowledge and best practices to achieve targeted outcomes and enhance patient safety. This series reflects APIC's commitment to implementation science and focus on the utilization of infection prevention research. Topic-specific information is presented in an easy-to-understand-and-use format that includes numerous examples and tools.

Visit www.apic.org/implementationguides to learn more and to access all of the titles in the Implementation Guide series.

Copyright © 2013 by the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC)

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopied, recorded, or otherwise, without prior written permission of the publisher.

Printed in the United States of America
First edition, January 2013
ISBN: 1-933013-54-0

All inquiries about this guide or other APIC products and services may be directed addressed to:

APIC
1275 K Street NW, Suite 1000
Washington, DC 20005
Phone: 202-789-1890
Fax: 202-789-1899
Email: info@apic.org
Web: www.apic.org
Email: info@apic.org
Web: www.apic.org

Disclaimer

APIC provides information and services as a benefit to both APIC members and the general public. The material presented in this guide has been prepared in accordance with generally recognized infection prevention principles and practices and is for general information only. It is not intended to provide, or act as a substitute for, medical advice, and the user should consult a health care professional for matters regarding health and/or symptoms that may require medical attention. The guide and the information and materials contained therein are provided "AS IS", and APIC makes no representation or warranty of any kind, whether express or implied, including but not limited to, warranties of merchantability, noninfringement, or fitness, or concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this resource, and assumes no liability therefore.

Table of Contents

Acknowledgments	4
Declarations of Conflicts of Interest and Disclaimer.	6
Introduction.	8
Section 1: Guide Overview.	9
Section 2: Epidemiology and Pathogenesis: Infectious Diseases in EMS	12
Section 3: Risk Factors/Risk Assessment in EMS	23
Section 4: Surveillance	28
Section 5: Engineering and Work Practice Controls and Personal Protective Equipment	32
Section 6: Occupational Exposure Health Issues.	43
Section 7: Bioterrorism and Infectious Disease Emergency Preparedness	65
Section 8: Education, Training, Compliance Monitoring, and Summary	71
Appendix A: Sample Ambulance Cleaning Procedures	78
Appendix B: Sample Exposure Control Plan	80
Appendix C: Definition of Terms	83
Appendix D: Acronyms and Abbreviations.	86

Acknowledgments

Lead Author

Janet Woodside, RN, MSN, COHN-S
EMS Program Manager, Portland Fire and Rescue, Portland, OR

Authors

Terri Rebmann, PhD, RN, CIC
Associate Professor, Institute for Biosecurity, Saint Louis University, School of Public Health,
Saint Louis, MO

Carolyn Williams, RN, BSN
Occupational Health/Infectious Disease Program Manager, City of Portland, Portland, OR

Jeff Woodin, NREMT-P, FAHA
Tualatin Valley Fire and Rescue, Tigard, OR

Research Assistant

Martin B. Schopp
EMS Intern, Portland Fire and Rescue, Student Nurse, Concordia University, Portland, OR

Reviewers

Linda Bell, MSN, ARNP, EMT-P
Programs Coordinator, Consultant Services, Middleburg, FL

Greg Bruce A-EMCA
CHICA-Canada, Platoon Supervisor/Infection Control Officer, County of Simcoe Paramedic Services,
Ontario, Canada

William E. Coll, BA, MPUB AFF, LP, REHS
Clinical Commander/ICO, Austin/Travis County EMS, Austin, TX

Jeffrey D. Ferguson, MD, FACEP, MS-HES, NREMT-P
Assistant Professor of Emergency Medicine, Medical Director, Vidant Medical Transport, Assistant EMS
Director, Pitt County, NC; Brody School of Medicine, East Carolina University, Greenville, NC

Louis Gonzales, BS, LP
System Coordinator – Performance Improvement and Research, Senior Science Editor, American Heart
Association, Office of the Medical Director, Austin/Travis County EMS system, Austin, TX

Arthur Mata

Medical Coordinator, Training Division, City of Flint, Michigan Fire Department (Retired), National Fire Academy Instructor – EMS

Katherine H. West, BSN, MEd, CIC

Infection Control/Emerging Concepts, Manassas, VA

Production Team

Managing Editor

Thomas Weaver, DMD

Director, Professional Practice

Association for Professionals in Infection Control and Epidemiology, Inc.

Project Management and Production Oversight

Anna Conger

Sr. Manager, Practice Resources

Association for Professionals in Infection Control and Epidemiology, Inc.

Layout

Meredith Bechtle

Maryland Composition

Cover Design

Sarah Vickers

Art Director

Association for Professionals in Infection Control and Epidemiology, Inc.

Declarations of Conflicts of Interest

Linda Bell, MSN, ARNP, EMT-P, serves as national faculty for the American Heart Association (AHA), serves on the AHA Task Force #3 Committee, and is owner of Community Training Center through AHA.

Greg Bruce, A-EMCA, has nothing to declare.

William E. Coll, BA, MPUB AFF, LP, REHS, has nothing to declare.

Jeffrey D. Ferguson, MD, FACEP, NREMT-P, has nothing to declare.

Louis Gonzales, BS, LP, has nothing to declare.

Arthur Mata has nothing to declare.

Terri Rebmann, PhD, RN, CIC, has nothing to declare.

Martin Schopp has nothing to declare.

Carolyn Williams, RN, BSN, has nothing to declare.

Jeff Woodin, NREMT-P, FAHA, has nothing to declare.

Janet Woodside, RN, MSN, COHN-S, has nothing to declare.

Katherine H. West, BSN, MEd, CIC, has nothing to declare.

Disclaimer

The *Guide to Infection Prevention in Emergency Medical Services* is advisory and informational and is intended to assist and guide EMS agencies, including Public Safety and Fire, in providing a safe workplace through effective Infection Prevention programs adapted to the needs of EMS system responders. Although many regulations are introduced in this guide, each EMS agency should be familiar with, implement, and comply with state and federal regulatory requirements.

It is the intent of APIC to enhance access of infection prevention information through the content, references, and resources contained within this guide. Resources are continuously being updated, and APIC has made every effort to present the most current information, including information maintained by other public and private organizations. This information is useful; however, APIC cannot guarantee the accuracy, relevance, timeliness, or completeness of information developed from outside sources.

Introduction

Emergency Medical Services (EMS) system responders deliver medical care in many unique and oftentimes dangerous environments. They render care to increasingly mobile populations who potentially have a higher likelihood of having an infectious or emerging disease. In addition to treating accident victims of every nature (vehicular, falls, cuts, burns, and more), they treat the homeless, nursing home patients, trauma victims, and the critically ill with multiple diseases and infections. They have unique concerns such as suspect searches, communal living arrangements, and the need to clean and disinfect their work equipment. Like many other healthcare professionals, they face ever-increasing exposures to infectious diseases.

Many of the agencies that employ EMS system responders are not hospital-based and therefore may not have the same knowledge of the importance of infection prevention as healthcare facilities. Many EMS agencies lack funding and have limited staffing. Infection prevention resources exist, but they are not easy to find. Resources for EMS system responders, such as the *United States Fire Administration Guide to Managing an Emergency Service Infection Control Program* (2002) and *Infectious Diseases and the*

Fire and Emergency Services (2001), are out of date and many changes have taken place since they were published. APIC saw a need to develop this Infection Prevention Guide because EMS agencies, including public safety and fire, needed a comprehensive, easy-to-use guide to serve as a resource to develop or enhance their current knowledge of infection prevention strategies. The information contained in this guide is intended as a roadmap to develop a comprehensive infection prevention program.

For the purpose of this guide, all EMS personnel will be referred to as EMS system responders. This group encompasses all paid and volunteer paramedics and emergency medical technicians (EMTs) on ambulances, first responders, fire paramedics and firefighter EMTs, police, and public safety officers. Although most EMS issues are similar, there are some differences among EMS system responders. Every effort has been made to address those differences.

This *Guide to Infection Prevention in EMS* is intended to assist in keeping EMS system responders and the patients they care for safe and healthy while reducing their exposure risks.

Section 1: Guide Overview

Purpose and scope

The purpose of this guide is to provide Emergency Medical Services (EMS) system responders and their organizations with a practical resource to infection recognition and prevention in the EMS environment. This guide contains current information, recommendations, regulations, resources, program examples, and forms to utilize in the EMS system responder setting.

Key concepts

- Infection preventionists (IPs) are healthcare professionals who have special training in infection prevention and monitoring.
- Many of the principles and practices that hospital IPs employ for infection prevention can and should be used in EMS settings, whether it be a fire department, police agency, or public or private ambulance company.
- EMS system responders are exposed to all manners of infectious diseases and must be trained to recognize them and prevent their spread.
- Designated Infection Control Officers (DICOs) are healthcare professionals who work for EMS agencies, have special training, and serve as their agencies' IP. Federal law requires agencies have a designated DICO.
- The DICO must be up to the challenging tasks of keeping current on infection prevention topics, conducting ongoing research, and updating procedures and policies as necessary.

- Although compliance with infection prevention standards may seem complex, this guide will attempt to simplify the process and explain why utilizing the guide is the key to a safe workplace.
- EMS leadership must support infection prevention staff and the development of infection prevention programs in compliance with laws and regulations. Leadership support is critical to successful implementation of basic infection prevention strategies.

Infection prevention

Created in hospitals and clinics, infection prevention training has by necessity expanded to include EMS system responders and out-of-hospital emergency medical care agencies. Infection prevention programs are designed to prevent the transmission of infectious disease agents and to provide a safe work environment for healthcare personnel and their patients.

Infection prevention programs both inside and outside the hospital setting should contain six major components:

- Administrative controls
- Engineering controls
- Work practice controls
- Education
- Medical management
- Vaccine/immunization program

These components will be discussed later in the guide.

Although there are articles, references, and guides available on infection prevention in EMS, infection prevention is limited because the expertise and resources are not present in many agencies. EMS agencies have known about bloodborne pathogens for years. However, it has only been in the last 5 to 6 years that articles describing methicillin-resistant *Staphylococcus aureus* (MRSA) in ambulances and fire stations have appeared in fire and EMS literature along with ways to prevent exposures. Two studies found in the *American Journal of Infection Control* address the transmission and carriage of MRSA within the fire department and ambulance environments. The University of Washington Department of Environmental and Occupational Health Services stated that fire and ambulance personnel have the unique opportunity to acquire and transfer infections from both hospital and community sources.¹ James V. Rago, PhD, and his team from Lewis University and Orland Fire Protection District, found that 70 percent of ambulances in the Chicago metropolitan area contained at least one strain of *S. aureus* bacteria.²

Infection prevention in the public safety sector is challenging. Because the scope of public safety members' duties has expanded, there is an increased need to develop awareness and education.

In most states, police agencies fall under the Occupational Safety & Health Administration (OSHA), Ryan White Notification Law, and infection prevention umbrella like other EMS system responders. However, they often have less training and minimal or no personal protective equipment (PPE) when they respond to a medical emergency or when they encounter a person with open wounds, blood, or infectious diseases.

The National Institute for Occupational Safety and Health (NIOSH) completed national surveys that reveal a high incidence of exposures to bloodborne pathogens for paramedics.³ Recent articles discuss the underreporting of exposures, the lack of safety equipment, the lack of PPE, and the lack of training in the use of PPE.³

This guide contains standards and regulatory information along with easy-to-follow templates and forms that can be used to develop an Exposure Control Plan and conduct infectious disease surveillance, risk assessments, and postexposure management, as well as monitor compliance.

The treatment of exposures and injuries for EMS system responders has expanded significantly with the institution of occupational doctors, health nurses, safety chiefs, and other DICOs to oversee personnel health services. These groups have developed alliances with local hospitals and county health departments to ensure appropriate postexposure follow-up. They ensure exposures are handled within accepted treatment guidelines.

Unfortunately, many departments, counties, and states do not have the funding needed for education and training in infection prevention. Some municipal hospitals provide this service and training free to EMS, police, and fire agencies. This guide has included some resources and websites that provide courses, online training, sample programs, and other information regarding infection prevention.

EMS system responders are prepared for disasters and bioterrorism to varying degrees, but are largely dependent on the available resources and expertise within their EMS agencies. Larger municipal, metropolitan, and regional systems are often perceived as more prepared to deal with disaster and bioterrorism situations. Although there is increased awareness of bioterrorism incidents throughout the United States since September 11, 2001, no one can be truly prepared for all the hazards they could encounter during a bioterrorism event. This guide provides an overall view of the types of major biological weapons that might be encountered, types of PPE, and ways to protect one's self and others.

Although EMS system responders acknowledge the importance of protocols for cleaning and disinfecting equipment, several articles in EMS trade journals cite contamination of fire

stations, ambulances, and equipment, such as with MRSA.^{4,5} OSHA compliance monitoring requirements are presented later in the guide.

The major goal of this guide is to increase awareness, educate, and provide guidance to EMS system responders who are at risk for occupational exposure to blood, other potentially infectious materials, infectious diseases, and bioterrorism. Standard EMS training curriculum contains information on infection prevention. However, EMS needs more integration with other community IPs and more efficient communication networks for information sharing. It is our sincere hope that this guide helps ensure a safer environment for both EMS system responders and the patients they care for in the community.

2 Rago RV, Buhs K, Makarovaite V, Patel E, Pomeroy M, Yasmine C. Detection and analysis of *Staphylococcus aureus* isolates found in ambulances in the Chicago metropolitan area. *Am J Infect Control* 2012 Apr;40(3):201-205.

3 Centers for Disease Control and Prevention. *Preventing exposures to bloodborne pathogens among paramedics*. April 2010. Available at: <http://www.cdc.gov/niosh/docs/wp-solutions/2010-139/>. Accessed December 6, 2012.

4 Merlin AM, Wong ML, Pryor PW, Ryan K, Marques-Baptista A, Perritt R, et al. Presence of methicillin-resistant *Staphylococcus aureus* on the stethoscopes of EMS providers. *Prehosp Emerg Care* 2009 Jan-Mar;13(1):71-74.

5 Roline CE, Rumpecker C, Dunn TM. Can methicillin resistant *Staphylococcus aureus* be found in an ambulance fleet? *Prehosp Emerg Care* 2007 Apr-June;11(2):241-243.

Cited References

1 Roberts MC, Soge OO, No D, Beck NK, Meschke JS. Isolation and characterizations of methicillin-resistant *Staphylococcus aureus* (MRSA) from fire stations in two northwest fire districts. *Am J Infect Control* 2011 Jun;39(5):382-389.

Section 2: Epidemiology and Pathogenesis: Infectious Diseases in EMS

Key concepts

- Effective efforts to eliminate or reduce bloodborne and infectious disease exposures and transmission are guided by the epidemiology (causes and distribution) of those diseases.
- Communicable diseases can be passed from one person to another. Infectious disease can cause illness in a person but is not necessarily communicable.
- The current infectious disease burden for the agency and setting is found by conducting an environmental risk assessment.
- EMS agencies must ensure all EMS system responders report to work healthy. They must have a written plan in place outlining work restriction guidelines when EMS system responders contract and/or are exposed to an infectious disease.
- EMS agencies must ensure all EMS system responders have the necessary immunizations or written proof of immunity to protect them against infectious diseases.

Background

Epidemiology is defined as the study of the distribution and determinants of health-related states in specified populations, and the application of this study to control health problems.¹ Epidemiology includes outbreak investigation, disease surveillance, and

screening and comparison of treatment effects. Pathogenesis of a disease is the mechanism by which the disease is caused.

The Centers for Disease Control and Prevention (CDC), through the Ryan White Act, is charged with keeping a list of potentially life-threatening diseases that must be reported by medical facilities to EMS agencies when one of those diseases is found in a patient transported to their facility. This list reflects diseases that have been around for many years and diseases that have recently re-emerged (see Table 2.1). EMS agencies should also be aware of nonreportable diseases that threaten their workforce.

In the Guideline for Infection Control in Health Care Personnel 1998, the CDC recognized EMS system responders as being at risk for acquiring infections from or transmitting infections to patients, other personnel, household members, or other community contacts.² The DICO or personnel health services should arrange for the prompt diagnosis of job-related illnesses and postexposure prophylaxis after job-related exposures. Decisions on work restrictions are based on mode of transmission and epidemiology of the disease (Table 2.2). Exclusion policies should contain a statement of authority defining who can exclude personnel and should be designed to encourage personnel to report their illnesses or exposures without penalizing them with loss of wages, benefits, or job status.

Table 2.1. List of potentially life-threatening infectious diseases to which emergency response employees may be exposed

Diseases routinely transmitted by contact or body fluid exposures	Diseases routinely transmitted through aerosolized airborne means	Diseases routinely transmitted through aerosolized droplet means	Diseases caused by agents potentially used for bioterrorism or biological warfare
Anthrax, cutaneous (<i>Bacillus anthracis</i>)	Measles (Rubeola virus)	Diphtheria (<i>Corynebacterium diphtheriae</i>)	These diseases include those caused by any transmissible agent included in the HHS Select Agents List
Hepatitis B (HBV)	Tuberculosis (<i>Mycobacterium tuberculosis</i>)—infectious pulmonary or laryngeal disease; or extrapulmonary (draining lesion)	Novel influenza A viruses as defined by the Council of State and Territorial Epidemiologists (CSTE)	
Hepatitis C (HCV)	Varicella disease (<i>Varicella zoster virus</i>)—chickenpox, disseminated zoster	Meningococcal disease (<i>Neisseria meningitidis</i>)	
Human immunodeficiency virus (HIV)		Mumps (Mumps virus)	
Rabies (Rabies virus)		Pertussis (<i>Bordetella pertussis</i>)	
Vaccinia (Vaccinia virus)		Plague, pneumonic (<i>Yersinia pestis</i>)	
Viral hemorrhagic fevers (Lassa, Marburg, Ebola, Crimean-Congo, and other viruses yet to be identified)		Rubella (German measles; Rubella virus)	
		SARS-CoV	

Adapted from National Institute for Occupational Safety and Health. List of potential life-threatening diseases.³

Table 2.2. Summary of suggested work restrictions for healthcare personnel exposed to or infected with infectious diseases of importance in healthcare settings, in the absence of state and local regulations

Disease/problem	Work restriction	Duration	Category
Conjunctivitis	Restrict from patient contact and contact with the patient’s environment	Until discharge ceases	II
Cytomegalovirus infections	No restriction		I
Diarrheal diseases Acute stage (diarrhea with other symptoms)	Restrict from patient contact, contact with the patient’s environment, or food handling	Until symptoms resolve	I IB

(continued)

Table 2.2. Summary of suggested work restrictions for healthcare personnel exposed to or infected with infectious diseases of importance in healthcare settings, in the absence of state and local regulations, continued

Disease/problem	Work restriction	Duration	Category
Convalescent stage, <i>Salmonella</i> spp.	Restrict from care of high-risk patients	Until symptoms resolve; consult with local and state health authorities regarding need for negative stool cultures	IB
Diphtheria	Exclude from duty	Until antimicrobial therapy completed and 2 cultures obtained 24 hours apart are negative	IB
Enteroviral infections	Restrict from care of infants, neonates, and immunocompromised patients and their environments	Until symptoms resolve	II
Hepatitis A	Restrict from patient contact, contact with patient's environment, and food handling	Until 7 days after onset of jaundice	IB
Hepatitis B Personnel with acute or chronic hepatitis B surface antigenemia who do not perform exposure-prone procedures Personnel with acute or chronic hepatitis B e antigenemia who perform exposure-prone procedures	No restriction; refer to state regulations; Standard Precautions should always be observed Do not perform exposure-prone invasive procedures until counsel from an expert review panel has been sought; panel should review and recommend procedures the worker can perform, taking into account specific procedure as well as skill and technique of worker; refer to state regulations	Until hepatitis B e antigen is negative	II
Hepatitis C	Restrict only from Class III procedures		II
Herpes simplex Genital Hands (herpetic whitlow) Orofacial	No restriction Restrict from patient contact and contact with the patient's environment Evaluate for need to restrict from care of high-risk patients	Until lesions heal	II IA
Human immunodeficiency virus	Do not perform exposure-prone invasive procedures until counsel from an expert review panel has been sought; panel should review and recommend procedures the worker can perform, taking into account specific procedure as well as skill and technique of the worker; standard precautions should always be observed; refer to state regulations		

(continued)

Table 2.2. Summary of suggested work restrictions for healthcare personnel exposed to or infected with infectious diseases of importance in healthcare settings, in the absence of state and local regulations, continued

Disease/problem	Work restriction	Duration	Category
Measles Active	Exclude from duty	Until 7 days after the rash appears	IA
Postexposure (susceptible personnel)	Exclude from duty	From 5th day after 1st exposure through 21st day after last exposure and/or 4 days after rash appears	IB
Meningococcal infections	Exclude from duty	Until 24 hours after start of effective therapy	IA
Mumps Active	Exclude from duty	Until 9 days after onset of parotitis	IB
Postexposure (susceptible personnel)	Exclude from duty	From 12th day after 1st exposure through 26th day after last exposure or until 9 days after onset of parotitis	II
Pertussis Active	Exclude from duty	From beginning of catarrhal stage through 3rd wk after onset paroxysms or until 5 days after start of effective antimicrobial therapy	IB
Postexposure (asymptomatic personnel)	No restriction; prophylaxis recommended		I
Postexposure (symptomatic personnel)	Exclude from duty	Until 5 days after start of effective antimicrobial therapy	IB
Rubella Active	Exclude from duty	Until 5 days after rash appears	IA
Postexposure (susceptible personnel)	Exclude from duty	From 7th day after 1st exposure through 21st day after last exposure	IB
Scabies	Restrict from patient contact	Until cleared by medical evaluation	IB
<i>Staphylococcus aureus</i> Infection Active, draining skin lesions	Restrict from contact with patients and patient's environment or food handling	Until lesions have resolved	IB
Carrier state	No restriction, unless personnel are epidemiologically linked to transmission of the organism		IB

(continued)

Table 2.2. Summary of suggested work restrictions for healthcare personnel exposed to or infected with infectious diseases of importance in healthcare settings, in the absence of state and local regulations, continued

Disease/problem	Work restriction	Duration	Category
Streptococcal infection, group A	Restrict from patient care, contact with patient's environment, or food handling	Until 24 hours after adequate treatment started	IB
Tuberculosis Active disease PPD converter	Exclude from duty No restriction	Until proved noninfectious	IA IA
Varicella Active	Exclude from duty	Until all lesions dry and crust	IA
Postexposure (susceptible Personnel)	Exclude from duty	From 10th day after 1st exposure through 21st day (28th day if VZIG given) after last exposure	IA
Zoster Localized, in healthy person	Cover lesions; restrict from care of high-risk patients†	Until all lesions dry and crust	II
Generalized or localized in immunosuppressed person	Restrict from patient contact	Until all lesions dry and crust	IB
Postexposure (susceptible personnel)	Restrict from patient contact	From 10th day after 1st exposure through 21st day (28th day if VZIG given) after last day exposure or, if Varicella occurs, until all lesions dry and crust	IA
Viral respiratory infections, acute febrile	Consider excluding from the care of high-risk patients‡ or contact with their environment during community outbreak of RSV and influenza	Until acute symptoms resolve	IB

*Unless epidemiologically linked to transmission of infection

†Those susceptible to varicella and who are at increased risk of complications of varicella, such as neonates and immunocompromised persons of any age.

