HealthStream Regulatory Script

Transmission-Based Precautions: Airborne
Release Date: May 2010
HLC Version: 603

Lesson 1: Introduction
Lesson 2: Airborne Precautions
Lesson 3: Airborne Pathogens
Lesson 4: Tuberculosis
Welcome to the introductory lesson on Airborne Precautions. This lesson provides the course rationale, goals, and outline.

As your partner, HealthStream strives to provide its customers with excellence in regulatory learning solutions. As new guidelines are continually issued by regulatory agencies, we work to update courses, as needed, in a timely manner. Since responsibility for complying with new guidelines remains with your organization, HealthStream encourages you to routinely check all relevant regulatory agencies directly for the latest updates for clinical/organizational guidelines.

If you have concerns about any aspect of the safety or quality of patient care in your organization, be aware that you may report these concerns directly to The Joint Commission.
Three important pathogens are known to be spread by the airborne route. These are:

- Varicella-zoster virus (VZV), the cause of chickenpox and shingles
- Measles (or rubeola) virus
- *Mycobacterium tuberculosis*, the cause of TB

All three pathogens can cause severe disease.

Importantly, all three pathogens can be spread in the healthcare setting.

This course will teach you how to prevent the spread of airborne infection in the healthcare setting.

You will learn about:

- Current airborne threats
- Airborne Precautions
### Course Goals

After completing this course, you should be able to:

- List and describe the elements of Airborne Precautions
- Recognize key features and specific precautions for: varicella, measles, SARS, and smallpox
- Recognize key features and OSHA [glossary](#) requirements for tuberculosis
Course Outline

Lesson 1 provided the course rationale and goals.

Lesson 2 will describe components of Airborne Precautions including patient placement, respiratory protection, and patient transport.

Lesson 3 will give additional information on VZV, measles, SARS-CoV, and smallpox. This includes specific precautions for each.

Finally, lesson 4 will give additional information on *Mycobacterium tuberculosis*. This includes OSHA requirements for TB safety.
Lesson 2: Airborne Precautions

Introduction

Welcome to the lesson on Airborne Precautions.

This lesson will describe components of Airborne Precautions including patient placement, respiratory protection, and patient transport.
Airborne Transmission

Person-to-person airborne transmission happens as a result of infectious droplet nuclei. (Click for more information.)

These tiny particles can stay airborne for long periods of time.

They can travel long distances on air currents.

Transmission happens when a susceptible host [glossary] inhales an infectious particle.

Certain hospitalized patients are particularly susceptible to infection. These patients include:

- Patients with weakened immune systems
- Patients with chronic illnesses
- The very young and very old
- Institutionalized individuals

CLICK TO REVEAL

More About Droplet Nuclei

Coughing, sneezing, and sighing all produce respiratory droplets. These respiratory droplets are too heavy to stay in the air for long.

When a person has an infection, respiratory droplets may contain the infectious organism. As these droplets start to dry out, most types of organisms are killed.

Some types of organisms can survive drying out. This results in the formation of infectious droplet nuclei: evaporated droplets containing an organism that can still cause disease.

Dust particles can also contain the infectious organism.

These tiny nuclei are less than five microns across. They can stay airborne for long periods of time. This allows for the spread of airborne disease.
Patients with diagnosed airborne disease require isolation.

Patients who appear to have an airborne disease also should be isolated, until a certain diagnosis can be made.

Isolation should include:
- Airborne Precautions
- Standard Precautions

Note: Standard Precautions are used in the care of all patients.
Airborne Precautions have three basic elements:
- Patient placement
- Respiratory protection
- Patient transport

Let’s take a closer look at each.
<table>
<thead>
<tr>
<th>Patient Placement: Private Room</th>
</tr>
</thead>
</table>

A patient requiring Airborne Precautions should be placed in a private room. This room is referred to as an **AIIR** [glossary].

An AIIR room should have monitored negative air pressure. This means that the air pressure in the isolation room is lower than the air pressure in nearby areas. Therefore, contaminated air will not flow out of the room into nearby areas.

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Point 5 of 13
<table>
<thead>
<tr>
<th>2006</th>
<th>Patient Placement: AIIR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The isolation room also should have six to twelve air changes per hour. This helps reduce the concentration of infectious particles in the room air.</td>
</tr>
<tr>
<td></td>
<td>For air changes, room air should be vented directly to the outside of the facility. If this is not possible, room air must be filtered before it ties into the facility’s general ventilation system. High efficiency particulate filtration (HEPA) should be used.</td>
</tr>
<tr>
<td></td>
<td>The door to the isolation room should be kept closed.</td>
</tr>
<tr>
<td></td>
<td>The patient should stay in the room.</td>
</tr>
</tbody>
</table>
If there are no private rooms, patients on Airborne Precautions should be **cohorted**.

