Nosocomial Antibiotic Resistant Organisms
MRSA & VRE

Course
Health Science

Unit VII
Infection Control

Essential Question
Does improved hand hygiene really reduce the spread of bacteria in healthcare settings?

TEKS
130.204 (c) 1G, 11A, 12A

Prior Student Learning
An understanding of infection control.

Estimated time
3 hours

Rationale
Widespread use of antibiotics has been associated with the emergence of drug resistant microorganisms. According to the CDC, more than 70% of the bacteria now causing hospital-acquired infections are resistant to at least one of the drugs most commonly used to treat them. All health-care workers play a role in preventing the spread of these nosocomial infections.

Objectives
Upon completion of this lesson, the student will be able to:

- Analyze a current public health topic
- Protect themselves and their clients from nosocomial antibiotic resistant organisms
- Assess infection control measures needed in health care facility

Engage
A 41-year-old woman presented to the hospital with acute renal failure, which came to be diagnosed as a first presentation of systemic lupus erythematosus (SLE). During the hospitalization, she developed additional complications of SLE including cerebritis, hemolytic anemia, and thrombocytopenia.

After 2 weeks in the hospital, the patient was given vancomycin and piperacillin/tazobactam for altered mental status and leukocytosis of 19,000. A few days later, antibiotics were changed to vancomycin and levofloxacin for persistent leukocytosis and low-grade fevers. Multiple cultures from urine, blood, and sputum yielded no organisms, but the patient was kept on antibiotics due to fevers. Although no clear source of infection was identified, antibiotics were continued for 3 weeks, at which point her fevers spiked to 38.5°C. At that time, a single blood culture grew vancomycin-resistant *Enterococcus faecium* (VRE), as did a central line catheter tip. Furthermore, urine cultures grew more than 100,000 colonies of *Candida glabrata*.

The patient received a consultation from an infectious disease specialist, who recommended that all antibiotics be discontinued. Within 24 hours, the patient defervesced. She remained hemodynamically stable and underwent further treatment for her SLE.

http://www.webmm.ahrq.gov/case.aspx?caseID=16

Key Points

MRSA

MRSA is becoming more prevalent in healthcare settings. According to CDC data, the proportion of infections that are antimicrobial resistant has been growing. In 1974, MRSA infections accounted for two percent of the total number of staph infections; in 1995 it was 22%; in 2004 it was 63%.

A. MRSA - Methicillin resistant *Staphylococcus aureus*
    1. Resistant to most antibiotics
    2. Found in health care facilities
        a. hospitals
        b. long term care facilities
        c. other care facilities
    3. Not a threat to a healthy individual
B. MRSA concerns
    1. MRSA is difficult to contain
    2. MRSA is easily spread
C. MRSA risk factors
    1. Surgery
    2. devices used in invasive procedures
    3. burn wards or intensive care units (ICU)
    4. age
    5. Treatment with multiple antibiotics
    6. Severe illness or disability
    7. Prolonged or repeated hospital stays
    8. compromised immune system
D. MRSA transmission
    1. direct contact between health-care workers and clients.
    2. Health-care workers are the main carriers of MRSA
    3. Colonization vs. Infection
        a. Colonization means that the organism is present or in the body, but is not causing illness.
        b. Infection means that the organism is present and causing illness.
    4. MRSA is not usually spread through the air
E. Identifying MRSA infection
    1. Symptoms:
        a. Drainage from a wound
        b. Fever and chills
        c. Elevated white blood count
    2. Common sites of infection
        a. Respiratory tract
        b. Surgical wounds
        c. Perineum or rectum
        d. Skin
        e. Urinary tract
F. MRSA prevention

1. Proper hand-washing
    a. Before caring for each client
    b. After removing gloves
    c. Before leaving the client's room
2. Follow facility protocol for standard precautions

G. Community Acquired MRSA
1. MRSA infections that are acquired by persons who have not been recently (within the past year) hospitalized or had a medical procedure (such as dialysis, surgery, catheters) are known as CA-MRSA infections.
2. Staph or MRSA infections in the community are usually manifested as skin infections, such as pimples and boils, and occur in otherwise healthy people.