‡High-risk patients as defined by the ACIP for complications of influenza.

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

Category IA - Strongly recommended for all hospitals and strongly supported by well-designed experimental or epidemiologic studies.

Category IB - Strongly recommended for all hospitals and reviewed as effective by experts in the field and a consensus of Hospital Infection Control Practices Advisory Committee members on the basis of strong rationale and suggestive evidence, even though definitive scientific studies have not been done.

Category II - Suggested for implementation in many hospitals. Recommendations may be supported by suggestive clinical or epidemiologic studies, a strong theoretic rationale, or definitive studies applicable to some but not all hospitals.

No recommendation; unresolved issue - Practices for which insufficient evidence or consensus regarding efficacy exists.

Source: Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchman SD, et al. Guideline for infection control in healthcare personnel, 1998. Centers for Disease Control and Prevention. Available at: www.cdc.gov/hicpac/pdf/InfectControl98.pdf

Immunization programs

Ensuring that personnel are immunized against vaccine-preventable diseases is an essential part of successful personnel health programs, and OSHA is enforcing the CDC immunization guidelines (Table 2.3). Immunization can prevent transmission of vaccine-preventable diseases and eliminate unnecessary work restriction. Prevention of illness through comprehensive personnel immunization programs is far more cost-effective than case management, outbreak control, sick leave, and replacement costs.

Decisions about vaccines to include in immunization programs have been made by considering the following:

- (a) The likelihood of personnel exposure to vaccine-preventable diseases and the potential consequences of not vaccinating personnel
- (b) The nature of employment (type of contact with patients and their environment)
- (c) The characteristics of the patient population within the healthcare organization
- (d) Nationally accepted standards such as NFPA 1581 (NFPA 1581, Standard on Fire Department Infection Control Program) and 1582 (Standard on Comprehensive Occupational Medical Program for Fire Departments).

Example of epidemiology, pathogenesis, and transmission

Staphylococcus aureus is found on the skin of humans as part of our normal body flora. It is estimated that nasal colonization in the general U.S. adult population is 25 to 30 percent.⁴ *S. aureus* from nasal colonization can be transferred to skin and other body areas. An infection occurs when a breach in the skin allows staph bacteria to enter. Methicillin-

resistant *S. aureus* (MRSA) is a strain of staph bacteria that is resistant to β -lactam antibiotics.

Until the late 1990s MRSA was predominately found in hospitals. However, starting in the late 1990s, MRSA infections were increasingly found in populations with no known healthcare-associated risks for acquisition.⁵ These cases were labeled community-acquired MRSA (CA-MRSA). According to the International Association of Fire Fighters, MRSA is considered a serious threat to EMS system responders.⁶ Because EMS system responders bridge the community and healthcare settings, they are at high risk for contracting and transmitting MRSA.

Although hospital-associated MRSA infections are tracked, most EMS agencies do not have the processes in place to track cases of CA-MRSA. In order to implement interventions to reduce or eliminate MRSA, total number of cases each year should be tracked along with all associated medical costs.

Strategies to prevent transmission of MRSA and other infectious diseases

Documentation shows MRSA transmission both directly from infected and colonized patients and indirectly via contaminated equipment, supplies, and environmental surfaces. Standard Precautions is the first step in prevention, as is identification of common transmission routes. When the sources of transmission are identified, infection prevention staff or the DICO should implement a series of focused interventions including the following:

- Education in infection prevention
- Proper and frequent use of disinfectants
- Hand hygiene and the appropriate use of gloves
- Replacement of cloth surfaces with hard surfaces

Table 2.3. Immunobiologics and schedules and immunizing agents strongly recommended for healthcare personnel

Generic name	Primary booster dose schedule	Indications	Major precautions and contraindications	Special considerations
Hepatitis B recombinant vaccine	Two doses IM in the deltoid muscle 4 weeks apart; third dose 5 months after second; booster doses not necessary	Healthcare personnel at risk of exposure to blood and body fluids	No apparent adverse effects to developing fetuses, not contraindicated in pregnancy; history of anaphylactic reaction to common baker's yeast	No therapeutic or adverse effects on HBV-infected persons; cost-effectiveness of prevaccination screening for susceptibility to HBV depends on costs of vaccination and antibody testing and prevalence of immunity in the group of potential vaccines; healthcare personnel who have ongoing contact with patients or blood should be tested 1–2 months after completing the vaccinations series to determine serologic response
Influenza vaccine (inactivated whole or split virus)	Annual single-dose vaccination IM with current (either whole or split-virus) vaccine	Healthcare personnel with contact with high-risk patients or working in chronic care facilities; personnel with high-risk medical conditions and/or ≥ 65 years	History of anaphylactic hypersensitivity after egg ingestion	No evidence of maternal or fetal risk when vaccine was given to pregnant women with underlying conditions that render them at high risk for serious influenza complications
Measles live-virus vaccine	One dose SC; second dose at least 1 month later	Healthcare personnel born in or after 1957 without documentation of (a) receipt of two doses of live vaccine on or after their first birthday, (b) physician-diagnosed measles, or (c) laboratory evidence of immunity; vaccine should be considered for all personnel, including those born before 1957, who have no proof of immunity	Pregnancy; immunocompromised* state; (including HIV-infected) persons with severe immunosuppression) history of anaphylactic reactions after gelatin ingestions or receipt of neomycin; or recent receipt of immune globulin	MMR is the vaccine of choice if recipients are also likely to be susceptible to rubella and/or mumps; persons vaccinated between 1963 and 1967 with (a) a killed measles vaccine alone, (b) killed vaccine followed by live vaccine, or (c) a vaccine of unknown type should be revaccinated with two doses of live measles vaccine

Table 2.3. Immunobiologics and schedules and immunizing agents strongly recommended for healthcare personnel, continued

Generic name	Primary booster dose schedule	Indications	Major precautions and contraindications	Special considerations
Mumps live-virus vaccine	One dose SC; no booster	Healthcare personnel believed to be susceptible can be vaccinated; adults born before 1957 can be considered immune	Pregnancy; immunocompromised* state; history of anaphylactic reactions after gelatin ingestions or receipt of neomycin	Women pregnant when vaccinated or who become pregnant within 3 months of vaccination should be counseled on the theoretic risks to the fetus, the risk of rubella vaccine-associated malformations in these women is negligible; MMR is the vaccine of choice if recipients are also likely to be susceptible to measles or mumps
Rubella live-virus vaccine	One dose SC; no booster	Healthcare personnel, both male and female, who lack documentation of receipt of live vaccine on or after their first birthday, or of laboratory evidence of immunity; adults born before 1957 can be considered immune, except women of childbearing age	Pregnancy; immunocompromised* state; history of anaphylactic reaction after receipt of neomycin	Women pregnant when vaccinated or who become pregnant within 3 months of vaccination should be counseled on theoretic risks to the fetus, the risk of rubella vaccine-associated malformations in these women is negligible; MMR is the vaccine of choice if recipients are also likely to be susceptible to measles or mumps
Varicella zoster live-virus vaccine	Two 0.5 mL doses SC, 4–8 weeks apart if ≥ 13 years	Healthcare personnel without reliable history of varicella or laboratory evidence of varicella immunity	Pregnancy, immunocompromised* state, history of anaphylactic reaction after receipt of neomycin or gelatin; salicylate use should be avoided for 6 weeks after vaccination	Because 71%–93% of persons without a history of varicella are immune, serologic testing before vaccination may be cost-effective

IM, Intramuscular; *SC*, subcutaneously.

*Persons immunocompromised because of immune deficiencies, HIV infection, leukemia, lymphoma, generalized malignancy, or immunosuppressive therapy with corticosteroids, alkylating drugs, antimetabolites, or radiation.

Source: Bolyard EA, Tablan OC, Williams WW, Pearson ML, Shapiro CN, Deitchman SD, et al. Guideline for infection control in healthcare personnel, 1998. Centers for Disease Control and Prevention. Available at: www.cdc.gov/hicpac/pdf/InfectControl98.pdf. Accessed January 24, 2013.

- Confinement of turnout gear to work areas
- Station wear kept at the station and laundered after use.

In addition, EMS system responders should use Standard Precautions as described below in Table 2.4 to prevent transmission of MRSA and other multidrug-resistant organisms.

Contact Precautions for MRSA patients

In addition to Standard Precautions described, CDC recommends using Contact Precautions if a patient is known to be colonized with MRSA or has an active MRSA infection. In general, Contact Precautions will be applied once the patient is admitted to the hospital. However,

Table 2.4. Recommendations for application of standard precautions for the care of all patients in all healthcare settings⁷

Component	Recommendations
Hand hygiene	After touching blood, body fluids, secretions, excretions, contaminated items; immediately after removing gloves; between patient contacts
Personal protective equipment (PPE)	
Gloves	For touching blood, body fluids, secretions, excretions, contaminated items; for touching mucous membranes and nonintact skin
Gown	During procedures and patient-care activities when contact of clothing/exposed skin with blood/body fluids, secretions, and excretions is anticipated
Mask, eye protection (goggles), face shield*	During procedures and patient-care activities likely to generate splashes or sprays of blood, body fluids, secretions, especially suctioning, endotracheal intubation
Soiled patient-care equipment	Handle in a manner that prevents transfer of microorganisms to others and to the environment; wear gloves if visibly contaminated; perform hand hygiene
Environmental control	Develop procedures for routine care, cleaning, and disinfection of environmental surfaces, especially frequently touched surfaces in patient-care areas
Textiles and laundry	Handle in a manner that prevents transfer of microorganisms to others and to the environment
Needles and other sharps	Do not recap, bend, break, or hand-manipulate used needles; if recapping is required, use a one-handed scoop technique only; use safety features when available; place used sharps in puncture-resistant container
Patient resuscitation	Use mouthpiece, resuscitation bag, other ventilation devices to prevent contact with mouth and oral secretions
Patient placement	Prioritize for single-patient room if patient is at increased risk of transmission, is likely to contaminate the environment, does not maintain appropriate hygiene, or is at increased risk of acquiring infection or developing adverse outcome following infection

(continued)

Table 2.4. Recommendations for application of standard precautions for the care of all patients in all healthcare settings⁷, continued

Component	Recommendations
Respiratory hygiene/cough etiquette (source containment of infectious respiratory secretions in symptomatic patients, beginning at initial point of encounter; e.g., triage and reception areas in emergency departments and physician offices)	Instruct symptomatic persons to cover mouth/nose when sneezing/coughing; use tissues and dispose in no-touch receptacle; observe hand hygiene after soiling of hands with respiratory secretions; wear surgical mask if tolerated or maintain spatial separation, >3 feet if possible.

* During aerosol-generating procedures on patients with suspected or proven infections transmitted by respiratory aerosols (e.g., SARS), wear a fit-tested N95 or higher respirator in addition to gloves, gown, and face/eye protection. As part of respiratory etiquette, EMS system responders are advised to wear an approved mask or respirator and eye protection when examining and caring for patients with signs and symptoms of a respiratory infection. More detailed information on masks is provided in the Work Practice Controls and Personal Protective Equipment (PPE) section later in the guide.

EMS system responders can adapt elements of these precautions to prevent contracting or transmitting MRSA prior to the patient’s arrival to the hospital, particularly in cases in which patients have draining wounds or difficulty

controlling body fluids. Table 2.5 describes the basic components of Contact Precautions with some adaptations made for the EMS environment.

Table 2.5. Basic components of Contact Precautions

Component	Recommendations
Patient transport	Ensure infected or colonized areas of the patient’s body are covered and contained; don clean PPE and perform hand hygiene prior to transporting patient and again when handling the patient upon arrival to transport destination
Gloves	For touching intact skin or surfaces and articles in close proximity to the patient
Gown	For interactions with the patient or in the patient care environment that may result in contamination of clothing or environment outside of the area of patient care; gowns should be disposed and hand hygiene performed prior to leaving the patient care environment, ensuring that clothing and skin do not come in contact with contaminated surfaces
Patient care equipment	When possible, use dedicated noncritical patient care equipment; ensure any nondedicated equipment is properly cleaned and disinfected before use with another patient
Environmental control	Develop procedures to ensure cleaning and disinfection of high-touch surfaces and areas in close proximity to patient on Contact Precautions
Patient placement	(Upon arrival at hospital) Single patient room, if available, or cohorting with other patients who have MRSA or who have low risk of acquiring or suffering adverse effects of a MRSA infection

Adapted from: Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings, 2007. Available at: <http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html>. Accessed January 24, 2013.

Cited References

1 Centers for Disease Control and Prevention. *An introduction to epidemiology*. 2004. Available at: www.cdc.gov/excite/classroom/intro_epi.htm. Accessed January 24, 2013.

2 Sepkowitz KA. Occupationally acquired infections in health care workers. Part I and II. *Ann Intern Med* 1996;125:826-834/917-928.

3 Implementation of Section 2695 (42 USC 300ff-131) of Public Law 111-87: Infectious Diseases and Circumstances Relevant to Notification Requirements. *Federal Register* Nov 2 2011;76(212). Available at: <http://www.cdc.gov/niosh/topics/ryanwhite/pdfs/FRN11-2-2011GPO.pdf>. Accessed January 24, 2013.

4 Centers for Disease Control and Prevention. *MRSA and the workplace*. 2011. Available at: www.cdc.gov/niosh/topics/mrsa. Accessed January 24, 2013.

5 Aureden K, Arias K, Burns L, Green, C, Hickok J, Moody J, et al. *Guide to the elimination of methicillin-resistant Staphylococcus aureus (MRSA) transmission in hospital settings*, 2nd ed. Washington, DC: Roche, 2010; 8.

6 Williams D. Danger in the station: drug resistant infections. *Fire Engineering* 2006;159:69-74.

7 The CDC Healthcare Infection Control Practices Advisory Committee. *2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings*. Available at: <http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html>. Accessed January 24, 2013.

Additional Resources

Centers for Disease Control and Prevention. List of potentially life-threatening infectious diseases to which emergency response employees may be exposed. *Federal Register* Dec 2 2011;76(212).

NFPA 1581, Standard on Fire Department Infection Control Program, 2005.

NFPA 1582, Standard on Comprehensive Occupational Medical Program for Fire Departments, 2007.

Ryan White HIV/AIDS treatment extension act of 2009. Available at: <http://www.cdc.gov/niosh/topics/ryanwhite/>. Accessed December 13, 2012.

CDC Select Agent Program. Available at: http://www.cdc.gov/phpr/documents/DSAT_brochure_July2011.pdf. Accessed December 13, 2012.

Section 3: Risk Factors/Risk Assessment in EMS

Purpose

Awareness of hazards is an important part of protecting EMS system responders. Agencies can perform a hazard risk assessment to obtain a baseline incidence, prevalence, and transmission of hazards. These include exposure to communicable diseases, hazardous materials, and sharps-related injuries. The hazard risk assessment guides development of a surveillance, prevention, and infection control program.

Key concepts

- Past and current agency-specific surveillance data is the focus of the risk assessment.
- Exposure and injury surveillance data includes demographic, geographic, and published EMS/Fire/Public Safety data on risk.
- Risk assessment should be continuously revised or updated when there is a change based on ongoing surveillance, when populations change, or when additional risks are identified.
- Information from the risk assessment drives education and improvement processes. Epidemiology is the foundation of the process.

Background

EMS system responders face a wide variety of serious hazards due to the unpredictable nature of their jobs. There are exposure and injury risks at motor vehicle accidents, fires, hazardous materials (hazmat) incidents, and mass casualty incidents to

name a few. EMS system responders are routinely exposed to situations that threaten their personal safety, including exposures to infectious diseases, hazardous materials, and sharps-related injuries. They may encounter combative patients, patients with infectious diseases, traumatic injuries, and exposure to chemical, biological, radiological agents, and exposures related to bioterrorism.

There are many federal, state, and local practice standards, resources, and expert guidance to assist agencies with infection prevention plans. Agencies must also develop a tracking system to monitor exposure and injury trends. Monitoring trends over time will show whether incidences of exposures and sharps-related injury rates are decreasing or whether additional actions need to be taken if rates are increasing. Comparison with baseline measurements and analysis will determine the need for an intervention and determine the appropriate intervention. Continued monitoring is needed to reassess the effectiveness of the interventions.

If available, past and current agency surveillance data is the core of the risk assessment.

Agencies can obtain relevant infectious disease surveillance data from local and state public health departments. Agencies should monitor community and population-specific risk factors and epidemiology for the following diseases:

- Tuberculosis
- HIV/AIDS
- Hepatitis C
- Influenza
- MRSA

- Other emerging multidrug-resistant organisms (MDROs)
- Other diseases on the CDC list of reportable diseases (see Table 2.1)

In addition, each DICO should be aware of their state’s specific regulations (i.e., California 5199) for disease monitoring and reporting.

Infectious disease and sharps injury risk factors

General risk factors for infectious diseases and sharps-related injuries are well documented in medical literature. Known risk factors include, but are not limited to:

- Exposure to patients with chronic diseases (HIV, hepatitis B and C)
- Exposure to blood and other potentially infectious fluids
- Exposure to patients with infectious diseases (MRSA, meningitis, influenza)
- Failure to use engineering controls such as self-sheathing IV catheters and needleless systems
- Failure to use appropriate sharps containers
- High-risk procedures such as intubation, IV starts, and bandaging
- Noncompliance with Standard Precautions
- Poor hand washing techniques
- Faulty, defective, or improperly used equipment
- Lack of preventative immunizations
- Failure to properly decontaminate equipment and other work surfaces
- Poorly lit work area
- Hazardous work areas including hazardous material or fire responses
- Combative patients with obvious blood exposure
- Inappropriate disposal of contaminated sharps

Infectious diseases and sharps-related injuries risk assessment basics

EMS system responders should use Standard Precautions for all patients. They should use additional PPE based on the risks they identify from the information they receive from dispatch or from their assessment when they arrive on the scene. Some agencies have the ability to identify patients with confirmed or suspected infectious diseases in dispatch information. However, given the mobile nature of society, agencies must be aware that the person at the address may not be the same as in agency records. EMS agencies must develop relationships with hospital IPs and local public health departments to develop a system for reporting and treating personnel with exposures. The ability to track infectious disease exposures and sharps-related injuries is essential for risk assessment. Standardized processes for capturing relevant data ensure that statistical evaluation is relevant and can be compared over time. The following is an example to illustrate risk assessment basics.

The EMS exposure risk assessment requires the person responsible for tracking exposures (i.e., DICO, occupational health RN, IP) to do the following:

Example 3.1. Utilizing exposure surveillance data for infectious diseases, airborne, bloodborne, hazmat, and sharps-related exposures when a risk assessment is conducted

Description of exposures and action required are summarized in the table below.

EXPOSURE DESCRIPTION	ACTION REQUIRED
Exposure of open skin, cuts, or breaks or mucous membranes, such as eyes, nose, or mouth, to blood or body fluids. This includes needlesticks and human bites.	Clean exposed area; if in the mouth, rinse and spit; flush eyes as appropriate. Provide first aid if needed. Call your DICO.

Example 3.1. Annual Summary of Reported EMS Exposures

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	No. of exposures	1	0	2	4	4	4	2	4	2	7	2	3	35
Airborne	Infectious	0	0	1	2	2	4	1	0	1	0	1	2	14
	Hazmat	1	0	0	0	0	0	0	4	0	2	0	0	7
Bloodborne	Needlestick	0	0	0	1	0	0	0	0	0	0	0	0	1
	Nonintact skin	0	0	0	1	0	0	1	0	1	2	1	0	6
	Mucous membrane	0	0	1	0	2	0	0	0	0	3	0	1	7

- Establish baseline incidence and/or prevalence of exposures and injuries (agencies should look for the incidence rate tied to patient contacts; i.e., exposures per 1,000 patient contacts).
- Identify high-risk employee practices or stations based on incident rates and identify clusters to determine if additional interventions may be needed.
- Evaluate infectious disease transmission over time to characterize station-specific and disease-specific prevalence or transmission rates.
- Track employee absenteeism to detect subtle variances in sick leave associated with specific stations, or shifts, to serve as an early sentinel to possible infectious disease implications.
- Establish rates and ensure compliance with Standard Precautions and PPE use.
- Focus data-driven interventions on stations/employees with high exposure or injury rates.
- Obtain employee input to improve infection control policies and procedures to maximize support and participation.
- Identify gaps in knowledge for targeted educational interventions.

- Ensure employees have annual exposure control plan training that allows enough time for feedback and questions.

In the example provided, using infectious disease exposure surveillance data for the infectious disease assessment of the EMS system responders who had a reported exposure (number = 6), three were diagnosed and treated for MRSA. Since beginning to track MRSA-reported exposures, reporting has increased, although the total number of actual patients with MRSA is unknown because that information is not always given to the EMS system responder. The DICO investigated all reported MRSA-related exposure reports and determined only six patients had confirmed MRSA. Because of the Health Insurance Portability and Accountability Act (HIPAA) constraints, not all crews receive confidential patient medical information regarding their potential infectious disease status as part of the call read back from the dispatch center and hospitals do not always report back to the EMS system responders.

