CHAPTER FOUR: EPIDEMIOLOGY

Practical Application: Book Activity

Practical Application

Setting the Scene

Legionnaires' disease is a type of pneumonia caused by the Legionella bacteria. In nature, Legionella live in nature and rarely cause illness. In a man made setting, Legionella can grow if water is not properly maintained. These man made water sources become a health problem when small droplets of water that contain the bacteria get into the air and people breathe them in (CDC, 2022b).

Legionnaires' Disease is a national reportable condition. In 2015, the New York City Department of Health and Mental Hygiene (NYC DOHMH) detected an abnormal number of Legionnaires' cases in the South Bronx via the notifiable conditions public health policy. To better understand how and why this was occurring, the response team within the Department of Health collected more data, including the sampling of many cooling towers within the designated areas within NYC in search of the Legionella pneumophilia bacteria. Using the surveillance data and information about the disease, such as where bacteria are commonly found, the health department was able to identify the source (environment) as a cooling tower in the city. Locating this tower led to the destruction of the bacteria within the tower and a new local law to test for Legionella as part of the required certification and maintenance inspections (Chamberlain, et al. 2017).

Think About It.

1. Imagine you were a nurse during this outbreak.
    a. How might you have been involved in the outbreak?
    b. What steps would you take if a patient came in with Legionnaires' Disease?

2. Imagine you were a part of the NYC DOHMH when this outbreak took place.
    a. What questions would you ask when the abnormal number of cases first arose?
    b. How would you answer these questions? What data would you need to collect?
    c. What were the three corners/vertices of the Epidemiologic Triangle for this outbreak?
    d. Why might Legionnaires disease be classified as a notifiable condition?
3. Classify the following diseases as epidemic, pandemic, or cluster. Describe why you selected each classification.
    a. Malaria in Africa, which is present at all times because of the presence of infected mosquitoes.
    b. Ebola in parts of Africa where it exceeds what is expected for this region.
    c. COVID-19
    d. Measles, as occurring among employees at Factory X in Fort Worth, Texas in March 1981

Practical Application: Additional Guidance

Exercise Title

Epidemiology in Community/Population Care

Objective

This exercise aims to engage nursing students in understanding the functions of epidemiology in the process of community diagnosis and health surveillance, in the formulation of objectives and targets.

Preparing for the Exercise

- **Introduction**: Introduce the Legionnaires' outbreak in New York City in 2015. It could be helpful to also provide additional information to students, including
    - Presentation slides or handouts on Legionnaires' disease (including information on Legionella bacteria, transmission, symptoms, and risk factors). Video
    - Access to relevant case studies or outbreak scenarios.

- PBS video, with Dr. Anne Schuchat of the Centers for Disease Control and Prevention. What caused the Legionnaires' disease outbreak in NYC? | PBS NewsHour

Exercise Components

1. **Analysis of Factors**: Prompt students to begin the 5 steps of the health surveillance process with data collection in finding trends and data related to Legionnaires Disease in NYC in 2015.
2. **Identification of Epidemiological Data**: Guide students in identifying key factors regarding the data. What is known is that it is Legionnaires' disease, but now other factors such as how much, when, where and among whom.
3. **Proposed Interventions**: Challenge students to identify key elements regarding the epidemiological data that lead to the identification as to the source of the outbreak.

Exercise Activities and Timeline

1. Introduction (10 minutes):
   a. Briefly introduce Legionnaires' disease and its significance.
   b. Discuss the role of nurses in public health preparedness.
2. Scenario Discussion (20 minutes):
   a. Present the NYC outbreak scenario to students.
   b. Facilitate a discussion on how nurses might have been involved during the outbreak.
   c. Encourage participants to consider patient care, surveillance, and communication strategies.
3. Group Activity (30 minutes):
   a. Divide participants into small groups.
   b. Provide each group with a specific aspect of outbreak response (e.g., patient assessment, contact tracing, environmental investigation).
   c. Ask groups to brainstorm steps they would take in their assigned role.
4. Whole Group Discussion (15 minutes):
   a. Have each group share their findings and strategies.
   b. Discuss challenges, ethical considerations, and collaboration among healthcare professionals.

Evaluation and Assessment

- **Critical Analysis**: Assess students' ability to critically analyze the inferences drawn from the data identifying the Legionnaires' outbreak, its impact and subsequent action plan to address the cause.
- **Engagement in Discussion**: Evaluate students' active participation in discussions, including their ability to identify and understand health surveillance and epidemiologic investigation help identify and

address population and public health concerns. Consider having students write a 1-minute essay of their reflections that can be submitted as a participation grade.