A **cohort** is a group of patients who have:
- The same active infection
- No other infections

Sometimes:
- There are no private rooms.
- The patient cannot be placed with a cohort.

In this case, the facility's infection control experts decide where to place the patient.
<table>
<thead>
<tr>
<th>Healthcare staff must wear certified respiratory protection when working with some patients on Airborne Precautions.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N95 respirators are most commonly used.</strong></td>
</tr>
<tr>
<td>A surgical mask:</td>
</tr>
<tr>
<td>• Is NOT a certified respirator</td>
</tr>
<tr>
<td>• Will not protect against airborne transmission</td>
</tr>
<tr>
<td>Respiratory Protection: Measles and Chickenpox</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>For patients with measles or chickenpox, immune staff members do not need to wear respirators.</td>
</tr>
<tr>
<td>Susceptible (non-immune) staff members must wear respirators. However, non-immune staff should not work with these patients if an immune staff member is on duty.</td>
</tr>
</tbody>
</table>

**Note:**
While respirators may not be necessary for all patients on airborne precautions, some hospitals may require workers to use a respirator when entering into all AllIRs. You should be familiar with the policies at your hospital.
Patients on Airborne Precautions should not be transported unless absolutely necessary.

During necessary transport, the patient should wear a surgical mask, if possible.
Select the answer that best fits the question.

A room could be used for airborne isolation if it had:

- a. Negative air pressure. Two air changes per hour.
  Room air vented directly to the outside.
- b. Positive air pressure. Eight air changes per hour. Room air vented directly to the outside.
- c. Negative air pressure. Eight air changes per hour. Room air returned to general ventilation system after HEPA filtration.
- d. Positive air pressure. Twelve air changes per hour. Room air returned to general ventilation system after HEPA filtration.

**MULTIPLE CHOICE INTERACTION**

Correct answer: C

Feedback for A: Incorrect. An airborne infection isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for B: Incorrect. An airborne infection isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for C: Correct. An airborne infection isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for D: Incorrect. An airborne infection isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.
Select the answer that best fits the question.

A surgical mask is a certified respirator for Airborne Precautions.

a. True
b. False

<table>
<thead>
<tr>
<th>TRUE / FALSE INTERACTION</th>
</tr>
</thead>
</table>

Correct answer: B

Feedback for A: Incorrect. A surgical mask is NOT a certified respirator. It will not protect against airborne transmission.

Feedback for B: Correct. A surgical mask is NOT a certified respirator. It will not protect against airborne transmission.
You have completed the lesson on Airborne Precautions.

Remember:
- Infectious droplet nuclei cause airborne transmission.
- Patients who have airborne diseases are isolated with Standard Precautions and Airborne Precautions.
- Patients on Airborne Precautions should be placed in private rooms or cohorted.
- Airborne infection isolation rooms should have special systems for air and ventilation.
- Non-immune healthcare staff must wear respirators when working with patients on Airborne Precautions.
- If possible, only immune staff should care for patients with measles or varicella.
- Patients on Airborne Precautions should be transported only when absolutely necessary. During necessary transport, the patient should wear a surgical mask, if possible.
Welcome to the lesson on pathogens that call for Airborne Precautions.

This lesson will give additional information on VZV, measles, SARS-CoV and smallpox. This includes specific precautions for each.
Three important airborne pathogens are:
- Varicella-zoster virus (VZV)
- The measles virus (rubeola)
- *Mycobacterium tuberculosis*

Other pathogens that call for Airborne Precautions are:
- SARS-CoV
- The smallpox virus

This lesson focuses on VZV, measles, SARS, and smallpox. *Mycobacterium tuberculosis* will be covered in the next lesson.
<table>
<thead>
<tr>
<th>3003</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Varicella-Zoster Virus</strong></td>
</tr>
</tbody>
</table>

**Varicella-zoster virus (VZV)** causes:
- Chickenpox (varicella)
- Shingles (herpes zoster, varicella zoster, or zoster)

VZV can be spread in the healthcare setting.
This can happen if a facility has:
- Patients with chickenpox or shingles
- Staff with chickenpox or shingles
- Visitors with chickenpox or shingles

Source: CDC/ Dr. Erskine Palmer; B.G. Partin
All non-immune people are at risk for chickenpox and its complications.

These complications can be severe.

Certain groups are at increased risk for severe VZV disease and complications. These groups include:

- Pregnant women
- Premature infants with non-immune mothers
- Infants born at less than 28 weeks or weighing less than 1000 grams (with immune or non-immune mothers)
- Patients with weakened immune systems
Airborne Precautions can help prevent the spread of VZV in the healthcare setting.