EMS system responders submit an exposure report and document the disease they were exposed to during patient care (see Example 3.2). EMS

Example 3.2. MRSA exposure report

Year	2003	2004	2005	2006	2007	2008	2009	2010
Number of Reported MRSA Exposures	1	5	4	9	0	12	21	24

system responders are required to document the type of PPE worn. EMS agencies can analyze their exposure data to evaluate MRSA-related exposures and MRSA illness transmission to EMS system responders. This type of analysis can be done to determine crews at high risk. Interventions and education can be introduced to decrease the number of EMS system responders diagnosed with MRSA. In the case above, EMS system responders were educated on MRSA to reduce their fear of the disease and educate them on the modes of transmission.

MRSA assessment and intervention scenario

As seen in Example 3.2, an upward trend of MRSA reported exposures and EMS system responders with MRSA led to increased multipronged educational interventions on how to reduce risk of contracting MRSA. This MRSA Awareness Program included:

- An interactive, visual, fact-based awareness program to crews via closed circuit TV
- Stories from actual EMS system responders (identities were kept confidential) who had contracted MRSA
- A frequently asked questions memo sent out to all crews
- CDC fact sheets sent to all crews to be posted at stations
- Reminders to crews about hand washing and use of PPE
- Reminders to crews to decontaminate all medical equipment and not to bring equipment into stations
- Quick drills sent out every 6 months to remind crews about MRSA and ways to prevent it

Agencies must continue to monitor for a reduction in MRSA-related infection rates

among EMS responders once education and infection prevention interventions have been implemented. The DICO will then communicate the results of MRSA surveillance to all employees. Employees can also be monitored for compliance with hand hygiene, use of PPE, and environmental and equipment decontamination. Although MRSA continues to be a problem in the United States, significant progress can be made among EMS system responders to reduce their risk. According to recent news broadcast (KVOA, Tucson, Arizona), Tucson Arizona Fire Department reported no cases of MRSA, which was down from 26 cases over a period of years. In 2007, the department worked with Mel and Enid College of Public Health to develop training to prevent contamination. They implemented changes such as using hand sanitizers and special cleaners, replacing fabric-covered furniture with cleanable fabric, and confining turnouts to the work area.

Tuberculosis risk assessment

EMS agencies are advised to go to the CDC website to determine the tuberculosis (TB) risk for the particular area and to implement a TB elimination program. The following sites provide information to develop a TB Exposure Prevention and Skin Testing Policy:

<http://www.cdc.gov/tb/>

http://www.cdc.gov/tb/publications/guidelines/Control_Elim.htm

Needlestick safety and prevention act

In response to continued problems with accidental sharps injuries, Congress passed modifications to the OSHA Bloodborne Pathogens Standard which went into effect in 2001. EMS agencies can access an easy-to-use frequently asked question guide on this topic at: <http://www.osha.gov/needlesticks/needlefaq.html>

A Needlestick-Prevention Device evaluation form can be found at: [http://www.osha.gov/OshDoc/ Directive_pdf/CPL_2-2_69_APPBForm2.pdf](http://www.osha.gov/OshDoc/Directive_pdf/CPL_2-2_69_APPBForm2.pdf)

Resources

Sexton J, Reynolds KA, Peate W. Study of MRSA bacteria in the fire station environment. Executive Summary, April 9, 2008.

Section 4: Surveillance

Historically, EMS agencies have not conducted active surveillance programs. Currently there are no national benchmarks for EMS to compare infectious diseases, hazmat exposures, and sharps injuries. Each EMS agency must ensure they have a strong internal method of defining diagnosed cases or incidences and time period for each type of infectious disease, hazmat exposure, and sharps injuries that EMS system responders report.

This section presents basic surveillance methodology and an example of surveillance in EMS. For more in-depth information on surveillance, refer to chapter 3, Surveillance, in *APIC Text of Infection Control and Epidemiology*, 3rd edition (also available online at <http://text.apic.org>; subscription required to access).

Purpose

Surveillance is an essential element of any infection prevention program.¹ The purpose of surveillance is to identify trends, outbreaks, emerging infectious diseases, MDROs, sharps injuries, and bioterrorism events so infection prevention measures can be implemented.

Key concepts

- Surveillance methods continue to evolve as healthcare delivery systems shift out of traditional hospital facilities.
- A surveillance program should be designed in accordance with current practices and should consist of defined elements.
- Surveillance activities should include identifying risk factors for infection and other adverse events, implement risk-reduction activities, and monitor the effectiveness of interventions.

- Surveillance programs in EMS should include infection prevention, performance improvement, patient safety, and public health activities.

Mandatory state and federal reporting requirements frame surveillance programs.

Components of infection prevention surveillance plan

- Select the surveillance methodology.
- Assess and define the population(s) to be studied.
- Choose the indicators (events) to monitor.
- Determine time period for observation.
- Identify surveillance criteria.
- Identify data elements to be collected.
- Determine methods for data collection and management.
- Determine methods for data analysis.
- Identify recipients of the surveillance report.
- Develop a written surveillance plan.

Example of surveillance in EMS: Pertussis (Whooping Cough) – re-emergence of a disease in Oregon

In 2010, surveillance in Oregon led public health authorities to launch Metropolitan Area Pertussis Surveillance (MAPS), enhancing surveillance in certain counties to better delineate the epidemiology of pertussis. Each reported case was investigated extensively and standardized data was collected.

Surveillance methodology

Healthcare systems use one of three surveillance methodologies: total or whole house, targeted, or a combination of targeted and whole house. CDC surveillance requirements have moved increasingly to targeted surveillance that focuses on specific patient populations and/or specific infections, procedures, or epidemiologically significant organisms (e.g., MRSA).

In this example, targeted surveillance methodology focused on EMS system responders who were at increased risk of being exposed to pertussis. Targeted surveillance is defined and developed from the risk assessment.

Population to be studied

Targeted surveillance may focus on persons at greatest risk of adverse outcome should they become infected. In the case of pertussis surveillance in Oregon, the risk assessment determined the population to be EMS system responders who were at risk for contracting pertussis infections due to exposure from the infants and children for whom they were providing emergency care. There was increased risk of transmitting the disease to other susceptible persons, including unimmunized or incompletely immunized infants and children, including their own.

Indicator monitors and time period

Indicators are based on population served, procedures performed, and services provided. The indicator may be all EMS system responders in the workforce with a pertussis infection diagnosis.

The time period of surveillance activities is based on the needs of the organization and the scope of activities, but it must be long enough to accrue a sufficient number of cases for valid analysis. The time period may be a few months to a year.

In this case study, incidence and prevalence (below) were monitored annually.

Surveillance criteria

These must be clear, concise, and consistent so it will be comparable to historical data.

Data elements

Data elements should be determined based on the type of infection, event, or organism being monitored and the statistical elements that will be used to analyze the data. Data elements were useful in characterizing pertussis cases. Typical elements used are age, gender, diagnosis date, source patient information, culture date, culture source, and presence of known pertussis risk factors.

Incidence and prevalence

Incidence rates measure the probability that healthy people will develop a disease or sustain an injury during a specified period of time. It is the number of new cases in a population over a period of time (usually one year). Incidence tells us the rate at which new disease or injury occurs in a defined group of people with no previous record of that disease or injury.

$$\text{Incidence rate} = \frac{\text{Number of new cases over a period of time}}{\text{Population at risk}}$$

Prevalence rates measure the number of people in a population who have the disease or injury at a given time. Prevalence depends on the number of people who have been ill in the past and duration of the illness. A prevalence rate will include all new incidence of the disease at the time it is measured. Therefore prevalence includes both new and existing cases.

$$\text{Prevalence rate} = \frac{\text{Number of existing cases at a point in time}}{\text{Total population}}$$

When using incidence rates, the population at risk is that subset of the total population that is specifically at risk for developing a disease or sustaining an injury.

In the pertussis example, the surveillance data revealed that cases of pertussis in Oregon had tripled in number from the same time the previous year. In the fall of 2011 when the Portland fire and rescue department first began to see the number of pertussis cases rise in nearby Washington state and in Oregon, the department proactively offered all firefighters the tetanus, diphtheria, and acellular pertussis (Tdap) vaccination. Because cases of pertussis occur in adults because of decline in protective immunity over time, the Tdap vaccine would not only protect the firefighters themselves, but it would also help protect their families and high-risk children and infants to which they provide care. Although there was an increase in the number of pertussis cases in the general population, no firefighters have reported contracting pertussis since the Tdap vaccine was offered.

CDC now requires all EMS system providers who have not previously received the Tdap vaccine as an adult, and who have direct patient contact, to receive a single dose of Tdap to protect EMS system providers and their patients against pertussis. Tdap can be administered regardless of interval since the previous tetanus-diphtheria (Td) dose; however, shorter intervals between Tdap and Td may increase the risk of mild local reaction at injection site.² EMS agencies can purchase Tdap vaccine through their local health departments. For more information related to this requirement, Tdap consent and declination forms go to: <http://www.cdc.gov/vaccines/who/teens/vaccines/tdap.html>

Surveillance data analysis and management

Before initiating data collection, it is important to determine the statistical measures that will be used in data analysis. If rates or ratios will be calculated, the values corresponding to each numerator and denominator must be defined.

At this time, EMS surveillance is not as sophisticated as hospital-based surveillance. EMS systems across the United States may track the number of cases of EMS responders diagnosed with pertussis; however, there is no comparison of data across agencies. An agency could track and report pertussis incidents and rates using a standardized definition, such as:

New pertussis case = pertussis-positive diagnosis from EMS responder with new onset history of pertussis divided by the number of EMS responders in the study population in a particular time period.

Written surveillance plan

A written surveillance plan should describe the objectives, the indicators (monitors), the reason for selecting each indicator, the methodology used for case identification, data collection, analysis, and the type of reports generated. The surveillance plan should be developed to address the specifics of the organization.

Surveillance program evaluation

The surveillance program should be evaluated at least annually to determine trends and the efficacy of actions, as well as its usefulness and ability to meet the organization's objectives. Revisions should be made at time of review, or sooner when indicated by ongoing surveillance results if changes in incidence or outbreaks are identified. If an outbreak occurs or incidences of a certain disease increases, action should be taken immediately to meet the organization's stated objectives.

Cited References

1 Carrico R, ed. *APIC text of infection control and epidemiology*. Washington, DC: Association for Professionals in Infection Control and Epidemiology, Inc., 2009.

2 Immunization of health-care workers: recommendations of the Advisory Committee for Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC). *MMWR Recomm Rep* Dec 26 1997;46(RR-18):1-42.

Additional Resources

Carrico R, ed. *APIC text of infection control and epidemiology*. Washington, DC: Association for Professionals in Infection Control and Epidemiology, Inc., 2009; chapter 3.

Section 5: Engineering and Work Practice Controls and Personal Protective Equipment

Purpose

Engineering and work practice controls and PPE are key components to a comprehensive infection prevention program. They maximize protection against infectious diseases and sharps-related injuries for both EMS system responders and the public. The term engineering controls addresses redesign of equipment to ensure employee risk reduction, procedures that serve to reduce exposure such as cleaning equipment or areas that have been contaminated, and the use of barrier techniques to reduce direct contact with blood and other potentially infectious materials.

Key concepts

- Hand washing is the single most important means of preventing the spread of disease (see example of proper hand hygiene at the end of this section).
- Risk of exposure to infectious diseases and sharps-related injuries can be greatly reduced and eliminated by introducing and adhering to best practices and the Needlestick Safety and Prevention Act of 2000 for engineering and workplace controls.
- The word “personal” in PPE means EMS system responders are responsible to wear PPE for their own personal safety. Supervisors and DICOs are responsible to ensure their employees are adhering to policies.
- The use of Standard Precautions and utilizing PPE for all patient contact is

recommended to minimize infectious disease transmission to EMS system responders.

- Any body fluid containing **visible blood** and other potentially infectious materials (OPIM) pose increased risk. OPIM include the following:
 - Cerebrospinal fluid
 - Synovial fluid
 - Amniotic fluid
 - Pericardial fluid
 - Vaginal secretions
 - Semen
- Effective environmental cleaning, disinfection, and disposal of contaminated materials or equipment will reduce the risk of infectious disease transmission.

Background

The U.S. Department of Labor estimates there are approximately 1.5 million EMS personnel and firefighters (many of whom are crossed trained in EMS) and 794,300 police and detectives along with 493,100 correctional officers who are at risk for being exposed to infectious diseases and sharps-related injuries.¹ EMS system responders and their patients face a growing number of exposures to infectious diseases including MDROs. Self-protection from infection includes cleaning and disinfecting ambulances, fire apparatus, patrol cars, and equipment. In order to prevent infectious disease exposures there must be an emphasis placed on the commitment

to establishing an organizational culture that encourages the proper use of PPE and adherence to policies and procedures. This chapter details methods EMS system responders can utilize to maintain a clean, safe work environment.

Standard Precautions

Standard Precautions are based on the principle that all blood, body fluid secretions, excretions (except sweat), nonintact skin, and mucous membranes may contain infectious organisms. Implementation of Standard Precautions is the primary strategy preventing healthcare-associated transmission of infectious agents among patients and healthcare personnel.² Standard Precautions are intended to be applied to the care of all patients in EMS and healthcare settings. These practices include: hand hygiene, use of PPE (gloves, gown, mask, eye protection or face shield, depending on the anticipated exposure), and safe injection practices. See Table 2.4 in Section 2 for an overview of Standard Precautions components.

PPE can prevent blood and other body fluids from coming in contact with skin, eyes, and mouth.³ Equipment or items in the patient environment likely to have been contaminated with infectious body fluids must be handled in a way that prevents transmission of infectious agents (e.g., wear gloves for handling soiled equipment, properly clean and disinfect or sterilize reusable equipment before use on another patient, ensure the appropriate disposal of contaminated disposable items).

The application of Standard Precautions during patient care is determined by the nature of the emergency responder–patient interaction and the extent of anticipated blood, body fluid, or pathogen exposure. For some patient care, such as starting an IV, only gloves may be needed. When a patient is being intubated the use of gloves and face shield or mask and goggles are required. OSHA requires a chart that lists tasks and PPE to be used when performing tasks (see page 51).

Another mode of disease transmission is respiratory (e.g., cough, congestion, or droplets from the nose). Respiratory/cough etiquette recommendations are intended to decrease the spread of infectious particles that are expelled via respiratory droplets. There are four primary components: education, source control, hand hygiene, and spatial separation.

EMS system responders are advised to wear a mask, gloves, and eye protection when examining and caring for patients with signs and symptoms of a respiratory infection, fever, or flu-like symptoms (temperature range 100°F or greater, runny nose, cough, sneezing, and bodily aches). They must take precautions by covering the mouth and nose of a potentially infectious patient with a tissue when the patient is coughing, properly disposing of used tissues, using a surgical mask on the coughing patient when tolerated and appropriate, and washing their hands after contact with respiratory secretions or droplets. To minimize the risk of respiratory transmitted infection, it is advisable to keep a safe distance (if possible, at least 6 feet) from the patient.⁴ Minimize the number of crew members caring for the patient and within the breathing/coughing zone of the patient.

The CDC's Public Health Guidance for Community Level Preparedness and Response to Severe Acute Respiratory Syndrome (SARS)⁵ recommends the receiving facility staff meet the patient at the ambulance door to limit the need for EMS system responders to enter the emergency department in contaminated PPE. After transferring the patient, the EMS system responder should remove and discard their PPE and perform hand hygiene. This can be done for other types of infectious diseases other than SARS. These simple measures are very important during an infectious disease disaster. A 2004 study found that 40 percent of healthcare personnel who developed SARS after exposures to coughing patients had not been wearing a mask or eye protection when exposed. Many, if not all of these

infections may have been prevented if healthcare personnel had been wearing respiratory and eye protection.

Hand hygiene is also an important component of respiratory etiquette and critical response to an infectious disease disaster. Education about hand hygiene should improve knowledge and reinforce positive behavior.⁶

Defining engineering and work practice controls

Engineering controls are devices or changes in the physical environment that reduce the risk of exposure. These are important to isolate or remove the infectious disease hazards from the workplace. Examples of these are self-sheathing IV catheters, needleless systems, puncture-proof containers, decontamination areas, masks, respirators, and adequate ventilation systems.

EMS agencies need to conduct periodic surveys to evaluate the use of engineering controls and identify current needs. The process should include the ability to conduct appropriate evaluations and/or field tests to ensure the devices will not adversely impact the delivery of patient care or result in providers delaying treatment attempting to circumvent the intended functioning of the safety device. Determine whether there should be adjustments to the system's protocols, clinical operating guidelines, and educational requirements to integrate use of devices into the patient care system.

Work practice controls are behavior-based and are intended to reduce the risk of exposure by changing the way in which the tasks are performed. Examples of these are avoiding passing a syringe with an unsheathed needle and placing sharps directly into appropriate sharps containers located as closely to the point of care as possible. EMS system responders have been reported to stick a needle in their boot, stretcher mattress, bench seat, and box of gloves because they stated

they did not have a chance to grab a sharps container. These methods are not acceptable and pose increased risk of needlesticks to the individual, his or her colleagues, and the patient.

Basic engineering control components

The following engineering controls should be in use at each station or apparatus:

- Hand washing facilities
- Availability of alcohol-based hand cleansers or towelettes for on-scene use
- Disinfectant wipes for equipment
- Self-sheathing IV catheters and needleless systems
- Puncture-resistant, leak-proof, color-coded, conveniently located sharps containers that are available on response apparatus
- Leak-proof, properly labeled, and conveniently located contaminated-waste receptacles
- Decontamination areas at stations (see page 34 for description)
- Single-use devices in place of reusable devices

The Federal Needlestick Safety and Prevention Act provides additional guidance on sharps injury prevention.⁷

All EMS system responders that have rotating or changing assignments should be oriented to the engineering controls in the station or apparatus by a designated and knowledgeable person.

Basic work practice controls

The following work practice controls must be used by all personnel:

- Wash hands or use antiseptic hand cleaner⁸ before and after patient care,

before and as soon as gloves are removed, on returning to the station, after cleaning or decontaminating equipment, after using the restroom, and before preparing food.

- Flush eyes or mucous membranes with large amounts of water or saline if exposed to blood or body fluids.
- Dispose of sharps in puncture-resistant containers and keep in a secure position.
- Do not eat, drink, smoke, or handle contact lenses or apply lip balm in areas of possible contamination (in emergency vehicles, on scene, or while cleaning equipment).
- Use pocket masks or bag valve masks for ventilation.
- Do not keep food and drink in refrigerators designated biohazard with potentially infectious materials or medications.
- Place blood specimens in marked plastic bags for transport.
- Dispose of sharps containers when three-quarters full or when at the full line.
- Appropriate identification and disposition of medical waste according to state regulations.

Personal protective equipment

PPE is barrier protection and the last line of defense to prevent occupational exposure to blood or body fluids. PPE is necessary because all exposures cannot be minimized or eliminated by engineering or work practice controls. PPE reduces the risk but is only effective if used correctly. The use of PPE does not replace basic hygiene measures. Hand washing is still essential to prevent transmission of infection.

Appropriate use of gloves helps protect both EMS system responders and patients from exposures to infectious diseases. Nonsterile disposable medical gloves should be available to all EMS system

responders. Gloves manufactured for healthcare purposes are subject to U.S. Food and Drug Administration (FDA) evaluation and clearance.⁹ Gloves are available in vinyl, nitrile, and latex. If possible, avoid use of latex and nitrile gloves due to latex sensitivity in personnel and patients and documented problems with nitrile gloves. Due to the sometimes dangerous conditions under which EMS system responders have to provide patient care (i.e., motor vehicle accidents), it is highly recommended to use an alternative, more durable type glove and/or use a double gloving routine. If fire-fighting gloves are worn over medical gloves, wash them with disinfectant detergent upon returning to the station or according to manufacturer's instructions.

Masks can protect EMS system responders from infectious diseases, respiratory exposures, and splashes of blood and other body fluids. States vary on their mask requirements. Check state rules. Departments required to use masks should provide personnel with well-fitting surgical/medical or N95 respirators. If employers choose the NIOSH-approved N95 respirator they are required by OSHA to conduct an initial medical clearance, provide fit testing (respirator fit testing performed to determine if an employee can maintain an acceptable respiratory fit and seal), education on proper use, and conduct periodic (annual at a minimum) re-evaluation.¹⁰

Goggles or safety glasses for eye protection should be issued. They should fit comfortably and securely and allow for peripheral vision. EMS system responders can also use prescription glasses with removable side shields per OSHA. These protect from splashes and respiratory diseases spread by droplets.

When exposure to large amounts of blood or body fluid is anticipated, the use of a gown, sleeves, or booties over boots is also recommended.

The employer is responsible for the supply, repair, replacement, and safe disposal of contaminated PPE. EMS system responders must report any

issues with PPE verbally and in writing to their manager. Reusable PPE should be cleaned after every use or as needed. The following guidelines should be followed when using PPE:

- Discard all disposable contaminated PPE in appropriate containers as soon as feasible. Follow your state rules for discarding contaminated PPE.
- Remove and appropriately dispose of gloves when they become soiled or torn.

EMS system responders, including police and correctional officers, should carry an extra change of work clothing with them at all times in the event their work clothes are grossly contaminated in the course of their work.

Although there are no known documented transmissions of HBV or HIV during mouth-to-mouth resuscitation, due to the risk of salivary transmission of other infectious diseases (e.g., herpes simplex, *Neisseria meningitidis*), disposable airway equipment or resuscitation bags should be used during artificial ventilation. Disposable equipment is preferred but if multiuse equipment is used, follow the manufacturer's recommendations for cleaning and disinfection.

Law enforcement and correctional facility officers

Officers may face the risk of exposures to blood during the conduct of their duties. They may encounter blood-contaminated hypodermic needles or weapons or be called upon to assist with body removal. In order to reduce risk, the following guidelines should be followed¹¹:

- When blood is present and a suspect or inmate is combative or threatening to staff, gloves should be put on as soon as conditions permit.
- Protective masks or airways should be easily accessible in case mouth-to-mouth is needed.