Integration into Curriculum

- **Alignment with Course Objectives**: Ensure that the exercise aligns with course objectives related to basic epidemiologic principles in health promotion, disease and injury prevention, surveillance, investigation and control.
- **Sequencing**: Determine the appropriate timing and sequencing of the exercise within the course curriculum to complement other content and activities.
- **Integration of Theory and Practice**: Emphasize the application of nursing theory and evidence-based practice to real-world scenarios, fostering the development of culturally competent and socially conscious nursing practice.

Resources and Support

- **Learning Resources**: Provide students with access to relevant literature, articles, and resources on Epidemiology and nursing role, including:
  - Centers for Disease Control and Prevention (CDC). Legionnaires' Disease: Information for Health Professionals. Link
  - Chamberlain, A. T., et al. (2017). An outbreak of Legionnaires' disease associated with a decorative water wall fountain in a hospital. Infection Control & Hospital Epidemiology, 38(8), 936-942.
- **Faculty Support**: Offer guidance, feedback, and support to students as they engage in the exercise, addressing any questions or concerns they may have about the scenario or related topics.

Conclusion

By following these guidelines, nurse educators can create a practical application exercise that engages nursing students in a meaningful exploration of health surveillance, epidemiology, and the nurse's role.

Additional Activities

Role-playing/Communication Exercise

Scenario Title

Outbreak Investigation in a Community

Objectives

- Understand the roles and responsibilities of a nurse in an outbreak investigation.
- Practice communication and collaboration skills in a public health crisis.
- Apply epidemiological principles such as surveillance, case definition, and outbreak control measures.

Roles

- **Community Health Nurse (Participant A)**: You are a community health nurse responsible for the neighborhood affected by a suspected outbreak of a contagious disease (choose a disease relevant to your learning goals, such as influenza, measles, etc.).
- **Health Department Nurse (Participant B)**: You are a nurse working for the health department investigating and managing the outbreak.

Role-Playing Activity

1. Situation Briefing (5 minutes): The facilitator sets the stage by briefing both participants on the current situation: several cases of the disease have been reported in the neighborhood, and there is concern about its spread.
2. Initial Assessment (10 minutes): Participant A (the nurse) conducts an initial assessment of the affected individuals and gathers epidemiological data (number of cases, symptoms, possible sources of infection, demographics, etc.).
3. Planning and Coordination (10 minutes): Participant A and Participant B discuss and plan the next steps, including:

    a. Isolation and quarantine measures if necessary.
    b. Communication strategies with affected individuals and the community.
    c. Collection of samples for laboratory testing, if applicable.
    d. Contact tracing and identification of potential sources of infection.

4. Execution and Role Play (20 minutes): Participants execute their plans:

   a. Participant A implements nursing interventions such as providing care, education on prevention, and monitoring symptoms.
   b. Participant B coordinates with laboratories, communicates findings to public health officials, and manages data collection and analysis.

5. Debriefing (10 minutes): After the exercise, both participants discuss what went well, what challenges they faced, and what they learned from the experience

Debriefing and Feedback

After the role-play, conduct a debriefing session where each participant reflects on their experience, provides feedback, and discusses lessons learned.

- Understanding Roles and Responsibilities
  - What specific responsibilities did you find most crucial in managing the outbreak? Why?
- Communication and Collaboration Skills
  - What were some effective communication strategies you utilized during the exercise? How did they contribute to managing the crisis?
- Application of Epidemiological Principles
  - How did you apply surveillance methods during the investigation? What were the challenges in collecting and analyzing data?

Reflective Practice

This activity could occur on a discussion board or by uploading a video using Flip or Canvas Studio.

How did your nursing expertise contribute to applying epidemiological principles during the

outbreak investigation, and what insights did you gain about integrating clinical nursing practice with public health strategies to manage community health crises effectively?

Interactive Module

Create an interactive escape room using Google Forms that challenges students to solve puzzles related to the chapter topic. These NCLEX-style questions can be a starting point.

1. A community health nurse is involved in investigating an influenza outbreak in a local school. Which of the following actions is a priority for the nurse?