VRE

A. VRE - Vancomycin resistant *enterococcus*
B. VRE concerns
1. VRE is hard to treat
2. VRE can pass on their drug-resistant genes

C. VRE risk factors
1. Severe illness
2. Treatment with multiple antibiotics
3. Abdominal or cardiac surgery
4. Devices used in invasive procedures
5. Age
6. Intensive care unit (ICU)
7. Prolonged or repeated hospital stays
8. Compromised immune system

D. Pathogenesis of VRE
1. Opportunistic
2. Bacteria transmitted between clients and health-care workers
    a. Colonized vs. infected persons

E. Signs of infection
1. Drainage from a wound
2. Fever and chills
3. Elevated white blood count

F. Role of health care workers in prevention of VRE
1. Hand-washing helps stop the spread of VRE
    a. Wash before caring for a patient
    b. After removing gloves
    c. Before leaving the patient's room
2. Follow facility protocol for standard precautions

GNB

A. Gram-negative bacteria are those bacteria that do not retain crystal violet dye in the Gram staining protocol.
B. Gram negative bacteria associated with nosocomial infections include *Acinetobacter baumanii*, which cause bacteremia, secondary meningitis, and ventilator-associated pneumonia in intensive care units of hospital establishments.
   1. *Acinetobacter* is a group of bacteria commonly found in soil and water.
   2. It can also be found on the skin of healthy people, especially healthcare personnel.
C. One of the several unique characteristics of Gram-negative bacteria is the structure of the outer membrane. This outer membrane protects the bacteria from several antibiotics, dyes, and detergents which would normally damage the inner membrane or cell wall.

Activity

I. Complete the **Test Your Knowledge Quizzes**.
II. Choose a local hospital or long-term care facility and interview an infection control professional on the statistics of VRE, MRSA and/or GNB in their facility. Report findings. **Interview Questions**.
III. Research and report in cooperative groups on an MSRA, GNB or VRE case study. Present findings using a multimedia presentation.
IV. Consider the types of patients who are most likely to be at risk of contracting MRSA, GNB or VRE and compile a list of risk factors. Undertake a risk assessment of three patients in your clinical area and assess the type of control measures that may be necessary to stop cross-infection with MRSA, GNB or VRE.

Assessment

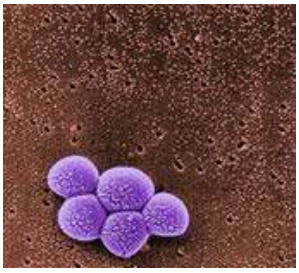
Successful completion of Quizzes
Multimedia Presentation Rubric
Project Rubric

Materials

Nosocomial Antibiotic Resistant Organisms PowerPoint

"Test Your Knowledge" Quizzes
http://www.fda.gov/cdrh/fdaandyou/lesson15.html
http://www.cdc.gov/niosh/topics/mrsa/

MRSA Photos:



http://www.cdc.gov/niosh/topics/mrsa/

MRSA Podcast – CDC - http://www2a.cdc.gov/podcasts/player.asp?f=6936

Graphic photos - http://www.dshs.state.tx.us/idcu/health/antibiotic_resistance/mrsa/picpage.asp

Management of Multidrug-Resistant Organism 2006- http://www.cdc.gov/ncidod/dhqp/pdf/ar/MDROGuideline2006.pdf

Accommodations for Learning Differences
For reinforcement, the student will design a chart of standard precautions for MSRA, GNB and VRE.

For enrichment, the student will choose MRSA, GNB or VRE and investigate through the CDC the latest statistics on the antibiotic resistant organisms and their economic impact.

National and State Education Standards
National Health Science Cluster Standards
HLC06.01
Health care workers will understand the existing and potential hazards to clients, co-workers, and self. They will prevent injury or illness through safe work practices and follow health and safety policies and procedures.

