TN Department of Education | College, Career and Technical Education

# Pharmacological Sciences

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| **Primary Career Cluster:** | Health Science |
| **Program Manager:** | Sloan Hudson, (615) 532-2839, Sloan.Hudson@tn.gov |
| **Course Code:** | C14H20 |
| **Prerequisite(s):** | *Health Science* (C14H14) |
| **Credit:** | 1 |
| **Grade Level:** | 10-12 |
| **Focus Elective Graduation Requirements:** | This course satisfies one of three credits required for an elective focus when taken in conjunction with other Health Science courses. |
| **POS concentrator:** | This course satisfies one out of two required courses that must be taken from a single program of study to meet the Perkins V concentrator definition requirements. |
| **Programs of Study and Sequence:** | This is one of several options available as the second or third course in the *Therapeutic Services* program of study. |
| **Aligned Student Organization(s):** | HOSA: http://www.tennesseehosa.org<br>Christina Isong, (615) 532-6270, Christina.Isong@tn.gov |
| **Coordinating Work-Based Learning:** | Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/career-and-technical-education/work-based-learning.html. |
| **Available Student Industry Certifications:** | Students are encouraged to demonstrate mastery of knowledge and skills learned in this course by earning the appropriate, aligned department-promoted industry certifications. Access the promoted list here for more information. |
| **Teacher Endorsement(s):** | 577, 720 |
| **Required Teacher Certifications/Training:** | None |
| **Teacher Resources:** | https://www.tn.gov/content/dam/tn/education/ccte/cte/cte_resource_health_science.pdf |

## Course Description

*Pharmacological Sciences* is a second or third-level applied course in the *Therapeutic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of the healthcare worker in a pharmacy setting. This course equips students with the communication, goal-setting, and information-processing skills to be successful in the workplace, in addition to covering

key topics in pharmacology, pharmacy law and regulations, sterile and non-sterile compounding, medication safety, quality assurance, and more. Upon completion of this course, proficient students who have also completed a *Clinical Internship* can apply to sit for the Pharmacy Technician Certification Board examination immediately after high school graduation.

## Program of Study Application

This is the second or third course in the *Therapeutic Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-health-science.html.

## Course Standards

**Pharmacology for Technicians**

1) Research the professional standards and state and federal laws regarding the roles and responsibilities of pharmacists, pharmacy technicians, and other pharmacy employees; describe when a pharmacist should provide consultation for a patient/client. Explain the process to determine the state, federal, and local laws and regulations that apply to a practice site. Create an informative artifact highlighting the many specialties pharmacists have the option to pursue linking them with their aligned professional organization.

2) Receive and screen prescription/medication orders for completeness and authenticity, identifying classifications, generic and name brands of pharmaceuticals, strengths/dose, dosage form, physical appearance, route of administration, and duration of drug therapy. Develop an informative brochure explaining the top 200 medications per the criteria previous listed flagging narrow therapeutic index (NTI) medications.

3) Construct a teaching plan for a senior customer explaining:
    a. Definitions of various drug interactions including drug-disease, drug-drug, drug-dietary supplement, drug-OTC, drug-laboratory, and drug-nutrient.
    b. Effects of patient-specific factors on drug and non- drug therapy (e.g., cultural beliefs, disabilities, language barriers, socioeconomic status)
    c. Proper storage of medications (e.g., temperature ranges, light sensitivity, restricted access

4) Compare and contrast the principles of pharmaceutical equivalents, generic equivalence, bioequivalence, pharmaceutical alternatives, and therapeutic equivalents as defined by the U.S Food and Drug Administration (FDA). Summarize the criteria for deeming a product therapeutically equivalent.

5) Differentiate between common and severe side effects or adverse effects, allergies, and therapeutic contraindications associated with the top 200 medications as published in pharmaceutical print and online journals.

Research indications for using legend in the place of selected over-the-counter (OTC) drugs and herbal and dietary supplements. Illustrate findings in an oral, visual, or digital presentation, citing information obtained from print and online medical sites such as the U.S. National Library of Medicine databases.

**Pharmacy Law and Regulations**

Design an action plan for a pharmacy related to the storage, handling, and disposal of hazardous substances and wastes (e.g., MSDS) that includes procedures for prevention and treatment of hazardous substances exposure (e.g., eyewash, spill kit, MSDS).

