Content Areas
of the
Pharmacy Curriculum Outcomes Assessment® (PCOA®)

Area 1.0 – Basic Biomedical Sciences (10%)
Area 2.0 – Pharmaceutical Sciences (33%)
Area 3.0 – Social/Behavioral/Administrative Sciences (22%)
Area 4.0 – Clinical Sciences (35%)

Area 1.0 - Basic Biomedical Sciences (10%)

1.1 Physiology

- Function of the major body systems and homeostatic impact at organ and system level

1.2 Biochemistry

- 1.2.1 Chemistry and utilization of biomacromolecules including proteins, lipids, carbohydrates, nucleic acid, intermediary metabolism of energy and nutritional molecules
- 1.2.2 Enzymology and coenzymes and kinetics
- 1.2.3 Cell chemistry, signal transduction pathways
- 1.2.4 Transport and mobility
- 1.2.5 Recombinant DNA and molecular biotechnology
- 1.2.6 mRNA translation and protein synthesis

1.3 Microbiology Related to Human Disease

- 1.3.1 Structure, function, and characteristics of microorganisms: microbe classification, structure, metabolism, genetics
- 1.3.2 Pathogenic microorganisms of humans

1.4 Immunology

- 1.4.1 Innate and adaptive immunity
- 1.4.2 Principles of antibody actions
- 1.4.3 Hypersensitivity and types of reactions

Area 2.0 – Pharmaceutical Sciences (33%)

2.1 Medicinal Chemistry

- 2.1.1 Physicochemical properties of drugs in relation to drug absorption, distribution, metabolism, and excretion (ADME)
- 2.1.2 Chemical basis for drug action
- 2.1.3 Fundamental pharmacophores for drugs used to treat diseases
- 2.1.4 Structure-activity relationships in relation to drug-target interactions
- 2.1.5 Chemical pathways of drug metabolism
- 2.1.6 Applicability to making drug therapy decisions

2.2 Pharmacology and Toxicology

- 2.2.1 Mechanisms of action of drugs of various categories including biologics
- 2.2.2 Pharmacodynamics of drug binding and response
- 2.2.3 Adverse effects and side effects of drugs
- 2.2.4 Mechanisms of drug-drug interactions
- 2.2.5 Drug discovery and development
- 2.2.6 Acute and chronic toxic effect of xenobiotics, including drug and chemical overdose and antidotes

2.3 Pharmacognosy and Dietary Supplements

- 2.3.1 Concepts of crude drugs, semi-purified, and purified natural products
- 2.3.2 Classes of pharmacologically active natural products
- 2.3.3 Science and regulation of dietary supplements (vitamins, minerals, and herbals)

2.4 Pharmaceutics/Biopharmaceutics

- 2.4.1 Biopharmaceutical principles of drug delivery to the body via dosage forms: liquid, solid, semisolid, controlled release, patches, implants
- 2.4.2 Materials and methods used in preparation of drug forms
- 2.4.3 Physicochemical properties relating to drug entities and dosage forms
- 2.4.4 Principles of drug and dosage form stability, including chemical degradation and physical instability

2.5 Pharmacokinetics

- 2.5.1 Basic principles of in-vivo drug kinetics (linear and nonlinear)
- 2.5.2 Principles of bioavailability and bioequivalence
- 2.5.3 Physiologic determinates of drug onset and duration, including disease and dietary influences on absorption, distribution, metabolism, and excretion

2.6 Pharmacogenomics and Genetics

- 2.6.1 Molecular genetics, genomic, proteomic, and metabolomic principles that serve as a foundation for pharmacogenomics and the genetic basis of disease
- 2.6.2 Genetic variants affecting drug action and metabolism, adverse drug reactions, and disease risk that influence the practice of personalized medicine

2.7 Sterile and Nonsterile Compounding

- 2.7.1 United States Pharmacopeia guidelines on sterile and nonsterile compounding, hazardous drugs, and FDA regulation of compounding
- 2.7.2 Techniques and principles used to prepare and dispense individual extemporaneous prescriptions, including dating of compounded dosage forms
- 2.7.3 Dosage form preparation calculations
- 2.7.4 Sterile admixture techniques, including stability, clean-room requirements, sterility testing, and dating

Area 3.0 – Social/Behavioral/Administrative Sciences (22%)

3.1 Health Care Delivery Systems and Public Health

- 3.1.1 Organization of health care delivery systems at the national, state, and local levels: various settings where pharmacy is practiced and the structure of health care delivery systems such as managed care organizations, accountable care organizations, health departments
- 3.1.2 Health care delivery financing in the United States
- 3.1.3 Social, political, and economic factors that influence the delivery of health care in the United States
- 3.1.4 Public Health and Wellness: chronic disease prevention, health promotion, infectious disease control, demographics, physical, social, and environmental factors leading to disease, comparing and contrasting public health with individual medical care
- 3.1.5 The health care delivery system compared and contrasted with that of other industrialized nations

3.2 Population-based Care and Pharmacoepidemiology

- 3.2.1 Data sources and analytic tools that provide an estimate of the probability of beneficial or adverse effects of medication use in large populations
- 3.2.2 Application of epidemiological study designs to evaluate drug use and outcomes in large populations
- 3.2.3 Methods for continually monitoring unwanted effects and other safety-related aspects of medication use in large populations

3.3 Economic and Humanistic Outcomes of Health Care Delivery

- 3.3.1 General microeconomic and general macroeconomic principles
- 3.3.2 Pharmacoeconomic analysis and its application to improve the allocation of limited health care resources
- 3.3.3 Humanistic outcomes and their application to improve the allocation of limited health care resources

