



**AMERICAN ASSOCIATION
OF COLLEGES OF PHARMACY**

Center for the Advancement of Pharmaceutical Education

Educational Outcomes 2004

AACP, the national organization representing and supporting colleges and schools of pharmacy and their faculties, is committed to education and scholarship for improving drug therapy.

Founded in 1900, the American Association of Colleges of Pharmacy (AACP) is the national organization representing pharmaceutical education in the United States. AACP's mission is to serve member colleges and schools and their respective faculties by acting as their advocate and spokesman at the national level, by providing forums for interaction and exchange of information among its members, by recognizing outstanding performance among its member educators, and by assisting member colleges and schools in meeting their mission of educating and training pharmacists and pharmaceutical scientists.

The material expressed in this document is meant as a resource and does not necessarily represent the views of the Board of Directors of the American Association of Colleges of Pharmacy, views of the membership at large, nor has it been adopted as official Association policy.

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Background

In 1992, to support and facilitate the efforts of colleges and schools of pharmacy in the US to transform their curricula to support the education of future practitioners to deliver pharmaceutical care, AACP initiated a series of initiatives under the Center for the Advancement of Pharmaceutical Education (CAPE). Significant to the design of new curricula were the CAPE *Educational Outcomes*, which were intended to be the target toward which the evolving pharmacy curriculum should be aimed.

The development of the CAPE *Educational Outcomes* was guided by a consultant and an advisory panel composed of educators and practitioners nominated for participation by practitioner organizations. The advisory panel used as resources the papers of the AACP Commission to Implement Change in Pharmaceutical Education, the AACP Focus Group on the Liberalization of the Professional Curriculum, and the results of the Scope of Practice Project survey that was supported by AACP, the American Pharmacists Association (then the American Pharmaceutical Association), the American Society of Health-System Pharmacists, and the National Association of Boards of Pharmacy. The CAPE *Educational Outcomes* were completed and distributed in 1994.

The AACP Board of Directors, during its July 1997 meeting, determined that, in light of the continued evolution of pharmacy practice and the roles and functions of pharmacists, a review and possible revision of the *Educational Outcomes* was needed. The CAPE Advisory Panel on *Educational Outcomes* was reconvened for that purpose and a revised document was made available in 1998.

2004 Revision Process

At the urging of the 2001-02 AACP Academic Affairs and Professional Affairs Committees, the AACP Board of Directors committed to a review and revision of the CAPE *Educational Outcomes* during 2003-04. This revision process was timely given the anticipated revision of the ACPE Accreditation Standards and Guidelines for the Professional Degree Program in Pharmacy Leading to the Doctor of Pharmacy Degree. Periodic review and revision is necessary to assure the contemporary validity of the educational content and outcomes with emerging sciences and scientific developments and evolving roles of the pharmacist in serving patient and public health needs. In addition to guiding curriculum development, the resultant CAPE *Educational Outcomes* were anticipated to assist students in making a connection between what they are learning and the practice of pharmacy and, when taken in whole, the CAPE *Educational Outcomes* would “tell the story” to external audiences about the role of the pharmacist.

Nine practitioner organizations were invited to nominate members to serve on an advisory panel and participate in the review, revision, and development of the updated *Educational Outcomes*. Individuals with a commitment to the educational process and, if possible, an understanding of instructional planning and the use of outcomes statements to drive curriculum development were specifically sought. Six members of the CAPE Advisory Panel on Educational Outcomes were nominated by the practitioner organizations and six were appointed by AACP. The process was led by Gail D. Newton, Ph.D. (Purdue), who served as consultant to the project.

At the outset of revision process, it was agreed that the CAPE *Educational Outcomes* document would be simplified from previous versions, with attention paid to assure that the document not be made too simple and vague, yet not so detailed that it is prescriptive. It was also agreed that, to the extent possible, the revised CAPE *Educational Outcomes* would employ similar language to other

competency/outcomes documents in the health professions (e.g., Institute of Medicine, Accreditation Council for Graduate Medical Education, Pharmacy's Framework for Drug Therapy Management, Medical School Objectives Project). The advisory panel reaffirmed pharmaceutical care as the philosophy of practice upon which the *CAPE Educational Outcomes* would continue to be anchored and used the evolving "desired future" vision within the Joint Commission of Pharmacy Practitioners (JCPP) strategic planning exercise as background.

The CAPE Advisory Panel offers in this document a new organizing framework for the *Educational Outcomes* that integrates science, professional attributes, interprofessional practice, and professionalism across new major headings of pharmaceutical care, systems management, and public health, as they are in the practice of pharmacy. Working from this broad framework, AACP's academic sections and faculties at member colleges and schools are encouraged to add discipline- and content-specific outcome statements that are meaningful within their context.

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Educational Outcomes

1. **PHARMACEUTICAL CARE** Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving pharmaceutical, biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.
 - a. Provide patient-centered care.
 - i. Design, implement, monitor, evaluate, and adjust pharmaceutical care plans that are patient-specific and evidence-based.
 - ii. Communicate and collaborate with prescribers, patients, care givers, and other involved health care providers to engender a team approach to patient care.
 - iii. Retrieve, analyze, and interpret the professional, lay, and scientific literature to provide drug information to patients, their families, and other involved health care providers.
 - iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact patient-specific therapeutic outcomes.
 - b. Provide population-based care.
 - i. Develop and implement population-specific, evidence-based disease management programs and protocols based upon analysis of epidemiologic and pharmaco-economic data, medication use criteria, medication use review, and risk reduction strategies.
 - ii. Communicate and collaborate with prescribers, population members, care givers, and other involved health care providers to engender a team approach to patient care.
 - iii. Retrieve, analyze, and interpret the professional, lay, and scientific literature to provide drug information to other health care providers and to the public.
 - iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact population-based, therapeutic outcomes.

2. **SYSTEMS MANAGEMENT** Manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers, and administrative and supportive personnel, to promote health; to provide, assess, and coordinate safe, accurate, and time-sensitive medication distribution; and to improve therapeutic outcomes of medication use.
- a. Manage human, physical, medical, informational, and technological resources.
 - i. Apply relevant legal, ethical, social, economic, and professional principles/issues to assure efficient, cost-effective utilization of human, physical, medical, informational, and technological resources in the provision of patient care.
 - ii. Communicate and collaborate with patients, prescribers, other health care providers, and administrative and supportive personnel to engender a team approach to assure efficient, cost-effective utilization of human, physical, medical, informational, and technological resources in the provision of patient care.
 - iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact management of human, physical, medical, informational, and technological resources in the provision of patient care.
 - b. Manage medication use systems.
 - i. Apply patient- and population-specific data, quality assurance strategies, and research processes to assure that medication use systems minimize drug misadventuring and optimize patient outcomes.
 - ii. Apply patient- and population-specific data, quality assurance strategies, and research processes to develop drug use and health policy, and to design pharmacy benefits.
 - iii. Communicate and collaborate with prescribers, patients, caregivers, other involved health care providers and administrative and supportive personnel to identify and resolve medication use problems.
 - iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact medication use systems, to develop use and health policy, and to design pharmacy benefits.

3. **PUBLIC HEALTH** Promote health improvement, wellness, and disease prevention in cooperation with patients, communities, at-risk populations, and other members of an interprofessional team of health care providers.
- a. Assure the availability of effective, quality health and disease prevention services.
 - i. Apply population-specific data, quality assurance strategies, and research processes to develop identify and resolve public health problems.
 - ii. Communicate and collaborate with prescribers, policy makers, members of the community and other involved health care providers and administrative and supportive personnel to identify and resolve public health problems.
 - iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may affect the efficacy or quality of disease prevention services to amend existing or develop additional services.
 - b. Develop public health policy.
 - i. Apply population-specific data, quality assurance strategies, and research processes to develop public health policy.
 - ii. Communicate and collaborate with prescribers, policy makers, members of the community and other involved health care providers and administrative and supportive personnel to develop public policy.
 - iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may affect public health policy, to amend existing or develop additional policies.



