

## Masters of Science in Infection Prevention & Epidemiology

### Course Descriptions & Student Learning Outcomes

#### Introduction to Epidemiology

##### **Course Description:**

Epidemiology is the study of the distribution and determinants of disease. It is the foundational science for infection prevention. The principles of epidemiology are used to solve global problems, such as an outbreak of Ebola in West Africa, and on a smaller scale, analyzing the spread of healthcare associated infections in one hospital. This introductory course will provide students the opportunity to research and evaluate key study designs and their application. Other important topics that will be covered include study screening and sampling, disease transmission and prevention, key components related to the chain of infection and risk factors in the spread of disease. Upon completion of this course, students will be able to understand fundamental concepts of epidemiology and apply them to real world scenarios, especially in relation to infection prevention within the healthcare setting.

##### **Student Learning Outcomes:**

1. Understand and apply basic terminology, definitions and principles of epidemiology to infection prevention.
2. Describe and analyze a current epidemiologic problem in terms of magnitude, person, place, and time.
3. Identify the risk factors for an epidemiological problem and how these risk factors could have been prevented, if possible.
4. Calculate basic measurements of epidemiology including prevalence, incidence, 2x2 table, relative risk, odds ratio, and confidence intervals.
5. Conduct and evaluate a research review of epidemiological data and share the findings in a scholarly manner.

#### Statistics & Research Methods

**Course Description:** Infection prevention and epidemiology is founded in research and statistical methods to gather and interpret data. Knowing how to use and apply these skills is key in both acquiring needed data and interpreting the research results of others. This course will provide a foundational knowledge in research methods and use of statistics for the field of infection prevention and epidemiology. You will learn to use this knowledge to both design and conduct research and to evaluate the literature in this field. An emphasis is also placed on doing this work collaboratively with a team and in presenting findings and recommendations to a variety of audiences.

##### **Student Learning Outcomes:**

1. Critically appraise and apply statistics and research methodologies to the literature.
2. Use statistical tests appropriate for a given research design and data type.
3. Analyze, interpret, and present statistical data.
4. Work in a team to form an IP/Epi research question, design an experiment, collect and analyze data, report findings in APA format manuscript, and present findings.

## Principles and Epidemiology of Infectious Disease

**Course Description:** This course introduces fundamental principles of infectious disease epidemiology and infection prevention. Principles include nomenclature, epidemiologic characteristics, host-parasite relationships, trends, natural history, diseases of significance, standard and transmission-based precautions, screening methods, and outbreak investigation. Case-studies focus on infectious diseases/organisms commonly found in the healthcare setting, and those with significant impact to patient safety.

### **Student Learning Outcomes**

1. Explain the foundational principles of disease transmission to inform decision-making within the organization.
2. Utilize epidemiologic principles to determine appropriate infection prevention precautions on a case-by-case basis.
3. Apply the epidemiology, signs and symptoms, transmission-based precautions, and key topics of concern for diseases of high concern/significance as they are presented in this course.
4. Create interventions to enhance healthcare worker awareness of transmission-based precautions and hand hygiene.
5. Conduct an outbreak investigation, develop strategies for risk mitigation, and share the investigation findings in a scholarly paper.
6. Distinguish pathology and primary prevention measures for major infection types (UTI, intravascular device, indwelling device, pneumonia, surgical site) found in the healthcare setting.

## Molecular and Immunological Methods in Infectious Disease

### **Course Description**

This course offers a comprehensive view of modern immunology at the molecular and cellular level. The first half of the course presents the fundamentals of immunology, beginning with innate immunity and followed by a discussion of the structure and function of important molecules in the immune system, such as antibodies, major histocompatibility antigens, complement and the T-cell receptor. The second half of the course is focused on immunological and nucleic acid based methods as they pertain to medical diagnostics and infection prevention practices.

### **Student Learning Outcomes**

1. Apply the principles of immunology as they relate to infection prevention.
2. Compare and contrast immune system responses to microbial and viral infections and assess their relevance for infection prevention.
3. Analyze techniques used to measure immunity or the state of the immune system and accurately interpret the results. Recognize the limitations of each test and evaluate how these may influence the outcomes.
4. Use the fundamental principles of immunological techniques to discriminate between and select appropriate methodology for diagnosis, prevention, and control of infectious diseases.
5. Evaluate an infection prevention challenge and apply evidence-based research to facilitate and implement solutions.