HLC06.02
Health care workers will understand the fundamentals of wellness and the prevention of disease processes. They will practice preventive health behaviors among their clients

TEKS
130.204 (c)(1)(G) research the global impact of disease prevention and cost containment;
130.204 (c)(11)(A) conform to governmental regulations and guidelines from entities such as the World Health Organization, Centers for Disease Control, Occupational Safety and Health Administration, Food and Drug Administration, and National Institute for Occupational Safety and Health; and
130.204 (c)(12)(A) research wellness strategies for the prevention of disease.

Texas College and Career Readiness Standards
English Language Arts
II. B. Understand new vocabulary and concepts and use them accurately in reading writing and speaking.
III. B. Develop effective speaking styles for both group and one on one situations.
IV. A. Apply listening skills as an individual and as a member of a group in a variety of settings.

Science
I. A. 1. Utilize skepticism, logic and professional ethics in science
I. C. 2. Understand and apply safe procedures in the laboratory and field, including chemical, electrical, and fire safety and safe handling of live or preserved organisms.

Cross-Disciplinary
I. C. 1. Analyze a situation to identify a problem to be solved.
I. C. 3. collect evidence and data systematically and directly relate to solving a problem

Interview Questions

MRSA

1. Are MRSA clients isolated?

2. How is MRSA infection treated?

3. Is MRSA more contagious than other species of staph?

4. Should health-care workers be screened for MRSA?

5. Can a carrier of MRSA continue working?

6. Can nursing facilities refuse clients because they have MRSA?

VRE

1. Are VRE patients isolated?

2. Should patients from high-risk hospitals be screened for VRE?

3. Are there special precautions for moving VRE clients to other facilities?

4. Should all health-care workers be screened for VRE?

5. Can a carrier of VRE continue working?

6. Can nursing facilities refuse clients because they have VRE?

MRSA QUIZ

Please answer the following true or false questions.

1. MRSA infects anyone who comes in contact with it. T or F

2. MRSA infection can be hard to stamp out once it's established in a facility. T or F

3. Open wounds give MRSA easy entry into the body. T or F

4. Those who are already seriously ill are at higher risk of MRSA infection. T or F

5. Most cases of MRSA infection are the result of patient-to-patient contact. T or F

6. Anyone who is colonized with MRSA will eventually become infected. T or F

7. MRSA is rarely spread through the air. T or F

8. Symptoms of MRSA infection are different than symptoms of other kinds of *Staphylococcus* infection. T or F

9. Wearing gloves when caring for patients makes hand-washing unnecessary. T or F

10. MRSA is no more contagious that other types of *Staphylococcus.* T or F

VRE QUIZ

Please answer the following true or false questions.

1. VRE infects anyone who comes into contact with it. T or F

2. VRE infection can be hard to stamp out once it's established in a facility. T or F

3. Open wounds give VRE easy entry into the body. T or F

4. Those who are already seriously ill are at higher risk of VRE infection. T or F

5. VRE can only be spread by health-care workers. T or F

6. The hospital microbiology laboratory should immediately report the presence of VRE. T or F

7. Health-care providers should prescribe vancomycin whenever possible. T or F

8. The presence of *enterococci* in a patient's gastrointestinal tract is a sign of infection. T or F

9. Wearing gloves when caring for patients makes hand-washing unnecessary. T or F

10. Equipment such as thermometers should be disinfected after each use. T or F

Critical Thinking Scenarios
Staph Infections

Instructions: *Write a response to each scenario based on your knowledge of staph infections.*

1. Sara and her soccer teammates are changing into their uniforms for a game. Sara mentions to her friend Jill that she wishes she had had time to shave her legs earlier. Jill offers Sara the use of her razor. Sara notices the razor appears to have been used. Should Sara use the razor, why or why not?