PREFACE
2004 CAPE Educational Outcomes
Supplements

The 2004 CAPE Educational Outcomes delineated terminal ability outcomes for pharmacy graduates in terms of three practice functions:

- Pharmaceutical Care
- Systems Management
- Public Health

General and professional abilities were integrated within this structure to demonstrate that general abilities should be taught and assessed within various professional contexts at multiple points of the curriculum. In previous versions of the CAPE Outcomes, general abilities (thinking, communication, valuing and ethical decision making, social and contextual awareness, social responsibility, social interaction, self learning) were listed separately at the end of the document.

The 2004 CAPE Outcomes were intended to guide curriculum development and assessment and to assist students in making connections between their learning experiences and the practice of pharmacy. Recognizing this, the Accreditation Council for Pharmaceutical Education (ACPE) incorporated the 2004 CAPE Outcomes into the 2007 Accreditation Standards and Guidelines (in particular attention should be directed toward Appendix B of the Standards as this pertains to course content and the *Supplements*). While the term, “pharmaceutical care,” is used throughout the *Supplements*, it should be noted the ACPE Standards no longer use this term, rather the terms “patient-centered care” and “medication therapy management” are described.

Compared to the 1998 and 1994 CAPE Outcomes, the 2004 Outcomes were abbreviated to more clearly demonstrate to pharmacy constituents and the public what a pharmacist is able to do during professional practice upon graduation. Detailed enabling outcomes were largely omitted from the document. The development of enabling or developmental outcomes that are discipline- and course-specific may facilitate better understanding of the relationship between all curricular coursework and the terminal outcomes. It is important to demonstrate that achievement of abilities requires more than delivery of content; an ability is composed of knowledge, skills, and attitudes/values/habits. All components of the ability must be taught, practiced, and assessed if the ability is to be achieved.

These *Supplements* were created to provide pharmacy faculty with suggested discipline-specific language that clearly describes the knowledge, skills, and attitudes/values/habits that students should develop to achieve the terminal practice outcomes. The *Supplements* are intended to serve as an additional resource for faculty in developing and assessing curricula, courses, and learning experiences directed toward achieving the 2004 CAPE Educational Outcomes. The *Supplements* themselves are not meant to provide teaching strategies or to serve as an assessment tool but to provide a resource with which to develop teaching strategies and assessment instruments. The *Supplements* attempt to clarify outcomes; faculty, curriculum committees, and assessment committees can use the *Supplements* to create practice opportunities, criteria, and assessment tools to ensure that the outcomes are achieved. AACCP is indebted to the contributions of the many AACCP-member volunteers over the past two years in the compilation of these *Supplements* (identified with each discipline-specific supplement).

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March 2007

**ANATOMY, PHYSIOLOGY and PATHOPHYSIOLOGY
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

- I. Utilize and integrate knowledge of physiology, pathophysiology and anatomy in order to formulate a therapeutic care plan.
 - A. Utilize knowledge of physiology and anatomy to recommend and defend the course of treatment that best addresses a patient's needs.
 - B. Discuss the pathophysiological factors contributing to a specific patient problem and disease state.
 - C. Interpret and evaluate patient data taking into consideration normal and disease states as well as the interaction and interrelationship among organ systems.
 - D. Apply knowledge of physiology, pathophysiology and anatomy to evaluate the effectiveness of a treatment regimen and manage medications in a manner that assures optimal therapeutic outcomes.
- II. Taking into consideration the differences in a patient's anatomy, physiology and pathophysiologic state, recommend changes in pharmacotherapeutic regimens that eliminate drug interactions, reduce side effects, increase compliance and improve therapeutic outcomes.
 - A. Based on individual patient characteristics and medical conditions, determine alternative pharmacotherapeutic options by evaluating patient specific variables with regard to pathophysiology and anatomical characteristics.
 - B. Modify drug therapy regimens based on the evaluation of a patient's anatomy, physiology and pathophysiologic state.
- III. Use appropriate scientific terminology to convey anatomical, physiologic and pathophysiologic concepts.
 - A. Effectively communicate the rationale based on the patient's pathophysiologic state for therapeutic decisions at an appropriate level of understanding for patients, caregivers, and other health care professionals.
 - B. Respond accurately and appropriately to questions related, either directly or indirectly, to patient pathophysiology posed by patients and other health care professionals.
- IV. Develop evidence-based disease prevention programs for patient populations
 - A. Considering patient pathophysiology from a population perspective, suggest appropriate use of pharmacologic agents in the prevention of disease or the modification of normal bodily function.

**ANATOMY, PHYSIOLOGY and PATHOPHYSIOLOGY
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

- B. Recognize potential problems in disease prevention initiatives by utilizing the knowledge of principles of anatomy, physiology and pathophysiology.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); Peggy Piascik, University of Kentucky; Melody Ryan, University of Kentucky; and others.

BIOLOGY (Biochemistry and Molecular and Cellular Biology)
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

1. Describe the structure, function and metabolic pathways for carbohydrates, amino acids and lipids.
 - a. Identify the biochemical class (lipid, carbohydrate, amino acid) to which a monomeric compound belongs.
 - b. Outline the general primary biochemical pathway by which such a compound is oxidized in the cell.
 - c. Predict pathological consequences of blockages or regulatory errors in these pathways. Note points where drug therapeutic intervention may be possible.
 - d. Describe how foods vary in nutritional value, relating this to the chemical composition of the foodstuff.
 - e. Relate energy generation, storage, and mobilization in the body to the function of adipose tissue, liver, and kidney.
 - f. Distinguish essential from nonessential nutrients, including lipids, amino acids, vitamins, and minerals, and explain why they are essential.
2. Discuss the alterations in lipid and carbohydrate metabolism that occur as a result of diabetes.
 - a. Distinguish among the types of diabetes in terms of their underlying causes.
 - b. Relate differences in causes of different types of diabetes to upsets in metabolic pathways for lipids and carbohydrate, and connect these upsets to symptoms of the various types of diabetes. Note where drug therapeutic intervention may be possible.
3. Discuss the metabolism of lipoproteins, medical problems associated with abnormal lipoprotein levels and therapeutic agents used to treat lipid disorders.
 - a. For lipids taken in the diet, outline the process of digestion and transport within the body, noting the role of lipoproteins, triglycerides, and cholesterol.
 - b. Outline the mechanisms of storage and mobilization of lipids for energy production in the body.
 - c. Predict pathological consequences of blockages or regulatory errors in these mechanisms and processes. Note points where drug therapeutic intervention may be possible.
4. Describe the metabolism of arachidonic acid and discuss the therapeutic implications related to the mechanism of NSAIDs and asthma therapy.
 - a. Relate the structure of arachidonic acid to its biochemical role as a precursor of prostaglandins, thromboxanes, and leukotrienes.
 - b. Describe the reactions performed by cyclo-oxygenases and outline the connections to the inflammatory process and to asthma.

- c. Employ knowledge of NSAID structural features to predict and rationalize their therapeutic effects and adverse effects.
 - d. Relate dietary intake of polyunsaturated fatty acids to cyclo-oxygenase action and production of mediators of inflammation.
 - e. Employ knowledge of leukotriene modifiers to predict and explain their action in treating asthma.
5. Describe how enzyme activity is regulated through second messengers and hormones.
 - a. List common second messengers and the biochemical pathways they play a role in. Note enzymes that produce or are regulated by these second messengers.
 - b. List common protein and peptide hormones and relate them to physiological systems such as the immune system, digestion, blood pressure regulation, and others. Do the same for common lipid-based hormones. Note enzymes that produce or are regulated by these hormones.
 - c. Note points in these pathways where drug therapeutic intervention may be possible.
6. Describe the processes involved in replication, transcription and translation of genetic information.
 - a. Describe the enzymatic reactions involved in the processes of replication, transcription, and translation.
 - b. Relate the action of antibiotics to these processes, describing the basis for selective inhibition of microbial processes over mammalian processes.
 - c. Explain how changes in genes and their expression can lead to altered biochemical function, and contribute to pathologies such as cancer and inborn errors in metabolism. List biochemical mechanisms leading to such genetic changes.
 - d. Outline the processes by which nucleotides are synthesized biochemically, and relate these to pathologies such as gout, Lesch-Nyhan disease, and immunodeficiencies. Note points in these pathways where drug therapeutic intervention may be possible.
 - e. Outline forensic and diagnostic uses of DNA amplification and hybridization technology. Describe the biochemical reactions that form the basis for this technology.
7. Describe the role of vitamin and minerals in metabolism and identify reactions utilized by these compounds.
 - a. List the vitamins and minerals needed for human health, and describe the amounts needed in the diet.
 - b. List dietary sources of the various vitamins and minerals, noting their relative richness as sources.
 - c. Identify the structure of vitamins and the related enzymatic cofactors, and note characteristic features. Relate the structure and chemical features to their function in enzymatic catalysis.
 - d. Note characteristic chemical properties of the required minerals, and relate these to their function in enzymatic catalysis.
8. Describe the biochemistry of membranes.
 - a. List the general biological functions performed by membranes.

