Appendix 1
Required Elements of the Didactic Doctor of Pharmacy Curriculum[4]

The following didactic content areas and associated learning expectations are viewed as central to a contemporary, high-quality pharmacy education and are incorporated at an appropriate breadth and depth in the required didactic Doctor of Pharmacy curriculum. Where noted, content areas may be addressed in the pre-professional curriculum (i.e., as requirements for admission). Required content areas may be delivered within individual or integrated courses, and may involve multiple disciplines.

This appendix was purposely written at the level of broad learning outcomes. It was constructed to provide statements of concepts and understandings essential for pharmacists to master, rather than a list of required topics to cover in the didactic curriculum. The goal is to ensure that critical areas of learning are included in the curricula of all programs without dictating how the lessons are structured, organized, or delivered.

The clear expectation embedded within Appendix 1 is that students will develop the comprehensive knowledge base required to be 'practice ready' and that they will be able to retain, recall, build upon, and apply that knowledge to deliver quality patient care in a variety of entry-level practice settings.

NOTE: The topics under each Science category are organized in alphabetical order.

Biomedical Sciences (may be addressed in the pre-professional curriculum)

Biochemistry

- Structure, properties, biological functions, applicable kinetics, and metabolic fate of macromolecules essential to life (proteins, lipids, carbohydrates, and nucleic acids). Application of these concepts to identify endogenous targets for drug therapy and rational drug design strategies.

Biostatistics

- Appropriate use of commonly employed statistical tests, management of data sets, and the evaluation of the validity of conclusions generated based on the application of those tests to the data sets.

Human Anatomy

- Structure of major human body systems at the cellular, tissue, organ, and system level.

Human Physiology

- Homeostatic function and normal response reactions across the lifespan of non-diseased human cells, organs, and systems.

Immunology

- Human immune system components, innate and adaptive immune responses to infection, injury and disease, and augmentation of the human immune system to prevent disease.

[4] Revised Appendix B from Standards 2007.

Medical Microbiology

- Structure, function, and properties of microorganisms (bacteria, viruses, parasites, and fungi) responsible for human disease, and rational approaches to their containment or eradication.

Pathology/Pathophysiology

- Basic principles, mechanisms, functional changes and metabolic sequelae of human disease impacting cells, organs, and systems.

Pharmaceutical Sciences

Clinical Chemistry

- Application of clinical laboratory data to disease state management, including screening, diagnosis, progression, and treatment evaluation.

Extemporaneous Compounding

- Preparation of sterile and non-sterile prescriptions which are pharmaceutically accurate regarding drug product and dose, free from contamination, and appropriately formulated for safe and effective patient use. Analysis of the scientific principles and quality standards upon which these compounding requirements are based.

Medicinal Chemistry

- Chemical basis of drug action and behavior in vivo and in vitro, with an emphasis on pharmacophore recognition and the application of physicochemical properties, structure-activity relationships, intermolecular drug-receptor interactions and metabolism to therapeutic decision-making.

Pharmaceutical Calculations

- Mastery of mathematical skills required to accurately prepare prescriptions (including extemporaneously compounded dosage forms) that are therapeutically sound and safe for patient use. Calculation of patient-specific nutritional and drug dosing/delivery requirements.

Pharmaceutics/Biopharmaceutics

- Physicochemical properties of drugs, excipients, and dosage forms important to the rational design and manufacture of sterile and non-sterile products. Application of physical chemistry and dosage form science to drug stability, delivery, release, disposition, pharmacokinetics, therapeutic effectiveness, and the development of quality standards for drug products.

Pharmacogenomics/genetics

- Genetic basis for disease and individual differences in metabolizing enzymes, transporters, and other biochemicals impacting drug disposition and action that underpin the practice of personalized medicine.

Pharmacokinetics

- Mathematical determination of the rate of drug movement from one therapeutic or physiologic compartment to another. Application of physicochemical and kinetic principles and parameters to therapeutically important issues, such as drug delivery, disposition, therapeutic effectiveness, and beneficial or adverse interactions in general and specific populations.

Pharmacology

- Pharmacodynamics, mechanisms of therapeutic and adverse drug actions and interactions, lifespan-dependent variations in physiology or biochemistry that impact drug action and effectiveness, and application of these principles to therapeutic decision-making.

Toxicology

- Pharmacodynamics, mechanisms, prevention, and treatment of the toxic effects of drugs and poisons, including poisons associated with bioterrorism.

Social/Administrative/Behavioral Sciences

Cultural Awareness

- Exploration of the potential impact of cultural values, beliefs, and practices on patient care outcomes.

