

CORHA Principles and Practices for Healthcare Outbreak Response

CHAPTER 1

Overview

TABLE OF CONTENTS

Preface	13
Introduction	13
Overview of Chapter 2: Fundamental Concepts	14
Overview of Chapter 3: Planning and Preparation	17
Overview of Chapter 4: Outbreak Detection and Reporting	20
Overview of Chapter 5: Investigation and Control	23
Overview of Chapter 6: Laboratory Best Practices	27
Overview of Chapter 7: Multifacility and Multijurisdictional Outbreaks ..	29
Overview of Chapter 8: Notification and Communication	31
Overview of Supplement A: Medical Product Investigations	33
Overview of Supplement B: Infection Control Breach Investigations	34



Overview



Preface

The field of healthcare epidemiology has expanded tremendously during the last few decades. What was once a specialty area, narrowly focused within hospital walls, has now grown to an extensive network of healthcare and public health professionals working collaboratively across a wide variety of healthcare settings, government agencies, and partner organizations to decrease healthcare-associated infections (HAIs) and antimicrobial resistance (AR).

One part of this partnership is rapid and efficient outbreak responses to prevent and halt the transmission of pathogens or spread of disease. The *CORHA Principles and Practices for Healthcare Outbreak Response* (hereafter referred to as the *CORHA Principles and Practices*) is intended to be a comprehensive reference comprised of chapters and materials that cover key areas related to HAI/AR outbreak detection, reporting, investigation, and control.

Introduction

Throughout the *CORHA Principles and Practices*, we use the terms “HAI/AR outbreak” and “response.”

The term “HAI/AR outbreak” includes outbreaks involving infections that meet the definition of an HAI as well as infections or colonization with organisms typically associated with the receipt of healthcare, including pathogens demonstrating resistance to antimicrobial treatment (AR pathogens). Public health agencies often respond to outbreaks that extend beyond traditional HAIs and AR pathogens, and beyond exposures found solely within healthcare settings. Therefore, the *CORHA Principles and Practices* includes content applicable to

response activities involving noninfectious chemical and other toxic agents as well as outbreaks that include both healthcare-associated and community cases.

“Outbreak response” (or simply “response”) refers to efforts made to assist with the assessment and investigation of specific, acute HAI/AR risks. The types of hazards addressed by healthcare outbreak response include overt outbreaks, clusters of infections, sentinel cases (e.g., indications of an uncommon HAI or emerging AR threat), and serious breaches in infection control practice. As this list suggests, response activities often extend to cover *potential* outbreaks: situations that portend danger and may require action to assess risk, prevent exposure, or avoid harm. As used in the

Chapter 1 Overview

CORHA Principles and Practices, “healthcare outbreak response” is inclusive of this broader array of event types and activities.

The primary intended audience of the *CORHA Principles and Practices* consists of personnel at public health agencies at the federal, state, and local levels; however, the information presented here can also be useful to healthcare professionals, employees at healthcare facilities, and other partners involved in a healthcare

outbreak response. It is important to acknowledge that the work involved in responding to and preventing HAI/AR outbreaks occurs across the healthcare–public health continuum. Healthcare institutions, public health and government agencies, and other partners working in this arena comprise a large community of professionals collaborating on the same goal: rapid detection of HAI/AR risks and intervention to stop outbreaks. Below we offer brief overviews of the chapters contained in this document with references to chapter sections and subsections.

Overview of Chapter 2: Fundamental Concepts

In Chapter 2, the focus is on the background and basis for surveillance of healthcare-associated infections (HAIs) and antimicrobial-resistant (AR) pathogens as well as associated outbreak response activities. The chapter contains information on healthcare settings with which public health professionals may interact as part of an HAI/AR outbreak response; changes to healthcare

delivery, regulations, funding, and public health capacity over time that have impacted HAI/AR surveillance practices and outbreak responses; and trends in surveillance, including descriptions of systems used to identify potential outbreaks as well as types of outbreaks and other events to which public health routinely responds.

OVERVIEW OF TOPICS COVERED IN CHAPTER 2

SECTION	SUBHEADING	COVERED TOPICS
Introduction (2.0)		<ul style="list-style-type: none"> • Definition and prevalence of HAIs • Definition and prevalence of AR pathogens • Types of HAI/AR outbreaks • Primary audience
Trends in Healthcare (2.1)	Healthcare Settings (2.1.1)	<ul style="list-style-type: none"> • Definition of a healthcare setting • Types of healthcare settings • Healthcare settings’ influence on outbreaks • Definitions, characteristics, and staff with whom public health will interact stratified by specific healthcare setting
	Healthcare Delivery (2.1.2)	<ul style="list-style-type: none"> • Trends in healthcare delivery • Influence of healthcare delivery changes on outbreaks
	Regulation and Oversight (2.1.3)	<ul style="list-style-type: none"> • Trends in regulations related to the prevention of healthcare-related infections • Introduction to regulatory partners • Variations in regulation across healthcare settings • Infection prevention and antimicrobial stewardship regulation; resources for HAI rate comparisons



Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 2

SECTION	SUBHEADING	COVERED TOPICS
Trends in Surveillance (2.2)	Overview (2.2.1)	<ul style="list-style-type: none"> • Definition of surveillance • Purposes of disease surveillance • HAI/AR program development (2.2.1.1) • Funding for public health HAI/AR initiatives • Reportable diseases and conditions (2.2.1.1.1) • Surveillance within healthcare facilities (2.2.1.2)
	Public Health Systems (2.2.2)	<ul style="list-style-type: none"> • Overview of public health surveillance • Description of a surveillance case definition • Population-based surveillance (2.2.2.1) • Healthcare facility–based surveillance (2.2.2.2) • Other surveillance systems and forms of surveillance (2.2.2.3) • Emerging Infections Program: Healthcare-Associated Infections Community Interface (2.2.2.3.1) • Antibiotic Resistance Laboratory Network (2.2.2.3.2) • Sentinel surveillance (2.2.2.3.3) • Syndromic surveillance (2.2.2.3.4) • Regulatory monitoring systems (2.2.2.3.5) • Administrative databases (2.2.2.3.6)
	Impact of Advances in Laboratory Methods on HAI/AR Surveillance (2.2.3)	<ul style="list-style-type: none"> • Trends in microbiological and molecular testing and their impact on HAI/AR surveillance • Introduction to the impact of polymerase chain reaction (PCR) and whole genome sequencing (WGS) on surveillance and outbreak detection • Culture-independent diagnostic testing (CIDT) and its impact on public health surveillance • Link to a laboratory protocol resource at the Centers for Disease Control and Prevention (CDC)
	Quality and Usefulness of Surveillance Data (2.2.4)	<ul style="list-style-type: none"> • Uses of surveillance data (2.2.4.1) • Reasons for incomplete surveillance data (2.2.4.2) • Methods to improve the quality of surveillance data (2.2.4.2) • NHSN validation (2.2.4.2)

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 2

SECTION	SUBHEADING	COVERED TOPICS
Trends in Outbreak Detection and Response (2.3)		<ul style="list-style-type: none"> • Overview of outbreak detection and response • Changes to public health HAI/AR programs leading to improvements in outbreak detection and response • Other factors contributing to improvements in outbreak detection and response • Overview of the wide span of a healthcare outbreak response
	Modes of Transmission (2.3.1)	<ul style="list-style-type: none"> • Overview and examples of point-source and person-to-person spread of disease • Relationship of pathogens to mode of transmission
	Outbreak Types Based on Etiology (2.3.2)	<ul style="list-style-type: none"> • Importance of outbreak types • Outbreak detection and response based on pathogen, including when to suspect an outbreak and the importance of laboratory testing (2.3.2.1) • Outbreak detection and response based on infection type, including frequency and considerations (2.3.2.2) • Noninfectious causes of HAI/AR-related outbreaks (2.3.2.3)
	Outbreak Types Based on Setting (2.3.3)	<ul style="list-style-type: none"> • Impact of healthcare setting on the type of outbreak • Examples of types of outbreaks based on the healthcare setting • Single-facility outbreaks including typical causes (2.3.3.1) • Introduction to multifacility outbreaks, including typical causes and detection (2.3.3.2) • Local multifacility outbreaks (2.3.3.2.1) • Widespread multifacility outbreaks (2.3.3.2.2) • Outbreaks related to international travel (2.3.3.2.3) • Healthcare facility role in detection of outbreaks outside the facility and in the community (2.3.3.3)
	Investigation of Serious Infection Control Breaches (2.3.4)	<ul style="list-style-type: none"> • Introduction to serious infection control breaches • Centers for Medicare and Medicaid Services (CMS) requirement to report serious infection control breaches • Core infection control practices
Tables and Box		<ul style="list-style-type: none"> • Box 2.1 Reporting to the National Healthcare Safety Network (NHSN): Conditions and Healthcare Settings • Table 2.1 Selected Healthcare Settings Where Public Health May Conduct HAI/AR Outbreak Response Activities: Definitions, Characteristics, and Key Staff • Table 2.2 Outbreak Examples Based on Healthcare Setting or Procedure Type

Chapter 1 Overview

Overview of Chapter 3: Planning and Preparation

In chapter 3, strategies for planning and preparation before an outbreak occurs are discussed. Background information on agencies and partners that may be involved in an outbreak response is provided, and their respective roles and responsibilities are described, including considerations for a coordinating agency and

the composition of outbreak response teams. Other topics include planning and preparation for resource identification and record management, communication considerations, understanding legal authorities, and preparation for escalation, recovery, and follow-up, including potential implementation of an incident command system (ICS).

OVERVIEW OF TOPICS COVERED IN CHAPTER 3

SECTION	SUBHEADING	COVERED TOPICS
Introduction (3.0)		<ul style="list-style-type: none"> • Advantages of advanced preparation • Enumeration of tasks for public health agencies prior to an outbreak
Agency Roles (3.1)	Overview (3.1.1)	<ul style="list-style-type: none"> • Overview of the importance of understanding roles and responsibilities • Centralized and decentralized governance and relationship to public health agencies
	Local, State, and Federal Agencies (3.1.2)	<ul style="list-style-type: none"> • Description of local public health agency experience and capacity (3.1.2.1) • The local public health agency role in planning for HAI/AR outbreaks (3.1.2.1) • Local public health agency roles, responsibilities, and resources (3.1.2.1) • Description of state public health agency experience and capacity (3.1.2.2) • The state public health agency role in planning for HAI/AR outbreaks (3.1.2.2) • State public health agency roles, responsibilities, and resources (3.1.2.2) • Role of the state survey and facility licensing agency and strategies for coordination (3.1.2.3) • Role of the state provider licensing agency and strategies for coordination (3.1.2.4) • Role of CDC and coordination with state and local public health agencies and healthcare facilities (3.1.2.5) • Role of the Food and Drug Administration (FDA) in HAI/AR outbreak investigations (3.1.2.6)
	Healthcare Facilities (3.1.3)	<ul style="list-style-type: none"> • Roles and responsibilities of healthcare facilities • Role of the team tasked with preventing infections, including the infection preventionist and the medical epidemiologist within healthcare facilities • General information about facility planning for an outbreak • Variations in resources among healthcare facility types
	Patients and Other Agencies/Partners (3.1.4)	<ul style="list-style-type: none"> • Professional member organizations for healthcare professionals and healthcare facilities (3.1.4.1) • Tribal entities and the Indian Health Service (IHS) (3.1.4.2) • Law enforcement (3.1.4.3)