BIOLOGY (Biochemistry and Molecular and Cellular Biology)
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004

- 1) List lipids commonly found in biological membranes.
 - 2) Describe the leaflet structure of lipid bilayers and relate this to the chemical features of lipids commonly found in biological membranes.
- b. Relate the lipid composition of biological membranes to differences in physical properties of the membrane, and hence to differences in biological function. Note pathologies associated with membrane lipid biosynthesis and turnover.
 - c. Describe how proteins are associated with biological membranes, and relate the type of association (peripheral, integral) to the biological functioning of the protein.
 - d. Describe the role of biological membranes in drug absorption, distribution, and action.
9. Describe DNA recombination and discuss the impact it has on production of proteins as drugs.
- a. Describe the general process of expression cloning of proteins, and note differences in such protein production by bacteria, yeast, and animal cells.
 - b. List examples of proteins produced by recombinant DNA technology for therapeutic and diagnostic uses.
 - c. Compare such artificially-produced proteins to those derived from traditional natural sources, noting differences in purity, cost, effectiveness, and safety.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); and others.

MEDICINAL CHEMISTRY
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

I. Acquire, comprehend, apply, analyze, synthesize, and evaluate information about the chemical structure of drugs and drug classes in order to design, implement, monitor, evaluate, and adjust pharmaceutical care plans that are patient-specific and evidence based.

- A. Identify the chemical and/or pharmacological classification to which a drug belongs.
- B. Predict therapeutic applications for individual drugs based on knowledge of chemical and/or pharmacologic classification.
- C. Given patient-specific information, select optimal drug within a pharmacologic class based on structure-activity relationships (SAR) and those structural features responsible for binding to biological targets that account for relative drug potencies and receptor affinities.
- D. Select optimal drug therapy within a chemical and/or pharmacologic class based on structural features that affect absorption, distribution, metabolism and excretion.
- E. Determine the appropriate route(s) of drug administration based on the contribution of specific chemical features to drug solubility in biological fluids and delivery vehicles.
- F. Predict and prevent drug-drug interactions, drug-food interactions, drug-herbal interactions, and drug side effects and toxicities by applying knowledge of structural features and other chemical principles.
- G. Select appropriate drug therapy based on mechanism of drug action via integration of knowledge gained from the drug structure with concepts of organic chemistry, anatomy, physiology, pharmaceuticals and pharmacology.

II. Recommend changes in pharmacotherapeutic regimens based on chemical differences among drugs that relate to solving patient problems, providing patient-centered care, and providing population-based care.

- A. Based on individual patient characteristics and medical conditions, evaluate pharmacotherapeutic options by analyzing chemical features that determine solubility, routes of metabolism, duration of action, and acid-base characteristics.
- B. Modify drug therapy regimens based on the evaluation of structural features and chemical properties of drugs that are related to adverse drug reactions, drug-drug interactions, nutritional effects, and lack of efficacy.

III. Resolve drug therapy problems of individual patients by applying knowledge of drug chemistry across pharmacological classes.

**MEDICINAL CHEMISTRY
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

- A. Prevent drug-drug interactions by consideration of the pharmacodynamics and pharmacokinetic differences of drugs.
 - B. Utilizing chemical principles, predict the potential adverse effects that contribute to patient morbidity and nonadherence.
 - C. Anticipate and prevent problems with drug delivery systems and routes of administration associated with the chemical properties of drugs.
 - D. Select an appropriate multi-source drug product based on knowledge of the chemical, physical and biochemical properties of a generic drug.
- IV. Use appropriate chemical terminology to explain chemical, pharmacological and basic therapeutic concepts.
- A. Effectively communicate the chemical rationale for therapeutic decisions at an appropriate level of understanding for patients, caregivers, and other health professionals.
 - B. Respond accurately and appropriately to questions related, either directly or indirectly, to drug structure or chemistry that are posed by patients and other health care professionals.
- V. Maintain professional competence by employing knowledge of structural features to predict mechanisms, adverse effects, metabolism, solubility, acid/base characteristics, potential drug interactions, and therapeutic effects of future drug products.

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PHARMACEUTICS
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

1. Identify and explain the physicochemical and formulation properties of a drug that influence its absorption and stability.
 - a. Identify and describe the factors that influence the aqueous solubility and partition coefficient of a drug. Explain the importance of appropriate aqueous solubility and partition coefficient in the formulation design and absorption of drugs.
 - b. Understand and explain the ionization of weak acidic and weak basic drugs and calculate the fraction of a drug in its ionized and un-ionized forms as a function of pH. Describe how pKa and pH influence the observed solubility and partitioning of a drug.
 - c. Identify, evaluate, and explain the factors that affect the chemical stability of a drug under various environmental and packaging conditions.
 - d. Identify and explain the factors that control the physical and microbiological stability of a drug product under various environmental and packaging conditions.
 - e. Identify and explain the unique pharmaceutical challenges posed by contemporary biotechnology based drug products (biopharmaceuticals).

2. Identify and explain the properties of a drug that influence dosage form design and its route of administration.
 - a. Describe the various routes of administration available for drug delivery, and discuss the advantages and disadvantage of each delivery system.
 - b. Describe the characteristics of an ideal drug delivery system. Identify the various types of liquid, solid and semisolid dosage forms available.
 - c. Discuss how physicochemical properties of a drug influence the design of various dosage forms, including biotech drugs.
 - d. Explain the various formulation approaches taken to improve the in-vitro dissolution, solubility, stability and absorption of drugs from different dosage forms.
 - e. Identify physical-chemical and formulation properties that make a drug suitable for modified release/controlled release, and explain the various formulation approaches available for modifying drug release from dosage forms.
 - f. Discuss the methods/techniques used for establishing the performance and quality of dosage forms.

3. Identify and explain the dosage form features that influence therapeutic outcomes.
 - a. Describe the role and functions of inactive/inert ingredients in different types of dosage forms.
 - b. Describe the various methods of compounding and/or manufacture of different types of dosage forms.
 - c. Explain the importance of packaging and storage conditions in expiration dates and drug product quality and assurance.
 - d. Select an appropriate packaging container based on the physicochemical properties of the drug which meets a patient's need.
 - e. Explain principles underlying the proper use of dosage forms, and their influence on bioavailability and therapeutic outcome.
 - f. Determine the importance of selection of appropriate dosage form in drug therapy.

