

ACCP WHITE PAPER

Clinical Pharmacist Competencies

American College of Clinical Pharmacy

John M. Burke, Pharm.D., FCCP, William A. Miller, Pharm.D., FCCP, Anne P. Spencer, Pharm.D., Christopher W. Crank, Pharm.D., Laura Adkins, Pharm.D., Karen E. Bertch, Pharm.D., FCCP, Dominic P. Ragucci, Pharm.D., William E. Smith, Pharm.D., Ph.D., and Amy W. Valley, Pharm.D.

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The American College of Clinical Pharmacy (ACCP) strategic plan summarizes its core ideology, envisioned future, core purpose and mission, and critical issues for the organization and the profession.¹ A longstanding critical issue of the college's plan is how ACCP can contribute to ensuring an appropriately educated and skilled clinical pharmacy workforce. Toward that end, the college sought to publish a definition of clinical pharmacy and establish the competencies of a clinical pharmacist. Coincident with the development of its definition of clinical pharmacy,² the ACCP Board of Regents charged a task force to develop a complete set of competency statements for the clinical pharmacist. These statements were to be assessable and able to serve as a foundation for the development of future clinical pharmacist assessment tools.

In developing the competency statements for this paper, the authors reviewed a number of documents that addressed competencies within the profession of pharmacy, including the Accreditation Council for Pharmacy Education (ACPE) Accreditation Standards for the Doctor of Pharmacy degree, the American Association of Colleges of Pharmacy (AACCP) Center for the

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Address reprint requests to the American College of Clinical Pharmacy, 13000 West 87th Street Parkway, Suite 100, Lenexa, KS 66215-4530; e-mail: accp@accp.com, or download from <http://www.accp.com>.

Advancement of Pharmaceutical Education (CAPE) Education Outcomes, the American Society of Health-System Pharmacists (ASHP) and ACCP joint statement on learning objectives for residency training in pharmacotherapy, and the Board of Pharmaceutical Specialties content outline for the Pharmacotherapy Specialty Certification examination.^{3–10} Consensus competencies of a clinical pharmacist were identified. Draft competencies and associated content knowledge components were then prepared for review by the ACCP Board of Regents. After extensive deliberations, the authors identified key differences between the competencies of a clinical pharmacist and today's pharmacy generalist.

Background

The ACCP's vision for the profession is that "pharmacists will be recognized and valued as the preeminent health care professionals responsible for the use of medicines in the prevention and treatment of disease."¹ The vision articulated by the Joint Commission of Pharmacy Practitioners also calls for future pharmacists to be responsible for rational medication use.^{11, 12} Today, few pharmacists are viewed by the public, government, payers of health care, physicians, nurses and other health professionals, or patients as the preeminent health care professionals responsible for the use of medicines in the prevention and treatment of disease or rational medication use. However, the profession has reason for optimism because a growing number of clinical pharmacists and clinical pharmacy specialists practicing in a

variety of institutional and ambulatory care settings are viewed by other health professionals as essential to ensuring rational medication use. To achieve the ACCP's vision, the profession must ensure that there will be an adequate supply of appropriately educated and skilled clinical pharmacists practicing as both clinical pharmacy generalists and specialists.¹³ Among the strategies that will help address this issue is to clearly define and promote the core competencies of a clinical pharmacy practitioner. Hence, the ACCP sought to publish a definition of clinical pharmacy and the core competencies of a clinical pharmacist.

The ACCP definition of clinical pharmacy states that "clinical pharmacy is that area of pharmacy concerned with the science and practice of rational medication use."² The AACP, through CAPE, has published educational outcomes to serve as a "target towards which the evolving pharmacy curriculum should be aimed."⁴ The ACPE doctor of pharmacy accreditation curricular standards state that "graduates must possess the basic knowledge, skills and abilities to practice pharmacy, independently, at the time of graduation."³ This implies that pharmacy graduates upon entry to the profession are capable of independently providing pharmacotherapy to patients. The ASHP postgraduate year one (PGY1) residency standard states that a "first-year residency program enhances general competencies in managing medication-use systems and supports optimal medication therapy outcomes for patients with a broad range of disease states."¹⁴ The standard goes on to state that the purpose of PGY1 residencies is to provide residents with "the opportunity to accelerate their growth beyond entry-level professional competence in patient-centered care and in pharmacy operational services and to further the development of leadership skills...PGY1 residents acquire substantial knowledge required for skillful problem solving, refine their problem-solving strategies, strengthen their professional values and attitudes, and advance the growth of their clinical judgment." The postgraduate year two (PGY2) standard states that PGY2 programs "increase the resident's depth of knowledge, skills, attitudes, and abilities to raise the resident's level of expertise in medication therapy management and clinical leadership" in a specific and focused area of practice.¹⁵ After review of the AACP, ACPE, and ASHP papers related to pharmacy education and training, and the

competencies of today's pharmacy graduates upon entry into the profession, the authors reached the following conclusions:

1. Competency lists and statements by each organization are similar. All of the statements are aimed at producing graduates of Pharm.D. or residency programs who can independently provide patient care and manage pharmacotherapy.
2. There are different competence levels that reflect the amount of experience that a pharmacy graduate has obtained in a doctor of pharmacy degree program or from completion of a PGY1 or PGY2 residency program. The PGY1 residency programs are, in most cases, aimed at producing pharmacy generalists. The PGY2 programs are aimed at producing pharmacy specialists or pharmacists who practice in well-differentiated areas of clinical pharmacy practice.
3. A key factor in developing competence is the continual learning of new knowledge and the enhancement of critical thinking and problem-solving skills through practice. Repetition is essential in the development of practice skills, and thus the average levels of performance of doctor of pharmacy and residency program outcomes vary depending upon the amount of patient care practice included in the program. Upon entry into the profession, pharmacy graduates are novices at managing pharmacotherapy. Entry-level pharmacy graduates usually gain some clinical pharmacy practice experience during their educational programs. This experience prepares them for entry into the profession, but not as fully competent clinical pharmacists.^{14, 15} Pharmacy graduates are often able to competently perform basic clinical activities such as routine patient counseling, provision of drug information, and targeted drug monitoring, but are not competent at providing more complex clinical services. Graduates of PGY1 residency programs are minimally competent to provide general clinical services (e.g., patient counseling, routine drug monitoring) but often are not prepared to independently assume responsibility for the more complex decision making involved in drug therapy selection and drug therapy management. The PGY2 programs allow residents to develop more in-depth knowledge and skills by working in specialized or differentiated areas of practice.¹⁵ Focusing on specific patient care populations (e.g., critical care, oncology, and pediatrics) allows graduates of PGY2 programs to enter practice

as entry-level clinical pharmacists. Through continued clinical and additional learning opportunities they become proficient clinicians and eventually experts in a field of practice. In summary, clinical pharmacists develop proficiency through formal training and practice experience.

4. The term clinical pharmacist is used in many different contexts. Some pharmacy leaders view all of today's pharmacists as clinical pharmacists. Although this viewpoint is consistent with the future vision for the profession, we find this to be an unrealistic assessment of today's practitioners. Similarly, some educators maintain that all graduates of doctor of pharmacy programs are prepared to be clinical pharmacists. We feel that this is not a realistic assessment of the outcomes of today's doctor of pharmacy programs. In addition, we agree with this future vision for the profession but feel that future manpower needs will determine if today's clinical pharmacists actually become the pharmacy generalists of the future.¹³
5. Reporting of the outcomes achieved by many doctor of pharmacy and residency programs is based predominantly on subjective data. Current pharmacy licensure board examinations evaluate only minimal practice competency. Advancement of pharmacy education and residency training could be enhanced by educational research that focuses on objective measures of clinical performance.
6. A number of important qualities define the clinical pharmacist.^{2, 11} Although a majority of today's pharmacists perform some clinical functions as part of their practice, they are not necessarily clinical pharmacists, just as all physicians who perform heart auscultations to assess cardiac disease are not cardiologists. The authors conclude that the following key qualities define the clinical pharmacist:
 - Clinical pharmacists have a broad scope and depth of pharmacotherapy knowledge and clinical skills. Knowledge is obtained and clinical skills are developed through formal education and training programs, including doctor of pharmacy degree and postgraduate residency programs, lifelong learning, and continuing professional development. Clinical pharmacist competence is achieved when one possesses the knowledge, skills, and attitudes required to provide direct care to patients and to ensure rational medication

use. Although many pharmacists possess some clinical knowledge or skills and perform some clinical functions or tasks, they must demonstrate comprehensive clinical competence in order to be clinical pharmacists.