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 3

SECTION	SUBHEADING	COVERED TOPICS
Outbreak Response Team (3.2)	Overview (3.2.1)	<ul style="list-style-type: none"> • Basic composition of an outbreak response team • Introduction to roles and responsibilities of outbreak response team members
	Roles of Team Members (3.2.2)	<ul style="list-style-type: none"> • Introduction to the coordinating agency • Roles of the public health outbreak response team members • Role and responsibilities of the public health team leader (3.2.2.1) • Roles and responsibilities of the epidemiologist(s) on the public health team (3.2.2.2) • Role and responsibilities of the infection preventionist on the public health team (3.2.2.3) • Roles and responsibilities of public health laboratorians (3.2.2.4) • Other team members, who may include administrative staff, statisticians, public health information officers, legal staff, and emergency preparedness staff (3.2.2.5)
	Outbreak Response Team Model Practices (3.2.3)	<ul style="list-style-type: none"> • Pre-identified dedicated outbreak response teams (3.2.3.1) • Scaling up additional support (3.2.3.2) • Establishing outbreak response plans and protocols (3.2.3.3) • Training for outbreak response team members (3.2.3.4)
Resources (3.3)		<ul style="list-style-type: none"> • Introduction to resource components needed during the response to an outbreak
	Equipment and Supplies (3.3.1)	<ul style="list-style-type: none"> • List of equipment and supplies to consider in preparation for an outbreak response
	Outbreak Investigation Documents and Toolkits (3.3.2)	<ul style="list-style-type: none"> • Investigation documents, tools, and protocols to consider preparing ahead of an outbreak
	Reference Materials (3.3.3)	<ul style="list-style-type: none"> • Reference materials to consider compiling ahead of an outbreak
	Tracking Time and Resources (3.3.4)	<ul style="list-style-type: none"> • Advantage of setting up processes to track time and resources during large-scale investigations
Records Management (3.4)	Overview (3.4.1)	<ul style="list-style-type: none"> • Overview of systematic information management during an outbreak response
	Records Management Model Practices (3.4.2)	<ul style="list-style-type: none"> • Standardized information collection (3.4.2.1) • Considerations for sharing information across agencies (3.4.2.1) • Tracking data during an outbreak investigation, including what situations to track and data system considerations (3.4.2.2)

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 3

SECTION	SUBHEADING	COVERED TOPICS
Communication (3.5)		<ul style="list-style-type: none"> • Importance of communication across all partners • Considerations for communication preparation ahead of an outbreak
Escalation (3.6)	Overview (3.6.1)	<ul style="list-style-type: none"> • Notifying leadership within your agency • Obtaining help within your agency • Considerations for transferring coordination responsibilities to another agency
	When to Ask for Help (3.6.2)	<ul style="list-style-type: none"> • Considerations for when to ask for help from another agency
	How to Obtain Help (3.6.3)	<ul style="list-style-type: none"> • Whom to ask for help • Contact information for CDC
Incident Command System (3.7)		<ul style="list-style-type: none"> • History and description of the incident command system (ICS) • ICS in government agencies • ICS in healthcare organizations • Considerations for ICS activation
Other Aspects of Preparation (3.8)	Legal Preparedness, Authorities, and Litigation (3.8.1)	<ul style="list-style-type: none"> • Understanding legal authority • Anticipating legal situations and preparing in advance
	Ethics (3.8.2)	<ul style="list-style-type: none"> • Consideration of potential ethical dilemmas in advance
	Privacy (3.8.3)	<ul style="list-style-type: none"> • Understanding privacy laws and regulation • Maintaining confidential information • Preparing for protection versus disclosure of information
	Permissions and Approvals (3.8.4)	<ul style="list-style-type: none"> • Considerations for the need for permissions or approvals • Preparation for accessing medical records
Planning for Recovery and Follow-Up (3.9)	Overview (3.9.1)	<ul style="list-style-type: none"> • Planning for recovery and follow-up
	Recovery and Follow-Up Model Practices (3.9.2)	<ul style="list-style-type: none"> • Model practices to assist in planning for recovery and follow-up
Tables, Boxes, and Keys to Success		<ul style="list-style-type: none"> • Box 3.1 Selected Training Resources • Box 3.2 Selected Resources from Federal Regulatory Agencies • Box 3.3 Types of Facilities Required by CMS to Develop Emergency Preparedness Plans • Table 3.1 Additional Agencies and Partners that Public Health Agencies Interact with During an Outbreak Response • Table 3.2 Partners to Consider Involving by Type of Event • CORHA Keys to Success: Developing Relationships Prior to an Outbreak

Chapter 1 Overview

Overview of Chapter 4: Outbreak Detection and Reporting

Chapter 4 examines the detection and reporting of potential outbreaks, including detection via reports and through use of surveillance data. Definitions of sentinel cases, clusters, and outbreaks are described. The section on direct reporting of outbreaks includes information on reporting within a healthcare facility and reporting to public health,

entities that can report to public health, and types of events that may be reported. This is followed by an overview of the use of routine surveillance systems for cluster and outbreak detection. Strengths and limitations, key determinants of successful detection, and model practices are described for both types of detection methods.