- Due to the risk of puncture wounds or needlesticks during suspect searches, an officer should use extreme caution in searching the clothing of suspects. Wear protective gloves, especially for body searches.
- Always use a flashlight to search such areas as under the seat of a car or purse to avoid being stuck.
- To avoid tearing gloves, use evidence tape instead of staples to seal evidence.
- Use puncture-proof containers to store sharp instruments.
- Use thick gloves to search suspects.
- Avoid handling personal items while wearing contaminated gloves.
- Prisoners may spit at officers and throw feces; sometimes these substances have been purposefully contaminated with blood. Although there are no documented cases of HBV or HIV transmission from this, other diseases could be transmitted. These materials should be removed after donning gloves then decontaminate with an appropriate germicide and dispose of gloves properly.

Environmental decontamination

General principles of disinfection

The rationale for cleaning, disinfecting, or sterilizing patient care equipment can be understood more readily if medical devices, equipment, and surgical materials are divided into three general categories based on the potential risk of infection involved in their use: critical items, semicritical items, and noncritical items.

Critical items are instruments such as needles or surgical instruments that are introduced directly into the bloodstream or into other normally sterile areas of the body. These items are sterile at the time of use.

Semicritical items are items such as laryngoscope blades, Magill forceps, and other items that may come in contact with mucous membranes but do not ordinarily penetrate body surfaces. Although sterilization is preferred for these instruments, a high-level disinfecting procedure that destroys microorganisms, most fungal spores, tubercle bacilli, and small nonlipid viruses may be used after meticulous physical cleaning to remove any visible contamination.

Noncritical items either do not ordinarily touch the patient or touch only intact skin.

Items include splints, backboards, and blood pressure cuffs. Disinfect noncritical items by cleaning with soap and water followed by disinfection with an appropriate disinfectant. Equipment must be thoroughly cleaned with soap and water and scrubbed to remove organic matter (blood and tissue) and other residue. Cleaning must precede disinfection because organic matter shields organisms from destruction and may inactivate some disinfectants. Scrubbing to remove gross decontamination is more effective than soaking because soaking does not always remove all contaminants.

Disinfection procedures

General procedure

Upon the completion of all responses, contaminated equipment should be removed and replaced with clean equipment. Supplies of PPE on response vehicles should also be restocked. Contaminated equipment should be placed in a leak-proof bag and segregated from clean equipment. Cleaning and decontamination should be done as soon as practical.

Utility gloves should be worn when cleaning equipment and when using disinfectants to protect the skin from damage and contamination. OSHA states that the employer should base the selection of appropriate hand protection on an evaluation of the performance characteristics of

the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.⁹

Wash hands and change clothes, if necessary, after decontamination of equipment and clothing. Before disinfection, equipment must be thoroughly cleaned with soap and water and scrubbed to remove organic matter (blood and tissue) and other residue.

Ensure cleaned items are properly stored to prevent reinfection or contamination during storage.

Disinfection solutions

Select U.S. Environmental Protection Agency (EPA)-registered disinfectants or detergent/disinfectants that meet the department's routine cleaning and disinfection guidelines.¹² Follow manufacturer's guidelines for appropriate selection and use of disinfecting solutions, and pay special attention to the prescribed contact time.

Decontamination stations

Each station is required by OSHA to have a decontamination area. These areas should be marked with decontamination area and biohazard signs and symbols and equipped with the following:

- A sink, constructed of nonporous materials with proper lighting
- Adequate counter areas constructed of nonporous materials with rack space to allow air-drying of equipment
- Appropriate containers for disposal of biohazard waste (receptacles/red bags)
- Facilities for the safe storage, use, and disposal of cleansing and disinfecting solutions along with appropriate PPE (safety glasses/goggles, utility gloves, face masks)
- Material safety data sheets (MSDSs) for cleaning and disinfecting solutions. MSDS information may be kept

electronically; however, they must be accessible to all employees and updated as new products are purchased

- Liquid soap and paper towels
- Sharps container

All EMS system responders using these solutions should be familiar with the MSDS and should use the recommended PPE. **Under no circumstances should kitchens, bathrooms, or living areas be used for decontamination or storage of patient care equipment or infectious waste.**

Equipment decontamination

1. Semicritical items such as laryngoscopes, Magill forceps, and bag mask ventilation devices:

Clean and scrub with soap and water, paying attention to crevices. Soak in disinfectant per manufacturer's instructions. Thoroughly rinse equipment several times with copious amounts of water. Each rinse should be a minimum of 1 minute in duration unless otherwise noted by the device or equipment manufacturer.

2. Delicate equipment such as cardiac monitors, defibrillators, glucometers, and radios:

Clean with soap and warm water and wipe or spray with disinfectant. Do not spray disinfectant on the screen or controls of the monitors or defibrillators. Use disinfectants or ready-to-use disinfectant wipes on paddles and wires.

3. Patient transport equipment such as backboards, extrication devices, etc.: Clean and scrub with soap and warm water, paying attention to crevices, and wipe or spray with appropriate disinfectant and allow equipment to air-dry.

4. Medical/Trauma/Pediatric Kits: Empty contents weekly and wash kit with soap and water. Wipe or spray with disinfectant, and let air-dry.

5. Emergency Apparatus (engines, trucks, rescues, patrol vehicles): Exterior and interior surfaces of vehicles, especially those areas

that are commonly handled by EMS system responders (e.g., door handles, steering wheel, clipboard, etc.), should be disinfected at least weekly and after each call where the potential for contamination exists. Wipe with soap and water then wipe or spray with disinfectant and allow a 1 minute contact time (air-dry).¹³

6. Miscellaneous equipment such as stethoscopes, thermometers, blood pressure cuffs, instrument cases, sharps containers: These items should be disinfected weekly and after each call where potential for contamination exists. Wipe with soap and water and then wipe or spray with disinfectant and let air-dry. When contamination of shoes worn on calls is suspected, shoes should be cleaned with soap and water before entering living quarters.

7. Stations/Living quarters: Recent research shows increased rates of MRSA in fire stations, ambulances, and fire apparatuses.¹⁴ Crews must clean or disinfect their equipment and items inside their stations to include counters, door handles, remote controls, sinks, furniture, exercise equipment, and any other shared use items. An appropriate disinfectant or a 1:100 (1 part bleach to 99 parts of water) concentration of water to household bleach can be used to clean most surfaces. The bleach solution should always be made just prior to its use to ensure effectiveness.¹⁵

8. Soiled or contaminated uniforms, bunker gear, turnouts: Wash immediately with detergent. Contaminated bunker gear/turnouts should be cleaned according to the manufacturer's recommendation and National Fire Protection Association (NFPA) 1581.

9. Boots and shoes: When there is a massive amount of blood contamination on floors, the use of disposable impervious shoe coverings should be considered. Boots and leather goods may be brush scrubbed with soap and water to remove contamination.

10. **Oxygen tanks:** Spent oxygen tanks should be visibly inspected and cleaned/disinfected if they are contaminated with blood or OPIM.

Blood and body fluid spills

Use layered disposable superabsorbent pads on large amounts of blood. Wearing proper PPE, place the needed number of pads over the liquid. Liquid will be absorbed quickly into the pad for safer handling. Carefully pick up the pad and place in red biohazard bag. Use disinfectant and apply over the affected area and, if needed, rinse the affected area with a small amount of water.

Skin and mucous membranes

Any intact skin contamination to blood or body fluids should be removed by washing with soap and water. Vigorously wash the affected area for a minimum of 15 seconds. Examine exposed skin for any breaks or rough chapped areas.

Any nonintact skin should be covered with a dressing directed by OSHA. If the area is too large, personnel should be placed on restricted duty until their wound heals. Do not use strong chemical solutions like bleach or an approved disinfectant solution to disinfect skin as they can cause skin irritation and allergic problems.

Any mucous membrane exposure to blood or body fluids should be decontaminated by rinsing with large amounts of water or saline solution. Rinse the affected area for 2 minutes. Eyes may be irrigated using large amounts of water. Rinse the affected eye(s) for 3 minutes. If this is not available, saline solution and IV tubing may be used.

Disposal of contaminated items

Disposable equipment and other waste generated during on-scene operations should be discarded into an appropriate waste container. Used needles and other sharps should be disposed of in approved sharps containers. Sharps containers should be easily accessible on scene. Blood, suctioned fluids, or other liquid waste may be poured carefully into a drain connected to a

sanitary sewer system. Self-contained suction canisters should be recapped and placed in a sealable plastic bag to prevent leakage of the contained items.

Ambulance and rescues

These vehicles are mobile patient care environments. Air circulation in the vehicle is generally rapid, low-velocity airflow. Some ventilation systems fully exchange patient care air space in 1 to 2 minutes. Some vehicles have high-efficiency particulate air (HEPA) filters which need to be changed every 6 months. There are also exhaust fans to assist in air exchange. These air handling systems allow for good ventilation. However, if a patient is exhibiting the signs of a respiratory disease such as presented earlier in the guide, place a mask or tissue over their mouth as tolerated.

The ambulance cab should be maintained as a “clean zone,” free of contamination. Gloves or other PPE used during patient care should be removed prior to entering the cab. Grossly contaminated clothing should also be removed before entering the cab and place the clothes in an appropriate dirty or contaminated linen bag as marked.

The ambulance cab should be promptly decontaminated with detergent or disinfectant at the earliest practical opportunity following contamination.

A detailed ambulance cleaning procedure can be found in Appendix A.

Emerging technologies

With the increase in community-associated infections and threats of contamination of EMS system responders, systems continue to be developed to disinfect EMS vehicles.

Recently approved by CDC for hospital room disinfection, “fogging” systems previously tested and used in stationary medical units such as hospitals may hold promise for disinfecting EMS

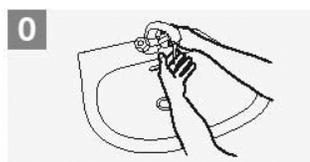
vehicles. Research on the use of this technology in EMS needs to be performed. Most of these systems utilize an alcohol-based chemical that is able to penetrate ventilation ducts, under equipment, and in various cracks and crevices often missed during routine manual sanitizing.

Additional technologies, chemicals, and systems continue to be explored and tested in order to improve vehicle decontamination. It is mandatory that whenever any cleaning product is added to a department's chemical inventory, even products under trial use, that the MSDS is added

How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

 Duration of the entire procedure: 40-60 seconds



0 Wet hands with water;



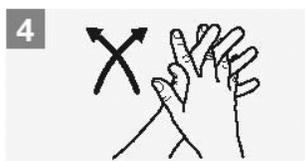
1 Apply enough soap to cover all hand surfaces;



2 Rub hands palm to palm;



3 Right palm over left dorsum with interlaced fingers and vice versa;



4 Palm to palm with fingers interlaced;



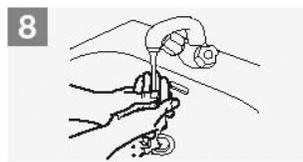
5 Backs of fingers to opposing palms with fingers interlocked;



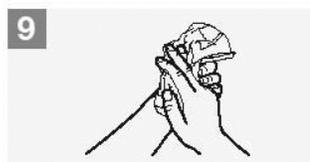
6 Rotational rubbing of left thumb clasped in right palm and vice versa;



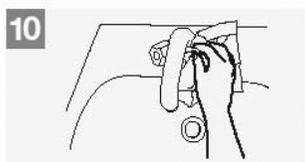
7 Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



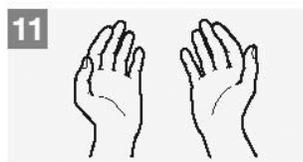
8 Rinse hands with water;



9 Dry hands thoroughly with a single use towel;



10 Use towel to turn off faucet;



11 Your hands are now safe.



World Health Organization

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES

Clean Your Hands

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this document. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use. WHO acknowledges the Hôpital Universitaire de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

May 2000

Source: <http://www.cdc.gov/handhygiene/Basics.html>

to the department's electronic MSDS inventory and printed for inclusion in the paper MSDS inventory. All secondary containers (spray/squirt bottles) for the dispensing of disinfection solutions need to be labeled with the appropriate contents.

Cited References

- 1 Bureau of Labor Statistics, U.S. Department of Labor. *Occupational outlook handbook, 2008-09 edition, emergency medical technicians and paramedics*. Available at: <http://www.bls.gov/ooh/Healthcare/EMTs-and-paramedics.htm>. Accessed December 13, 2012.
- 2 Siegel JD, Rhinehart E, Jackson M, Chiarello L, The Healthcare Infection Control Practices Advisory Committee. *The guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings 2007*. Available at: <http://www.cdc.gov/hicpac/2007ip/2007isolationprecautions.html>. Accessed December 13, 2012.
- 4 OSHA. Bloodborne pathogen standard (29CFR Part 1910.1030). Washington, DC: Department of Labor, Occupational Safety and Health Administration. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10051. Accessed December 13, 2012.
- 5 OSHA. *Guidance on preparing workplaces for an influenza pandemic*. Available at: <http://www.osha.gov/Publications/OSHA3327pandemic.pdf>. Accessed December 13, 2012.
- 6 CDC. *Public health guidance for community-level preparedness and response to severe acute respiratory syndrome (SARS)*. Available at: <http://www.cdc.gov/sars/guidance/I-infection/prehospital.html>. Accessed December 13, 2012.
- 7 McGuire-Wolfe A, Haiduven D, Hitchcock CD. A multifaceted pilot program to promote hand hygiene at a suburban fire department. *Am J Infect Control* 2012;40:323-327.
- 8 OSHA. *Needlestick Standard Precautions*. Available at: <http://www.osha.gov/SLTC/bloodbornepathogens/standards.html>. Accessed December 13, 2012.
- 9 CDC. *Guidelines for hand hygiene in healthcare settings*. Available at: <http://cdc.gov/handhygiene/Guidelines.html>. Accessed December 13, 2012.
- 10 OSHA. *Hand protection*. Available at: <http://www.osha.gov/Publications/osha3151.html>. Accessed December 13, 2012.
- 11 OSHA. *Respiratory protection*. Available at: <http://www.osha.gov/SLTC/respiratoryprotection/index.html>. Accessed December 13, 2012.
- 12 CDC. Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to health-care and public safety workers. A response to P.L. 100-607 The Health Omnibus Programs Extension Act of 1988. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00001450.htm>. Accessed December 13, 2012.
- 13 Rutala WA, Weber DJ. Disinfection and sterilization in health care facilities; what clinicians need to know. *Clin Infect Dis* 2004;39(5):702-709.
- 14 Rutala WA, Weber DJ and the Healthcare Infection Control Practices Advisory Committee. *Guidelines for disinfection and sterilization in healthcare facilities 2008*. Available at: http://www.cdc.gov/hicpac/Disinfection_Sterilization/3_4surfaceDisinfection.html. Accessed December 13, 2012.
- 15 Roberts MC, Soge OO, No D, Beck NK, Meschke, JS. Isolation and characterizations of methicillin-resistant *Staphylococcus aureus* (MRSA) from fire stations in two northwest fire districts. *Am J Infect Control* 2011;39:382-389.
- 16 Martin A, Dworsky PI. *On the road with pre-hospital infection control, infection control technologies, 2009*. Available at: <http://www.infectioncontroltoday.com/articles/2011/01/on-the-road-with-pre-hospital-infection-control.aspx>. Accessed December 13, 2012.

Additional Resources

Standard on Fire Department Infection Control Program. National Fire Protection Association, (NFPA) 1581. Available at: <http://www.nfpa.org/AboutTheCodes/AboutTheCodes.asp?docnum=1581&tab=docinfo>

Guide to Infection Prevention in Emergency Medical Services

Needlestick Safety and Prevention Act. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=106_cong_public_laws&docid=f:publ430.106

OSHA Bloodborne Pathogen Standard. http://www.osha.gov/SLTC/bloodbornepathogens/gen_guidance.html

OSHA Enforcement Procedures for the Occupational Exposure. http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=2570

Section 6: Occupational Exposure Health Issues

Purpose

Anyone whose job requires providing EMS system response medical care in which there is a reasonable expectation of contact with blood or OPIM is at risk for contracting an infectious disease.^{1,2} Communication, collaboration, planning, and using PPE can prevent and/or mitigate, to a great extent, the outcomes of such exposures. This chapter identifies infection risks and possible solutions.

Key concepts

- EMS agencies need to provide a safe environment for their staff.
- The DICO has a vital role in identifying the risks associated with the work of EMS system responders.
- EMS system responders need to understand that exposure does not necessarily mean they have been infected.
- An Exposure Control Plan (ECP) must include more than just information on bloodborne pathogens, and this information must be understood by all employees.
- Management must support and provide the resources for appropriate implementation of the ECP in order for it to be effective.
- Adequate and timely communication across healthcare settings helps address the unique infection transmission risks experienced by EMS system responders.³

Agencies may internally delegate infection issues to a DICO to focus more attention on infection prevention. The DICO must receive specialized training and be knowledgeable on infection prevention. This is consistent with the Ryan White Act and the National Fire Protection Standard 1581 for handling exposure incidents. Prior collaboration between local hospitals, DICOs, and those who interact with the potentially infected patient will enhance a timely response, if an employee is exposed. Some jurisdictions may rely solely on the Ryan White Act which now includes a clause that requires the notification of EMS system responders (this includes law enforcement and corrections officers) if a patient with which they worked is determined to be infectious. IPs at all medical facilities must be familiar with this law and their facility's protocol in meeting its strict time requirements. Collaboration between public health, medical facilities, and DCIO/IPs from involved agencies must be ongoing.

Bloodborne pathogen exposure control plan

An understandable, functional, written ECP that is used daily is crucial to the success of your program and safety of your employees. (See Appendix B for a sample Exposure Control Plan.) All of the requirements of OSHA's Bloodborne Pathogens standard can be found in Title 29 of the Code of Federal Regulations at 29 CFR 1910.1030. States and territories that operate their own OSHA-approved state programs are required to adopt a bloodborne pathogens standard that is

at least as effective as the federal OSHA standard.⁴ If you are implementing a new program, check state and federal authorities to see whose jurisdiction your organization must follow.

Public employees in non-OSHA participating states may fall under different state regulations (or none). However, the plan outlined is a minimum standard and should be noted.

The OSHA standard requires the following nine elements as the foundation of a Bloodborne Pathogen program (for a Quick Reference Guide to the Bloodborne Pathogens Standard, see http://www.osha.gov/SLTC/bloodborne pathogens/bloodborne_quickref.html).

1. Determination of employee exposure

The employer must create a list of job classifications in which all workers have occupational exposure and a list of job classifications in which some workers have occupational exposure, along with a list of the tasks and procedures performed by those workers that result in their exposure. This list also determines who needs ECP training. See Example 6.1 at the end of this section for an example of a job classification list for fire departments.

2. Implementation, including date, of various methods of exposure control including:

- *Standard Precautions:* One must treat all human blood and OPIM as if known to be infectious for bloodborne pathogens.
- *Engineering and work practice controls:* Identify and use engineering controls. Identify and ensure the use of work practice controls. You should already have safer devices in place. If you have not already evaluated and implemented appropriate and available engineering controls, you must do so now. Also, employees with

occupational exposure to blood and OPIM must be trained regarding the proper use of all engineering and work practice controls.

- *Personal protective equipment (PPE):* Provide PPE such as gloves, gowns, eye protection, and masks. Employees must clean, repair, and replace this equipment as needed. Provision, maintenance, repair, and replacement are at no cost to the employee.

3. Hepatitis B vaccination

This vaccination must be offered after the worker has received the required bloodborne pathogens training and within 10 days of initial assignment to a job with occupational exposure. Written documentation must be kept if the worker declines to be vaccinated.

4. Postexposure evaluation and follow-up

Make available a postexposure evaluation and follow-up for any worker who experiences an occupational exposure incident. This should be done immediately as postexposure prophylactic medications, if needed, should be started within a few hours.

Procedures for evaluating circumstances surrounding exposure incidents

- An exposure incident is a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or OPIM that results from the performance of an EMS system responder's duties.
- The evaluation and follow-up must be at no cost to the worker and includes documenting the route(s) of exposure and the circumstances under which the exposure incident occurred.
 - Identifying and testing the source individual for HBV, HCV, syphilis, and HIV infectivity, if the source individual consents or the law does not require consent;

rapid HIV testing is enforced by OSHA

- Collecting and testing the exposed worker's blood, if the worker consents (for baseline)
- Offering postexposure prophylaxis
- Offering counseling and evaluating reported illnesses
- The healthcare personnel will provide a limited written opinion to the employer and all diagnoses must remain confidential

5. Communication of hazards to employees

Warning labels must be affixed to containers of regulated waste, containers of contaminated sharps, contaminated equipment that is being shipped or serviced, and bags or containers of contaminated laundry, except as provided in the standard.⁵

6. Provide information and training to workers

Employers must ensure that their workers receive regular training that covers all elements of the standard.⁶ Employers must offer this training on initial assignment, at least annually thereafter, and when new or modified tasks or procedures affect a worker's occupational exposure. Annual training differs from initial training. Workers must have the opportunity to ask the trainer questions. Training must be presented at an educational level and in a language that workers understand.

7. Recordkeeping

Medical records relating to exposures must be kept for 30 years beyond the time of employment. Training records must be kept for 3 years. The employer also must maintain a Sharps Injury Log, unless it is exempt under Part 1904 — Recording and Reporting Occupational

Injuries and Illnesses, in Title 29 of the Code of Federal Regulations.

8. Creation of a written plan, updated annually

The update must reflect changes in tasks, procedures, and positions that affect occupational exposure, and technological changes that eliminate or reduce occupational exposure. In addition, employers must annually document in the plan that they have considered and begun using appropriate, commercially available, effective, safer medical devices designed to eliminate or minimize occupational exposure. Employers must also document that they have solicited input from frontline workers in identifying, evaluating, and selecting effective engineering and work practice controls.