6) Evaluate the Drug Enforcement Administration (DEA) rules and regulations surrounding the transfer of controlled substances, verification of a prescriber's DEA number, and documentation requirements for receiving, ordering, returning, loss/theft, and destruction of controlled substances. Investigate the standards of practice of record keeping for repackaged and recalled products and supplies, including the FDA's recall classification. Summarize findings in an oral, written, or digital presentation.

7) Summarize professional standards related to data integrity and security and Health Insurance Portability and Accountability Act (HIPAA) guidelines. Using HIPAA guidelines, create a policy and procedure for the proper use of pharmacy reports such as inventory reports, diversion reports, discrepancy reports, override reports, usage reports, input accuracy reports, and business summary reports. Include a process for handling and destroying confidential/classified information.

8) In a lab/clinical setting, demonstrate application of concepts and skills of asepsis, Universal Precautions, sanitation, disinfection, and sterilization for pharmacy settings in adherence to standards and guidelines from the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA). Perform or check for functions such as proper laminar air flow, hand washing, ensuring a clean room or workspace, and cleaning of counting trays, countertops, and equipment.

9) Formulate a list of facility, equipment, and supply requirements (e.g., space requirements, prescription file storage, cleanliness, and reference materials) required for a retail pharmacy as compared with a hospital-based pharmacy.

10) Develop a reference toolkit of federal pharmacy requirements for the each of the following:
    a. Receiving, ordering, refilling, labeling, dispensing, returning, take-back programs, and loss or theft of non-controlled substances
    b. OSHA Hazard Communication Standard (i.e., Employee Right to Know)
    c. Availability of medications (i.e., legend, over the counter, and behind the counter)
    d. Non-controlled substance prescription transfer
    e. OBRA-90 requirement for consultation
    f. Process to determine the state, federal, and local laws and regulations
    g. Restricted drug programs

**Sterile and Non-Sterile Compounding**

11) Research and identify infection control standards utilized in a pharmacy compounding department as established by the CDC and OSHA. Demonstrate application of skills in lab/classroom/clinical setting in order to meet the standards identified.

12) Demonstrate the following skills surrounding compounding:
    a. Handling and disposal requirements (e.g., receptacles, waste streams)
    b. Documentation (e.g., batch preparation, compounding record)
    c. Determination of product stability (e.g., beyond-use dating, signs of incompatibility)
    d. Selection and use of equipment and supplies
    e. Sterile and non-sterile compounding processes
    f. Procedures to compound non-sterile products (e.g., ointments, mixtures, liquids, emulsions, suppositories, enema)

**Medication Safety**

13) Survey most common types of prescription errors and outline in a written or digital presentation industry standards surrounding medication safety. Cite information obtained from textbooks, online and print pharmacy journals, and related websites. Include at minimum the following:
    a. Error prevention strategies for data entry (e.g., prescription or medication order to correct patient)
    b. Patient package insert and medication guide requirements (e.g., special directions and precautions)
    c. Issues that require pharmacist intervention (e.g., DUR, ADE, OTC recommendation, therapeutic substitution, misuse, missed dose)
    d. Common safety strategies (e.g., tall man lettering, separating inventory, leading and trailing zeroes, limited use of error-prone abbreviations)
    e. Procedures for responding to FDA recalls of medications, devices, supplies, supplements,
    f. Guidelines for ensuring the stability of drugs such as oral suspensions, insulin, reconstitutables, injectables, and vaccinations
    g. Procedures for performing root cause analysis and reporting events such as medication errors, adverse effects, near miss, and product integrity
    h. Requirements and strategies for addressing errors in practice (e.g., quality improvement teams, adverse drug reaction reporting, opportunity/suggestion cards).

14) Identify strategies for preventing medication errors by distinguishing medications that either look alike or sound alike, such as Ceftin, Cefotan, Cefzil, Rocephin and Cipro. Include strategies related to recognizing high-alert/high-risk medications such as Sporanox for patients who have ventricular dysfunction.