OVERVIEW OF TOPICS COVERED IN CHAPTER 4

SECTION	SUBHEADING	COVERED TOPICS
Introduction (4.0)		<ul style="list-style-type: none"> • Description of what is covered in Chapter 4 • Purpose of detecting clusters and outbreaks • Benefits of detecting outbreaks
	Overview (4.1)	<ul style="list-style-type: none"> • Overview of methods of detection
		Outbreak Detection Pathways (4.1.1) <ul style="list-style-type: none"> • Introduction to outbreak reporting • Introduction to detection of clusters and outbreaks using surveillance data • Other activities that may lead to outbreak detection
	Definitions (4.1.2) <ul style="list-style-type: none"> • Definition of a cluster • Considerations for defining an outbreak • Threshold levels and outbreak definitions • General principles for determining when a situation warrants investigation and reporting 	
Reporting Sentinel Cases, Clusters, and Outbreaks (4.2)	Purpose (4.2.1)	<ul style="list-style-type: none"> • Importance of reporting as a method to detect outbreaks
	Background (4.2.2)	<ul style="list-style-type: none"> • Reporting potential outbreaks within healthcare facilities (4.2.2.1) • Reporting potential outbreaks to public health (4.2.2.2) • Public health processes to receive reports of potential outbreaks (4.2.2.2) • Requirements for reporting to public health (4.2.2.2) • Strategies to encourage reporting potential outbreaks to public health and perceived barriers to reporting (4.2.2.2) • Perceived barriers for reporting potential outbreaks (4.2.2.2)
	Reporting Entities (4.2.3)	<ul style="list-style-type: none"> • Sources of outbreak reports • Healthcare facility and provider reports (4.2.3.1) • Clinical and public health laboratory reports (4.2.3.2) • Public, patient, and media reports (4.2.3.3) • Other government agencies that may report, including state facility licensing agencies (4.2.3.4) • Other partners that may report (4.2.3.5)



Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 4

SECTION	SUBHEADING	COVERED TOPICS
Reporting Sentinel Cases, Clusters, and Outbreaks (4.2)	Epidemiology Process (4.2.4)	<ul style="list-style-type: none"> • Importance of a pre-established process • Determining if cases, clusters, and outbreaks are linked
	Laboratory Process (4.2.5)	<ul style="list-style-type: none"> • Importance of communication between epidemiology and laboratory staff upon report of a potential outbreak
	Strengths and Limitations of Outbreak Reporting Systems (4.2.6)	<ul style="list-style-type: none"> • Strengths of outbreak reporting systems (4.2.6.1) • Limitations of outbreak reporting systems (4.2.6.2)
	Key Determinants of Successful Outbreak Reporting Systems (4.2.7)	<ul style="list-style-type: none"> • Definition of a successful outbreak reporting system • Factors impacting the sensitivity of outbreak detection (4.2.7.1) • Impact of the prevalence of disease on outbreak detection (4.2.7.2) • Impact of relationships among reporting entities and public health agencies (4.2.7.3)
	Model Practices for Outbreak Reporting Systems (4.2.8)	<ul style="list-style-type: none"> • Establishing requirements for reporting (4.2.8.1) • Ensuring timeliness of reporting (4.2.8.2) • Establishing a clearly defined reporting process methodology (4.2.8.3) • Useful tools to apply to outbreak reporting systems (4.2.8.4) • Importance of tracking outbreaks (4.2.8.5)
Detecting Sentinel Cases, Clusters, and Outbreaks through Surveillance (4.3)	Purpose (4.3.1)	<ul style="list-style-type: none"> • Importance of use of surveillance data as a method to detect outbreaks
	Background (4.3.2)	<ul style="list-style-type: none"> • Basic surveillance principles impacting detection of sentinel cases, clusters, and outbreaks • Techniques to assist with detecting patterns in surveillance data • Detection of clusters and outbreaks within a healthcare facility using surveillance data (4.3.2.1) • Surveillance data typically collected by public health that can be used to detect clusters and outbreaks (4.3.2.2)
	Types of Surveillance Data (4.3.3)	<ul style="list-style-type: none"> • Types of surveillance data used for cluster detection
	Epidemiology Process (4.3.4)	<ul style="list-style-type: none"> • General epidemiology process for collection of surveillance data • Manual review of surveillance data for cluster detection • Automated processes for cluster detection using surveillance data
	Laboratory Process (4.3.5)	<ul style="list-style-type: none"> • General laboratory process for conditions under surveillance • Methods for support of cluster detection using laboratory data

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 4

SECTION	SUBHEADING	COVERED TOPICS
Detecting Sentinel Cases, Clusters, and Outbreaks through Surveillance (4.3)	Strengths and Limitations of Surveillance for Outbreak Detection (4.3.6)	<ul style="list-style-type: none"> • Strengths of outbreak reporting systems (4.3.6.1) • Limitations of outbreak reporting systems (4.3.6.2)
	Key Determinants of Successful Outbreak Detection via Surveillance Systems (4.3.7)	<ul style="list-style-type: none"> • Surveillance system components that support outbreak detection • Factors impacting complete reporting of conditions under surveillance (4.3.7.1) • Effect of sensitivity of surveillance on cluster detection (4.3.7.2) • Impact of the prevalence of disease on cluster detection (4.3.7.3) • Influence of the speed of reporting diseases and conditions under surveillance on outbreak detection (4.3.7.4)
	Model Practices for Detecting Outbreaks through Surveillance (4.3.8)	<ul style="list-style-type: none"> • Strategies for rapid case detection (4.3.8.1) • Advantages of submission and characterization of isolates (4.3.8.2) • Standardized processes for cluster detection using surveillance data (4.3.8.3) • Communication practices supporting cluster detection (4.3.8.4) • Tools that can be used for cluster detection using surveillance data (4.3.8.5) • Importance of tracking outbreaks (4.3.8.6)
Multifacility and Multijurisdictional Considerations (4.4)		<ul style="list-style-type: none"> • Importance of complete reporting to identify multifacility and multijurisdictional outbreaks • Factors influencing multifacility and multijurisdictional cluster and outbreak detection
Table and Keys to Success		<ul style="list-style-type: none"> • Table 4.1 Potential Methods of Outbreak Detection by Healthcare Facilities and Public Health Agencies • CORHA Keys to Success: Maximizing Outbreak Detection