The following patients should be placed on Airborne Precautions:

- Patients with chickenpox
- Patients with disseminated shingles [glossary]
- Patients with weakened immune systems and localized shingles [glossary]

Note: VZV is also spread by contact. Therefore, patients should be placed on Contact Precautions, as well. For more information on Contact Precautions, see the course Transmission-Based Precautions: Contact and Droplet.
All non-immune healthcare personnel should consider varicella vaccination.

The varicella vaccine is especially important for non-immune personnel who work with high-risk patients.

Healthcare personnel should not come to work if they:
- Have chickenpox
- Have shingles
- Have been exposed to chickenpox or shingles and are not immune
Select the answer that best fits the question.

VZV can be spread only by patients with chickenpox.

- a. True
- b. False

**TRUE / FALSE INTERACTION**

Correct answer: B

Feedback for A: Incorrect. VZV can be spread by people with chickenpox or shingles.

Feedback for B: Correct. VZV can be spread by people with chickenpox or shingles.
Measles is a systemic viral infection.

Patients have high fever. They also have a typical rash that:
- Begins on the face and head
- Spreads downward and outward to the hands and feet
- Fades in the same order that it appears

The measles virus is spread by:
- The droplet route
- The airborne route

Airborne transmission is the predominant route.

Measles can be spread in the healthcare setting.
Measles: Complications

Approximately 30% of patients with measles have complications.

Complications are most common in:
- Children under the age of five
- Adults over the age of 20

Potential Complications of Measles:
- Diarrhea
- Ear infection
- Pneumonia
- Encephalitis
- Hospitalization
- Death
Measles: Preventing Transmission

- All patients with known or suspected measles should be placed on Airborne Precautions.
- Note: Recall that measles can be spread by both droplet and airborne transmission.
- What about Droplet Precautions for measles patients?
- Droplet Precautions are not necessary. Droplet Precautions do not add anything to Airborne Precautions. Airborne Precautions protect against both airborne and droplet spread.

<table>
<thead>
<tr>
<th>Airborne Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Placement</td>
</tr>
<tr>
<td>Respiratory Protection</td>
</tr>
<tr>
<td>Patient Transport</td>
</tr>
<tr>
<td>TB Precautions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Droplet Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Placement</td>
</tr>
<tr>
<td>Mask</td>
</tr>
<tr>
<td>Patient Transport</td>
</tr>
</tbody>
</table>
Healthcare personnel should not come to work if they:
- Have measles
- Have been exposed to measles and are not immune

Measles-mumps-rubella (MMR) vaccine is recommended for all non-immune personnel.

Click on each category below to learn more about immunity in:
- **Healthcare workers born before 1957**
  - These personnel are non-immune if 1) they have **not** been vaccinated and 2) they do **not** have either of the following:
    - History of measles disease
    - Positive blood test for measles immunity

- **Healthcare workers born during or after 1957**
  - These personnel are non-immune if they do **not** have any of the following:
    - Documentation of measles disease diagnosed by a M.D.
    - Documentation of **two** doses (at least four weeks apart) of live measles vaccine on or after their **first birthday**
    - Positive blood test for measles immunity
Select the answer that best fits the question.

One of your workmates is not sure whether she needs a measles vaccine. She was born in 1968. She thinks she was vaccinated as an infant. But she does not have documentation of her childhood immunizations. She does not remember ever having measles. Your workmate should have:

- a. MMR vaccination
- b. Blood test for measles immunity
- c. Either of these
- d. Neither of these

### MULTIPLE CHOICE INTERACTION

Correct answer: C

Feedback for A: Not quite. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for B: Not quite. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for C: Correct. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for D: Incorrect. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.
Severe acute respiratory syndrome (SARS) is a viral respiratory illness. The cause of the disease is the SARS-associated coronavirus (SARS-CoV).

SARS-CoV is known to be spread by contact and droplet. These are the most common routes of transmission. Airborne transmission also is a possibility.

SARS-CoV can be spread in the healthcare setting. In fact, in the epidemic of 2003, the spread of SARS happened mostly in healthcare facilities.
Almost 100% of SARS patients develop pneumonia visible on x-ray. This pneumonia is usually bad enough to call for hospitalization. The overall SARS death rate is 10%. In patients over the age of 60, the death rate can be higher than 50%.
Patients should be placed on Airborne Precautions if they have:
- Positive lab tests for SARS-CoV infection
- Signs, symptoms, and risk factors that make SARS a likely diagnosis

Note: These patients also should be placed on Contact Precautions.
Remember: SARS-CoV can spread rapidly through healthcare facilities.