3.4 Pharmacy Practice Management

- 3.4.1 Management principles (planning, organizing, directing, and controlling pharmacy resources) applied to various pharmacy practice setting and patient outcomes
- 3.4.2 Personnel management
- 3.4.3 Planning, including delineation between business and strategic planning
- 3.4.4 Marketing of goods and services: product versus service pricing, distribution, promotion
- 3.4.5 Accounting and financial management
- 3.4.6 Budgeting
- 3.4.7 Risk management

3.5 Pharmacy Law and Regulatory Affairs

- 3.5.1 Legal and regulatory principles applied to pharmacy practice: dispensing, professional services, drug use control
- 3.5.2 Administrative, civil, and criminal liability
- 3.5.3 Authority, responsibilities, and operation of agencies and entities that promulgate or administer laws, regulations, or guidances related to practice and prescription and nonprescription medications

3.6 Biostatistics and Research Design

- 3.6.1 Research study designs used in medical research
- 3.6.2 Application and interpretation of statistical tests and data collection instruments

3.7 Ethical Decision Making

- 3.7.1 Principles of biomedical ethics
- 3.7.2 Ethical dilemmas in the delivery of patient, centered care including, conflicts of interest, end-of-life decision making, use of codes of ethics, oaths of the pharmacist
- 3.7.3 Research ethics

3.8 Professional Communication

- 3.8.1 Communication abilities (appropriate verbal, nonverbal, visual, and written) with patient and caregivers, including empathetic communication
- 3.8.2 Communication abilities with other health care providers
- 3.8.3 Assertiveness and problem-solving techniques in relation to difficult social and professional conflicts and situations
- 3.8.4 Measurement and use of health literacy in pharmacy communications
- 3.8.5 Development of cultural competency in pharmacy personnel such that services are respectful of and responsive to the health beliefs, practices, and cultural and linguistic needs of diverse patient populations

3.9 Social and Behavioral Aspects of Pharmacy Practice

- 3.9.1 Health-, illness-, and sick-role behaviors of patients
- 3.9.2 Principles of behavior modification
- 3.9.3 Patient adherence to therapies and recommendations
- 3.9.4 Caregiving throughout the lifecycle
- 3.9.5 Death and dying

3.10 Medication Dispensing and Distribution Systems

- 3.10.1 Systems for safe and effective preparation and dispensing of medications in all types of practice settings
- 3.10.2 Role of automation and technology: pharmacy informatics, information management
- 3.10.3 Continuous quality improvement programs or protocols in the medication-use process, including identification and prevention of medication errors, and establishment of error reduction programs

Area 4.0 – Clinical Sciences 35%

4.1 Evidence-based Practice

- 4.1.1 Interpret and evaluate drug information
- 4.1.2 Apply drug-information skills for the delivery of medication therapy management
- 4.1.3 Evaluate the reliability of various sources of information
- 4.1.4 Interpret guidelines as they apply in a clinical setting
- 4.1.5 Utilize core scientific and systems-based knowledge in the patient care decision-making process
- 4.1.6 Utilize basic science principles in the development and/or implementation of drug treatment protocols and clinical practice guidelines
- 4.1.7 Evaluate clinical trials that validate clinical appropriateness

4.2 Clinical Pathophysiology

- 4.2.1 Apply concepts of pathophysiology to clinical decision making

4.3 Clinical Pharmacokinetics

- 4.3.1 Utilize pharmacokinetics to calculate, evaluate, and individualize drug therapy
- 4.3.2 Interpret clinical pharmacokinetics of commonly used and low-therapeutic-index drugs

4.4 Clinical Pharmacogenomics

- 4.4.1 Utilize pharmacogenomics to calculate, evaluate, and individualize drug therapy

4.5 Disease Prevention and Population Health

- 4.5.1 Recognize the proper use of nonpharmacologic therapies, including complementary and alternative medicines
- 4.5.2 Describe measures to promote wellness and disease prevention
- 4.5.3 Identify the role of immunizations in disease prevention and health promotion

4.6 Patient Assessment

- 4.6.1 Describe techniques for obtaining a comprehensive patient history
- 4.6.2 Describe how to perform patient physical assessments: inspection, palpation, percussion, auscultation
- 4.6.3 Differentiate between normal physical assessment findings and modifications caused by common disease states and drug therapy
- 4.6.4 Interpret common clinical laboratory values and diagnostic tests
- 4.6.5 Perform calculations related to patient assessment:
- BMI, CrCl, lab adjustments
- 4.6.6 Describe the use of OTC point-of-care testing devices: glucometers, pregnancy tests, home testing for HbA1c, drug screening

4.7 Clinical Pharmacology and Therapeutic Decision Making

- 4.7.1 Make therapy recommendations based on dosage calculations, specific uses and indications of drugs, and nutritional and support therapy
- 4.7.2 Interpret therapeutic drug concentrations
- 4.7.3 Assess pharmacotherapy considering contraindications, therapeutic duplications, dietary interactions, adverse drug reactions and interactions, and allergies
- 4.7.4 Triage and identify when to refer patients to other health professionals
- 4.7.5 Design patient-centered, culturally-relevant treatment plans
- 4.7.6 Apply evidence-based decision making to patient care
- 4.7.7 Recommend nonprescription and natural product therapies
- 4.7.8 Identify and manage drug toxicity, drug-induced diseases, and misuse or abuse
- 4.7.9 Monitor drug therapy for misuse, abuse, and non-adherence