Chapter 1 Overview

Overview of Chapter 5: Investigation and Control

Chapter 5 contains a review of the key elements and steps involved in the investigation and control of outbreaks involving HAIs and AR pathogens. The chapter is arranged to follow steps typically followed in an outbreak investigation, recognizing that such steps

may indeed not occur in linear order and will depend on the precise nature and needs of the response. The chapter also reviews the goals of a healthcare outbreak investigation and includes collections of resources to support and improve the HAI/AR outbreak response.

OVERVIEW OF TOPICS COVERED IN CHAPTER 5

SECTION	SUBHEADING	COVERED TOPICS
Introduction (5.0)		<ul style="list-style-type: none"> • Description of what is covered in Chapter 5 • Overall function of public health in an outbreak investigation • Collaboration between public health and healthcare • Importance of a systematic approach
Perform an Initial Assessment (5.1)	Initial Information to be Gathered (5.1.1)	<ul style="list-style-type: none"> • Initial information to be gathered when an outbreak is detected or use of surveillance data
	Initial Control Measures (5.1.2)	<ul style="list-style-type: none"> • Initial control measures at the time of outbreak detection
	Determining the Level of Response (5.1.3)	<ul style="list-style-type: none"> • Considerations for determining the level of response: full investigation and response following a facility investigation or receipt of a report
	Developing Hypotheses (5.1.4)	<ul style="list-style-type: none"> • Development of an initial hypothesis
Verify the Diagnosis (5.2)		<ul style="list-style-type: none"> • Information review to aid in diagnosis verification • Importance of the laboratory in diagnosis verification
Assemble and Brief the Outbreak Response Team (5.3)		<ul style="list-style-type: none"> • Composition of the outbreak response team • Introduction to team roles • Introduction of the concept of a coordinating agency
	Partners (5.3.1)	<ul style="list-style-type: none"> • Partners' outbreak response teams, including healthcare facilities and regulatory partners • Escalation of response and partner roles
	Public Health Team Communication (5.3.2)	<ul style="list-style-type: none"> • Considerations related to public health team communication
	Communication Among Partners (5.3.3)	<ul style="list-style-type: none"> • Considerations related to communication among partners • Coordination among public health agencies and regulatory agencies

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 5

SECTION	SUBHEADING	COVERED TOPICS
Establish a Plan and Prepare for Fieldwork (5.4)		<ul style="list-style-type: none"> • Determination of missing information and steps to gather that information • Gathering of information on similar outbreaks, including information on the pathogen or type of infection • Considerations for utility and burden of planned steps during preparations • Considerations for on-site investigations • Onsite preparation steps including gaining access to medical records, preparing for data collection (including tool development), and infection control preparation
Confirm the Presence of an Outbreak (5.5)		<ul style="list-style-type: none"> • Factors involved in verifying outbreaks • Pseudo-outbreaks
Establish Case Definition and Classification Criteria (5.6)		<ul style="list-style-type: none"> • Components of a case definition • Creation of a useful case definition • Stratified case definitions and classification criteria
Identify and Count Cases (5.7)		<ul style="list-style-type: none"> • Retrospective and prospective case counting • Methods to retrospectively identify cases • Methods to prospectively identify cases • Consideration of cases in healthcare workers, visitors, and community residents • Importance of systematic case counting and application of case definitions and classifications
Collect, Organize, and Analyze Data (5.8)	Data Collection (5.8.1)	<ul style="list-style-type: none"> • Data sources for collection of data • Importance and components of a standardized data collection tool • Protecting information that could be used to identify a patient
	Organizing Data and Perform Descriptive Epidemiology (5.8.2)	<ul style="list-style-type: none"> • Organizing data into a line list • Descriptive epidemiologic analysis • Other data organization tools including maps, timelines, and epidemic curves
	Refining the hypothesis (5.8.3)	<ul style="list-style-type: none"> • Considerations related to refining the hypothesis
	Analytic Epidemiology (5.8.4)	<ul style="list-style-type: none"> • Considerations for use of analytic epidemiology • How to conduct an analytic study