Therefore, the CDC recommends SARS screening for all patients who have pneumonia visible on X-ray.

These patients should be:
- Placed on Droplet Precautions as soon as they are admitted to the facility
- Screened for SARS-CoV risk factors

Patients with risk factors should be monitored. This can help determine whether further precautions are needed.

For more information on SARS-CoV surveillance and triage, see the course **Severe Acute Respiratory Syndrome**.
Radiographically evident pneumonia, requiring hospitalization, develops in nearly **100%** of patients infected with SARS-CoV.

Overall mortality rate for patients with confirmed SARS-CoV infection is approximately **10%**.

In patients over the age of 60, mortality can be higher than **50%**.
**Smallpox**

Smallpox is a viral disease.

Patients have:
- Fever
- Vomiting
- Aches
- Pustular rash

Mortality rates are high:
- 30% of unvaccinated patients die.
- 3% of vaccinated patients die.

Smallpox is spread mostly by droplet.

Source: CDC/Dr. John Nobel, Jr.

In 1980, the World Health Organization (WHO) declared that endemic smallpox was dead.

However, smallpox could return as a biological weapon.

After the events of September 11, 2001, the military began to again require active duty personnel to be vaccinated. Smallpox vaccination was also offered to healthcare workers and first-response personnel.

Between December 2002 and May 2007, over 1,200,000 people were vaccinated.
### Smallpox: Preventing Transmission

Airborne spread of smallpox from person-to-person is not common.

Nevertheless, all patients with confirmed or suspected smallpox should be placed on Airborne Precautions.

Anyone who has direct, unprotected contact with a smallpox patient also should be placed on Airborne Precautions. This should be for a minimum of 16 to 17 days.
Smallpox: Preventing Transmission

Smallpox vaccine should be given to all healthcare workers who will provide direct care to smallpox patients.

If there is no vaccine, only previously vaccinated workers should provide direct care to smallpox patients.

Previously vaccinated workers are:
- Workers born before 1972
- Workers who served in the military before 1989
- Workers who recently served in the military
- Workers who are members of a first response team
Smallpox is diagnosed in your facility. There is no vaccine on hand. Who should NOT provide direct care to smallpox patients?

- a. An orderly born in 1962
- **b. A nurse's aide born in 1978**
- c. A medical assistant born in 1970
- d. A nurse who served in the military from 1982 to 1987

### MULTIPLE CHOICE INTERACTION

Correct answer: **B**

Feedback for A: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for B: Correct. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for C: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for D: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.
You have completed the lesson on airborne pathogens.

Remember:
- Airborne pathogens can be spread in the healthcare setting.
- Varicella, measles, SARS, and smallpox all can have serious consequences.
- Use Airborne Precautions and other infection-control practices to prevent the spread of these diseases in the healthcare setting.
Lesson 4: Tuberculosis

Introduction

Welcome to the lesson on tuberculosis (TB).

This lesson will give additional information on *Mycobacterium tuberculosis*. This includes OSHA requirements for TB safety.

*Note: For more detailed information on the pathology, diagnosis, treatment, and prevention of TB, see the course *Tuberculosis*.**
Mycobacterium tuberculosis causes both:
- Latent TB infection
- Active TB disease

It is important to distinguish between these two conditions.

Review the table to the right.

Focus on two key differences:
- People with latent TB infection do not have symptoms. They cannot spread TB.
- People with active TB disease do have symptoms. They can spread TB.

<table>
<thead>
<tr>
<th></th>
<th>Infection</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Bacterium</td>
<td>Live, inactive</td>
<td>Live, active</td>
</tr>
<tr>
<td>Symptoms</td>
<td>None</td>
<td>Cough, fever, chills, weight loss</td>
</tr>
<tr>
<td>TB Test</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Normal</td>
<td>Abnormal chest x-ray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive sputum smear</td>
</tr>
<tr>
<td>Transmi?</td>
<td>Unable</td>
<td>Able</td>
</tr>
<tr>
<td>Outcome</td>
<td>May develop active disease</td>
<td>May die if not treated</td>
</tr>
</tbody>
</table>
Remember:
- People with latent TB infection do not have symptoms. They **cannot** spread TB.
- People with active TB disease do have symptoms. They **can** spread TB.

Transmission is airborne.

TB **can** be spread in the healthcare setting. However, transmission occurs at a low rate in U.S. hospitals.

**Transmission is higher in facilities serving communities with:**
- High rates of HIV infection
- High numbers of people from TB-endemic countries
- High prevalence of TB infection
<table>
<thead>
<tr>
<th>Preventing Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients with known or suspected TB disease should be placed on Airborne Precautions.</td>
</tr>
</tbody>
</table>
In 1994, the CDC published a final version of *Guidelines for Preventing the Transmission of M. tuberculosis in Health Care Facilities*. An updated version was published in 2005.