PHARMACEUTICS
SUPPLEMENTAL EDUCATIONAL OUTCOMES
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- g. Explain the influence of formulation, physiological, and anatomical factors on drug absorption from dosage forms.
 - h. Discuss how compliance and adherence can be improved by appropriate dosage form selection.
 - i. Select and recommend the best route of administration and dosage form for a patient.
 - j. Identify and prevent drug interactions and incompatibilities based on presence of active and inactive pharmaceutical ingredients.
 - k. Identify, solve, and prevent drug therapy problems related to dosage form, delivery system, and route of administration.
4. Make appropriate selection decisions for multisource drug products.
- a. Explain and understand the concepts of pharmaceutical equivalence, bioequivalence and therapeutic equivalence. Understand the basis for therapeutic equivalence or non-equivalence.
 - b. Use the Orange Book appropriately to select and recommend a drug.
 - c. Select and recommend appropriate drug product according to scientific, legal and economic guidelines where appropriate.
5. Compound safe and effective extemporaneous pharmaceutical products.
- a. Apply relevant standards of practice (including ethical guidelines) to prepare safe and effective dosage forms and perform in-process quality control.
 - b. Search and apply most accurate and standardized information on extemporaneous compounding.
 - c. Evaluate the suitability of an extemporaneously compounded dosage form for the administration of a drug for a patient.
 - d. Identify physical and chemical incompatibilities among active and inactive pharmaceutical ingredients of a formulation; recommend and follow approaches to avoid incompatibilities and unwanted interactions.
 - e. Calculate and measure the correct quantity of active and inactive pharmaceutical ingredients.
 - f. Use correct laboratory measuring procedures to obtain the desired quantity of all formulation ingredients.
 - g. Use good extemporaneous compounding practices in the preparation of a patient-specific drug product.
 - h. Design and maintain an adequate operational facility for compounding pharmaceutical products.
6. Preparing safe and effective sterile dosage forms and enteral nutrition products.
- a. Apply relevant standards of practice (including ethical guidelines) to prepare safe and effective sterile dosage forms and perform in-process quality control.
 - b. Calculate and measure the correct quantity of ingredients for preparing a sterile product.
 - c. Use proper aseptic techniques to prepare sterile products.
 - d. Identify physical and chemical incompatibilities among active and inactive components of sterile formulations; recommend and follow approaches to avoid unwanted interactions and incompatibilities.
 - e. Use sterilization methods that are appropriate for the drug and product.
 - f. Calculate the rate of drug administration based on the prescription order and the type of infusion pump used.
 - g. Determine a patient's fluid, electrolyte and nutritional needs and calculate the composition of parenteral or enteral nutrition sources to meet their needs.
 - h. Apply appropriate quality control procedures for sterile products.

PHARMACEUTICS
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004

- i. Evaluate the impact of physical and chemical stability on a sterile product.
 - j. Design and maintain an adequate operational facility for compounding sterile pharmaceutical products.
7. Maintain professional competence by identifying and analyzing emerging issues in pharmaceutical dosage forms and compounding.
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The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); Shelley Chambers Fox, Washington State University; Naushad Ghilzai, LECOM; Reza Mehvar, Texas Tech University Health Sciences Center; and Catherine A. White, University of Georgia.

**PHARMACOKINETICS
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

1. Evaluate the basic pharmacokinetics and pharmacodynamic properties of a drug and relate that to the manner in which the drug is used therapeutically.
2. Identify and explain the physical/chemical characteristics of a drug the influences its absorption, distribution and elimination.
3. Evaluate the primary and secondary drug information literature with regard to the pharmacokinetics and pharmacodynamics of drugs.
4. Estimate individual patient's kinetic parameters for any given drug from limited number of biological samples or from population kinetic data and patient characteristics.
5. Design dosage regimens based on the patient-specific or population (average) kinetic data.
6. Predict the effects of route and/or method of drug administration on the plasma concentration-time profiles using the individual or population (average) kinetic data and judge the appropriateness of dosage form and route of administration.
7. Predict the effects of changes in the pharmacokinetic parameters (due to drug interactions, disease states, or special populations) on the plasma concentration-time profile of drugs and modify, if necessary, the dosage regimen based on the altered kinetic parameters.
8. Explain the influence of transporters on the pharmacokinetics/pharmacodynamics of a drug and how to determine their influence in failure of drug therapy would be assessed.
9. Explain how the role of pharmacogenomics in pharmacokinetics/pharmacodynamics of drugs would be utilized with regard to individualizing dosage regimens and possibly predicting adverse drug reactions.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); Shelley Chambers Fox, Washington State University; Reza Mehvar, Texas Tech University Health Sciences Center; Nivedita K Pandit, Drake University; and Catherine A. White, University of Georgia.

**PHARMACOLOGY
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

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PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

- I. Acquire, comprehend, synthesize, apply and evaluate information about the pharmacology of therapeutic agents in order to design, implement, monitor, evaluate, and adjust pharmaceutical care plans that are patient-specific and evidence based.
 - A. Recognize the pharmacological classification to which a therapeutic agent belongs.
 - B. Determine therapeutic applications for an individual therapeutic agent based on its pharmacological classification. Recognize how drugs within a pharmacological class differ from one another with regard to mechanism of action, pharmacokinetic parameters and side effects.
 - C. Given patient-specific information, select optimal therapeutic agents based on their binding sites and molecular mechanisms of action which account for relative drug potencies, efficacies and therapeutic outcomes.
 - D. Select optimal drug therapy within a pharmacologic class based on knowledge related to absorption, distribution, metabolism and excretion.
 - E. Address and prevent side effects and toxicities from therapeutic agents and xenobiotics by applying knowledge of mechanisms of toxicity
 - F. Address and prevent drug-drug interactions, drug-food interactions, and drug-nutraceutical interactions by applying knowledge of pharmacodynamic and pharmacokinetic principles.
- II. Based on differences in pharmacological properties among drugs, recommend changes in pharmacotherapeutic regimens that eliminate drug interactions, reduce side effects, increase compliance and improve therapeutic outcomes.
 - A. Based on individual patient characteristics and medical conditions, determine alternative pharmacotherapeutic options by evaluating site and mechanism of action, pharmacokinetics, adverse effects and drug interactions
 - B. Modify drug therapy regimens based on the evaluation of pharmacological properties of drugs that are related to adverse drug reactions, drug-drug interactions, nutritional effects, and lack of efficacy.
 - C. Apply the knowledge of pharmacology to review medication usage to optimize therapeutic outcomes.
 - D. Apply knowledge of drug mechanism of action to reduce the incidence of duplicate therapy and polypharmacy in patients

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- III. Use appropriate scientific terminology to convey pharmacological and basic therapeutic concepts.
 - A. Effectively communicate the pharmacological rationale for therapeutic decisions at an appropriate level of understanding for patients, caregivers, and other health care professionals.
 - B. Respond accurately and appropriately to questions related, either directly or indirectly, to biological activity of therapeutic agents, posed by patients and other health care professionals.

- IV. Develop evidence-based disease prevention programs for patient populations
 - A. Suggest appropriate use of pharmacologic agents in the prevention of disease or the modification of normal bodily function.
 - B. Recognize potential problems in disease prevention initiatives by utilizing the knowledge of pharmacological principles.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Marc W. Harrold, Duquesne University (chair); Peggy Piascik, University of Kentucky; Melody Ryan, University of Kentucky; and others.

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March 2007

**PHARMACY PRACTICE
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

PHARMACEUTICAL CARE Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.

- I. Formulate a patient-centered pharmaceutical care plan (new or revised) in collaboration with other health care professionals, patients, and/or their caregivers.
 - A. Gather and organize accurate and comprehensive patient information to identify ongoing or potential drug therapy problems.
 1. Obtain necessary information from the patient, caregiver, and/or other members of the health care team.
 2. Identify relevant information in the patient profile or medical record.
 3. Interview the patient or caregiver employing effective communication strategies.
 4. Identify the patient's primary complaint(s) and reason(s) for seeking medical care
 5. Perform selected aspects of physical assessment, as appropriate.
 6. Protect the confidentiality of patient information.
 - B. Interpret and evaluate patient and drug-related data needed to identify actual or potential drug therapy problems (prescription and non-prescription).
 1. Evaluate information obtained from the patient's history and physical assessment.
 2. Assess any patient history of allergies and intolerances.
 3. Evaluate laboratory test results and pharmacokinetic data.
 4. Perform any additional patient calculations needed (e.g. creatinine clearance, ideal body weight, body surface area, body mass index)
 5. Identify the cause and significance of adverse drug effects.
 6. Evaluate the significance of actual or potential drug interactions.
 7. Assure that there is not excessive medication use or unnecessary drug duplication.
 8. Determine the extent to which medical conditions or diseases are treated or controlled.
 9. Assess patient adherence to previously prescribed medication regimens.
 10. Identify signs or potential indicators of drug misuse or abuse.
 - C. Develop a complete medical and drug therapy problem list.
 1. Use relative priority to direct the pharmacotherapeutic plan.
 2. Differentiate active from inactive problems.
 3. Rank patient problems based on urgency and severity.
 4. Identify any preventative and health maintenance issues.
 - D. Retrieve, analyze, and interpret the professional, lay, and scientific literature to make informed, rational, and evidence-based decisions.
 1. Construct well-built questions based on the patient's drug therapy problem(s) or needed information.
 2. Identify the types and quality of information that are available in primary, secondary, and tertiary information sources, including web-based resources and those intended for lay audiences.