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 5

SECTION	SUBHEADING	COVERED TOPICS
Perform an Infection Control Assessment (5.9)		<ul style="list-style-type: none"> • Considerations for performing on-site infection control assessments • Areas of focus during infection control assessments • Considerations for staff interviews
Consider an Environmental Assessment (5.10)		<ul style="list-style-type: none"> • Determining possible environmental factors that may have contributed to an outbreak • Environmental assessment as part of the infection control assessment • Determining when environmental sampling is appropriate • Laboratory considerations for environmental testing
Recommend Control Measures (5.11)		<ul style="list-style-type: none"> • Recommendations for infection control measures throughout the investigation • Providing written recommendations • Importance of follow-up after recommendations • What to do when there is imminent potential harm to patients
Interpret Results (5.12)		<ul style="list-style-type: none"> • Considerations for interpretation of results following the investigation
Monitor the Outbreak Until Completion (5.13)	Monitoring the Outbreak (5.13.1)	<ul style="list-style-type: none"> • Considerations related to monitoring the outbreak
	Re-evaluate Hypotheses and Case Definitions (5.13.2)	<ul style="list-style-type: none"> • Re-evaluation of hypotheses and case definitions during the monitoring phase
	Ending the investigation (5.13.3)	<ul style="list-style-type: none"> • Determining when to end an investigation • Post-outbreak and after-action meetings as a strategy for improvements
Other Follow-Up Activities (5.14)	Summarize Investigation Findings, Conclusions, and Recommendations (5.14.1)	<ul style="list-style-type: none"> • Writing a final report
	Distribute the Report (5.14.2)	<ul style="list-style-type: none"> • Considerations related to distribution of the final report
	Policy Action (5.14.3)	<ul style="list-style-type: none"> • Policy action that could result from an outbreak investigation

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 5

SECTION	SUBHEADING	COVERED TOPICS
Tables, Boxes, Figure, and Keys to Success		<ul style="list-style-type: none"> • Figure 5.1 Sample Timeline • Box 5.1 Selected HAI/AR Outbreak Investigation Resources • Box 5.2 Goals of an Outbreak Investigation • Box 5.3 Steps of an Outbreak Investigation • Box 5.4 Example Case Definitions • Box 5.5 Healthcare Facility Records to Consider Reviewing During an Outbreak Investigation • Table 5.1 Investigation Activities for Outbreak Response Objectives • Table 5.2 Immediate Control Measures for Healthcare Outbreak Management • CORHA Keys to Success: Initial Steps in the Investigation of Outbreaks • CORHA Keys to Success: Communication During an Investigation
Appendix		<ul style="list-style-type: none"> • Appendix A: Cohort and Case-Control Studies

Chapter 1 Overview

Overview of Chapter 6: Laboratory Best Practices

Chapter 6 expands on the basic concepts presented in previous chapters to highlight the roles and contributions of laboratory partners. This chapter further develops

concepts, explanations, and processes, while adding examples and emphasizing best practices.

OVERVIEW OF TOPICS COVERED IN CHAPTER 6

SECTION	SUBHEADING	COVERED TOPICS
Introduction (6.0)		<ul style="list-style-type: none"> • Description of what is covered in Chapter 6 • Overall function of public health laboratories • Collaboration between laboratories and public health partners
Types of Laboratories and Roles (6.1)	Public Health Laboratories (6.1.1)	<ul style="list-style-type: none"> • Structure and relationships of state public health laboratories • Coordination among state, regional, and CDC labs • Regional support network for sequencing • Role of Association of Public Health Laboratories (APHL)
	Clinical Laboratories (6.1.2)	<ul style="list-style-type: none"> • Role of clinical laboratories • Importance of collaboration with clinical laboratories
	Reference Laboratories (6.1.3)	<ul style="list-style-type: none"> • Role of reference laboratories • Development and structure of the AR Lab Network
Laboratory Functions in Support of a Healthcare Outbreak Response (6.2)	Surveillance (6.2.1)	<ul style="list-style-type: none"> • Laboratory role in surveillance • Discussion of National Healthcare Safety Network (NHSN) and associated federal regulatory agency reporting requirements
	HAI and AR Pathogen Detection and Confirmation (6.2.2)	<ul style="list-style-type: none"> • Testing assays that can support early detection • Phenotypic testing (6.2.2.1) • Genotypic testing (6.2.2.2) • Next generation sequencing (6.2.2.3) • Terminology (6.2.2.4) • Saving specimens and isolates (6.2.2.5) • Characterization testing (6.2.2.6)
	Reporting to Epidemiology and Other Partners (6.2.3)	<ul style="list-style-type: none"> • Role of laboratories in reporting data indicating a potential concern • Use of antibiograms for detection • Review of organisms that require immediate public health notification for action/intervention • Processes and partnerships involved in laboratory reporting

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 6

SECTION	SUBHEADING	COVERED TOPICS
Laboratory Functions in Support of a Healthcare Outbreak Response (6.2)	Detection of HAI Outbreaks by the Laboratory (6.2.4)	<ul style="list-style-type: none"> • Overview of how laboratories can support detection through characterization of isolates/organisms • Impact of next generation sequencing and the implications for data collection and interpretation that support detection • Pathogens that may be of concern at varying levels (e.g., single detection vs. cluster) and the public health systems for reporting, which include facilities/hospitals, localities/states, regional networks, and the CDC • Chain of reporting and importance of coordinated communication and awareness among key partners
	Environmental Testing (6.2.5)	<ul style="list-style-type: none"> • Value of environmental testing in support of clinical investigations • Types of environmental samples that might be considered and the kind of resources and expertise that should accompany those efforts
	Healthcare Worker Testing (6.2.6)	<ul style="list-style-type: none"> • Elements related to healthcare worker testing including available methods, potential implications, and legal/policy considerations
Safety, Quality Control, and Validation (6.3)		<ul style="list-style-type: none"> • Importance of following safety precautions including use of appropriate personal protective equipment • Role of FDA in review of evolving techniques
Laboratory Data Management (6.4)	Ensuring Chain of Custody (6.4.1)	<ul style="list-style-type: none"> • Overview of laboratory information systems and currently available national networks • List of suggested best practices for using laboratory data • Chain of custody processes and procedures
Epidemiology-Laboratory Communication (6.5)	Other Testing (6.5.1)	<ul style="list-style-type: none"> • Coordination among epidemiology and laboratory personnel for sample collection, investigation, monitoring, etc. • Consider available expertise, resources, and potential need for training or assistance • Utility of other types of testing such as toxin detection
Quality Control and Assurance (6.6)		<ul style="list-style-type: none"> • Mechanisms for quality control and assurance including validation protocols and regular testing of reagents in accordance with clinical laboratory standards
Tables, Boxes, Figure, and Keys to Success		<ul style="list-style-type: none"> • Figure 6.1 Antimicrobial Resistance Laboratory Network Map of Regional Laboratories • Table 6.1 Phenotypic and Genotypic Tests • Table 6.2 Common MDROs • Table 6.3 Tips for Collecting Environmental Samples • CORHA Keys to Success: Laboratory as a Key Team Member • CORHA Keys to Success: Appropriate and Rapid Testing