## Clinical Microbiology

**Course Description:** Central to the role of an Infection Preventionist is knowledge of microbiology as it pertains to the clinical setting. A successful partnership between the lab and the Infection Preventionist is essential for controlling and preventing infections, as well as improving patient care. This course focuses on the central concepts of medical microbiology, taking into consideration the pre-analytical (i.e. specimen selection and collection), analytical (i.e. diagnostic identification and susceptibility testing methods), and post-analytical (i.e. test interpretation and reporting) components in clinical microbiology.

### **Student Learning Outcomes**

1. Explain the essential functions of a clinical microbiology lab.
2. Examine the characteristics of the most common pathogens identified in the clinical microbiology laboratory for hospital- and community-acquired infections, and define common mechanisms of microbial pathogenicity.
3. Describe and apply fundamental applications of diagnostic tests used by clinical microbiology laboratories for identifying and characterizing pathogens, and understand how to interpret various laboratory results, from direct specimen stains to final reports.
4. Discuss the various antimicrobial susceptibility testing methods (phenotypic and genotypic), when it is appropriate to perform susceptibility testing, and how to interpret results, including evaluation of antibiogram data.
5. Understand and apply basic principles of newer technologies, both conventional and novel, for identification, detection and microbial typing, and evaluate these methods in the context of an outbreak investigation

## Antimicrobial Stewardship

### **Course Description**

This course will explore the development of antimicrobials and the history of antimicrobial resistance, with special attention to the human behaviors that accelerated the development of multi-drug resistant microbes. Students will learn about the pharmacology of antimicrobials, including the pharmacokinetic and pharmacodynamic principles of antimicrobials. Specific mechanisms of microbial resistance in major hospital-acquired pathogens will be discussed in the context of designing an antimicrobial stewardship program that is responsive to emerging resistance trends.

### **Student Learning Outcomes**

1. Develop a conceptual fluency in the domains of human infectious disease, antimicrobial pharmacology, and the history of antimicrobial therapy, in order to communicate effectively with a variety of healthcare professionals including infectious disease physicians, medical technologists, pharmacists, and nurses.
2. Explain the pathophysiology of hospital-acquired microbial infections that contribute to significant patient morbidity and mortality.
3. Examine and categorize problematic antimicrobial prescribing patterns that contribute to antimicrobial resistance (AMR), and discuss factors that influence antimicrobial prescribing habits.
4. Analyze data from antimicrobial susceptibility testing programs and antibiograms to anticipate emerging threats from resistance pathogens.
5. Apply pharmacokinetic and pharmacodynamic principles to evaluate antimicrobial stewardship practices for reducing or preventing the emergence of AMR.

6. Educate healthcare colleagues about the consequences of AMR, with the goal of inspiring compliance with antimicrobial stewardship and infection prevention practices.
7. Summarize outcome measures for antibiotic stewardship and recommend resources for ongoing education.

### Reprocessing & Environment of Care

**Course Description:** The risk of infectious disease transmission is not specific to person-to-person contact. The patient care environment, equipment, and supplies can play a major role in the acquisition of infections. This course focuses on the theory, research and practice of cleaning, disinfection, and sterilization of the Environment of Care and medical instrumentation.

#### **Student Learning Outcomes:**

1. Evaluate patient care areas for possible vehicles of infection.
2. Understand and describe the transmission risks associated with construction and renovation in a patient care area.
3. Examine a standard Infection Control Risk Assessment (ICRA) tool and describe how to appropriately utilize the tool, including special circumstances and areas of ambiguity.
4. Using a standard tool, explore potential transmission risks in the Environment of Care (EOC). This includes collaborative opportunities with other key hospital departments.
5. Gain a comprehensive understanding of the fundamentals of cleaning, disinfection and sterilization, including areas of risk and quality control requirements.
6. Examine and become familiar with leading evidence-based standards for reprocessing and accreditation standards for organizations.

### Regulation and Quality Improvement

**Course Description:** Infection Prevention (IP) is a highly regulated specialty area of health care, continually evolving with emerging infectious diseases, new technology and increasing regulatory requirements. It is essential for IPs to be knowledgeable about applicable laws, regulations and standards. Healthcare facilities are scrutinized for compliance with a myriad of rules and requirements. Non-compliance has significant potential safety, financial, legal and media implications. This course focuses on identifying the key federal, state and accrediting bodies that provide the rules that IPs must know to ensure compliance, develop policies, and effectively participate in a survey.