**PHARMACY PRACTICE
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3. Employ effective and efficient search strategies to find appropriate sources of drug and health information using a variety of information resources.
 4. Effectively and efficiently search secondary sources such as MedLine to locate pertinent primary literature.
 5. Critically analyze all relevant literature, considering its applicability and validity to the information needed.
 6. Critically analyze primary literature with regard to study design, methodology, findings, and conclusions.
 7. Integrate evidence from the literature with clinical expertise and consideration of patient preferences to draw a conclusion.
 8. Provide drug information clearly, accurately, concisely, and in a timely manner in a language appropriate for the target audience.
 9. Properly cite reference sources utilized.
- E. Select and recommend appropriate drug (prescription and non-prescription) and non-drug therapy as part of the care plan.
1. Identify pharmacotherapeutic goals and endpoints of therapy.
 2. Apply principles of biochemistry, medicinal chemistry, pharmacology, and pathophysiology to select the appropriate drug(s).
 3. Consider social, economic, and cultural factors that influence a patient's perspective on health, illness, and medication use.
 4. Apply pharmacokinetic and pharmacodynamic principles to select the appropriate dose, dosage schedule, and drug delivery system.
 5. Determine the appropriate therapy duration.
 6. Apply pharmacoeconomic principles in drug selection.
 7. Identify and minimize or avoid drug interactions, adverse effects, and contraindications associated with the recommended drug therapy.
 8. Assure that there is not excessive medication use or unnecessary drug duplication.
 9. Recommend complementary therapies as appropriate to enhance therapeutic outcomes.
 10. Apply principles of nutrition to improve health, augment drug therapy, and reduce disease risk.
 11. Recommend medical goods and devices that are appropriate based on the patient's needs.
- F. Devise and implement a patient monitoring plan to ensure achievement of desired therapeutic outcomes.
1. Monitor patient-specific subjective and objective parameters for drug efficacy and toxicity.
 2. Assess appropriate parameters in a timely manner and at appropriate intervals/frequencies.
 3. Determine whether patient-specific goals have been met and adjust the care plan accordingly.
 4. Anticipate, monitor for, and report adverse effects and drug interactions.
 5. Refer patients to other health care professionals when indicated.
- II. Prepare and dispense medication(s) prescribed (or recommended) as part of the patient's care plan.
- A. Review and interpret prescription orders for patients.

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1. Evaluate the acceptability of prescription order transmission and legitimacy of source.
 2. Determine the validity of the patient-prescriber relationship.
 3. Clarify, add, and/or correct prescription order information when necessary.
- B. Accurately prepare and dispense medications and/or supervise the preparation of medications.
1. Correctly count, measure, mix, reconstitute, and calculate the quantity of medications to dispense.
 2. Correctly prepare the label for the finished prescription.
 3. Select an appropriate container based on the chemical and physical properties of the drug that meets the patient's characteristics or needs.
- C. Accurately compound individual or bulk medications.
1. Locate accurate information on extemporaneous formulations.
 2. Evaluate the suitability of an extemporaneously compounded formulation.
 3. Calculate the correct quantity of ingredients.
 4. Use correct gravimetric and volumetric measuring procedures to obtain the desired quantity of the formulation component.
 5. Use good compounding practices in the extemporaneous production of a patient-specific drug delivery system.
 6. Identify physical and chemical incompatibilities among components of a given formulation and recommend appropriate alternatives to avoid incompatibilities.
- D. Prepare, store, and assure quality of sterile dosage forms.
1. Calculate the correct quantity of components when preparing a sterile product.
 2. Use proper aseptic techniques to prepare sterile dosage forms.
 3. Use sterilization methods that are appropriate for the pharmaceutical product.
 4. Calculate the rate of drug administration based on the prescription order and the type of infusion pump used.
 5. Determine a patient's fluid, electrolyte and nutritional needs and calculate the amount and composition of parenteral nutrition sources to meet those needs.
 6. Perform proper quality control procedures.
 7. Evaluate the stability and compatibility of sterile formulations.
- E. Comply with federal, state, and local statutes and regulations that affect pharmacy practice.
- F. Resolve ethical and moral decisions faced by pharmacists.
- III. Develop population-specific, evidence-based disease management programs.
- A. Assess the health needs of a specific patient population by analyzing epidemiologic data and identifying risk factors that would adversely affect patient health.
 - B. Develop appropriate criteria and outcome indicators and conduct medication reviews in specific populations.
 - C. Evaluate pharmaco-economic data relevant to appropriate disease-specific treatment plans.

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- D. Design evidence-based disease management programs that incorporate outcome indicators, drug treatment protocols, risk reduction strategies, and education programs for health care providers and patients.
 - E. Assure that all relevant members of a patient population receive needed services.
- IV. Communicate and collaborate with prescribers, patients, caregivers, and other involved health care providers to engender a team approach to patient care.
- A. Communicate clearly, accurately, compassionately, confidently, and persuasively with patients, caregivers, other health care professionals, and the public using appropriate listening, verbal, nonverbal, and written communication skills.
 - B. Exhibit a caring and respectful attitude and demonstrate empathy while establishing rapport and communicating with the patient and/or caregiver.
 - C. Establish collaborative relationships with other healthcare professionals that foster a team approach to patient care.
 - D. Demonstrate professionalism and leadership within professional and civic organizations.
 - E. Effectively communicate drug and health information at appropriate levels for patients and healthcare professionals.
 - F. Demonstrate sensitivity and tolerance within multicultural interactions and settings.
 - G. Educate patients and/or caregivers about drug therapy.
 - 1. Explain to patients or caregivers the drug, dosage, indication, and storage requirements for a given drug.
 - 2. Educate patients or caregivers on the symptomatology, significance, frequency, and management of adverse drug reactions.
 - 3. Explain any action that should be taken in the event of a missed dose.
 - 4. Demonstrate proper administration technique for a given drug delivery system and, as appropriate, confirm the patient's ability to perform such techniques.
 - 5. Facilitate patients assuming an active role in their self-care and overall health.
 - 6. Choose communication methods that are sensitive to the social and cultural background of the target audience.
 - 7. Confirm patient understanding of counseling provided and clarify if needed.
 - H. Educate patients or caregivers about the proper use of medical goods and devices.
 - 1. Identify print, audiovisual, and/or computerized sources of patient education information on medical devices and goods that meet the patient's needs.
 - 2. Demonstrate and verify the proper use of medical goods and devices to ensure effective use.
 - 3. Communicate storage, calibration, and maintenance information for medical goods and devices.
 - I. Document pharmaceutical care activity in a patient profile or medical record to facilitate communication and collaboration among healthcare providers.
- V. Maintain professional competency in providing pharmaceutical care by committing oneself to being an independent, self-initiated life-long learner.
- A. Identify and analyze emerging issues, products, and services that may impact patient-specific and population-based pharmaceutical care.
 - B. Assess one's own knowledge and abilities independently.
 - C. Set personal knowledge and ability goals and take responsibility for attaining them.
 - D. Recognize self-limitations and seek appropriate assistance/clarification.

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- E. Review topics relevant to patient care activities to enhance knowledge base and preparedness.
 - F. Accept feedback and implement suggestions for improvement.
 - G. Manage time appropriately and efficiently.
 - H. Exhibit intellectual curiosity and personal commitment to ensure ongoing professional competency.
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The supplemental outcomes were developed by the 2005 and 2006 AACP Pharmacy Practice Educational Outcomes and Objectives Supplements Task Forces: Mary Stamatakis, West Virginia University (chair); Marie Abate, West Virginia University; Eric Boyce, Wingate University; Shauna Buring, University of Cincinnati; Ina Lee Calligaro, Temple University; Ann Canales, Texas Tech University; Allison Chung, Auburn University; Lawrence Cohen, Washington State University; Wafa Dahdal, Midwestern University; Michelle Easton, University of Charleston; Diane Ginsburg, University of Texas at Austin; Brenda Gleason, St. Louis College of Pharmacy; Stuart Haines, University of Maryland; Dennis Hedge, South Dakota State University; Paul W. Jungnickel, Auburn University; James Karboski, University of Texas at Austin; Connie Kraus, University of Wisconsin - Madison; Roger Lander, Samford University; Sara Lanfear, St. Louis College of Pharmacy; Wanda Maldonado, University of Puerto Rico; Nanci L. Murphy, University of Washington; Erica Murrell, Massachusetts College of Pharmacy; Susan Paulsen, University of Colorado - Denver; Theresa Salazar, Butler College of Pharmacy; Jennifer Santee, Univ. of Missouri - Kansas City; Karen Sauer, University of Arizona; Amy H. Schwartz, University of Southern Nevada; Terry Schwinghammer, West Virginia University; Steven A. Scott, Purdue University; Kelly Shields, Ohio Northern University; Christopher Turner, University of Colorado; Ann Zweber, Oregon State University.