9. Infectious diseases prevalent in your area

Another element of an ECP should include the infectious diseases prevalent in your area. Collaborate and interact with your local health department to gather this information. Many states post this information online. You can also conduct a risk assessment to determine which diseases to target. The lists included in the Ryan White Act are a good starting point. Signs and symptoms as well as prevention methods should be discussed and updated annually.

Even with your ECP and all the safety nets in place, there are going to be times when gloves tear, clothes over nonintact skin get soaked with blood, or a coughing patient sprays an unprotected face. This is when planning comes to fruition, as demonstrated by the case study presented here.

Case Study

During a search of a suspect in custody, a law enforcement officer is stuck deeply by a recently

used, uncapped heroin syringe. In line with the Police Agency's Exposure Control Plan they contact the agency DICO/IP who triages the situation, advises that the officer needs to report to the local emergency room, with the suspect, for a source blood draw. The IP reminds the officer that their immunization record indicates a Tdap 4 years ago and a post-HBV series titer >150 mIU/mL (anything ≥ 10 mIU/mL is protective against HBV acquisition; testing the suspect for HBV is not necessary). The suspect consents to HIV, HCV, and syphilis testing and is found to be HIV positive and HCV negative after testing. The syphilis lab is pending. The cost of the suspect's testing is part of the officer's workers' compensation case. The officer has baseline labs drawn, is counseled, and given the first dose of postexposure prophylactic antiviral medications within the first several hours following exposure. The officer will receive follow-up with labs and counseling. The hospital IP calls the agency DCIO/IP the next day with the syphilis results. With preexisting relationships among providers, the facility IP, and agency DICO/IP, appropriate service was provided in a timely fashion. Note: this situation also calls for an entry on the agency's sharps log, even though the type of device is listed as unknown. Some risk mitigation with the officer would be to discuss the inherent exposure risk and encourage the use of Kevlar gloves during pat downs.

The Ryan White Act

The Ryan White HIV/AIDS Treatment Extension Act of 2009 (Pub. L. 111-87) addresses notification procedures and requirements for medical facilities and state public health officers and their designated officers regarding exposure of emergency response employees (EREs) to potentially life-threatening infectious diseases.⁵ The Ryan White Act identifies other infectious diseases of concern.⁶ The list of potentially life-threatening infectious diseases to which EMS system responders may be exposed was presented previously in this guide. These diseases include those caused by any transmissible agent included

in the Department of Health and Human Services (HHS) Select Agents List. Many are not routinely transmitted human to human but may be transmitted by exposure to contaminated environments. The HHS Select Agents List is updated regularly and can be found on the National Select Agent Registry website: <http://www.selectagents.gov/>. See Example 6.2 for a list of Select Agents as of December 5, 2012.

The Ryan White Act specifies that medical facilities must respond to appropriate requests by making determinations about whether EMS system responder's have been exposed to infectious diseases as soon as possible but no longer than 48 hours.

A medical facility has access to two types of information related to a potential exposure incident to use in making a determination.

First, the DICO's request submitted to the medical facility contains a "statement of the facts collected" about the EMS system responder's potential exposure incident. Information about infectious disease transmission provided in relevant CDC guidance documents^{7, 8, 9} or in current medical literature should be considered in assessing whether there is a realistic possibility that the exposure incident described in the statement of the facts could potentially transmit an infectious disease.

Second, the medical facility possesses medical information about the victim of an emergency transported and/or treated by the EMS system responder. This is the medical information that the medical facility would normally obtain according to its usual standards of care to diagnose or treat the victim, since the Act does not require special testing in response to a request for a determination. Each state varies in their consent and testing requirements so check with your state or local health department to determine your process.

Information about the potential exposure incident and medical information about the victim

should be used to make one of four possible determinations (see <http://www.cdc.gov/niosh/topics/ryanwhite/> for easy-to-follow flow charts with procedures for notification of possible exposure to infectious diseases).

1. **The EMS system responder involved has been exposed to an infectious disease included on the list.**

Facts provided in the request document a realistic possibility that an exposure incident occurred with potential for transmitting a listed infectious disease from the victim of an emergency to the involved EMS system responder; and the medical facility possesses sufficient medical information allowing it to determine that the victim of an emergency treated and/or transported by the involved EMS system responder had a listed infectious disease that was possibly contagious at the time of the potential exposure incident.

2. **The EMS system responder involved has not been exposed to an infectious disease included on the list.**

Facts provided in the request rule out a realistic possibility that an exposure incident occurred with potential for transmitting a listed infectious disease from the victim of an emergency to the involved EMS system responder; or the medical facility possesses sufficient medical information allowing it to determine that the victim of an emergency treated and/or transported by the involved EMS system responder did not have a listed infectious disease that was possibly contagious at the time of the potential exposure incident.

3. **The medical facility possesses no information on whether the victim involved has an infectious disease included on the list.**

The medical facility lacks sufficient medical information allowing it to

determine whether the victim of an emergency treated and/or transported by the involved EMS system responder had, or did not have, a listed infectious disease at the time of the potential exposure incident.

If the medical facility subsequently acquires sufficient medical information allowing it to determine that the victim of an emergency treated and/or transported by the involved EMS system responder had a listed infectious disease that was possibly contagious at the time of the potential exposure incident, then it should revise its determination to reflect the new information.

4. **The facts submitted in the request are insufficient to make the determination about whether the EMS system responder was exposed to an infectious disease included on the list.**

Facts provided in the request insufficiently document the exposure incident, making it impossible to determine if there was a realistic possibility that an exposure incident occurred with potential for transmitting an infectious disease included on the list from the victim of an emergency to the involved EMS system responder.

Good relationships with your area hospitals will expedite the process for an EMS system responder to be seen and have a source patient's blood drawn. (Note that the source patient is never charged for the lab work requested by your agency and the request must be in writing. It is the agency's financial responsibility. In some jurisdictions the cost of the source patient labs becomes part of the workers' compensation case of the exposed/injured EMS system responder.)

All treatment for postexposure management should follow the recommendations. See Figures 6.6 to 6.14 for algorithms of postexposure management guidelines for hepatitis B (known

responder, anti-HBs > 10 IU/mL; unvaccinated and source unknown; known and vaccinated nonresponder; vaccine response unknown), hepatitis C, HIV, and TB and anthrax (inhalation and cutaneous) set forth by the CDC guidelines, June 2001, October 2001, September 2005, December 2005, and August 2008 or more recent updated CDC guidelines. EMS agencies can develop postexposure guidelines and flow charts such as these examples from the CDC guidelines.

Program models

In one area of the country, five public service agencies have pooled their resources (occupational health nurses) for after-hours triage of exposure incidents. All agencies have widely disseminated an exposure control contact phone number to be used by employees in the event of an occupational exposure. The number is answered by an answering service who then pages the DICO (or on-call RN). That DICO calls the worker to determine the specifics of the exposure and then completes a standard form (see Examples 6.3 and 6.4). NFPA 1581, Standard on Fire Department Infection Control Program, 2005 edition, also has an example of a sample exposure report. If the employee needs to be seen at a hospital, the DICO calls ahead to the emergency room with basic information and request for source testing, if consent can be obtained. If the situation warrants, the hospital or infectious disease physician starts the employee on postexposure prophylaxis. Each agency follows up with their employee.

Note: A standard two-drug postexposure prophylaxis regime can cost as much as \$2000 for the required 28-day supply. In your preplanning discussions, consider asking the provider to write the first prescription for 3 to 7 days, as the regime is not always tolerated well and one of the drugs may be stopped. The individual placed on postexposure prophylaxis should be seen and evaluated at 72 hours.

Many agencies utilize Field Operations Guides (FOG) as a checklist for action in an exposure incident. See Example 6.5.

Special situations/concerns

- In an officer-involved shooting, the officer is typically not immediately available to the DCIO/IP. Ensure someone in the command structure has on their checklist to determine if the officer experienced a blood or tissue exposure. If so, they should notify the DICO/IP so source testing can be requested of the hospital or medical examiner.
- Agencies should have a specific plan for cleaning blood and OPIM from patrol cars and transport vehicles. If inmate workers are used, they and their supervisors should be trained in exposure control methods and proper use of PPE.
- Fire departments are sometimes requested to “wash down” a scene on public property that has blood and OPIM. A safer response would be a protocol involving absorbent pads and appropriate PPE. The reason for this is to prevent the introduction of large amounts of biological material into waterways that may cause pollution concerns and increased exposure risks if blood splatters onto EMS system responders.
- Clearing homeless camps should follow a standard procedure to decrease the risk of exposure to rodents, human waste, infested bedding, needles, and booby-traps.
- There are situations in which the patient is not transported to the hospital. The patient may be pronounced dead at the scene or refuse transport. The coroner or medical examiner is responsible for ensuring the deceased source patient’s blood is drawn in a postexposure event. Many states have statutes and procedures

in place and a close cooperative working agreement with the medical examiner's office can provide the efficient completion of postexposure testing of the deceased patient. The process in some states requires a signed affidavit attesting to the circumstances of the exposure. After review by the local health authority, the source patient can be traced and requested to submit to testing. There are also provisions for court-ordered testing should a voluntary attempt be unsuccessful.

- On occasion, police, correctional facility officers, and other emergency system responders are intentionally bitten by suspects or prisoners. When such bites occur, routine medical treatment (including assessment of tetanus status) should be implemented as soon as possible, since bites can result in infection with organisms other than HIV and HBV.

Cited References

1 Occupational transmission of *Neisseria meningitidis*-California 2009. *MMWR Recomm Rep* Nov 19 2010;59(45):1480-1483.

2 Harris S, Nicolai L. Occupational exposures in emergency medical service providers and knowledge of compliance with universal precautions. *Am J Infect Control* 2010;38:86-94.

3 Carrico R, ed. *APIC text of infection control and epidemiology*. Washington, DC: Association for Professionals in Infection Control and Epidemiology, Inc., 2009; chapter 113.

4 OSHA. *Occupational exposure to blood borne pathogens precautions for emergency responders*, OSHA 3130 (Revised) 1998. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10051. Accessed January 24, 2013.

5 *Federal Register* Nov 2 2011;RWCA76(212).

6 *Federal Register* Nov 2 2011;RWCA76(212):67741.

7 Siegel JD, Rhinehart E, Jackson M, Chiarello L, The Healthcare Infection Control Practices Advisory Committee. *The guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings 2007*. Available at: <http://www.cdc.gov/hicpac/2007ip/2007isolationprecautions.html>. Accessed December 13, 2012.

8 Implementation of Section 2695 (42 USC 300ff-131) of Public Law 111-87: Infectious Diseases and Circumstances Relevant to Notification Requirements. *Federal Register* Nov 2 2011;76(212). Available at: <http://www.cdc.gov/niosh/topics/ryanwhite/pdfs/FRN11-2-2011GPO.pdf>. Accessed January 24, 2013.

9 CDC. *Bloodborne pathogens and aerosols*. Available at: <http://www.cdc.gov/oralhealth/infectioncontrol/faq/>. Accessed January 24, 2013.

Additional Resources

Northwest AIDS Education and Training Center. Reproducible guide for postexposure prophylaxis for Occupational Bloodborne Exposures. Available at: <http://depts.washington.edu/nwaetc/resources/PEPManual.pdf>

North Dakota Ambulance Service Exposure Control Plan. Available at: <http://www.ndhealth.gov/EMS/Protocol.htm>

Example 6.1

EXPOSURE DETERMINATION

A. Employees with Potential for Occupational Exposure to BBP

The following categories of employees employed by the fire department are considered to have risk of occupational exposure to BBP:

1. All line personnel: All individuals in this class have a potential for occupational exposure. This includes all line firefighters, individuals that work a 40-hour week and work call-shifts, and administrative personnel that are involved in or present during ongoing fire and rescue services provided by the department.

The following job classifications are included in this category:

a.	Chief	b.	Division Chiefs
c.	Deputy Chiefs	d.	Fire Battalion Chiefs
e.	Fire Captains	f.	Fire Lieutenants
g.	Firefighters	h.	Fire Investigators
i.	Fire Inspectors	j.	EMS Specialists

Support Personnel: Other personnel who could have occupational exposure include:

a.	EMS support personnel	b.	Occupational Health Coordinator
c.	Hazardous Materials Coordinator	d.	Emergency Vehicle Technicians, delivery and shop personnel

B. Incidents and Procedures with Potential for Occupational Exposure

1. Firefighter/EMTs are involved in many types of incidents which have potential for occupational exposure. These incidents include, but are not limited to:

a.	Fires	b.	Extrications
c.	Forcible entries	d.	Water rescue
e.	Explosions	f.	Emergency medical calls
g.	Social problem intervention	h.	Hazmat related calls and disposition
i.	Scene clean up, decontamination, and disposal		

EXPOSURE DETERMINATION, continued

2. Tasks performed during or following emergency response incidents which could involve exposure include but are not limited to:

	Task	Gloves	Protective eyewear	Mask	Gown
a.	Airway management/intubation/suction	Yes	Yes	Yes	No
b.	Starting IVs/IOs	Yes	No	No	No
c.	Trauma, dressing wounds	Yes	Yes	Yes	Yes
d.	Obtaining blood samples	Yes	No	No	No
e.	Public assist calls	Yes	No	No	No
f.	Moving, evaluating, or treating patients	Yes	No	No	No
g.	Administering medications	No	No	No	No
h.	Performing CPR/mouth-to-mouth resuscitation (if off-duty and no barrier device was available)	Yes	No	No	No
i.	Handling, cleaning, and disposing of contaminated equipment or materials	Yes	Yes	No	*Varies
j.	Extrication/trauma	Yes	Yes	Yes	*Varies
<p>* Depending on volume of bodily fluids present</p> <p>Source: CDC. <i>2007 guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings</i>. Available at: http://www.cdc.gov/hicpac/2007IP/2007ip_table4.html. Accessed January 24, 2013.</p>					

Example 6.2

SELECT AGENTS AND TOXINS

The following biological agents and toxins have been determined to have the potential to pose a severe threat to both human and animal health, to plant health, or to animal and plant products. An attenuated strain of a select agent or an inactive form of a select toxin may be excluded from the requirements of the Select Agent Regulations. The list of excluded agents and toxins can be found at: <http://www.selectagents.gov>

HHS SELECT AGENTS AND TOXINS

Abrin
 Botulinum neurotoxins
 Botulinum neurotoxin producing species of *Clostridium*
 Cercopithecine herpesvirus 1 (Herpes B virus)
Clostridium perfringens epsilon toxin
Coccidioides posadasii/Coccidioides immitis
 Conotoxins
Coxiella burnetii
 Crimean-Congo hemorrhagic fever virus
 Diacetoxyscirpenol
 Eastern Equine Encephalitis virus
 Ebola virus
Francisella tularensis
 Lassa fever virus
 Marburg virus
 Monkeypox virus
 Reconstructed replication competent forms of the 1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments (Reconstructed 1918 Influenza virus)
 Ricin
Rickettsia prowazekii
Rickettsia rickettsii
 Saxitoxin
 Shiga-like ribosome inactivating proteins
 Shigatoxin
 South American Hemorrhagic Fever viruses
 Flexal
 Guanarito
 Junin
 Matchupo
 Sabia
 Staphylococcal enterotoxins
 T-2 toxin
 Tetradotoxin
 Tick-borne encephalitis complex (flavi) viruses
 Central European Tick-borne encephalitis
 Far Eastern Tick-borne encephalitis
 Kyasanur Forest disease
 Omsk Hemorrhagic Fever
 Russian Spring and Summer encephalitis
 Variola major virus (Smallpox virus)
 Variola minor virus (Alastrim)
Yersinia pestis

OVERLAP SELECT AGENTS AND TOXINS

Bacillus anthracis
Brucella abortus
Brucella melitensis
Brucella suis
Burkholderia mallei (formerly *Pseudomonas mallei*)
Burkholderia pseudomallei (formerly *Pseudomonas pseudomallei*)
 Hendra virus
 Nipah virus
 Rift Valley fever virus
 Venezuelan Equine Encephalitis virus

USDA VETERINARY SERVICES SELECT AGENTS

African horse sickness virus
 African swine fever virus
 Akabane virus
 Avian influenza virus (highly pathogenic)
 Bluetongue virus (exotic)
 Bovine spongiform encephalopathy agent
 Camel pox virus
 Classical swine fever virus
Ehrlichia ruminantium (Heartwater)
 Foot-and-mouth disease virus
 Goat pox virus
 Japanese encephalitis virus
 Lumpy skin disease virus
 Malignant catarrhal fever virus
 (Alcelaphine herpesvirus type 1)
 Menangle virus
Mycoplasma capricolum subspecies *capripneumoniae*
 (contagious caprine pleuropneumonia)
Mycoplasma mycoides subspecies *mycoides* small colony (*MmmSC*) (contagious bovine pleuropneumonia)
 Peste des petits ruminants virus
 Rinderpest virus
 Sheep pox virus
 Swine vesicular disease virus
 Vesicular stomatitis virus (exotic): Indiana subtypes
 VSV-IN2, VSV-IN3
 Virulent Newcastle disease virus¹

USDA PLANT (PPQ) SELECT AGENTS

Peronosclerospora philippinensis
Phoma glycnicola (formerly *Pyrenochaeta Yersinia pestis glycines*)
Ralstonia solanacearum race 3, biovar 2
Rathayibacter toxicus
Sclerophthora rayssiae var. *zeae*
Synchytrium endobioticum
Xanthomonas oryzae
Xylella fastidiosa (citrus variegated chlorosis strain)

¹ A virulent Newcastle disease virus (avian paramyxovirus serotype 1) has an intracerebral pathogenicity index in day-old chicks (*Gallus gallus*) of 0.7 or greater or has an amino acid sequence at the fusion (F) protein cleavage site that is consistent with virulent strains of Newcastle disease virus. A failure to detect a cleavage site that is consistent with virulent strains does not confirm the absence of a virulent virus.

Example 6.3

Communicable Disease Guidelines

Exposure Description	Action Required
Exposure of open skin, cuts, or breaks or mucous membranes, such as eyes, nose, or mouth to blood or body fluids. This includes needlesticks and human bites.	Clean exposed area with soap and large amounts of water; if in the mouth, rinse and spit repeatedly; flush eyes as appropriate. Provide first aid if needed. Call your DICO.

When calling the Exposure Control Line DICO, establish a procedure that is appropriate for the agency and setting. This should be addressed in the ECP.

- Identify self and your agency
- State issue briefly
- Give your call back number
- If not contacted by the DICO within 20 minutes, call the Exposure Control Line again

It is helpful if you have information about the “source person” you were in contact with and call as soon as possible, preferably from the emergency department where the patient was delivered.

- Name
- Date of birth
- Their location/contact information

Example 6.4

Occupational Exposure Worksheet		
Caller name: _____	Date: _____	Time: _____
Employee name: _____	Exposure date: _____	
Employer: _____	Exposure time: _____	
Phone: (w) _____ (h) _____ (c) _____		
Any other agencies responding to same incident? _____		
Type of Exposure:	<input type="checkbox"/> ID <input type="checkbox"/> HAZMAT	Source of Exposure:
<input type="checkbox"/> Mucous membrane _____		<input type="checkbox"/> Blood _____
<input type="checkbox"/> Needle/sharp _____		<input type="checkbox"/> Vomit _____
<input type="checkbox"/> Open skin _____		<input type="checkbox"/> Urine _____
<input type="checkbox"/> Intact skin _____		<input type="checkbox"/> Saliva _____
<input type="checkbox"/> Respiratory _____		<input type="checkbox"/> Feces _____
<input type="checkbox"/> Clothes/equip _____		<input type="checkbox"/> Respiratory _____
<input type="checkbox"/> Airborne _____		<input type="checkbox"/> Smoke _____
<input type="checkbox"/> Other _____		<input type="checkbox"/> Other _____
<u>Narrative of exposure incident:</u>		

<u>Precautions:</u>		
<input type="checkbox"/> Eyewear	<input type="checkbox"/> Mask	<input type="checkbox"/> SCBA <input type="checkbox"/> Turnouts <input type="checkbox"/> Gloves <input type="checkbox"/> Other
<u>Immunizations:</u>	<u>Counseling Issues</u>	
<input type="checkbox"/> HepB Vacc Date: _____	<input type="checkbox"/> HIV stats	<input type="checkbox"/> PEP
<input type="checkbox"/> Titer Date: _____	<input type="checkbox"/> Hep B	<input type="checkbox"/> Hep C
<input type="checkbox"/> Tetanus Date: _____	<input type="checkbox"/> Standard Prec	<input type="checkbox"/> Risks
<input type="checkbox"/> Tb Date: _____	<input type="checkbox"/> Blood donation	<input type="checkbox"/> Sex
<input type="checkbox"/> Other: _____	<input type="checkbox"/> Tb/Airborne	<input type="checkbox"/> Meningitis

Example 6.5

Blood and Body Fluid Exposure

Field Operations Guide (FOG)

Any of the following events will be considered a bloodborne exposure and require the DICO (Designated Infection Control Officer) to follow all steps outlined here.

1. Blood or amniotic fluid splash to the eyes, nose, or mouth.
2. Blood or amniotic fluid comes in contact with nonintact skin.
3. Contaminated needlestick.
4. Blood or amniotic fluid soaked clothing over nonintact skin.

The DICO will complete the following steps immediately and initial each box as completed.

- Upon dispatch contact unit and verify progress of source patient blood testing.
- Verify decontamination has been completed by the exposed employee.
- Place the unit out of service upon completion of the call.
- Contact supervisor to advise of the exposure and confirm the dispatch of the DICO.