Ethics

- Exploration of approaches for resolving ethical dilemmas in patient care, with an emphasis on moral responsibility and the ability to critically evaluate viable options against the needs of patients and other key stakeholders.

Healthcare Systems

- Examination of U.S. health systems and contemporary reimbursement models in which patient-centered and/or population-based care is provided and paid for, and how social, political, economic, organizational, and cultural factors influence providers' ability to ensure patient safety and deliver coordinated interprofessional care services.

History of Pharmacy

- Exploration of the evolution of pharmacy as a distinct profession, the transition from a focus on the drug to a focus on the patient and the drug (including pharmacist-provided patient care), and major milestones and contributors in the evolution of pharmacy.

Pharmacoeconomics

- Application of economic principles and theories to the provision of cost-effective pharmacy products and services that optimize patient-care outcomes, particularly in situations where healthcare resources are limited.

Pharmacoepidemiology

- Cause-and-effect patterns of health and disease in large populations that advance safe and effective drug use and positive care outcomes within those populations.

Pharmacy Law and Regulatory Affairs

- Federal and appropriate state-specific statutes, regulations, policies, executive orders, and court decisions that regulate the practice of pharmacy, including the mitigation of prescription drug abuse and diversion.

Practice Management

- Application of sound management principles (including operations, information, resource, fiscal, and personnel) and quality metrics to advance patient care and service delivery within and between various practice settings.

Professional Communication

- Analysis and practice of verbal, non-verbal, and written communication strategies that promote effective interpersonal dialog and understanding to advance specific patient care, education, advocacy, and/or interprofessional collaboration goals. Exploration of technology-based communication tools and their impact on healthcare delivery, healthcare information, and patient empowerment.

Professional Development/Social and Behavioral Aspects of Practice

- Development of professional self-awareness, capabilities, responsibilities, and leadership. Analysis of contemporary practice roles and innovative opportunities, and inculcation of professional attitudes, behaviors, and dispositions.

Research Design

- Evaluation of research methods and protocol design required to conduct valid and reliable studies to test hypotheses or answer research questions, and to appropriately evaluate the validity and reliability of the conclusions of published research studies.

Clinical Sciences

Clinical Pharmacokinetics

- Application of basic pharmacokinetic principles and mathematical models to calculate safe and effective doses of drugs for individual patients, and adjust therapy as appropriate through the monitoring of drug concentration in biological fluids.

Health Informatics

- Effective and secure design and use of electronic and other technology-based systems, including electronic health records, to capture, store, retrieve, and analyze data for use in patient care, and confidentially/legally share health information in accordance with federal policies.

Health Information Retrieval and Evaluation

- Critical analysis and application of relevant health sciences literature and other information resources to answer specific patient-care and/or drug-related questions and provide evidence-based therapeutic recommendations to healthcare providers or, when appropriate, the public.

Medication Dispensing, Distribution and Administration

- Preparation, dispensing and administration of prescriptions, identification and prevention of medication errors and interactions, maintaining and using patient profile systems and

prescription processing technology and/or equipment, and ensuring patient safety. Educating about appropriate medication use and administration.

Natural Products and Alternative and Complementary Therapies

- Evidence-based evaluation of the therapeutic value, safety, and regulation of pharmacologically active natural products and dietary supplements. Cultural practices commonly selected by practitioners and/or patients for use in the promotion of health and wellness, and their potential impact on pharmacotherapy.

Patient Assessment

- Evaluation of patient function and dysfunction through the performance of tests and assessments leading to objective (e.g., physical assessment, health screening, and lab data interpretation) and subjective (patient interview) data important to the provision of care.

Patient Safety

- Analysis of the systems- and human-associated causes of medication errors, exploration of strategies designed to reduce/eliminate them, and evaluation of available and evolving error-reporting mechanisms.

Pharmacotherapy

- Evidence-based clinical decision making, therapeutic treatment planning, and medication therapy management strategy development for patients with specific diseases and conditions that complicate care and/or put patients at high risk for adverse events. Emphasis on patient safety, clinical efficacy, pharmacogenomic and pharmacoeconomic considerations, and treatment of patients across the lifespan.

Public Health

- Exploration of population health management strategies, national and community-based public health programs, and implementation of activities that advance public health and wellness, as well as provide an avenue through which students earn certificates in immunization delivery and other public health-focused skills.

Self-Care Pharmacotherapy

- Therapeutic needs assessment, including the need for triage to other health professionals, drug product recommendation/selection, and counseling of patients on non-prescription drug products, non-pharmacologic treatments and health/wellness strategies.