**SOCIAL and ADMINISTRATIVE SCIENCES
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

- 1. PHARMACEUTICAL CARE** Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.
1. Apply the following social/behavioral principles and theories in the design, delivery and evaluation of pharmaceutical care.
 - A. Differentiate between psychosocial and drug therapy approaches to providing pharmaceutical care and employ both approaches in practice.
 - B. Identify and describe relationships between patient and practitioner knowledge, attitudes, beliefs, and behaviors, and use information to design pharmaceutical care plans.
 - C. Describe relevant behavioral theories of health, illness and medication use, and apply these theories to the pharmacotherapy plan.
 - D. Identify and describe social and behavioral factors associated with medication non-adherence, and identify strategies to improve adherence.
 - E. Apply social and behavioral research to understand and improve pharmaceutical care.
 - F. Apply concepts of behavioral change to facilitate improved patient outcomes in health promotion, disease prevention and medication management.
 - G. Demonstrate sensitivity to the various multicultural factors involved in pharmaceutical care.
 - H. Display professional attitudes, beliefs and behaviors in the delivery of pharmaceutical care.
 - I. Use ethical principles and theories to consider alternative sides of a pharmaceutical care and/or health care dilemma.
 2. Communicate with prescribers, patients, caregivers, and other involved health care providers to engender a team approach to patient care.
 - A. Develop verbal, non-verbal, written, and graphic communication skills to communicate effectively with patients, physicians, and others.
 - B. Apply effective communication skills in interprofessional relationships to improve the clinical, economic, and humanistic outcomes of patients.
 - C. Demonstrate provision of culturally and linguistically appropriate pharmaceutical care services to diverse patient populations.
 - D. Use communication skills in educating and counseling patients, e.g.,
 - i. Setting the stage
 - ii. Establishing rapport
 - iii. Eliciting information from the patient (Question asking)
 - iv. Providing information to the patient (Patient Education)
 - v. Organizing the encounter
 - vi. Promoting adherence to appropriate therapy
 - vii. Encouraging patient involvement
 - viii. Demonstrating sensitivity to and adjustment of communication based on contextual or cultural factors, including health literacy, literacy, cognitive impairment, etc.
 - ix. Exhibiting professional demeanor
 - x. Exhibiting professional decision-making
 - xi. Concluding the encounter

**SOCIAL and ADMINISTRATIVE SCIENCES
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2. **SYSTEMS MANAGEMENT** Manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers, and administrative and supportive personnel, to promote health; to provide, assess, and coordinate safe, accurate, and time-sensitive medication distribution; and to improve therapeutic outcomes of medication use.

1. Describe and demonstrate appropriate utilization of management principles and use of health care resources in the American health care system.
 - A. Identify the key features of private and public payers of health care.
 - i. Differentiate modes and mechanisms of paying for health and pharmaceutical care
 - ii. Describe benefits provided under Medicare.
 - iii. Describe the roles of state and federal governments in financing and administering Medicaid.
 - B. Describe the objectives of health insurance and managed health care programs.
 - i. Differentiate between insuring health and managing health care.
 - ii. Describe the evolution of pharmacists' roles in the health care system.
 - iii. Understand the impact of health care costs on the medication distribution and use systems.
 - iv. Define the role of the pharmacist in providing medication therapy management.
 - v. Demonstrate the role of pharmacists in providing access to pharmaceutical care to all patients.
 - vi. Demonstrate an awareness of health disparities and means of addressing the problem.
2. Manage pharmacy operations.
 - i. Evaluate a pharmacy for ownership or management using principles of financial management and business indicators.
 - ii. Conduct a basic analysis to diagnose and resolve financial and management problems.
 - iii. Establish a mission statement with component goals and actions.
 - iv. Develop a strategic plan to achieve the identified goals.
 - v. Apply the principles of business planning to develop a business plan that supports the implementation and provision of pharmaceutical care services, identifies and acquires necessary resources, and assures financial success of the practice, i.e.,
 - a. Address the financial, legal, accounting, and managerial role of the management/technical team.
 - b. Determine the cost to dispense a prescription and the appropriateness of pricing strategies.
 - c. Determine a budget for financial resource allocation.
 - d. Predict patient care needs and professional service opportunities.
 - e. Establish effective time management and priority-setting procedures.
 - f. Determine strategies for managing organizational change.
 - g. Evaluate the achievements of a practice in relation to the established mission, fiscal resources, and customer needs.
 - vi. Apply marketing principles to effectively market a pharmacy or pharmaceutical care service.
 - a. Assess demand (among patients, providers, and payers) and competition, and identify a viable market within a target location.
 - b. Develop strategies to address marketing needs (products/services, price, promotion, place, personnel).

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- c. Document services and outcomes to enhance marketing and reimbursement.
 - d. Develop direct-selling skills for approaching patients, providers, and payers to engage in medication therapy management or pharmaceutical care services.
 - vii. Identify the impact of the government and third party payers on pharmacy operations and understand the basic principles/strategies for negotiating contracts with payers.
 - viii. Develop strategies for reimbursement of pharmacy services, such as medication therapy management.
3. Manage personnel.
- A. Determine the organizational structure of a pharmacy.
 - B. Identify the components of a job description.
 - C. Identify a staff of persons (professional, technical and supportive) capable of fulfilling the practice mission.
 - D. Interpret state and federal regulations that affect personnel policies.
 - E. Understand the role of staffing plans in maintaining workforce productivity.
 - F. Determine the process used to recruit, retain, and reward an individual.
4. Optimize physical and technological resources required to fulfill the practice mission.
- A. Evaluate a pharmacy's layout.
 - B. Design/redesign a pharmacy to maintain efficiency and enhances patient-focused care services.
 - C. Utilize automated medication storage and distribute systems, which improve the practice mission.
 - i. Determine the benefits of medication storage and distribution systems, medication-packing systems, and bar-code labeling systems.
 - ii. Identify electronic information systems that assists in the transfer of patient information needed for medication management.
 - iii. Identify the role of pharmacists when computerized prescriber order-entry systems are utilized.
5. Manage medication distribution and control systems.
- A. Utilize inventory control concepts to develop and implement an inventory control system.
 - i. Determine and maintain optimal inventory mix/level.
 - ii. Select drug products based on bioequivalence and therapeutic equivalence.
 - iii. Assess and evaluate the utility of automated medication storage and distribution devices.
 - iv. Maintain records of products received and removed from inventory.
 - v. Perform drug control, storage and security functions.
 - B. Design, select, implement, and/or manage drug distribution systems for various practice settings.
 - i. Recognize distinguishing characteristics of drug distribution systems in a variety of settings, including automated systems.
 - ii. Develop appropriate job descriptions for a given drug distribution system.
 - iii. Develop and utilize policies and procedures that provide quality assurance/control for improving the efficiency and effectiveness of a given drug distribution system.
6. Manage medication use systems.
- A. Participate in the pharmaceutical care system's process for reporting and managing medication errors and adverse drug reactions.