    A. Distributing educational pamphlets about hand hygiene to students
    B. Administering flu vaccines to unvaccinated students
    C. Identifying and reporting new cases to public health authorities
    D. Arranging for the school to be closed immediately

2. During a measles outbreak, a community health nurse is tasked with contact tracing. Which of the following individuals should the nurse prioritize for follow-up?

    A. Individuals who were in direct contact with confirmed cases
    B. Individuals who have received the MMR vaccine
    C. Individuals who show no symptoms of measles
    D. Individuals who have a history of measles infection

3. In the event of a tuberculosis outbreak, what is the primary role of the community health nurse concerning epidemiological principles?

    A. Providing nutritional support to affected individuals
    B. Educating the community about the symptoms of tuberculosis
    C. Conducting active case finding and contact investigation
    D. Distributing face masks to the community

4. A community health nurse is part of a team responding to a foodborne illness outbreak.

Which epidemiological task should the nurse perform first?

A. Collecting stool samples from affected individuals
B. Identifying the source of the food contamination
C. Implementing immediate isolation for all affected individuals
D. Providing oral rehydration therapy to patients

5. What is an important responsibility of the community health nurse during the recovery phase of a public health crisis?

A. Continuing surveillance for new cases
B. Distributing personal protective equipment (PPE) to the community
C. Administering initial treatments to newly diagnosed patients
D. Initiating quarantine measures for all exposed individuals

Case Study: Epidemiological Management of a Measles Outbreak in a Community

Background

Taylor is a community health nurse working in an urban neighborhood. Recently, a measles outbreak has been reported in the community, affecting several households. Taylor has been assigned to investigate the outbreak, manage the situation, and implement measures to prevent further spread.

Patient Information:

- Name: Various (Community Residents)
- Age: Ranges from infants to adults
- Gender: Both male and female
- Presenting Symptoms: High fever, cough, runny nose, red and watery eyes, followed by a rash that starts on the face and spreads to the rest of the body.

Objectives

- Understand the nurse's role in epidemiological investigation and outbreak management.
- Develop and implement a comprehensive outbreak response plan.
- Apply epidemiological principles to trace contacts and control the spread of infection.
- Communicate effectively with stakeholders, including community members, healthcare providers, and public health officials.

Scenario

Taylor begins by gathering detailed information on the affected individuals and their symptoms. They review their medical histories and confirm the diagnosis of measles through laboratory testing. They also identifies common factors among the cases, such as recent travel history, vaccination status, and close contacts.

Key Actions and Interventions:

1. Initial Response:

    1. Conduct a rapid assessment to determine the extent of the outbreak.
    2. Isolate confirmed and suspected cases to prevent further transmission.
    3. Communicate with affected individuals and their families to guide managing symptoms and preventing spread.

2. Epidemiological Investigation:

    1. Collect data on the onset of symptoms, contact history, and vaccination status of affected individuals.
    2. Trace contacts and identify potential sources of infection.
    3. Utilize public health resources to test and confirm measles cases and to analyze the data.

3. Infection Control Measures:

    1. Educate community members about the symptoms of measles, the importance of vaccination, and preventive measures such as hand hygiene and avoiding contact with infected individuals.
    2. Coordinate with local healthcare providers to ensure that unvaccinated individuals,

especially children, receive the MMR (measles, mumps, and rubella) vaccine.
   3. Implement enhanced cleaning and disinfection procedures in public spaces, schools, and healthcare facilities.

4. Communication and Coordination:

   1. Hold community meetings to provide updates and answer questions.
   2. Coordinate with local public health officials to ensure a unified response and access to resources.
   3. Develop and distribute educational materials on measles prevention and care.

5. Ongoing Monitoring and Support:

   1. Monitor the health of the community members, tracking new cases and recoveries.
   2. Provide support to families dealing with sick individuals, offering guidance on symptom management and when to seek medical care.
   3. Evaluate the effectiveness of the response measures and adjust strategies as needed.

Outcomes:

After implementing the response plan, Taylor observes a decrease in new measles cases in the community. The educational efforts have increased awareness and improved preventive practices among community members. Vaccination rates have increased, reducing the risk of future outbreaks.

Questions for Reflection and Analysis

- How did Taylor's nursing expertise contribute to the effective management of the measles outbreak?
- What were the key epidemiological principles applied in this case study, and how did they help control the spread of infection?
- How did communication and collaboration with various stakeholders impact the outcome of the outbreak response?
- What challenges did Taylor face during the outbreak, and how did she address them?
- What additional measures could be taken to prevent future measles outbreaks in similar settings?