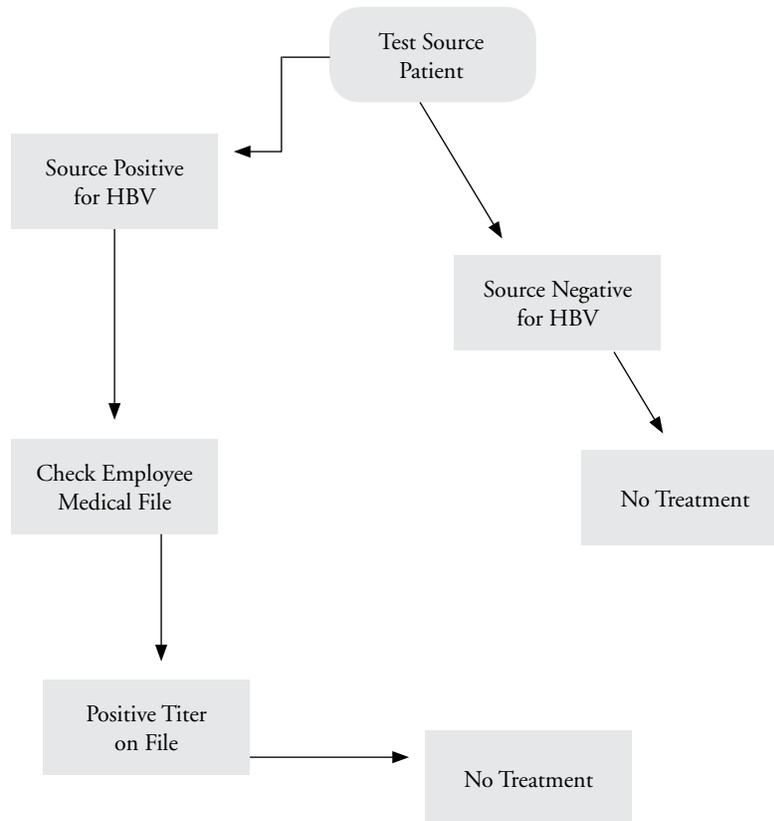
The DICO will complete the following steps as soon as possible after the exposure and initial each box as completed.

- Contact hospital for source patient testing.
- Have source blood sample drawn by authorized medical personnel.
- Verify exposed employee gets follow-up counseling and treatment, if required.

During the course of the FOG either the DICO or EMS Field Supervisor will contact the unit OIC (officer in charge) to determine destination and provide further instructions. This completed form will be presented to the DICO upon arrival.

Figure 6.1. Postexposure HBV Prophylaxis: Known Responder*

(*a responder has adequate levels of serum antibody to HBsAG [i.e., anti-HBs \geq 10 mIU/mL]).

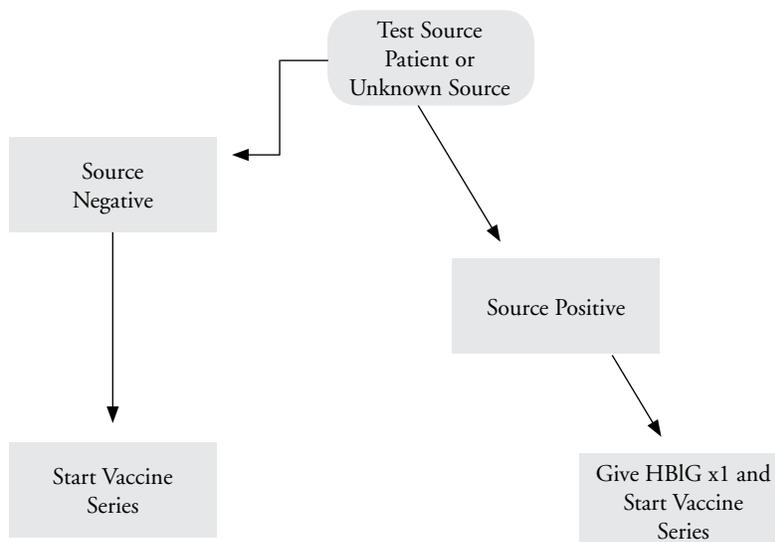


CDC. MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008

[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)

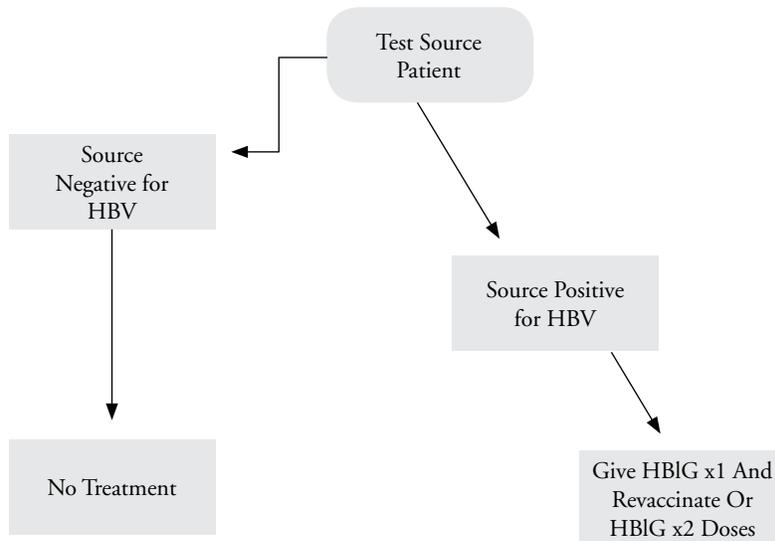
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

Figure 6.2. Postexposure HBV Prophylaxis: Nonvaccinated Employee or Source Unknown



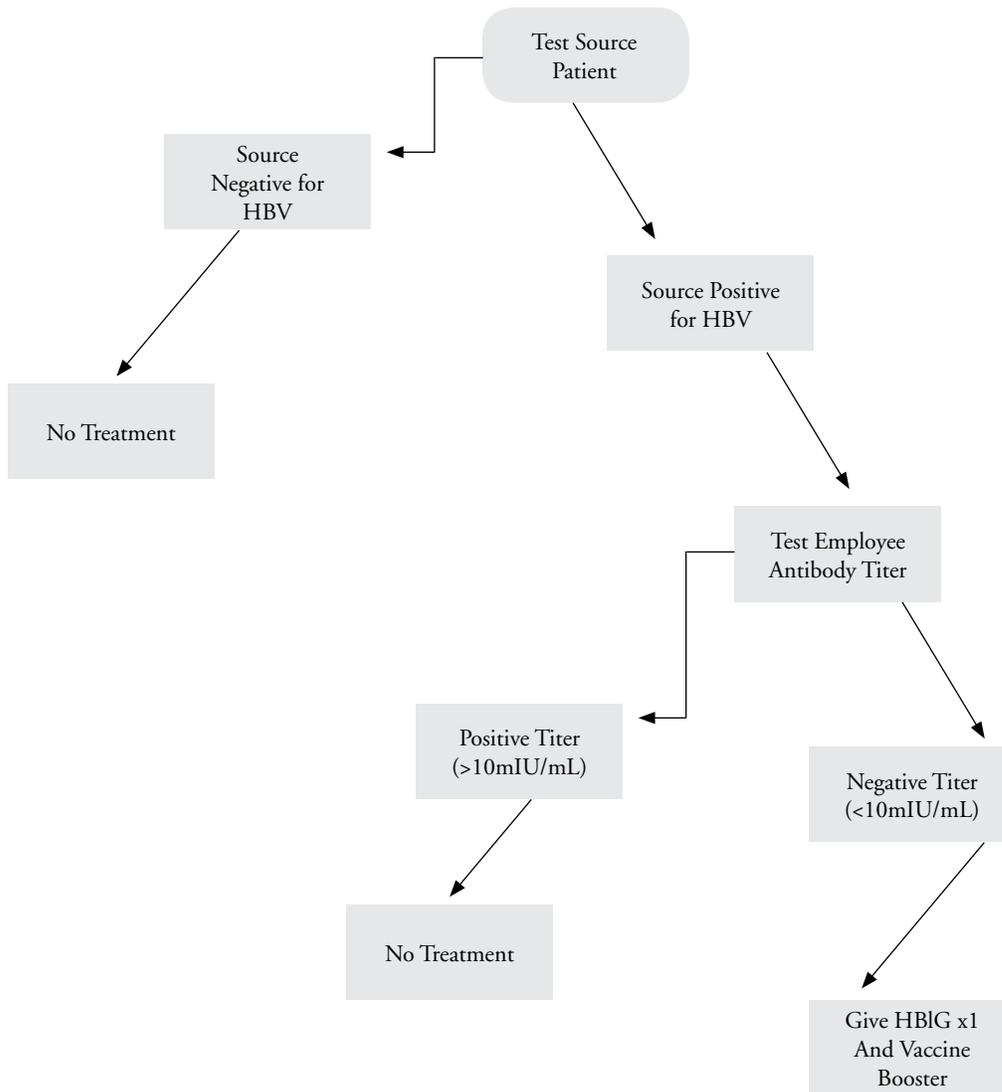
CDC, MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008
[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

Figure 6.3. Postexposure HBV Prophylaxis: Known Vaccine Nonresponder



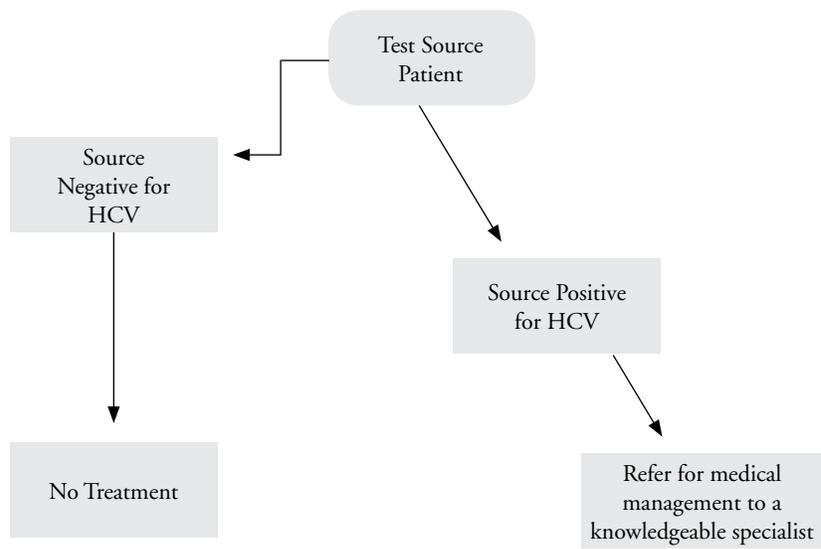
CDC, MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008
[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

Figure 6.4. Postexposure HBV Prophylaxis: Vaccine Response Unknown



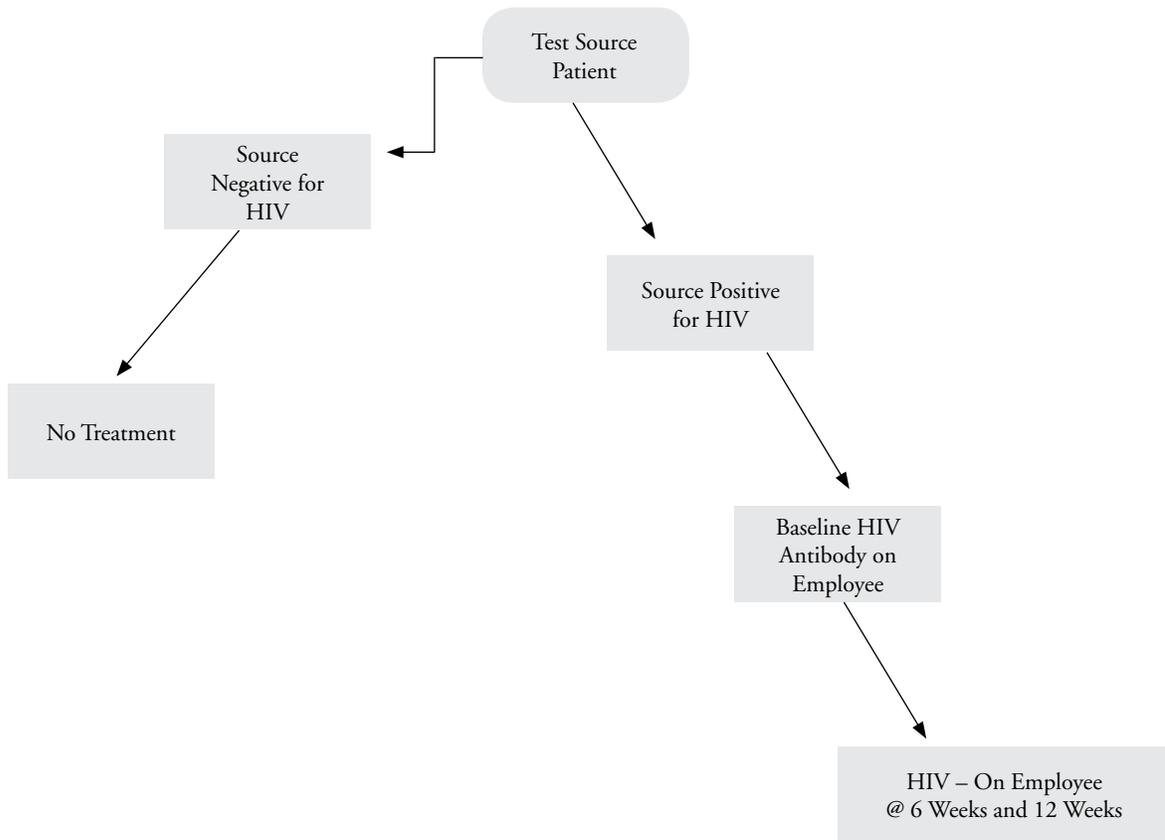
CDC, MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008
[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

Figure 6.5. Post HCV Exposure Prophylaxis



CDC, MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008
[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

Figure 6.6. Post HIV Exposure Prophylaxis



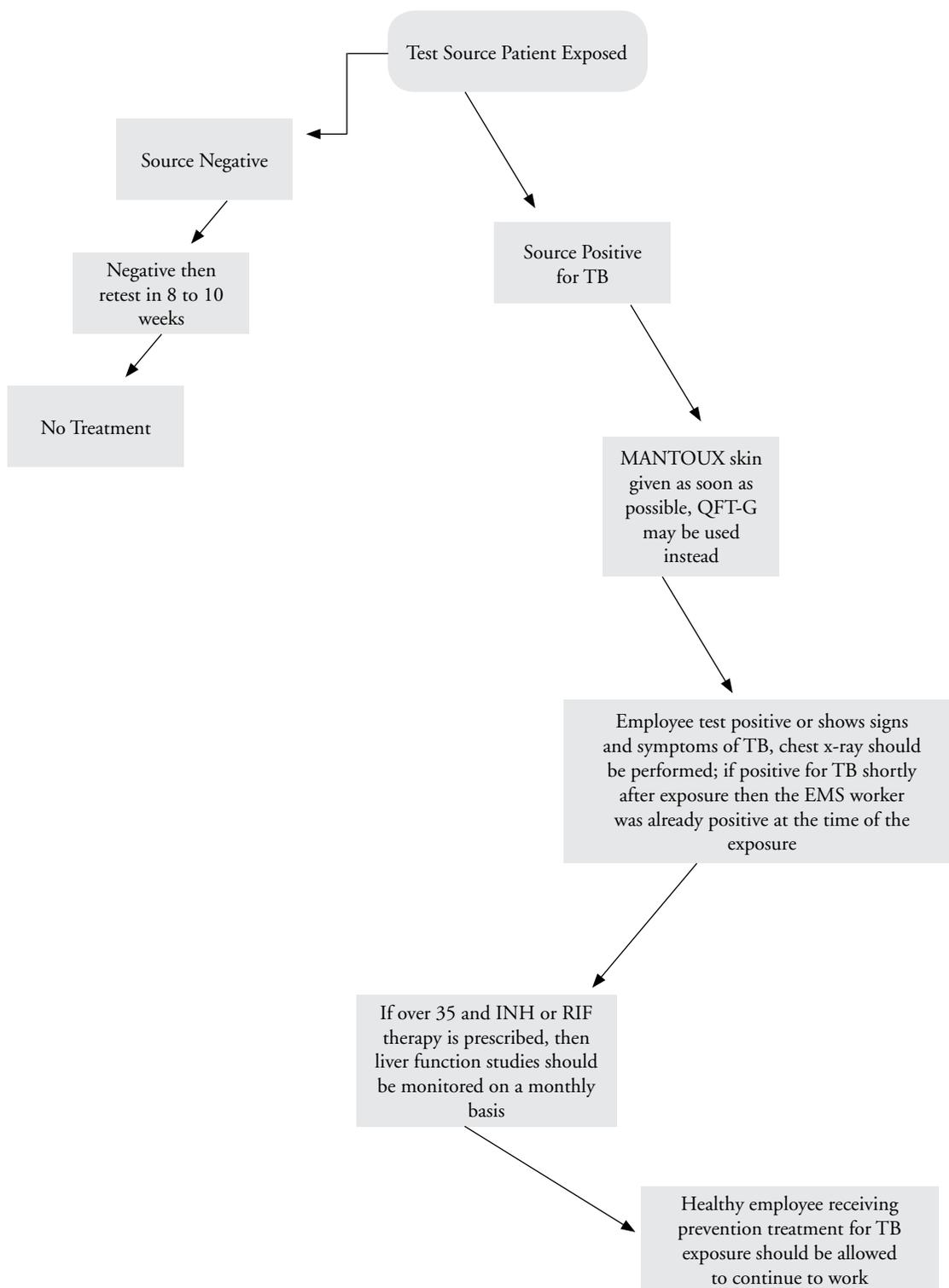
HIV postexposure prophylaxis (PEP) should be started ASAP and preferably within hours. If this is delayed more than 24 to 36 hours, seek expert consultation. PEP should continue for 28 days. Consult an expert for the recommended HIV PEP drug regimen. If information on the source patient is unknown, and the decision to start PEP is made (based on risk factors, exposure type, etc.), PEP should not be delayed; changes can be made as needed after PEP is started. The exposed EMS system responder should be reevaluated within 72 hours as additional information about the source patient is obtained. If source patient is found to be HIV-negative, PEP should be discontinued.

PEP Resources

National Clinicians' Post-exposure Prophylaxis Hotline (PEpline) 1-888-448-4911

CDC, MMWR, June 29, 2001, Sept. 30, 2005, August 1, 2008
[http://www.mpaetc.org/downloads/PEP%20final%20\(2006\).pdf](http://www.mpaetc.org/downloads/PEP%20final%20(2006).pdf)
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5706a1.htm>

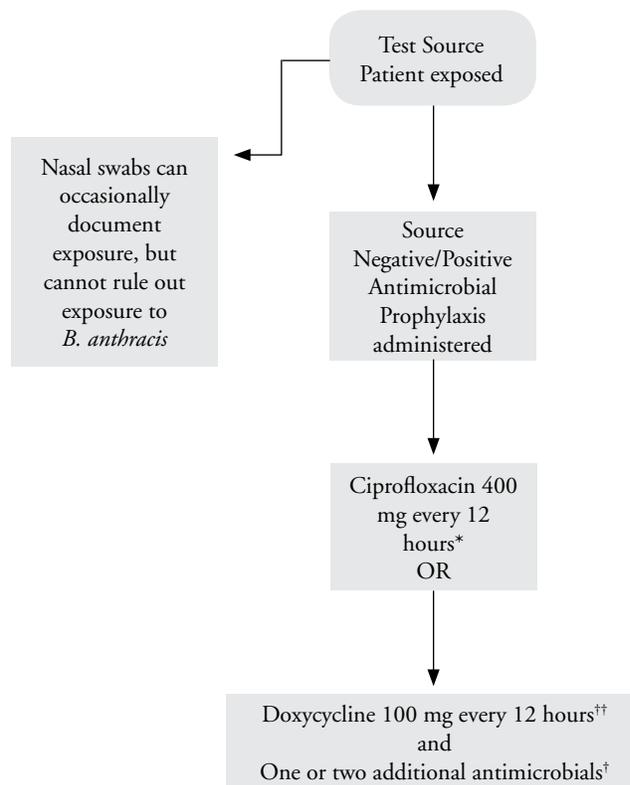
Figure 6.7. Post Tuberculosis Exposure Prophylaxis



CDC, MMWR, December 16, 2005

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5415a4.htm>

Figure 6.8. Post Anthrax (Inhalation) Exposure Prophylaxis



CDC, MMWR, October 26, 2001

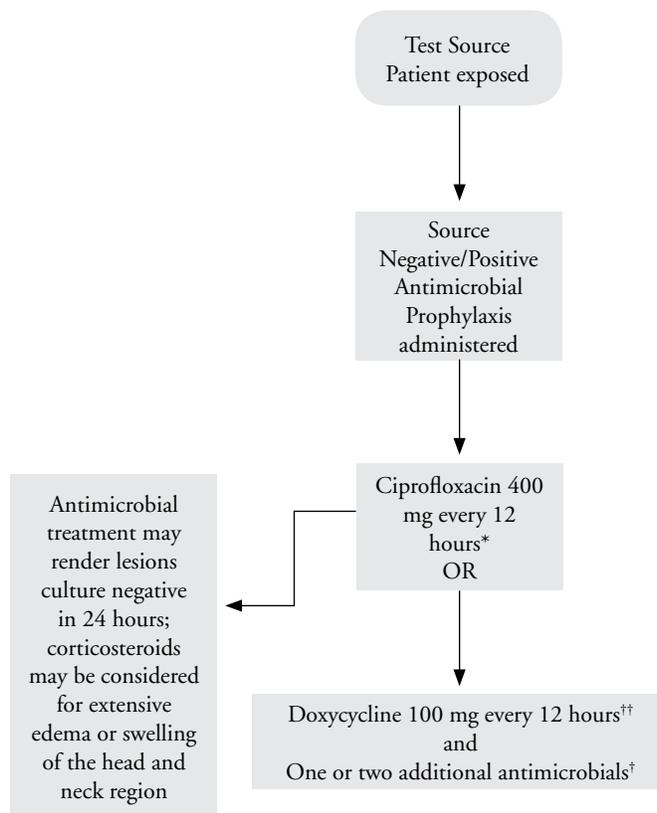
<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5042a1.htm>

* For gastrointestinal and oropharyngeal anthrax, use regimens recommended for inhalation anthrax.

† Other agents with *in vitro* activity include rifampin, vancomycin, penicillin, ampicillin, chloramphenicol, imipenem, clindamycin, and clarithromycin. Because of concerns of constitutive and inducible beta-lactamases in *Bacillus anthracis*, penicillin should not be used alone. Consultation with an infectious disease specialist is needed.