2. Marcus is working out in the gym's weight room with a group of friends. His friend Seth has just finished using the chest press machine and offers it to Marcus. What should Marcus do to help protect himself from bacteria that may be on the chest press machine?

3. Mai accidentally cut her hand during marching band practice. How should she care for the wound to help prevent getting or transmitting staph or other bacterial infections?

4. On a Saturday afternoon Juan decides to go for a run. As he heads home, Juan considers stopping at a friend's house to play video games. Should Juan stay in his sweaty running clothes when he plays video games, why or why not?

5. Frankie and his sister Jennifer share a bathroom. Frankie, who has a cut on his leg from baseball practice, takes a shower and hangs his towel up to dry. Two hours later Jennifer uses the same towel to dry her hands. Should Jennifer have used Frankie's towel, why or why not?

http://www.fda.gov/cdrh/fdaandyou/lesson15.html

Critical Thinking Scenarios
Staph Infections

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1. Sara and her soccer teammates are changing into their uniforms for a game. Sara mentions to her friend Jill that she wishes she had had time to shave her legs earlier. Jill offers Sara the use of her razor. Sara notices the razor appears to have been used. Should Sara use the razor, why or why not?

A: Sara should not use the razor. To avoid getting/spreading staph infection you should not share personal items, such as towels and razors.

2. Marcus is working out in the gym's weight room with a group of friends. His friend Seth has just finished using the chest press machine and offers it to Marcus. What should Marcus do to help protect himself from bacteria that may be on the chest press machine?

A: Before using the chest press machine, Marcus should wipe the equipment with a clean towel.

3. Mai accidentally cut her hand during marching band practice. How should she care for the wound to help prevent getting or transmitting staph or other bacterial infections?

A: Mai should clean the cut then keep it covered with a clean, dry bandage until it has healed.

4. On a Saturday afternoon Juan decides to go for a run. As he heads home, Juan considers stopping at a friend's house to play video games. Should Juan stay in his sweaty running clothes when he plays video games, why or why not?

A: Juan should not stay in his sweaty clothes because staph infection can be transferred by sweat.

5. Frankie and his sister Jennifer share a bathroom. Frankie, who has a cut on his leg from baseball practice, takes a shower and hangs his towel up to dry. Two hours later Jennifer uses the same towel to dry her hands. Should Jennifer have used Frankie's towel, why or why not?

A: Jennifer should not have used Frankie's towel. She should have used a different one. To avoid getting staph infections you should not share personal items, such as towels.

http://www.fda.gov/cdrh/fdaandyou/lesson15.html

Project Rubric

Student: _____

Course: _____

Date: _____

Scoring criteria	4. Excellent	3. Good	2. Needs Some Improvement	1. Needs Much Improvement	N/A
Clearly/effectively communicates the main idea or theme.					
Information clearly provided.					
Strong examples used to describe the theme or objective.					
Illustrations follow a logical reasoning.					
Each image and font size is legible to entire audience.					

NOTE: N/A represents a response to the performance which is "not appropriate."

Scale:
22-25 - A Excellent
18-21 - B Good
14-17 - C Needs Some Improvement
10-13 - D Needs Much Improvement
5-9 - F Not Appropriate

TOTAL =

Multimedia Rubric

Student:_____ Class:_____
Title:_____ Date:_____
Other Group Members:_____ _____

Scoring criteria	5 Excellent	4 Good	3 Needs Some Improvement	2 Needs Much Improvement	1 N/A
Clearly and effectively communicates an introduction of the theme/objective of the project.					
Clearly and effectively communicates the content throughout the presentation.					
Integrated a variety of multimedia resources to create a professional presentation (transition, graphics).					
Presentation holds audience attention and relates a clear message.					
Timing between slides is beneficial for the viewer to read or observe content.					
Each image and font size is legible to entire audience.					

Scale:
26-30 A Excellent
21-25 B Good
16-20 C Needs Some Improvement
11-15 D Needs Much Improvement
6-10 F Not Appropriate

TOTAL=

Comments