Chapter 1 Overview

Overview of Chapter 7: Multifacility and Multijurisdictional Outbreaks

Chapter 7 focuses on the unique aspects of multifacility and multijurisdictional healthcare outbreak responses. Compared with single facility outbreaks, those that

involve multiple facilities or multiple jurisdictions are more complex and are often more difficult to detect, coordinate, and investigate.

OVERVIEW OF TOPICS COVERED IN CHAPTER 7

SECTION	SUBHEADING	COVERED TOPICS
Introduction (7.0)		<ul style="list-style-type: none"> • Description of what is covered in Chapter 7 • Definition of multifacility and multijurisdictional outbreaks
Overview (7.1)		<ul style="list-style-type: none"> • Risks for and contributors to multifacility and multijurisdictional outbreaks • Description of outbreak complexities and considerations for coordination and communication
Example Scenarios (7.2)	Multifacility Outbreak within One Jurisdiction (7.2.1)	<ul style="list-style-type: none"> • Contributions of infection control breaches and poor communication between the transferring and receiving facilities • Considerations regarding facilities in one jurisdiction accepting patients with residences in other jurisdictions
	Outbreaks that Span Multiple Jurisdictions (7.2.2)	<ul style="list-style-type: none"> • Detection and coordination of multi-jurisdiction outbreaks • Implications of international travel and healthcare exposure
	Outbreaks Involving Medical Tourism (7.2.3)	<ul style="list-style-type: none"> • Considerations for outbreaks involving major infection control breaches
	Contaminated Products (7.2.4)	<ul style="list-style-type: none"> • When to consider medical product contamination • Potential for multifacility and multijurisdictional outbreaks associated with contaminated medical products
Coordination of Multifacility and Multijurisdictional Outbreaks (7.3)	Initial Detection of a Multifacility or Multijurisdictional Outbreak (7.3.1)	<ul style="list-style-type: none"> • The role of clinicians in detecting multifacility and multijurisdictional outbreaks • The role of public health agencies in detecting multifacility and multijurisdictional outbreaks
	Initial Notification Upon Detection (7.3.2)	<ul style="list-style-type: none"> • Notification of potentially affected and/or collaborating agencies • List of potentially impacted entities
	Coordinating Agency (7.3.3)	<ul style="list-style-type: none"> • Importance of promptly identifying investigation partners • Considerations for identification of a coordinating agency

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 7

SECTION	SUBHEADING	COVERED TOPICS
Coordination of Multifacility and Multijurisdictional Outbreaks (7.3)	Interagency Outbreak Response Team (7.3.4)	<ul style="list-style-type: none"> Suggested practices for establishing interagency outbreak response teams
	Communication and Collaboration (7.3.5)	<ul style="list-style-type: none"> Highlighted key communication considerations for multifacility and multijurisdictional outbreaks
	Data Collection and Dissemination (7.3.6)	<ul style="list-style-type: none"> The role of the coordinating agency or designee in data collection and dissemination Data sharing considerations
	Regular Assessment of the Scope of the Outbreak and Resources Needed (7.3.7)	<ul style="list-style-type: none"> List of questions that should be periodically considered throughout the investigation
Concluding a Multifacility or Multijurisdictional Investigation (7.4)		<ul style="list-style-type: none"> Identifying opportunities to narrow the scope of a response Considerations for monitoring processes Considerations in concluding interagency responses
Tables, Boxes, Figure, and Keys to Success		<ul style="list-style-type: none"> Box 7.1 Examples of How Healthcare Outbreaks Can Affect Multiple Facilities and/or Multiple Jurisdictions

Chapter 1 Overview

Overview of Chapter 8: Notification and Communication

Chapter 8 describes the rationale and “who, what, how, and when” for the notification of patients and other stakeholders, along with information on risk communication principles and strategies, to support effective healthcare outbreak response. Incorporating notification into an outbreak

response can be challenging, particularly when not all information has been collected or analyzed. Nevertheless, public health agencies and healthcare providers should consider this type of communication part of their missions to protect health and serve their populations.