#### **Student Learning Outcomes:**

1. Identify regulatory organizations that govern healthcare facilities (inpatient, ambulatory, home care, and long-term care facilities) and understand their role in planning and decision-making.
2. Review and analyze in detail, specific regulations and examples of how facilities implement plans to ensure compliance.
3. Create communication plans to assist staff in understanding the rationale and purpose of regulations to facilitate compliance.
4. Develop a plan to implement a specific regulatory component of an IP program that will be cost-effective, feasible, and ensure compliance and best practices.
5. Identify a performance improvement project related to Infection Prevention, and compare implementation of the project using three of the models.

## Principles of Surveillance and Reporting

**Course Description:** This course introduces fundamental principles of infectious disease surveillance and reporting. Primary areas of focus include identification and evaluation of device and procedure-associated hospital-acquired infections. This course also focuses on utilizing surveillance data to conduct facility risk assessments and develop program plans.

### **Student Learning Outcomes**

1. Explain the foundational principles of infection prevention surveillance to inform decision-making and enhance information sharing.
2. Apply National Healthcare Safety Network (NHSN) surveillance definitions to case studies to determine which events constitute hospital-acquisition of infection.
3. Conduct a facility-level infection control program risk assessment and develop a prioritized program infection prevention plan based on findings.
4. Using information gathered from an organizational risk assessment, design a surveillance plan and system for a healthcare facility.
5. Utilize NHSN analysis, reporting tools and population data to inform decision-making, enhance information sharing and program reporting.
6. Understand and apply basic principles of infection prevention surveillance software functionality and use.

## Healthcare Informatics & Data Management

**Course Description:** More than ever, today's healthcare professionals are called upon to provide personalized patient care safely and efficiently with measurable outcomes and an emphasis on prevention. The field of Health Informatics offers tools and strategies that leaders can use to influence the use of technology, data, and information to improve healthcare safety, quality, efficiency, and the healthcare consumer/patient experience. This course will highlight these approaches and topics will include key concepts, theories, tools, and technologies in the fields of health informatics and data management.

### **Student Learning Outcomes**

1. Evaluate clinical, ethical, regulatory and technological considerations related to design, development and use of information systems to improve clinical care and advance the science of health care.
2. Apply selected theoretical models to acquire, process, and generate knowledge from data for evidence based practice.
3. Evaluate contributions of various types of information technologies and tools to health science research, clinical practice, education and administration.
4. Synthesize, reflect and present evidence of learning related to the use of information technology, including data extraction from practice information systems and databases

## Transformational Leadership

**Course Description:** Transformational leadership savviness is one leadership style that multiple organizations in business and healthcare have advocated for in the leaders they hire. How to inspire, motivate, challenge and develop loyal employees has been found by research to be a key component for

successful, effective, and high quality-oriented service organizational outcomes. This course focuses on the theory, research and practice dimensions of transformational leadership – how to lead from the heart to transform complex organizational systems.

**Student Learning Outcomes:**

1. Evaluate the relationships, roles, responsibilities, and results of transformational leadership.
2. Differentiate leadership from management while valuing both roles.
3. Design, develop and begin to implement a plan for continuing professional development as a transformational leader.
4. Identify collaborative and community collegial networks to engage in your transformational vision.
5. Identify essential distinctions about leadership, teams, change, communication, vision and strategy that can lead to powerful new outcomes within an organization.
6. Reflectively analyze your present capacity (strengths and limitations) to provide transformational leadership in a variety of settings.

**Internship & Capstone Project**

**Course Description:**

The capstone course is an opportunity for graduate candidates to synthesize, integrate and apply the skills and competencies they have acquired to an Infection Prevention and Epidemiology problem. It will be completed over 24 weeks in conjunction with courses 9, 10, and 11 of the program. Using the appropriate processes, data collection methods, resources, change theories and principles, the graduate candidate will assess, create, implement and evaluate a change project based on the needs of the internship facility. The capstone course demonstrates the culmination of learnings that result in the graduate candidate being able to perform the tasks of an Infection Preventionist competently and independently.

Within the 180 hours of each internship/capstone period (60 hours/credit), the graduate candidate and preceptor will discuss and decide on agreed upon specific learning outcomes and assignments to demonstrate skills and competencies for the appropriate topic at the graduate level.

**Student Learning Outcomes:**

1. Assess and identify opportunities, and implement strategies for change in the infection prevention arena.
2. Evaluate and synthesize research-based evidence related theories and principles of Infection Prevention and Epidemiology.
3. Submit the appropriate scholarly graduate level assignments that clearly demonstrates achievement of all learning outcomes.
4. Demonstrate the ability to act independently, under the guidance of a preceptor and a faculty member.