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- i. Identify and report medication errors and adverse drug reactions to appropriate individuals and organizations (including institutional and federal).
 - ii. Evaluate information obtained from adverse drug reaction and medication error reporting systems to identify preventable causes.
 - iii. Recommend and implement actions to minimize the occurrence of adverse drug reactions and medication errors.
- B. Participate as part of a multidisciplinary team in the pharmaceutical care system's process for conducting medication use evaluations.
- i. Develop appropriate criteria and outcome indicators.
 - a. Identify appropriate drugs for review.
 - b. Identify appropriate criteria or indicators developed by national organizations and regulatory agencies.
 - c. Adapt and/or modify existing criteria for use in a given situation.
 - d. Develop criteria and/or indicators based on analysis of the literature, and site-specific considerations.
 - ii. Conduct medication use evaluations.
 - a. Collect data for a medication utilization review.
 - b. Apply criteria to collected drug utilization review data.
 - c. Implement corrective actions to improve drug use, if necessary.
 - d. Assess outcomes of these corrective actions through a multidisciplinary system.
- C. Participate in the development and implementation of a formulary system.
- a. Develop standards for drug product inclusion in the formulary.
 - (a) Compile and evaluate relevant scientific literature and drug use data across patients and prescribers within the system.
 - (b) Develop therapeutic interchange guidelines.
 - b. Implement and manage the formulary system.
 - (a) Compile and evaluate data necessary to review therapeutic and/or generic classes of drugs and new products for formulary considerations.
 - (b) Monitor prescribers and pharmacists compliance with formulary standards.
 - (c) Implement corrective action if variances from the formulary standards occur.
 - (d) Communicate with managers and caregivers regarding formulary decisions.
 - (e) Re-evaluate formulary decisions and their impact on patient care on a continual basis.
- D. Apply principles of outcomes research and quality assessment methods to the evaluation of pharmaceutical care.
- i. Use appropriate structure, process, and outcome measures to evaluate the quality of pharmaceutical care.
 - ii. Apply elements of continuous quality improvement to pharmaceutical care.
 - iii. Apply appropriate drug use management methods to evaluate the quality of pharmaceutical care.
 - iv. Use appropriate critical pathways, clinical practice guidelines, and disease management protocols in the delivery of pharmaceutical care.
 - v. Document quality assurance activities according to the specifications of relevant accrediting and regulatory bodies.
 - vi. Explain and demonstrate use of report cards in assessing the quality of health care.
 - vii. Apply principles of pharmacoconomics in making pharmaceutical care decisions.
 - viii. Apply principles of humanistic outcomes in determining impact of pharmaceutical care services on patient's quality of life.

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7. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
 - A. Comply with federal, state, and local statutes and regulations that affect pharmacy practice.
 - B. Apply principles of civil law to the practice of pharmacy.
 - i. Recognize professional practice situations that may give rise to liability under civil law.
 - ii. Predict the likelihood of liability that may arise from errors of omission or commission in professional practice situations involving civil law.
 - C. Ensure that medication distribution systems (including Internet sources) provide timely and appropriate pharmacy services.
 - D. Identify ethical and moral decisions faced by pharmacists during the medication distribution process.

3. PUBLIC HEALTH Promote health improvement, wellness, and disease prevention in cooperation with patients, communities, at-risk populations, and other members of an interprofessional team of health care providers

1. Assure the availability of effective, quality health and disease prevention services.
 - A. Assure access to rational, safe, and cost-effective drug therapy and pharmaceutical care.
 - i. Provide clinical preventive services to improve outcomes and quality of life
 - ii. Educate patients about behaviors that promote health, maintain wellness, prevent and control disease, and reduce health disparities
 - iii. Evaluate the quality and effectiveness of clinical and community-based interventions designed to improve health
 - iv. Use communication strategies strategically to improve health.
 - B. Define and assess the health status of individuals and populations, including determinants of health and illness, factors contributing to health promotion and disease prevention, factors influencing the use of health services, and epidemiology (e.g., incidence, prevalence) of diseases.
 - C. Assess and monitor at-risk populations to identify and report health problems, and to prioritize interventions in collaboration with patients, other health professionals, members of the community, and policy makers
 - D. Select and implement strategies to prevent or detect disease in the target population.
 - i. Determine the pharmacist practice activity domains in public health initiatives and responses and promoting safe medication use in society.
 - ii. Formulate strategies to offer disease detection and prevention programs to the public.
 - iii. Implement disease detection and prevention health care services (e.g., smoking cessation, weight reduction, diabetes screening, blood pressure screening, immunization services) to prevent health problems and maintain health.
 - iv. Provide public health related educational material or services tailored to the needs and background of a given audience.
 - v. Identify the roles pharmacists play in emergency preparedness (e.g., bioterrorism and chemical terrorism, natural disasters) and response (e.g., medication dispensing, information provision, vaccination response teams, medical reserve

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- corps) on the local community and national levels. Provide care and evaluate outcomes.
 - vi. Provide patients with access to poison control and treatment information.
 - E. Identify methods to ensure that public health initiatives/programs continue to achieve stated goals.
 - i. Conduct a continuing assessment of community health assets and needs.
 - ii. Prioritize pharmacy-based programs based on identifiable criteria and standards.
 - iii. Amend existing programs or develop additional services.
 - iv. Recognize the importance of promoting a healthy lifestyle, including the appropriate use of screening tools and immunizations.
 - v. Consult and collaborate with other members of the health care team and public agencies; provide follow-up and referral when necessary.
 - F. Evaluate the outcomes of the program/intervention.
 - G. Advocate for improved policies that increase access to health services and reduce health risks.
2. Develop strategic efforts to collaborate with policy makers, payers, members of the community, health providers and other stakeholders and decision-makers to promote public health and resolve public health problems.
- A. Collaborate with pertinent local and state organizations, health care providers and policy makers responsible for the development of the public health initiatives and identify methods to stimulate their support.
 - B. Synthesize a solution through an action plan in collaboration with community leaders and organizations, such as the following
 - i. Develop a written plan for provision of informational and preventive efforts and identify potential methods and/or plans to generate physical or financial support from internal and external sources.
 - ii. Evaluate the conclusion and action plan to ensure goals will be met.
 - iii. Implement the action plan through collaboration with the ability to provide support for the position taken.
 - C. Tailor activities by identifying clinical characteristics of the pharmacy practice and community and learning about diseases associated with the service population and community
3. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- A. Describe local, state, federal and international regulations affecting public health policy development.
 - B. Evaluate and resolve ethical dilemmas that arise in the development of public health policy or find a solution that is acceptable to all parties involved.
 - C. Describe legal and ethical implications of intervention in life threatening situations such as poisoning or drug overdose.
 - D. Demonstrate the ability to place health care and professional issues within appropriate historical, cultural, social, economic, scientific, political, and philosophical frameworks.
 - E. Display a respect and sensitivity for patient and family attitudes, behaviors and lifestyles, paying particular attention to cultural, ethnic and socioeconomic influences and incorporate cultural preferences, spiritual and health beliefs and behaviors into the patient care plan.

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- F. Incorporate the needs and perceptions of a culturally diverse society in public health policy.
- G. Apply principles of pharmacoeconomics in public health policy development.
- H. Evaluate public health policy in terms of costs and effectiveness.
- I. Identify and collaborate with appropriate government agencies in the development of public health policy.
- J. Explain the role of professional organizations in the development of public health policy.
- K. Determine how professional standards and guidelines are incorporated into specific public health policies.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Donna Dolinsky, Long Island University (chair); Stephaine Crawford, University of Illinois-Chicago; Doug Ried, University of Florida; Mary Roth, University of North Carolina; and Betsy Sleath, University of North Carolina.

**LIBRARIES and EDUCATIONAL RESOURCES
SUPPLEMENTAL EDUCATIONAL OUTCOMES
BASED on CAPE 2004**

1. **PHARMACEUTICAL CARE** Provide pharmaceutical care in cooperation with patients, prescribers, and other members of an interprofessional health care team based upon sound therapeutic principles and evidence-based data, taking into account relevant legal, ethical, social, economic, and professional issues, emerging technologies, and evolving biomedical, sociobehavioral, and clinical sciences that may impact therapeutic outcomes.
 - a. Provide patient-centered care.
 - i. Design, implement, monitor, evaluate, and adjust pharmaceutical care plans that are patient-specific and evidence-based.
 1. *Understand and use principles of evidence-based medicine to assess information needs, formulate focused queries, acquire the best available evidence, evaluate the evidence, and apply clinical expertise in using the evidence in providing patient-centered care.*
 2. *Maintain awareness of evidence-based information resources. Identify and locate the best evidence on clinical questions, including systematic reviews, meta-analyses, practice guidelines, and randomized controlled trials.*
 - ii. Communicate and collaborate with prescribers, patients, care givers, and other involved health care providers to engender a team approach to patient care.
 3. *Identify and regularly use information resources that enhance the pharmacist's understanding of patient viewpoints, beliefs, and attitudes.*
 4. *Effectively communicate research findings at appropriate levels for patients and healthcare professionals.*
 - iii. Retrieve, analyze, and interpret the professional, lay, and scientific literature to provide drug information to patients, their families, and other involved health care providers.
 5. *Understand and use principles of evidence-based medicine to assess information needs, formulate focused queries, acquire the best available evidence, evaluate the evidence, and apply clinical expertise in using the evidence in providing patient-centered care.*
 6. *Maintain awareness of evidence-based information resources. Identify and locate the best evidence on clinical questions, including systematic reviews, meta-analyses, practice guidelines, and randomized controlled trials.*
 7. *Identify and regularly use information resources that enhance the pharmacist's understanding of patient viewpoints, beliefs, and attitudes.*
 8. *Effectively communicate research findings at appropriate levels for patients and healthcare professionals.*
 9. *Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.*
 10. *Demonstrate proficiency in searching the biomedical literature using a variety of resources and interfaces, including MedLine, via PubMed or other interfaces: Build search strategies using Boolean operators, controlled vocabularies where available (e.g. National Library of Medicine Medical Subject Headings (MeSH)), database limiting capabilities and field searching. Refine and implement effective search strategies for different purposes.*