The CDC guidelines give extensive recommendations for TB infection control.

For details, these guidelines may be accessed at [www.cdc.gov](http://www.cdc.gov/nchstp/tb/pubs/mmwrt/html/maj_guide.htm) (link).

Also, see the course *Tuberculosis*. 
### OSHA Policy

Protection from tuberculosis is covered under OSHA’s:
- General Duty Clause
- Respiratory Protection Standards
- Accident Prevention Signs and Tags
- Recording and Reporting Occupational Injuries and Illnesses

OSHA’s enforcement procedures are addressed in:
- *Tuberculosis and Respiratory Protection. Interpretation letter (July 30, 2004)*
- *Enforcement Procedures and Scheduling for Occupational Exposure to Tuberculosis (1996)*

Enforcement:
- Is based on CDC guidelines
- Is meant to protect workers from on-the-job exposure to TB
The OSHA TB Enforcement Policy addresses:

- Patient and employee management
- Respiratory protection
- Education and training for workers
- Posted signs
- Recordkeeping

Let's take a closer look at each.
Under the *TB Enforcement Policy*, healthcare facilities must have:

- Protocols to quickly identify and isolate patients with TB
- TB/AFB [glossary] isolation rooms, with proper air and ventilation systems

In addition, healthcare employers must provide certain TB services to employees, at no cost to the employee.

These services are:

- TB screening
- Evaluation and follow-up for employees who have positive screening tests
Under OSHA policy, healthcare workers **must** wear personal respirators during certain activities or procedures with TB patients.

These activities are:
- Entering an isolation room
- Procedures likely to generate infectious respiratory droplets (for example, bronchoscopy)
- Emergency response or transport

Respirators must meet certain minimum standards.

Fit-testing and fit-checking for respirators are **required**.
Employers are required to educate healthcare workers about TB.

Education and training should focus on:
- The basics of TB
- The importance of screening
- What TB skin tests mean
- TB infection control
- Underlying medical conditions that could increase a worker’s risk of developing active TB disease
TB enforcement policy: posted signs

TB isolation rooms must have posted signs. These signs should have:

- A signal word, such as “STOP” or “NO ADMITTANCE”
- A major message
  - “Respiratory Isolation”
  - “Pulmonary Isolation”
  - “AFB Isolation”
- Precautions required to interact with the patient
Finally, under OSHA’s *TB Enforcement Policy*, employers must keep TB records.

Records should be kept of all employees with:
- TB infection (positive skin test)
- TB disease
Complete the following chart with words from the word bank.

<table>
<thead>
<tr>
<th>A person with TB infection:</th>
<th>A person with TB disease:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carries the TB bacterium in a live, but</td>
<td>Carries the TB bacterium in a live, active</td>
</tr>
<tr>
<td>inactive, state</td>
<td>state</td>
</tr>
<tr>
<td>Does not have any symptoms</td>
<td>Has symptoms</td>
</tr>
<tr>
<td>Cannot spread TB to others</td>
<td>Can spread TB to others</td>
</tr>
</tbody>
</table>
Select the answer that best fits the question.

Under OSHA’s *TB Enforcement Policy*, healthcare employers are required to provide certain TB services to employees, at no cost to the employee. One of these services is TB screening.

- a. True
- b. False

**TRUE / FALSE INTERACTION**

Correct answer: A

Feedback for A: Correct. This statement is true.

Feedback for B: Incorrect. This statement is true.
You have completed the lesson on tuberculosis.

Remember:
- *Mycobacterium tuberculosis* can cause either latent infection or active disease.
- Patients with active TB disease can spread TB by the airborne route.
- All patients with known or suspected active TB disease should be placed on Airborne Precautions.
- Additional precautions are published in the CDC *Guidelines for Preventing the Transmission of M. tuberculosis in Health-Care Settings*, 2005.
- OSHA requires employers to protect workers from on-the-job exposure to TB, under the *TB Enforcement Policy*.  