†† If meningitis is suspected, doxycycline may be less optimal because of poor central nervous system penetration.

Figure 6.9. Post Anthrax (Cutaneous) Exposure Prophylaxis



CDC, MMWR, October 26, 2001

<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5042a1.htm>

* Cutaneous anthrax with signs of systemic involvement, extensive edema, or lesions on the head or neck require intravenous therapy, and a multidrug approach is recommended.

† Other agents with *in vitro* activity include rifampin, vancomycin, penicillin, ampicillin, chloramphenicol, imipenem, clindamycin, and clarithromycin. Because of concerns of constitutive and inducible beta-lactamases in *Bacillus anthracis*, penicillin should not be used alone. Consultation with an infectious disease specialist is needed.

†† If meningitis is suspected, doxycycline may be less optimal because of poor central nervous system penetration.

Section 7: Bioterrorism and Infectious Disease Emergency Preparedness

Bioterrorism

Bioterrorism refers to the use of biological agents on civilian or military populations, animals, or crops. A combination of factors have raised concerns about the actual use of bioterrorism agents, including the breakup of the former Soviet Union and the concomitant dispersal of scientists and agents involved in bioterrorism research, the rise of radical groups focused on destroying what they believe to be evil forces, and the discovery of Iraq's stockpiled anthrax, botulinum toxin, and other biological warfare agents. There are a broad range of potential bioterrorism agents, including bacteria, viruses, and other toxins of microbial, plant, or animal origin.

Nature of the bioterrorism threat

The most likely route of dissemination is an aerosolized release of 1 to 5 µm particles. Other methods of dissemination include oral (intentional contamination of food/water supply), percutaneous, infected animal vector (e.g., release of infected fleas), and human-to-human spread (individual infected with communicable disease walking among a crowd of healthy people). Other possible distribution methods, such as mailing a letter or package containing infectious particles, may also be feasible.

Pandemics

A pandemic is a large-scale outbreak that affects at least two continents. Unlike a bioterrorism attack or outbreak of an emerging infection, a pandemic is usually not an event that occurs suddenly, although a pandemic can strike without warning,

as evidenced by the 2009 H1N1 pandemic. The World Health Organization (WHO) describes six phases of a pandemic, starting with the period in which there are few to no human cases from the organism/disease to the period in which there is efficient and sustained disease spread from person to person. The six WHO pandemic phases are outlined in Table 7.1. Pandemics are expected to hit communities in multiple waves, each lasting approximately 6 to 8 weeks, making response a more prolonged event than with other types of disasters. Each pandemic wave will cause significant patient surge, including an increased need for emergency medical services. During an influenza pandemic, attack rates will likely be between 15 and 35 percent across all populations; young children and the elderly are expected to be disproportionately affected and have attack rates close to 40 percent.

Table 7.1. The six phases of pandemic

Phase	Description of the phase
1	Low risk of human cases
2	Higher risk of human cases
3	No or very limited human-to-human transmission
4	Evidence of increased human-to-human transmission
5	Evidence of significant human-to-human transmission
6	Efficient and sustained human-to-human transmission

Adapted from World Health Organization. *Current WHO phase of pandemic alert 2008*. Available at: http://www.who.int/topics/avian_influenza/en/

There are a number of agents that could cause a pandemic, including SARS and plague. Historically, influenza has caused the most pandemics and is expected to cause others in the future. One of the most recent pandemic threats has been H5N1, a strain of influenza A also called “avian influenza.”

Nature of the pandemic threat

As of December 2012, WHO indicates that we are in pandemic phase 3: there is an agent with the capacity to cause a pandemic (influenza A/H5N1), but there is currently no or very limited human-to-human transmission. There have been 610 human cases and 360 deaths from H5N1 avian influenza as of December 2012. It is not known whether H5N1 will continue to mutate and adapt to become more easily spread from person to person, resulting in a pandemic. It is also possible that another strain or organism could emerge and cause a pandemic. A future influenza pandemic is considered inevitable, but it is not known what strain will be involved or when the event will occur.

Infection prevention procedures

The amount of DICO involvement in disaster response depends on the agent involved. In an infectious disease disaster, involvement will be critical, especially if the agent is communicable. Many agents of bioterrorism are not transmitted from person to person, but some are. Most emerging infectious diseases are communicable, but a few are not.

Bioterrorism agents and emerging infectious diseases that are communicable pose the greatest risk to society. Examples of potential infectious disease disasters that involve communicable diseases include pneumonic plague, smallpox, viral hemorrhagic fever viruses, SARS, and pandemic influenza. In these instances, infection prevention will be essential to control the outbreak, prevent future cases, and decrease morbidity and mortality associated with the event.

Isolation, personal protective equipment, and hand hygiene

In addition to pharmacological interventions (anti-infective therapy, chemoprophylaxis, and vaccination), nonpharmacological interventions should be implemented to prevent and control disease spread during an infectious disease disaster. The primary nonpharmacological interventions involve isolation, PPE, and hand hygiene use as discussed previously in this guide. In regard to bioterrorism, the exact necessary infection prevention procedures cannot be estimated before an attack occurs. It depends on many factors, including how soon the release is detected (i.e., whether decontamination and prophylaxis are necessary), how soon the diagnosis is made, how soon appropriate isolation was initiated (i.e., the number of affected individuals), and what agent was used (i.e., whether the agent is contagious). Hand hygiene will be essential during any infectious disease disaster, and will aid in disease spread as well as protecting EMS personnel from exposure and illness.

Any time a bioterrorism-related or emerging infectious disease is suspected, infection prevention guidelines for that specific agent/disease should be followed. At the beginning of an infectious disease disaster when the agent may not have been identified or when there is not enough evidence to determine the disease transmission route, EMS system responders and DICOs need to base infection prevention decisions for patient care on syndromes and symptomology. This is referred to as syndrome-based isolation/control measures. These measures are especially important during an infectious disease disaster involving a newly emerging infection because there may be limited or no information available on the causative agent. Table 7.2 outlines the isolation categories and control measures to be used based on syndromes and symptomology.

SARS was an example of this situation. When SARS first emerged in 2003, the causative agent was unknown, as was the transmission route and control measures needed to prevent disease spread. Infection prevention decisions were made on

Table 7.2. Isolation categories and control measures to be used based on syndromes and symptomatology

Symptoms/syndrome	Isolation precaution category ^{a,b}
Respiratory Cough, runny nose, watery eyes Fever (>101.1°F) and cough in adults ^c Fever (>101.1°F) and cough in children ³ Fever (>101.1°F), cough with bloody sputum, and weight loss or with upper lobe pulmonary infiltrate in an HIV–negative patient or any lobe of an HIV+ patient ³ Fever (>101.1°F), cough, and pulmonary infiltrate in any lobe in patient with a travel history to country with active cases of SARS or avian influenza within past 10 to 21 days ^c	Droplet Droplet Droplet Contact Airborne and Contact, plus eye protection when performing aerosol-generating procedure Airborne and Contact, plus eye protection
Diarrhea and vomiting Vomiting Acute diarrhea with likely infectious cause in an incontinent or diapered patient Watery or explosive stools, with or without blood	Standard Contact Contact
Skin Fever (>101.1°F) and rash Fever (>101.1°F), upper chest rash, and stiff/sore neck Eye infections (drainage from eye) Draining wound/lesion that cannot be covered	Airborne Droplet Standard Contact
Rash Itchy rash without fever Petechial/ecchymotic with fever Rash and positive history of travel to an area with a current outbreak of VHF in the 10 days before fever onset Maculopapular with cough, coryza, and fever Vesicular, especially if centrifugal in pattern	Contact Droplet for 24 hours of antimicrobial therapy Droplet and Contact, plus eye protection (goggles or face shield). Add N95 or equivalent when performing aerosol-generating procedures. Airborne Airborne and Contact

^aAlways use Standard Precautions.

^bIf the causative agent is known, the appropriate isolation precautions for that disease should be used.

^cA temperature of 100°F should be used as the identifier for potential infection to identify the elderly or immunocompromised individuals whose physiological changes tend to mask normal signs of infection. In addition, clinical judgment should always be used.

Adapted from Rebmann T, Wilson R, Alexander S, et al. *Infection prevention and control for shelters during disasters*. Washington, DC: Association for Professionals in Infection Control and Epidemiology; 2008. Available at: <http://www.apic.org> and Siegal JD, Rhinehart E, Jackson M, et al., and the Healthcare Infection Control Practices Advisory Committee. *Guideline for isolation precautions: preventing transmission of infectious agents in healthcare settings 2007*. Available at: <http://www.cdc.gov/hicpac/pdf/isolation/Isolation2007.pdf>

the basis of patients’ symptoms, epidemiological information as it became available, and basic infection prevention principles.

During an infectious disease disaster in which hospitals will be full and potentially contagious patients may be triaged to alternate care sites,

emergency responder agencies should consider educating the public regarding how to implement basic infection prevention strategies in nonhospital settings. This may include isolation and PPE use in long-term care, alternate care sites, home health, medical clinics, community-based evacuation shelters, and any other care sites

that administers healthcare services or houses potentially contagious patients.

Healthcare personnel surge capacity

EMS agencies, organizations, and businesses, including healthcare, should expect high absenteeism rates during an infectious disease disaster.

Absenteeism is expected to be higher during an infectious disease disaster than other types of mass casualty events. Up to 20 percent of the workforce may be affected by illness at the same time during a pandemic, and others will be unable or unwilling to work due to family obligations or fear. WHO recommends that emergency managers plan for a 40 percent absenteeism rate during the peak of pandemic. Healthcare personnel are expected to be infected at the same rate as the general population during an infectious disease disaster, which will further reduce EMS agencies' ability to respond to such an event. EMS agencies need to plan for this increase in healthcare personnel absenteeism. Some recommended ways for increasing healthcare worker surge capacity include the following:

- Having back-up contracts for obtaining extra staff
- Providing incentives to acquire and retain staff
- Prioritizing EMS personnel for anti-infective therapy, prophylaxis, and vaccination
- Offering anti-infective therapy, prophylaxis, and vaccination to family members of EMS personnel

Protection of emergency medical services personnel

EMS personnel will be at high risk of exposure during an infectious disease disaster. Policies and procedures must be in place to protect EMS from exposure and minimize the risk of infection.

One option is to provide pre-event vaccination to EMS professionals. Beginning in 2009, the

CDC recommended that emergency response agencies consider offering staff the anthrax vaccine series pre-event as a way of protecting workers of exposure following an anthrax bioterrorism attack. Other pre-event vaccinations, such as seasonal influenza, should also be offered to EMS professionals to provide protection during an infectious disease disaster. Post event, all EMS professionals should be offered event-specific vaccine when applicable; an example was the prioritization of EMS to receive the H1N1 influenza vaccine during the early part of the H1N1 pandemic when vaccine supplies were insufficient. EMS should be prioritized to receive anti-infective therapy, prophylaxis, and vaccination during an infectious disease disaster when supplies are limited. EMS agencies should partner with community disaster planners to ensure that EMS professionals are included in the list of prioritized groups for pharmaceutical interventions.

EMS personnel should be educated regarding appropriate PPE to use during an infectious disease disaster and ensure that adequate PPE supplies are available. This includes choosing the appropriate PPE to wear for patient care activities as well as when handling suspicious letters or packages that may contain infectious particles. EMS personnel should be educated regarding how to handle suspicious letters or packages to reduce their risk of exposure while maintaining chain of custody for the purposes of investigating potential bioterrorism incidents.

PPE and other medical supplies are expected to be insufficient or depleted during an infectious disease disaster. Many hospitals are developing prioritization plans for allocation of PPE when supplies are limited. EMS agencies need to develop similar plans. PPE allocation should be made based upon the known or suspected risk of exposure during patient care procedures, and on the risk of disease for each worker. For example, aerosolizing procedures, such as cardiopulmonary resuscitation and providing nebulizer treatments, pose a high risk of exposure during outbreaks involving an

airborne or droplet spread disease. During events when PPE is limited, EMS agencies should consider prioritizing staff performing aerosolizing procedures to receive N95 respirators or other respiratory protection. EMS personnel who are at high risk of complications of infection, such as pregnant or immunocompromised workers, should either be prioritized to receive PPE or avoid performing high-risk procedures when PPE supplies are limited. Whenever possible, EMS agencies should develop a pre-event memorandum of agreement (MOA) or memorandum of understanding (MOU) with vendor(s) to ensure access to PPE and other medical supplies during a disaster. MOAs and MOUs will be most critical in preparing for biological disasters.

Decontamination

Decontamination may or may not be an issue after an infectious disease disaster, depending on the following factors:

1. Type of event (bioterrorism versus emerging infectious disease outbreak or pandemic)
2. Causative agent
3. How soon the event is identified
4. Source of concern (environment or patient).

Most infectious disease disasters, including bioterrorism attacks, will likely not require patient decontamination. Pandemics and outbreaks of emerging infectious diseases will not require patient decontamination. In the event of a covert release of a biological agent, patients will not become symptomatic and present to healthcare institutions until days to weeks after the exposure. In this instance, they will most likely have bathed and changed their clothes, thus decontaminating themselves. Only in the event of an announced bioterrorism attack (within 12 to 14 hours after the release) will exposed individuals need to be decontaminated. Patient decontamination consists of bathing, including shampooing of hair, with plain soap and water and changing their

clothing. EMS personnel are likely to be needed in performing patient decontamination in a community. It is essential that EMS professionals are educated about proper patient decontamination procedures to minimize exposure risk to patients and themselves. EMS personnel should participate in periodic exercises involving patient decontamination to ensure they are knowledgeable about these procedures and can perform them appropriately.

Given existing knowledge, environmental decontamination is not considered necessary for outside sources, such as streets, cars, or the outside of buildings after a bioterrorism attack. This is because weather plays a key role in rapidly disseminating biological agents in outside air.

Indoor environmental sources may require decontamination strategies after an infectious disease disaster, but the interventions vary according to the agent involved and the nature of the event. For example, more stringent decontamination methods are necessary for a bioterrorism attack using anthrax because of the hardy nature of spores. As the 2001 bioterrorism attacks illustrated, equipment or areas may require specialized decontamination strategies, such as contained buildings, ventilation systems, or machinery with small parts. EMS personnel may be the first responders on the scene of a potential bioterrorism attack and should be trained on the proper procedures for performing environmental decontamination, including choosing appropriate disinfectants and PPE to wear to protect themselves from exposure during decontamination procedures.

Other agents—especially those that are spread via fomites/contaminated surfaces—require diligent environmental decontamination as well. Strict adherence to environmental decontamination should help reduce disease spread in these situations. For EMS agencies, this includes frequent cleaning/disinfection of the EMS vehicle and medical equipment. Areas within the vehicle that are touched most often, such as stretcher

rails, cabinet handles, etc., should be cleaned/disinfected frequently to minimize bioburden in the environment. Disinfectants used for environmental decontamination should include EPA-registered germicides. All reusable patient care equipment should be disinfected between patients.

Exercises and drills

As part of infectious disease disaster preparedness, it is essential that EMS agencies participate in exercises and drills to test their emergency management plan. EMS exercises and drills should periodically include a biological agent scenario in order to assess the agency's ability to respond to an infectious disease disaster. Whenever possible,

these exercises need to be community-wide— involving EMS agencies, healthcare facilities/ agencies (including long-term care and home health), and community response agencies—to obtain a true sense of the community's preparedness for this type of event.

Cited References

1. Carrico R, ed. *APIC text of infection control and epidemiology*. Washington, DC: Association for Professionals in Infection Control and Epidemiology, Inc., 2009; chapters 117 and 118.
2. CDC. *Strategic national stockpile (SNS)*. Available at: <http://www.cdc.gov/phpr/stockpile/stockpile.htm>. Accessed January 25, 2013.

Section 8: Education, Training, Compliance Monitoring, and Summary

Key concepts

- Education is a critical component of every infection prevention program and must be supported accordingly.
 - Training must be presented by a qualified instructor at an educational level and in a language that EMS system responders understand, and workers must have the opportunity to ask the trainer questions.
 - Standard/planned training and just-in-time training are both useful methods of training EMS system responders on infection prevention.
 - EMS system responders are more likely to comply with infection prevention strategies if they understand the rationale for the prevention strategies.
 - Successful programs stress the importance of preventing transmission of diseases to EMS system responders, coworkers, their families, and patients.
 - EMS system responders must have the opportunity to ask questions and be able to use the DICO as a resource throughout their career.
 - EMS system responders are constantly bombarded with new information and therefore infection prevention must be presented often and be reinforced.
- Infection prevention education should be updated regularly and have evidence-based best practices, regulatory requirements, and compliance as its foundation. Eliminate fear-based training.
 - The value of a vaccination program and postexposure medical follow-up (counseling and education) cannot be understated.

Emergency Medical Services are delivered in various ways to communities. Ambulance companies, EMS departments, fire departments, law enforcement agencies, and volunteer organizations must continue to provide quality patient care. Accordingly, agencies must ensure all EMS system responders have the knowledge and skills to safely respond to medical emergencies. EMS system responders need reinforcement of their knowledge of standard infection prevention precautions and ways to prevent occupational exposures.

DICOs have to ensure that EMS system responders undergo continuing education, specialty training, and just-in-time training to keep up to date on a wide variety of information. Educational programs need to be concise and to the point. A quick drill information session at roll call in the morning before crews “hit the street” is one example of how a program could be reinforced and updated. See Example 8.1 for an example of a quick drill on MRSA.

Example 8.1. Sample quick drill for preventing MRSA infections

Quick Drill
HOT TOPIC: MRSA



There has been a sharp increase in documented exposures to MRSA. Some firefighters' cases of MRSA have been so severe they required hospitalization.

Here are some quick facts regarding MRSA:

- Staph is commonly found on the skin or in the nares (nasal passages) of normally healthy individuals. A small number of these people get MRSA.
- Most of these skin infections are minor (e.g., pimples and boils) and can be treated without antibiotics (also known as antimicrobial or antibacterial).
- Staph bacteria also can cause serious infections (e.g., surgical wound infections, bloodstream infections, and pneumonia).
- Transmission occurs when EMS system responders contact purulent sites of infection or common items found on apparatus or in stations such as stethoscopes or other medical equipment, the remote control, kitchen counter, telephone, and door handles.
- **HANDS** of personnel are the most common mode of transmission.

Here are some things you can do to avoid MRSA:

- Cover patient's draining wounds with clean bandages and use Contact Precautions.
- Wash hands (at least 30 seconds with liquid soap and water), especially after contact with a contaminated wound.
- Launder clothing after contact with a contaminated area on the skin. Dry clothes at least 30 minutes on high.
- Avoid sharing items (e.g., towels, bedding, clothing, razors, or athletic equipment) that may become contaminated by contact with wounds or skin flora.
- Disinfect/clean medical and sports equipment, kitchen counters, and other surfaces with an approved disinfectant or diluted bleach.
- Do not bring contaminated items into station. Decontaminate kits and other items before you go in!!

Training

Training issues have been presented throughout this guide. OSHA standards require new employee infection prevention training to include the agency's Exposure Control Plan, and EMS system responders have to undergo this training before they go on medical calls. The importance of annual infection prevention training cannot be overstated. Training needs to be documented with the date (within a year of the previous date of training), content of training, trainer's name with credentials, and names and job titles of students attending. EMS system responders should have access to infection prevention information at all times whether it is in hard copy form in their rig, at a station, or posted on the agency's intranet site.

Compliance monitoring

Compliance monitoring verifies that the programs you implement to keep EMS system responders safe are working. It also ensures your agency is in compliance with OSHA and/or other federal regulatory standards. Compliance monitoring also drives your training program as it identifies any training needs or problems. Agencies need to establish time frames for monitoring and disciplinary action if policies are not followed. Samples of compliance monitoring forms are provided at the end of this section.

EMS agencies can adopt the HHS seven fundamental elements for developing an effective compliance program¹:

1. Implement written policies, procedures, and standards of conduct
2. Designate a compliance officer and compliance committee
3. Conduct effective training and education
4. Develop effective lines of communication
5. Enforce standards through well-publicized disciplinary guidelines
6. Conduct internal monitoring and auditing
7. Respond promptly to detected offenses and develop corrective action

Also see OSHA's Enforcement Procedures for the Occupational Exposure Bloodborne Pathogens, which can be found at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=2570

Regulations

Federal and state regulations, including OSHA's Bloodborne Pathogens standard, Title 29 of the Code of Federal Regulations at 29 CFR 1910.1030, require that all healthcare workers, including EMS system responders, be provided with information and training on bloodborne pathogen exposure. Employers must ensure that their workers receive regular training that covers all elements of the standard. Employers must offer this training on initial assignment, at least annually thereafter, and when new or modified tasks or procedures affect a worker's occupational exposure. Training records must be kept for 3 years. Agencies must be aware that the standard does not specifically address all of the communicable diseases/pathogens and risks EMS system responders face. Therefore, it is extremely important the person in charge of each agency's infection prevention program—whether it be the EMS medical director, managers, fire chief, occupational health nurses, DICO, etc.—keep up to date with current guidelines, standards, initiatives, program resources, and emerging diseases. A quality infectious disease prevention education program for EMS system responders is imperative.

Components infection prevention education

Education related to infection prevention is an ongoing, constantly changing curriculum. Education for personnel should include the following components:

- Explanation of the agency's written Exposure Control Plan and location of plan for employee access

Guide to Infection Prevention in Emergency Medical Services

- Agency's administrative policies and procedures to ensure employee safety
- Explanation of the OSHA and/or local standards, including contents and compliance
- Infection prevention procedures and use of PPE such as gloves, goggles, and masks
- Recognition of tasks that may result in exposure to blood and OPIM
- Mandatory use of and compliance with appropriate safety devices and methods
- Evaluation, reporting, treatment, and postexposure management of significant exposures to blood and/or body fluids
- Documented symptoms of illnesses, epidemiology, portals of exposure
- Disposal of infectious and/or contaminated waste and sharps disposal
- Current infectious, emerging disease, and bioterrorism education
- Immunization updates and policies
- Education and techniques to minimize risks in the field
- Long-term consequences and dangers of noncompliance with Standard Precautions
- Work restriction guidelines (see Table 2.2)
- Documentation of agency's incidents (annual numbers) and types of employee exposures for each incident
- Reinforcement of potential exposure risks, even from seemingly "healthy" patients
- Understanding risks and causes of disease migration to regions of no previous disease incidence from an increasingly mobile population

Successful infection prevention education for EMS system responders must stress the importance of preventing transmission of diseases while adhering to local and federal standards. Documentation of the training should include a posteducation evaluation to assure all impacted personnel understand the importance of infection prevention and their safety and health risks.