**Pharmacy Quality Assurance**

15) Interpret quality assurance practices for medication and inventory control systems (e.g., matching National Drug Code (NDC) number, bar code, and data entry) and for infection control procedures and documentation (e.g., personal protective equipment [PPE], needle recapping). Evaluate information sources used to obtain data in a quality improvement process (e.g., the patient's chart, patient's medication profile, computerized information systems, medication administration record, immunization registry, medication therapy management [MTM] platforms)

16) Explain the common assurance measures used to monitor quality in a pharmacy. For example, explain risk management guidelines and regulations (e.g., error prevention strategies), communication channels necessary to ensure appropriate follow-up, medication control systems (e.g. automated dispensing systems, bar coding for floor stock and crash cart stock) and problem resolution (e.g., product recalls, shortages), and productivity, efficiency, and customer satisfaction measures. Summarize information gathered from textbooks, retail pharmacy websites, print pharmacy journals, and/or personal interviews of pharmacists or pharmacy technicians.

**Medication Order Entry and Fill Process**

17) Identify all information a pharmacist or pharmacy technician should obtain from the patient before filling and dispensing any medication. Information should include at minimum: name of patient/client, date of birth, address, insurance policy, physician's name, and any drug allergies. Practice interviewing skills in a lab/clinical/classroom setting.

18) Create either an electronic or paper profile detailing the order entry process per industry standards for each of the following: a hospital, a free-standing pharmacy, and a retail-based pharmacy.

    Calculate correct doses required when given a simulated prescription for a pediatric dose, adult dose, and geriatric dose based on weight, using the correct formulas, calculations, ratios, proportions, alligations and conversions. Also calculate length of administration, times per day of administration.. Document results using appropriate Sig codes (e.g., b.i.d., t.i.d and Roman numerals), abbreviations, medical terminology, and symbols for quantity dispensed, dosage, concentration and dilutions.

19) Demonstrate the following skills of the prescription fill process:
    a. Determine prioritization of prescription/medication order processing (e.g.,stat, maintenance, waiting)
    b. Select appropriate product
    c. Apply special handling requirements
    d. Measure and prepare product for final check
    e. Stage prescriptions for final verification

20) Demonstrate the following skills of prescription labeling requirements :
    a. Auxiliary and warning labels
    b. Expiration date

c. Patient-specific information

21) Select equipment/supplies required for drug administration (e.g., package size, unit dose, diabetic supplies, spacers, oral and injectable syringes). Demonstrate the following skills of prescription packaging requirements:
    a. Type of bags
    b. Syringes
    c. Glass
    d. PVC
    e. Child resistant
    f. Light resistant

22) In a classroom lab, demonstrate the following skills of the dispensing process:
    a. Validation of prescription with pharmacist
    b. Documentation and distribution

**Pharmacy Inventory Management**

23) Distinguish between the functions and applications of NDC number, lot numbers, and expiration dates of inventory found in a pharmacy. Articulate the importance of this information as it relates to protecting the safety of the public.

24) Define the concept of a formulary or approved/preferred product list. Research at least three different insurance companies for a listing of their approved formulary drug list. Compare and contrast the three lists with the top 200 drugs identified earlier in this course. Explain how the phrases "Dispense as Written" or "Do Not Substitute" can affect the formulary. Synthesize research into an informative essay.

25) Assess procedures for ordering medications and supplies including:
    a. Inventory control practices and record keeping (e.g. par and reorder levels, turnover rates, drug usage patterns, and perpetual inventory)
    b. Suitable alternatives for ordering (e.g. transferring or borrowing medications from another pharmacy
    c. Procedures to address improperly stored inventory (e.g., out of range temperature issues)
    d. Procedures for identifying and returning dispensable, non-dispensable, and expired medications and supplies (e.g., credit return, return to stock, reverse distribution)

**Pharmacy Information System Usage and Application**

26) Research common software and databases used by pharmacies to manage electronic medical records and prescriptions. Understand the uses and capabilities of these programs as they relate to the roles and responsibilities of the pharmacy technician.

**The following artifacts will reside in the student's portfolio:**

a. Standard 1 Informative brochure explaining the top 200 medications

b. Standard 6 Action plan for pharmacy related to hazardous substances or waste
c. Standard 7 Artifact over regulations related to controlled substances
d. Standard 15 Skills checklists

## Standards Alignment Notes

*References to other standards include:

- PTCB Knowledge Domain: Pharmacy Technician Certification Exam (PTCE) Blueprint. The PTCE content was developed nationally by experts in pharmacy technician practice based on a national job analysis study. The updated blueprint is the basis for the PTCE effective November 2013.

- P21: Partnership for 21st Century Skills Framework for 21st Century Learning
    - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.

## Additional Standards Notes

**Refers to standards that will require dosage calculations.