<table>
<thead>
<tr>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have completed the lesson on tuberculosis.</td>
</tr>
</tbody>
</table>

**NO IMAGE**
## Course Glossary

<table>
<thead>
<tr>
<th>#</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>acid-fast bacilli (AFB)</td>
<td>bacteria that test positive after a particular staining procedure</td>
</tr>
<tr>
<td>2</td>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>3</td>
<td>disseminated shingles</td>
<td>shingles covering a large area of the body</td>
</tr>
<tr>
<td></td>
<td>HEPA</td>
<td>high-efficiency particulate air</td>
</tr>
<tr>
<td>4</td>
<td>immunodeficient</td>
<td>having a weakened immune system</td>
</tr>
<tr>
<td>5</td>
<td>localized shingles</td>
<td>shingles confined to a small area of the body</td>
</tr>
<tr>
<td>6</td>
<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health</td>
</tr>
<tr>
<td>7</td>
<td>healthcare-associated transmission</td>
<td>spread of pathogens in the healthcare setting</td>
</tr>
<tr>
<td>8</td>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>9</td>
<td>susceptible host</td>
<td>person (or other organism) able to be colonized or infected by a particular microorganism</td>
</tr>
<tr>
<td>10</td>
<td>AIIR</td>
<td>Airborne Infection Isolation Room</td>
</tr>
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Pre-Assessment Questions:

1. Three important pathogens are known to be spread by the airborne route. These are:
   a. Varicella virus, rubeola virus, and *Myobacterium tuberculosis*
   b. Varicella virus, rubeola virus, and HIV
   c. Rubeola virus, herpes virus, and *e. coli* bacteria
   d. Rubeola virus, varicella virus, and *e. coli* bacteria

Correct answer: A
Rationale: Varicella virus, rubeola virus, and *Myobacterium tuberculosis* are the three important pathogens known to be spread by the airborne route.

2. Certain hospitalized patients are particularly susceptible to infection. These patients include all of the following EXCEPT:
   a. Patients with weakened immune systems
   b. Patients with chronic illnesses
   c. Patients who are at risk for cardiovascular events
   d. Patients who are institutionalized
   e. Very young patients
   f. Very old patients

Correct answer: C
Rationale: Patients who are at risk for cardiovascular events are not necessary susceptible to infection. All of the other patients listed are indeed susceptible to infection.

3. An AIIR room is a private patient room with:
   a. Monitored air pressure
   b. Negative air pressure
   c. Six to twelve changes of air per hour
   d. An air vent that leads directly to the outside
   e. All of the above

Correct answer: E
Rationale: An AIIR room is a private patient room with monitored negative air pressure, six to twelve changes of air per hour, and an air vent that leads directly to the outside.

4. A three-year-old girl is admitted to your facility with fever and a rash. You suspect measles. You place the patient on Airborne Precautions. No private rooms are available. The patient should be placed:
   a. In an isolation room with other patients who have airborne infections
   b. In an isolation room with other patients who have only measles
   c. In a bed on the pediatric unit, at least three feet away from the nearest uninfected patient
   d. None of these

Correct answer: B
Rationale: If a private room is not available, patients on Airborne Precautions should be placed with other patients who have only measles.

5. Which of the following statements is true?
   a. Healthcare staff must wear surgical masks when working with patients who are on Airborne Precautions.
   b. Non-immune staff should always wear respirators when treating patients with measles or chicken pox.
   c. N95 respirators are required only in the most virulent cases, such as Ebola virus.
   d. A surgical mask will afford adequate protection against most airborne transmissions.
   e. Patients should wear an N95 respirator during necessary transport.

Correct answer: B
Rationale: Non-immune staff should always wear respirators when treating patients with measles or chicken pox. Immune staff does not need to wear respirators. All of the other statements are false.

6. Certain groups are at severe risk for VZV disease. These groups include:
   a. Pregnant women and the elderly
   b. Premature infants born to immune mothers
   c. Pregnant women and premature infants born to non-immune mothers
   d. Children with active chicken pox
   e. None of the above

Correct answer: C
Rationale: Pregnant women and premature infants born to non-immune mothers are at severe risk for VZV disease. The other answers are incorrect.
7. Which of the following statements about measles are true?
   a. Measles begins on the hands and feet and spreads upward to the head.
   b. The first area to be affected is the last area to recover completely.
   c. The measles virus is not airborne but is spread by direct contact.
   d. All of the above
   e. None of the above

Correct answer: E
Rationale: Measles begins on the head and spreads downward to the hands and feet, the first area to be affected is the first area to recover, and the measles virus is airborne. None of the statements is true.

8. You are reviewing staff records and questionnaires. Based on your review, you will recommend MMR vaccine to appropriate staff. None of these staff members has had a blood test for measles immunity. You are likely to recommend MMR vaccine to:
   a. Jack, born in 1962. On his questionnaire, he reports that he was immunized as a child. He has never had measles.
   b. Linda, born in 1968. Her staff record contains documentation of measles diagnosed by an M.D.
   c. Andrew, born in 1950. His staff record shows that he was vaccinated against measles when he started work at your hospital.
   d. All of the above

Correct answer: A
Rationale: Linda and Andrew both have evidence of measles immunity. Jack reports that he was immunized as a child. However, he does not have documentation. As a child born in 1962, he probably received only one dose of measles vaccine in infancy. Therefore, Jack probably requires a second dose.