There are many resources available to EMS agencies to create a quality infection prevention education program, including this guide. Contact your local, county, or state health department for further assistance. Other possible sources of assistance include area EMS, Fire, Public Safety, or Law Enforcement agencies. Many have programs in place and will share them at no cost. DICOs and program administrators must stay current on infectious diseases and infection prevention issues, laws, and regulations applicable to their departments. Practices must be evidence-based.

It is imperative that leadership supports and emphasizes the importance EMS system responder protection and patient safety. Patient care, devices, types of patients, and procedures change rapidly and EMS system responders have to be properly educated to avoid injury and exposure. The cost of training pales in comparison to the cost of treating one exposure or sharps injury. A properly implemented infection prevention program can save an agency countless dollars from OSHA fines and the fees associated with unnecessary emergency department visits. It can also prevent human and organizational resource issues related to an employee exposure such as emotional trauma, replacement costs, increased insurance rates, fear of exposing other EMS system responders, and unwanted media attention. Strong leadership is the driving force behind a quality infection prevention program.

Guide to Infection Prevention in Emergency Medical Services

Compliance Checklist* – General Infection Prevention			
Practice Performed			Date: _____
Policies/Task/Procedure	Yes	No	Comments
1. Written infection prevention policies and procedures are available and current	<input type="checkbox"/>	<input type="checkbox"/>	
2. Personal protective equipment was available, donned, and removed appropriately	<input type="checkbox"/>	<input type="checkbox"/>	
3. Hand hygiene supplies provided and appropriate hand hygiene observed	<input type="checkbox"/>	<input type="checkbox"/>	
4. Gloves were used according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
5. Gloves were appropriately discarded after patient care	<input type="checkbox"/>	<input type="checkbox"/>	
6. Protective eyewear (goggles) were used according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
7. Masks were used according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
8. PPE was properly disposed of according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
9. All sharps were disposed of in a puncture-resistant container	<input type="checkbox"/>	<input type="checkbox"/>	
10. Filled sharps containers are disposed of according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
11. Vehicles were cleaned following medical calls	<input type="checkbox"/>	<input type="checkbox"/>	
12. Cleaning/decontamination was done using disinfectant/bleach according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
13. Station environmental services were cleaned/disinfected according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
14. Decon station is appropriately marked and used according to policy	<input type="checkbox"/>	<input type="checkbox"/>	
15. Infection prevention policies and procedures are reassessed at least annually or according to state or federal requirements	<input type="checkbox"/>	<input type="checkbox"/>	

Employee Signature: _____

Infection Prevention Staff/DICO _____

Comments:

*Adapted from CDC. Infection prevention checklist for outpatient settings: minimum expectation for safe care. Available at: <http://www.cdc.gov/HAI/pdfs/guidelines/ambulatory-care-checklist-07-2011.pdf>. Accessed January 25, 2013.

Guide to Infection Prevention in Emergency Medical Services

Infection Control Policy and Checklist*			
Review the recommendations for disinfection procedures below. Utilize this checklist to ensure daily and periodic cleaning and disinfection control is practiced at your station.			
General	Yes No		
All hard environmental surfaces are cleaned and disinfected daily with an EPA-registered product	<input type="checkbox"/>	<input type="checkbox"/>	
Light switches, doorknobs, door push bars, elevator controls, handrails, and community phones are disinfected daily with an EPA-registered product	<input type="checkbox"/>	<input type="checkbox"/>	
All hard flooring is cleaned and disinfected daily with an EPA-registered product	<input type="checkbox"/>	<input type="checkbox"/>	
Mop heads and buckets utilized for restrooms, locker rooms, and showers should be independent from program areas and office space; mop heads are cleaned and disinfected weekly	<input type="checkbox"/>	<input type="checkbox"/>	
Restrooms: wall dispensers are utilized for liquid soap (no bar soap)	<input type="checkbox"/>	<input type="checkbox"/>	
Exercise/Weight Rooms			
Grip areas on weight bars, dumbbells, and machines are wiped down at the beginning of day (shift), between each use, end of day (shift) with an EPA-registered product or 1:100 bleach solution; grip areas should not be taped	<input type="checkbox"/>	<input type="checkbox"/>	
Wall padding, lifting benches, stationary bike seats, and/or floor mats are cleaned daily with an approved product or 1:100 bleach solution	<input type="checkbox"/>	<input type="checkbox"/>	
Wall dispensers for hand cleaner ($\geq 70\%$ alcohol) are placed at each entry/exit door; signage to indicate minimum use: upon entering/leaving facility	<input type="checkbox"/>	<input type="checkbox"/>	
Shower Rooms/Locker Rooms			
Showers and locker rooms (shower area, locker room floors, and benches) are cleaned and disinfected daily with an EPA-registered product and wall dispensers are utilized for liquid soap and are placed within or directly adjacent to showers (no bar soap)	<input type="checkbox"/>	<input type="checkbox"/>	
Used towels or linens utilized are only handled by employees with gloves	<input type="checkbox"/>	<input type="checkbox"/>	
Towels or linens laundered in EMS facilities are washed at 160°F and dried in a clothes dryer	<input type="checkbox"/>	<input type="checkbox"/>	
Sports Equipment			
All sports equipment used during the day is cleaned and disinfected daily with an EPA-registered product	<input type="checkbox"/>	<input type="checkbox"/>	

*Permission to use this checklist, from Ed Neid, Deputy Chief, Tucson Fire Dept.

1 U.S. Department of Health and Human Services, Office of the Inspector General. Publication of OIG compliance program guidance for clinical laboratories. *Federal Register* 1998;63(163).

References and Resources

CDC. General Resources on Bloodborne Pathogens, Engineering Controls and Personal Protective Equipment. Available at: <http://www.cdc.gov/niosh/topics/bbp/universal.html> Accessed December 13, 2012.

NIOSH Alert, Preventing Needlestick Injuries in Healthcare Settings. Available at: <http://www.cdc.gov/niosh/docs/2000-108/pdfs/2000-108.pdf> Accessed December 13, 2012.

International Association of Firefighters, IAFF, Occupational Disease. <http://www.iaff.org/hs/index.htm> Accessed December 13, 2012.

The Northwest AIDS Education and Training Center. Postexposure Prophylaxis for Occupational Bloodborne Exposures. Available at: <http://depts.washington.edu/nwaetc/resources/PEPManual.pdf>. Accessed December 13, 2012.

APPENDIX A: Sample Ambulance Cleaning Procedures

Salt River Fire Department

Ambulance Cleaning Procedures

Used with permission courtesy of Salt River Fire Department, Scottsdale, Arizona.

Purpose

To ensure that ambulances that are being used for patient transport are properly cleaned after every transport in a standardized manner. To provide for the most sterile environment for Fire Department personnel and the patients they serve. This cleaning and disinfecting procedure is required and essential to ensure employee safety as well as that of the patients that are treated and transported daily.

I. Cleaning the vehicle and EMS equipment between calls and at the end of the shift.

(This should be monitored by the station Captain, whenever possible.)

- A. Personal Protective Equipment (PPE) is used:
 - 1. Isolation gown (if necessary)
 - 2. Mask (if necessary)
 - 3. Eye protection (MANDATORY)
 - 4. Booties (if necessary)
 - 5. Gloves (MANDATORY)
- B. Cleaning and disinfecting of equipment should be performed at the receiving medical facility as much as possible. Some facilities are equipped with a designated area to remove heavily contaminated equipment. Large items can be taken to this area and the majority of the contaminates hosed off into a containment area. Complete PPE should be worn in this area. The fewer contaminated items on board, the lesser the risk to exposure. Some equipment items may take extensive cleaning and decontamination efforts. These items must be red-bagged and transported back to quarters for immediate cleaning.
- C. To clean, deodorize, and disinfect hold the cleaning agent mixture dispenser 10 inches from the surface and atomize with quick short strokes, spraying evenly on contaminated or potentially contaminated areas of the equipment and affected interior patient compartment of the ambulance or other affected portions of the vehicle until wet. Wait 30 seconds and wipe dry with a paper towel. To kill staph, strep, and other common types of virus and bacteria strains, repeat as above, wait 10 minutes, and wipe dry. Blood and other body fluids must be thoroughly cleaned from surfaces and objects before application of the disinfectant.
- D. **Steps in cleaning after each transport:**
 - 1. Remove gurney.

2. All visible debris and soil contaminants are wiped off with towels.
3. Cleaning agent mixture is sprayed liberally on the interior of the transport compartment of the vehicle.
4. Cleaning agent mixture is sprayed liberally on the gurney mattress, the gurney frame, including wheels.
5. All surfaces are inspected to ensure that no visible signs of debris, soil, or contaminants are present; if such signs still exist, then repeat the cleaning process.
6. Towels are disposed of appropriately for washing. Paper towels must be placed in a red or properly marked biohazard bag or container if blood-soaked; otherwise, they may be treated as normal trash per Scottsdale Health Care SOGs.
7. Gloves must be placed in a red or properly marked biohazard bag or container if blood-soaked; otherwise, they may be treated as normal trash per Scottsdale Health Care SOGs.

II. Special Equipment Cleaning Instructions

- A. Patient restraint straps (spine board, gurney); remove immediately when contaminated with blood or body fluids or body substances/secretions and place in a red or appropriately marked biohazard bag.
 1. Straps are washed upon return to the station in an appropriate detergent according to manufactures instruction and recommendations.
 2. Air or machine dry as recommended.
- B. Equipment bags made of Cordura nylon; remove from service immediately when contaminated with blood, body fluids, or body substances/secretions and place in a red or appropriately marked biohazard bag.
 1. The bags will be washed upon return to the station in appropriate detergent according to manufacturer instructions and recommendations.
 2. Air or machine dry as recommended.
- C. MAST/PASG: Before washing, all gauges are removed, using the quick-disconnect tubing and closing all valves. Washing is done by hand in soapy water. **DO NOT DRY CLEAN, BLEACH, STEAM CLEAN, OR USE HARSH CHEMICALS. FOLLOW MANUFACTURERS INSTRUCTIONS.**
- D. Laryngoscope blades and Magill forceps, portable suction units (and any other nondisposable instruments that touch mucous membrane): equipment is cleaned with the cleaning agent mixture ensuring complete coverage with the agent mixture and then rinsing. Ensure that all needles and contaminated scalpels are placed in a sharps container
- E. The radio equipment should be decontaminated by spraying cleaning agent on a towel and wiping down the portable radio and microphones/mobile radio.
- F. Turnouts that have been contaminated should be removed from the individual, bagged in a red bag or appropriate biohazard container, and taken to the station. The turnouts should be first hosed off and brushed using liquid detergent that does not have any chlorine products. Once hosed off, the coat and pants should be separated from the liner (if possible) and placed in a washing machine with soap and hot water. The turnouts and liners should be air-dried. The washing machine should be cleaned using a 10% mixture of bleach and run through a complete cycle.

APPENDIX B: Sample Exposure Control Plan

North Dakota Ambulance Service

Exposure Control

DISCLAIMER

The protocols developed by the North Dakota Department of Health are meant to be used as general guidance for developing protocols for individual emergency medical services agencies. These sample protocols are not meant to be medical or legal advice; nor do they establish standards of care. Each emergency medical services agency must tailor protocols based on their specific needs or capabilities. Local medical directors must be consulted with and approve any protocol(s) prior to becoming operational in an emergency medical services agency.

Ambulances will be following the Occupational Safety and Health Administration (OSHA) standards to limit occupational exposure to blood and other potentially infectious materials since any exposure could result in transmissions of bloodborne pathogens which could lead to disease or death. Each member of the staff will receive training at least annually about the information contained in this plan and will be expected to follow the procedures outlined and use the equipment provided. Any questions should be referred to management.

1. POTENTIAL INFECTIOUS PLACES AND/OR MATERIALS
 - a. Semen
 - b. Vaginal secretions
 - c. Cerebrospinal fluid
 - d. Synovial fluid
 - e. Pleural fluid
 - f. Pericardial fluid
 - g. Peritoneal fluid
 - h. Amniotic fluid
 - i. Saliva
 - j. Any body fluid visually contaminated with blood and all body fluids in situations where it is difficult or impossible to differentiate between body fluids
 - k. Any unfixed tissue or organs other than intact from a human (living or dead) and HIV cells or tissue cultures

**All personnel working on ambulance crews and first responders are at risk for exposure to blood and bodily fluids.

2. Possible areas in the workplace that could be contaminated with bloodborne pathogens:
 - a. Every call could be potential for contamination, therefore it is mandatory that all safety precautions be taken when doing patient care (universal blood precautions).
 - b. Cleaning inside patient care area of ambulance, safety precautions must be followed (universal blood precautions).
 - c. When cleaning any patient care equipment, safety precautions must be followed (universal blood precautions).

3. Personal Protective Equipment that will be provided:
 - a. Nonsterile latex-free gloves.
 - b. Gowns
 - c. Goggles
 - d. Masks
 - e. Sharps disposal system
 - f. Fluid absorbent, dust pan, and whisk broom
 - g. Small resealable plastic bags
 - h. Hand cleaner
4. Universal Precautions
 - a. Nonsterile gloves will be used when handling body fluids, secretions, and excretions as well as articles contaminated with them. Gloves shall be worn when in contact with mucous membranes and nonintact skin.
 - b. Hands shall be washed immediately if they are in contact with blood or body fluids and after completion of each call. Hand sanitizer is a waterless product located in all rigs for times when soap and water washing are not available. Wash your hands with soap and water as soon as you get the opportunity after using the approved hand sanitizer.
 - c. Gown if soiling is anticipated with blood and/or body fluids, secretions, or excretions.
 - d. Goggles, if splashing of blood and/or body fluids is anticipated.
 - e. Mask, if sustained contact with patient who is coughing extensively, for intubated patients being suctioned, or if splashing of blood and/or body fluids is anticipated.
 - f. Dispose of sharps in receptacles. Only recap needles by using one hand to hold the base of the needle as you slide it back into the protective cap. Do not stick your hand or fingers in a sharps container or place garbage in a sharps container.
 - g. Do not eat, drink, smoke, apply makeup or lip balm, or adjust contact lenses in the patient compartment of the ambulance.
5. HBV immunizations
 - a. The service will provide hepatitis B immunizations to all team members.
 - b. The service will also provide annual education on precautionary measures, epidemiology, and modes of transmission and prevention of HIV/HBV.
 - c. Immunizations should be started within ten (10) working days of employment, unless the team member refuses or has medical documentation that states that the team member does not need the immunization.
6. Types of significant exposure:
 - a. Contact with your nonintact skin (i.e., rash, lesion, open/healing wound, etc.).
 - b. Contact with your eyes.
 - c. Contact with your mouth, nose, or mucous membranes.
 - d. Puncture or penetration of your skin by any contaminated object.
7. Nonsignificant exposures:
 - a. Contact with intact skin.
 - b. Contact with clothing that does not soak through.
8. Steps to follow when exposed to body secretions:
 - a. Fill out an incident report to include: (a) name of patient; (b) any precautions that were taken at time of injury.
 - b. Fill out an exposure form at the hospital.

- c. Wait for report that will tell you if you need to be tested.
 - d. If testing is needed, contact your supervisor.
 - e. Copies of all reports must be kept on file at the facility. (These files will be kept confidential.)
 - f. If you test positive for HIV or HBV you can go to the hospital for counseling. All testing should be done as soon as possible or within 24 hours of the exposure.
 - g. Any time contact is made with a patient with a communicable disease, notify the operations supervisor so he/she can contact other responders.
9. Instructions for Exposed Materials:
- a. Contaminated disposable items will be placed in a red garbage bag in the ambulance or at the hospital.
 - b. Reusable equipment will be disinfected. Laryngoscope blades and stylettes shall be cleaned with soap and water, placed in approved cleaner for ten (10) minutes, and washed with soap and water again.
 - c. Soiled linen shall be placed in red bags. Normal bed linen can go to the cleaners.
 - d. Contaminated clothing shall be placed in red bags and taken to the cleaners. Do not take visibly contaminated clothing home to be washed.
10. Ambulance Decontamination
- a. In the event the ambulance is used to transport a patient with a known communicable disease, or the ambulance becomes contaminated with blood or bodily fluid, the unit will be taken out of service after the transport to be cleaned.
 - b. Materials to use for cleaning:
 - i. Spray cleaner (e.g., Hepacide[®] and BH38)
 - ii. Sani Wipes[®]
 - iii. Towels
 - iv. Gloves
 - v. Chlorasorb
 - vi. Broom and dustpan
 - c. Procedures for cleaning:
 - i. Spray all surfaces then wipe.
 - ii. Remove all linen and place in the red garbage bags.
 - iii. Use Chlorasorb or other fluid absorbent if needed to clean up large or small amounts of blood, vomit, urine, etc.
 - iv. After each call the ambulance shall be inspected for bodily fluids and general contaminants. If you suspect contamination, Hepacide or other cleaner shall be used to disinfect the soiled areas. BH38 may be used for general cleaning.
 - d. High Level Decontamination: Hepacide
 - i. Should be done once per month, and will be total ambulance decontamination.
 - ii. Any time bodily fluids cause a biohazard in the unit, the area or equipment will be decontaminated.
 - c. Low Level Cleaning: BH-38
 - i. General cleaning of the unit of soil or as needed.

Medical Director's Signature

Date

APPENDIX C

Definition of Terms

OSHA - Occupational Safety and Health Administration

U.S. Department of Labor

- Bloodborne pathogens. - 1910.1030
- Regulations (Standards - 29 CFR) - Table of Contents
- Part Number: 1910
- Part Title: Occupational Safety and Health Standards
- Subpart: Z
- Subpart Title: Toxic and Hazardous Substances
- Standard Number: 1910.1030
- Title: Bloodborne pathogens.
- Appendix: A

1910.1030(a) ***Scope and Application.*** This section applies to all occupational exposure to blood or other potentially infectious materials as defined by paragraph (b) of this section.

1910.1030(b) ***Definitions.*** For purposes of this section, the following shall apply:

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, or designated representative.

Blood means human blood, human blood components, and products made from human blood.

Bloodborne Pathogens means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Clinical Laboratory means a workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.

Contaminated means the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Contaminated Laundry means laundry which has been soiled with blood or other potentially infectious materials or may contain sharps.

Contaminated Sharps means any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Decontamination means the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Director means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designated representative.

Engineering Controls means controls (e.g., sharps disposal containers, self-sheathing needles, safer medical devices, such as sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.

Exposure Incident means a specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Fomites is an inanimate object or substance, such as clothing, furniture, or soap, that is capable of transmitting infectious organisms from one individual to another.

Hand Washing Facilities means a facility providing an adequate supply of running potable water, soap, and single-use towels or hot air drying machines.

HBV means hepatitis B virus.

HIV means human immunodeficiency virus.

Licensed Healthcare Professional is a person whose legally permitted scope of practice allows him or her to independently perform the activities required by paragraph (f) Hepatitis B Vaccination and Postexposure Evaluation and Follow-up.

Needleless systems means a device that does not use needles for: (1) the collection of bodily fluids or withdrawal of body fluids after initial venous or arterial access is established; (2) the administration of medication or fluids; or (3) any other procedure involving the potential for occupational exposure to bloodborne pathogens due to percutaneous injuries from contaminated sharps.

Occupational Exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Other Potentially Infectious Materials means (1) the following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids; (2) any unfixed tissue or organ (other than intact skin) from a human (living or dead); and (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral means piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions.

Personal Protective Equipment is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Production Facility means a facility engaged in industrial-scale, large-volume, or high concentration production of HIV or HBV.

Regulated Waste means liquid or semiliquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semiliquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

Research Laboratory means a laboratory producing or using research laboratory-scale amounts of HIV or HBV. Research laboratories may produce high concentrations of HIV or HBV but not in the volume found in production facilities.

Sharps with engineered sharps injury protections means a non-needle sharp or a needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with a built-in safety feature or mechanism that effectively reduces the risk of an exposure incident.

Source Individual means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components.

Sterilize means the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

****Universal Precautions** is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

Vector is an organism, such as a mosquito or tick that carries disease-causing microorganisms from one host to another.

Work Practice Controls means controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by technique).

****Although OSHA still uses the term Universal Precautions and focuses mainly on blood exposures, many EMS systems use the more common term Standard Precautions.**

Standard Precautions are based on the principle that all blood, body fluid secretions, excretions except sweat, nonintact skin, and mucous membranes may contain infectious diseases. Implementation of Standard Precautions constitutes the primary strategy for the prevention of healthcare-associated transmission of infectious agents among patients and healthcare personnel.

APPENDIX D

Acronyms and Abbreviations

ARO - Antibiotic-resistant organisms

CDC - The Centers for Disease Control and Prevention

DICO - Designated Infection Control Officers

ECP - Exposure Control Plan

EMT - Emergency medical technicians

EMS - Emergency Medical Services

EPA – Environmental Protection Agency

FOG - Field Operations Guides

HBV – Hepatitis B virus

HCV – Hepatitis C virus

HHS – U.S. Department of Health and Human Services

HIPAA - Health Insurance Portability and Accountability Act

HIV - Human immunodeficiency virus

IP - Infection preventionist

MDRO- Multidrug-resistant organism

MRSA – Methicillin-resistant *Staphylococcus aureus*

MSDS - Material Safety Data Sheets

NIOSH - The National Institute for Occupational Safety and Health

OPIM - Other potentially infectious materials

PPE - Personal protective equipment

SARS - Severe acute respiratory syndrome

SNS - Strategic National Stockpile