Simulation

Scenario

Managing an Influenza Outbreak in the Community

Overview

This simulation is designed to provide nursing students with practical experience in managing an influenza outbreak in a community setting. The simulation will focus on assessment, epidemiological investigation, communication, and intervention strategies.

Objectives

- Assess and identify cases of influenza within the community.
- Apply epidemiological principles to trace contacts and determine the outbreak source.
- Implement infection control measures to prevent further spread.
- Communicate effectively with patients, families, community members, and public health officials.
- Evaluate the effectiveness of interventions and adjust strategies as needed.

Roles

- Community health nurses
- Patients
- Community members
- Public health officials

Setting

A simulated community environment including a local clinic, community center, and several households.

Materials Needed

- Medical records
- symptom checklists
- contact tracing forms
- educational materials
- personal protective equipment (PPE)
- communication devices.

Simulation Outline

1. Introduction and Briefing (10 minutes):
    a. The facilitator provides an overview of the scenario: a sudden increase in flu-like symptoms reported in the community over the past week.
    b. The objectives and roles of the participants are explained.
    c. Participants are given initial data on reported cases and their symptoms.
2. Initial Assessment (15 minutes):
    a. Community health nurses conduct home visits and clinic assessments to gather detailed information on affected individuals, including symptom onset, severity, and possible exposure sources.
    b. Nurses collect basic epidemiological data such as the number of cases, demographics, and vaccination status.
3. Epidemiological Investigation (20 minutes):
    a. Nurses use contact tracing forms to identify close contacts of confirmed cases and potential sources of infection (e.g., school, workplace, social gatherings).
    b. Public health officials collaborate with nurses to analyze data and identify patterns or clusters of infection.
    c. The source of the outbreak is hypothesized, and initial containment measures are discussed.
4. Infection Control Measures (20 minutes):
    a. Nurses educate patients and families on proper hygiene practices, the importance of staying home when sick, and how to care for sick family members.

   b. PPE is distributed to healthcare providers and high-risk community members.
   c. Enhanced cleaning protocols are implemented in public spaces and households with confirmed cases.
   d. Vaccination clinics are organized to increase flu vaccination rates in the community.

5. Communication and Coordination (15 minutes):

   a. Nurses hold community meetings to provide updates on the outbreak, answer questions, and dispel any myths or misconceptions.
   b. Regular communication is established with public health officials to ensure a coordinated response.
   c. Educational materials are distributed to community members via flyers, social media, and local media outlets.

6. Ongoing Monitoring and Support (20 minutes):

   a. Nurses conduct daily follow-ups with affected individuals to monitor symptoms and provide support.
   b. New cases are tracked, and data is continually analyzed to adjust intervention strategies as needed.
   c. Community health workers are trained to assist with monitoring and education efforts.

7. Debriefing (15 minutes):

   a. Participants reflect on their experiences, discussing what went well and what challenges they faced.
   b. The facilitator provides feedback and highlights key learning points related to epidemiology, infection control, and communication.
   c. Participants discuss how they would apply these skills and knowledge in real-world situations.

Debriefing and Feedback

After the simulation, conduct a debriefing session where each participant reflects on their experience, provides feedback, and discusses lessons learned.

- How effective were your initial assessment and data collection efforts in identifying and managing the outbreak?

- What epidemiological principles did you apply during the investigation, and how did they guide your actions?
- How did you communicate effectively with patients, families, and community members?
- What infection control measures did you implement, and how did they impact the spread of the flu?
- How did ongoing monitoring and support contribute to managing the outbreak, and what challenges did you encounter

Competency Assessment

- Conduct community health assessments and surveillance activities to identify health trends and potential outbreaks.
- Use epidemiological tools and software to collect, analyze, and interpret health data.

Clinical Activities/Opportunities

1. Surveillance Activities:
    a. Engage in routine surveillance activities, such as monitoring disease incidence and prevalence.
    b. Use epidemiological software and tools to collect, analyze, and report data.
2. School Health Programs:
    a. Work with school health nurses to implement health promotion and disease prevention programs.

   b. Conduct screenings, provide health education, and manage outbreaks in school settings.

3. Chronic Disease Management Programs:

   a. Assist in programs focused on managing chronic diseases, such as diabetes or hypertension.
   b. Analyze data to evaluate the effectiveness of interventions and identify areas for improvement.