OVERVIEW OF TOPICS COVERED IN CHAPTER 8

SECTION	SUBHEADING	COVERED TOPICS
Introduction (8.0)	Patients’ Stories (8.0.1)	<ul style="list-style-type: none"> • Patient A case scenario as an example • Description of what is covered in Chapter 8
	Considerations for Notification (8.0.2)	<ul style="list-style-type: none"> • Utilitarian and ethical frameworks for considering patient notifications • Duty of public health agencies in making notifications • Notifications to aid patients and stakeholders in understanding and managing risk
Notification of Patients, Stakeholders, and the General Public (8.1)		<ul style="list-style-type: none"> • Overview and description of three potential triggers to perform patient notifications
	Immediate Notification (8.1.1)	<ul style="list-style-type: none"> • Affected and exposed patients (8.1.1.1) • Healthcare providers and personnel (8.1.1.2) • Visitors (8.1.1.3) • Other healthcare facilities (8.1.1.4)
	Expanded Notification (8.1.2)	<ul style="list-style-type: none"> • Affected and exposed patients (8.1.2.1) • Healthcare providers and personnel (8.1.2.2) • Visitors (8.1.2.3) • Other healthcare facilities (8.1.2.4)
	Public Notification (8.1.3)	<ul style="list-style-type: none"> • When to notify the public (8.1.3.1) • How to notify the public (8.1.3.2)
Communication Techniques (8.2)	Risk Communication Principles (8.2.1)	<ul style="list-style-type: none"> • Crisis and Emergency Risk Communication (CERC) • Identification of a spokesperson • Advanced planning of communications and considerations for media engagement
	Managing Differing Opinions Between Public Health Agencies and Healthcare Facilities (8.2.2)	<ul style="list-style-type: none"> • Considerations regarding public perception and trust • Considerations for the public health agencies when a facility holds a different opinion on notification

Chapter 1 Overview

OVERVIEW OF TOPICS COVERED IN CHAPTER 8

SECTION	SUBHEADING	COVERED TOPICS
Communication Techniques (8.2)	Tailoring Communication to the Audience and Setting (8.2.3)	<ul style="list-style-type: none"> List of key considerations for the audience, method and content of the message
	Tools (8.2.4)	<ul style="list-style-type: none"> List of tools and materials to consider developing prior to a patient notification event
Media (8.3)		<ul style="list-style-type: none"> Advanced planning for media attention and engagement
	Types of Media (8.3.1)	<ul style="list-style-type: none"> Types of media and communication methods
	Engaging the Media (8.3.2)	<ul style="list-style-type: none"> Early involvement of public information officer (PIO) and other key staff Information accuracy Considerations for the method of engaging with the media
	Proactive versus Reactive Media Communication (8.3.3)	<ul style="list-style-type: none"> Proactive vs reactive media engagement
Tables, Boxes, Figure, and Keys to Success		<ul style="list-style-type: none"> Box 8.1 Additional Considerations for Immediate and Expanded Notification and Communication Box 8.2 Tools and Materials to Develop When Planning for a Patient Notification Box 8.3. Example of Patient Notification: Legionella Outbreak in a General Medicine Ward Box 8.4. Example of Patient Notification: New Delhi Metallo-Beta-Lactamase-Producing Carbapenem Resistant Enterobacteriaceae (NDM-CRE) In A Long-Term Care Facility Table 8.1 Framework for Healthcare-Associated Infection Outbreak Notifications: Immediate and Expanded Notifications

Chapter 1 Overview

Overview of Supplement A: Medical Product Investigations

SECTION	COVERED TOPICS
Introduction (A.0)	<ul style="list-style-type: none"> • Unique challenges associated with medical product contamination events
Background: Intrinsic and Extrinsic Contamination (A.1)	<ul style="list-style-type: none"> • Definitions of intrinsic and extrinsic contamination
Detection and Reporting (A.2)	<ul style="list-style-type: none"> • Considerations for when to report infections and potential outbreaks linked to medical products • Channels through which to report, including FDA MedWatch
Investigation (A.3)	<ul style="list-style-type: none"> • Noted similarities to other types of investigations • Considerations for simultaneous exploration of hypotheses • Noted importance of engaging relevant experts early • Unique product testing considerations
Concluding a Medical Product Investigation (A.4)	<ul style="list-style-type: none"> • Noted potential for unique lessons learned in medical product investigations
Summary (A.5)	<ul style="list-style-type: none"> • Summary of the unique role and potential risks associated with medical products
Tables, Boxes, Figure, and Keys to Success	<ul style="list-style-type: none"> • Figure A.1 Opportunities for Intrinsic Contamination or Extrinsic Contamination, from Production through Patient Use and Reprocessing • Box A.1 Resources for Investigations of Blood, Biologic, Tissue, and Organ Contamination • Box A.2 CORHA Potential Medical Product-Related Outbreak: Assessment Questions • CORHA Keys to Success: Medical Product Investigations • Table A.1 Groupings of Organ Systems and Infection Types with Contaminated Medical Products and Pathogens
Appendix	<ul style="list-style-type: none"> • Appendix A: Key Resources & Additional Reading

Chapter 1 Overview

Overview of Supplement B: Infection Control Breach Investigations

SECTION	COVERED TOPICS
Introduction (B.0)	<ul style="list-style-type: none">• A brief discussion of how investigation of infection control breaches fits into the overall mission of public health agencies
Investigation of Infection Control Breaches (B.1)	<ul style="list-style-type: none">• Overview of resources public health agencies and healthcare partners can reference to assist with investigations of infection control breaches• List of select publications detailing infection control breach investigations
Selected Infection Control Resources and References (B.3)	<ul style="list-style-type: none">• List of generally relevant infection control resources, as well as resources specific to some of the more commonly reported infection control breaches
Investigation of a Drug Diversion Event (B.4)	<ul style="list-style-type: none">• Guidance and background for responding to reports of healthcare drug diversion

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Disclaimers: The findings and conclusions in this document are those of the authors and do not necessarily represent the official views of the CDC nor those of other CORHA member organizations.

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