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- 11. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.*
- 12. Determine accuracy of information by investigating authority of resources, effectiveness of search strategy, and potential biases or conflicts of interest in the information retrieved.*
- 13. Determine applicability of the information to specific clinical questions and draw conclusions from new information to build on previous knowledge base.*
- iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- 14. Understand issues of privacy, copyright, plagiarism and other issues involved in the legal and ethical uses of information.*
- v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact patient-specific therapeutic outcomes.
- 15. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.*
- 16. Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.*
- 17. Use current awareness tools such as journal and database alerting services.*
- b. Provide population-based care.
- i. Develop and implement population-specific, evidence-based disease management programs and protocols based upon analysis of epidemiologic and pharmaco-economic data, medication use criteria, medication use review, and risk reduction strategies.
- 1. Understand and use principles of evidence-based medicine to assess information needs, formulate focused queries, acquire the best available evidence, evaluate the evidence, and apply clinical expertise in using the evidence in providing patient-centered care.*
- 2. Maintain awareness of evidence-based information resources. Identify and locate the best evidence on clinical questions, including systematic reviews, meta-analyses, practice guidelines, and randomized controlled trials.*
- ii. Communicate and collaborate with prescribers, population members, care givers, and other involved health care providers to engender a team approach to patient care.
- 3. Identify and regularly use information resources that enhance the pharmacist's understanding of patient viewpoints, beliefs, and attitudes.*
- 4. Effectively communicate research findings at appropriate levels for patients and healthcare professionals.*
- iii. Retrieve, analyze, and interpret the professional, lay, and scientific literature to provide drug information to other health care providers and to the public.

**LIBRARIES and EDUCATIONAL RESOURCES
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5. *Understand and use principles of evidence-based medicine to assess information needs, formulate focused queries, acquire the best available evidence, evaluate the evidence, and apply clinical expertise in using the evidence in providing patient-centered care.*
6. *Maintain awareness of evidence-based information resources. Identify and locate the best evidence on clinical questions, including systematic reviews, meta-analyses, practice guidelines, and randomized controlled trials.*
7. *Identify and regularly use information resources that enhance the pharmacist's understanding of patient viewpoints, beliefs, and attitudes.*
8. *Effectively communicate research findings at appropriate levels for patients and healthcare professionals.*
9. *Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.*
10. *Demonstrate proficiency in searching the biomedical literature using a variety of resources and interfaces, including MedLine, via PubMed or other interfaces: Build search strategies using Boolean operators, controlled vocabularies where available (e.g. National Library of Medicine Medical Subject Headings (MeSH)), database limiting capabilities and field searching. Refine and implement effective search strategies for different purposes.*
11. *Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.*
12. *Determine accuracy of information by investigating authority of resources, effectiveness of search strategy, and potential biases or conflicts of interest in the information retrieved.*
13. *Determine applicability of the information to specific clinical questions and draw conclusions from new information to build on previous knowledge base.*
- iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
14. *Understand issues of privacy, copyright, plagiarism and other issues involved in the legal and ethical uses of information.*
- v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact population-based, therapeutic outcomes.
15. *Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.*
16. *Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.*
17. *Use current awareness tools such as journal and database alerting services.*

**LIBRARIES and EDUCATIONAL RESOURCES
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2. **SYSTEMS MANAGEMENT** Manage and use resources of the health care system, in cooperation with patients, prescribers, other health care providers, and administrative and supportive personnel, to promote health; to provide, assess, and coordinate safe, accurate, and time-sensitive medication distribution; and to improve therapeutic outcomes of medication use.
- a. Manage human, physical, medical, informational, and technological resources.
- i. Apply relevant legal, ethical, social, economic, and professional principles/issues to assure efficient, cost-effective utilization of human, physical, medical, informational, and technological resources in the provision of patient care.
- 1. Understand issues of privacy, copyright, plagiarism and other issues involved in the legal and ethical uses of information.*
- ii. Communicate and collaborate with patients, prescribers, other health care providers, and administrative and supportive personnel to engender a team approach to assure efficient, cost-effective utilization of human, physical, medical, informational, and technological resources in the provision of patient care.
- 2. Effectively communicate research findings at appropriate levels for patients and healthcare professionals.*
- 3. Identify, use, and share available resources for continuing education in the effective uses of current information resources and technologies.*
- iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact management of human, physical, medical, informational, and technological resources in the provision of patient care.
- 4. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.*
- 5. Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.*
- 6. Use current awareness tools such as journal and database alerting services.*
- 7. Identify, use, and share available resources for continuing education in the effective uses of current information resources and technologies.*
- b. Manage medication use systems.
- i. Apply patient- and population-specific data, quality assurance strategies, and research processes to assure that medication use systems minimize drug misadventuring and optimize patient outcomes.
- 8. Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.*

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- ii. Apply patient- and population-specific data, quality assurance strategies, and research processes to develop drug use and health policy, and to design pharmacy benefits.

9. Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.

- iii. Communicate and collaborate with prescribers, patients, caregivers, other involved health care providers and administrative and supportive personnel to identify and resolve medication use problems.
- iv. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- v. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may impact medication use systems, to develop use and health policy, and to design pharmacy benefits.

10. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.

11. Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.

12. Use current awareness tools such as journal and database alerting services.

- 3. **PUBLIC HEALTH** Promote health improvement, wellness, and disease prevention in cooperation with patients, communities, at-risk populations, and other members of an interprofessional team of health care providers.

- a. Assure the availability of effective, quality health and disease prevention services.
 - i. Apply population-specific data, quality assurance strategies, and research processes to develop identify and resolve public health problems.

1. Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.

- ii. Communicate and collaborate with prescribers, policy makers, members of the community and other involved health care providers and administrative and supportive personnel to identify and resolve public health problems.
- iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may affect the efficacy or quality of disease prevention services to amend existing or develop additional services.

2. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources.

3. Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.

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4. Use current awareness tools such as journal and database alerting services.

- b. Develop public health policy.
 - i. Apply population-specific data, quality assurance strategies, and research processes to develop public health policy.

5. Identify, evaluate and regularly use a variety of information resources, including those intended for lay people and those written for healthcare professionals and including reference books, fulltext databases, websites, and primary literature.

- ii. Communicate and collaborate with prescribers, policy makers, members of the community and other involved health care providers and administrative and supportive personnel to develop public policy.
- iii. Carry out duties in accordance with legal, ethical, social, economic, and professional guidelines.
- iv. Maintain professional competence by identifying and analyzing emerging issues, products, and services that may affect public health policy, to amend existing or develop additional policies.

6. Use available services of librarians and other information professionals to supplement information retrieval and to learn about new resources or enhancements to existing resources

7. Practice life-long learning by maintaining records of information retrieval processes and by updating and refining information search and retrieval skills to maintain awareness of current issues, products and services.

8. Use current awareness tools such as journal and database alerting services.

The supplemental outcomes were developed by Educational Outcomes and Objectives Supplements Task Force Members: Sue McGuinness, University of California San Diego (chair); Gerri Wanserski, University of Wisconsin Madison; and others.