9. Patients with diseases known to be spread by the airborne route should be placed on:
   a. Airborne Precautions
   b. Droplet Precautions
   c. Droplet Precautions and then Airborne Precautions if required
   d. Airborne Precautions for the first 24 hours and then Droplet Precautions thereafter

Correct answer: A
Rationale: Airborne Precautions include and exceed the elements of Droplet Precautions, so full protection will be achieved by Airborne Precautions alone.

10. Which of the following statements is true?
a. The overall death rate for SARS is about 25%.
b. Nearly 100% of SARS patients develop pneumonia visible on x-ray.
c. SARS-related pneumonia does not normally require hospitalization.
d. In patients older than 60, the death rate from SARS is less than 25%.
e. All of the above

Correct answer: B
Rationale: Nearly 100% of SARS patients develop pneumonia visible on x-ray. On the other hand, the overall death rate for SARS is about 10%, SARS-related pneumonia normally does require hospitalization, and in patients older than 60, the death rate from SARS is more than 50%.

11. Anyone who has direct, unprotected contact with a smallpox patient also should be placed on Airborne Precautions for a minimum of:
   a. 48 hours
   b. 72 hours
   c. 5-7 days
   d. 16-17 days

Correct answer: D
Rationale: Anyone who has direct, unprotected contact with a smallpox patient also should be placed on Airborne Precautions for a minimum of 16-17 days.

12. All of the following workers are virtually certain to have been vaccinated against smallpox EXCEPT:
   a. Workers born before 1957
   b. Workers born after 1975
   c. Workers who served in the military before 1989
   d. Workers who served in the military after 2005

Correct answer: B
Rationale: The United States stopped routine civilian vaccinations in 1972. Therefore, workers born after 1975 will not have been vaccinated UNLESS they served in the military after September 11, 2001, when smallpox vaccinations were resumed, first for active duty military personnel and then later for first responders and healthcare workers.

13. Protection from tuberculosis is covered under OSHA’s:
   a. General Duty Clause
   b. Respiratory Protection Standards
c. Accident Prevention Signs and Tags  
d. Recording and Reporting Occupational Injuries and Illnesses  
e. All of the above  

Correct answer: E  
Rationale: Protection from tuberculosis is covered under all of the OSHA guidelines listed.  

14. When working with tuberculosis patients, entering an isolation room with them, or transporting them, healthcare workers must wear:  
   a. Personal respirators  
   b. Droplet masks  
   c. Oxygen masks  
   d. All of the above  
   e. None of the above  

Correct answer: A  
Rationale: When working with tuberculosis patients, entering an isolation room with them, or transporting them, healthcare workers must wear personal respirators.  

15. TB isolation rooms must have posted signs that should include any of the following EXCEPT:  
   a. A signal word  
   b. A major message  
   c. Precautions required to interact with the patient  
   d. A word such as “STOP” or “NO ADMITTANCE”  
   e. A message such as “AFB isolation”  
   f. There are no exceptions; any of the items listed should be included in posted signs outside of TB isolation rooms.  

Correct answer: F  
Rationale: TB isolation rooms must have posted signs that should include any of the items listed. There are no exceptions.
Final Exam Questions:

1. Chickenpox, smallpox, and shingles are all caused by:
   a. Bacteria
   b. Viruses
   c. Fungi
   d. Parasites

Correct answer: B
Rationale: Chickenpox, smallpox, and shingles are all viral diseases

2. Droplet nuclei are:
   a. Dust particles containing the infectious organism
   b. Tiny drops of liquid expelled by the patient while coughing or sneezing
   c. Drops of liquid that have dried out but still contain the infectious organism
   d. Less than 5 mm across

Correct answer: C
Rationale: Droplet nuclei are formed when tiny drops of liquid expelled by the patient become dried out but still contain the infectious organism.

3. You are treating a patient with an active respiratory infection. Your patient coughs. This releases respiratory droplets. These droplets can evaporate to form infectious nuclei if your patient has:
   a. Influenza
   b. N. meningitides pneumonia
   c. Tuberculosis
   d. All of the above

Correct answer: C
Rationale: TB is transmitted by infectious droplet nuclei. The influenza virus and N. meningitides are transmitted by the droplet route. They do not form infectious droplet nuclei.

4. Airborne precautions include three basic elements. These are:
   a. Patient placement, patient transport, airborne precautions
   b. Patient placement, respiratory protection, and patient transport
   c. Patient transport, patient placement, standard precautions
d. Patient transport, patient placement, airborne precautions, and standard precautions

Correct answer: B
Rationale: Airborne precautions include three basic elements: Patient placement, respiratory protection, and patient transport.

5. A “cohort” is a group of patients who have:
   a. The same active infection and no other infection
   b. The same active infection and no more than one other infection or disorder
   c. The same medication requirements, even if the active infections are different
   d. No infections but the same equipment needs

Correct answer: A
Rationale: A “cohort” is a group of patients who have the same active infection and no other infection.

6. The varicella-zoster virus (VZV) is known to cause:
   a. Shingles
   b. Chicken pox
   c. Cervical cancer
   d. Both shingles and chicken pox

Correct answer: D
Rationale: The varicella-zoster virus (VZV) is known to cause both shingles and chicken pox. It does not cause cervical cancer.

7. All of the following patients should be placed on airborne precautions EXCEPT:
   a. Patients with chicken pox
   b. Pregnant women
   c. Patients with disseminated shingles
   d. Patients with weakened immune systems and localized shingles

Correct answer: B
Rationale: Pregnant women are the exception. While they are at risk for varicella virus diseases, they are not themselves the source of airborne pathogens.
8. Approximately 30% of patients with measles have complications. These are most common among:
   a. Children over the age of 5 and adults over the age of 20
   b. Children under the age of 5 and adults under the age of 30
   c. Children under the age of 5 and adults over the age of 40
   d. Children under the age of 5 and adults over the age of 20

Correct answer: D
Rationale: Among approximately 30% of measles patients with complications, these are most common among children under the age of 5 and adults over the age of 20.

9. All of the following statements about severe acute respiratory syndrome (SARS) is true EXCEPT:
   a. It is caused by a type of coronavirus.
   b. It is commonly spread by contact and droplet routes.
   c. It nearly always leads to pneumonia that is visible on x-ray.
   d. There are no exceptions; all of the statements are true.

Correct answer: D
Rationale: All of the items listed are true of SARS infections. There are no exceptions.

10. In 1980, the World Health Organization (WHO) declared that endemic smallpox was dead. As a result, vaccination for smallpox:
    a. Was discontinued worldwide in the 1970s and never resumed
    b. Is now given only to active duty military personnel
    c. Is now given to military personnel, first responders, and healthcare workers
    d. None of the above

Correct answer: C
Rationale: Since smallpox can potentially be used as a terrorist weapon, it is now given to military personnel, first responders, and healthcare workers.

11. People with latent tuberculosis (TB) infection:
    a. Test positive for TB but do not harbor the live tuberculosis bacterium
    b. Have no symptoms but can still transmit the disease to others
    c. May later develop an active form of the disease
    d. May have an abnormal chest x-ray but do not develop cough, fever, or chills
Correct answer: **C**  
Rationale: People with latent tuberculosis infection may later develop an active form of the disease. All of the other statements are untrue.

12. Fill in the blank in the following sentence: “The spread of TB in the healthcare setting occurs at ______ in U.S. hospitals.”  
   a. A low rate  
   b. A dangerously high rate  
   c. An fairly high rate  
   d. A moderate but slowly declining rate  

Correct answer: **A**  
Rationale: The spread of TB in the healthcare setting occurs at a low rate in U.S. hospitals.

13. Under the *TB Enforcement Policy*, healthcare facilities must have all of the following EXCEPT:  
   a. Protocols to quickly identify and isolate patients with TB  
   b. Education and training for patients with TB  
   c. TB/AFB isolation rooms with proper air and ventilation systems  
   d. TB screening for healthcare workers  
   e. Evaluation and follow-up for workers who test positive for TB  
   f. There are no exceptions; healthcare facilities must have all of the all of the items listed.

Correct answer: **B**  
Rationale: Under the *TB Enforcement Policy*, healthcare facilities must have all of the items listed except education and training for patients with TB. Although they are required to provide education and training for their staff, they are not required to provide it for patients with TB.

14. Employers are required to educate healthcare workers about TB. Education and training should focus on:  
   a. The basics of TB  
   b. The importance of screening  
   c. What TB skin tests mean  
   d. TB infection control  
   e. All of the above

Correct answer: **E**  
Rationale: Education and training for healthcare workers about TB should focus on all of the topics listed.
15. Under OSHA standards, respirators used to protect healthcare workers from TB must be:
   a. Fit-tested and vacuum tested
   b. Fit-checked and vacuum tested
   c. Fit-tested and fit-checked
   d. Fit-tested, fit-checked, and vacuum tested
   e. None of the above

Correct answer: C
Rationale: Under OSHA standards, respirators used to protect healthcare workers from TB must be fit-tested and fit-checked.