- Clinical pharmacists spend the majority of their time providing pharmacotherapy independently or in collaboration with other health care providers. Clinical pharmacists must be engaged in the provision of patient care for a sustained period of time to become fully competent and proficient. Although a number of pharmacists have been educated and trained in some aspects of clinical pharmacy, their current work responsibilities may not be characterized as practicing clinical pharmacy because they are not fully engaged in providing direct patient care and do not provide complex, in-depth clinical services. Functions associated with medication order fulfillment continue to prevent pharmacists from becoming fully competent and proficient clinical pharmacists. There are a number of other barriers that continue to prevent pharmacists from practicing as clinical pharmacists, such as inadequate leadership and management, failure to establish collaborative relationships with physicians and nurses, lack of reimbursement for clinical services, and provider status. Time in practice beyond pharmacy education and training is required to allow one to gain experience with a wide range of medical problems and therapies, and to develop the necessary scope and depth of knowledge and clinical skills required to proficiently function as a clinical pharmacist.
- Clinical pharmacists have completed postgraduate residency training. Although there are excellent clinical pharmacists in practice today who have not completed residency training, in most cases the preferred method for acquiring the competencies of a clinical pharmacist is through formal residency training. This will become increasingly important in the future. Individuals who satisfactorily complete PGY1 (and ideally PGY2) accredited residencies that focus on clinical practice should have sufficient knowledge and practice experience to be competent clinical pharmacists with sound clinical judgment.

Although experience may be obtained outside of a structured residency program, any experience deemed to be equivalent to residency training must allow for involvement in the direct care of a sufficient number of patients over a period of time long enough to foster the development of clinical judgment. Without the necessary level of judgment, practitioners are limited in their ability to make patient-specific decisions and to know when a situation extends beyond their limits of knowledge and expertise.

- Clinical pharmacists maintain and further develop competence through practice and continued professional development. Although many pharmacists assume some direct patient-care responsibilities, they may not have received comprehensive, systematic clinical training. Achieving and maintaining clinical competence is a responsibility of all health care professionals.¹⁶ Although pharmacists have been required to obtain continuing education credit to maintain their licensure, the value of this method of education, which is often unfocused and noncurricular, has been questioned.^{16, 17} The specific needs of the clinical pharmacist are often not addressed through these non-curricular programs. Hence, the profession is evaluating alternate approaches of continuing professional development to meet these needs.^{17, 18}

If clinical pharmacists are to effectively evaluate their own abilities to carry out clinical responsibilities, they must have a defined list of competencies against which they can measure performance. There are many competencies that apply to all pharmacists. However, this document addresses those competencies that must be achieved by a clinical pharmacist.

Establishing specific clinical pharmacist competencies is important. First, they describe the abilities necessary to practice as a clinical pharmacist. Second, they can be used by practitioners to perform a self-assessment and thereby determine what areas need to be strengthened in order to enter clinical practice or maintain clinical competence. Although these competencies will undoubtedly evolve over time, this paper describes the competencies of today's clinical pharmacist. Therefore, we provide below a set of clinical pharmacist competencies for contemporary clinical practice and a framework in which to apply them.

Clinical Pharmacist Competencies

Specific clinical pharmacist competencies are summarized in Appendix 1.^{6, 8-10} The following sections describe each major competency area and its respective rationale. We acknowledge that some clinical pharmacists may function primarily as researchers or administrators and that these responsibilities may require a different set of competencies. However, this paper focuses only on those competencies required for clinical practice.

Clinical Problem Solving, Judgment, and Decision Making

A combination of comprehensive therapeutic knowledge, experience, problem-solving skills, and judgment is necessary in order to be a competent clinical pharmacist. Clinical problem solving and decision making are the processes by which patient-specific data are collected, interpreted, and analyzed; medical problems are assessed; current drug therapy is evaluated; and therapeutic plans are developed. These processes are critical to optimizing medication therapy.

Clinical pharmacists must be able to identify patient problems, implement and manage patient pharmacotherapy, dispense and administer medications as needed, educate patients, monitor drug therapy, and consult with other patient care providers to improve patient outcomes.

Although monitoring of therapy is often taught as the final step in the patient care process, it must occur before, during, and after the start of drug therapy. To effectively monitor therapy, the clinical pharmacist must be able to collect and interpret patient data from a variety of sources. Recognizing and identifying important information, and then interpreting and analyzing it in the context of complex clinical situations, require practice and repetition. Only after sufficient experience is acquired can a clinician know which situation demands urgent attention and which merely requires ongoing monitoring. Although students often associate monitoring with a list of specific parameters to follow in patients who have particular medical problems or who are receiving specific therapies, patient monitoring is actually much more complex. It is an active, ongoing process of patient assessment that promotes changes in therapy in order to optimize therapeutic outcomes and avoid or correct drug-related problems. Only after a clinical pharmacist has cared for many patients in a variety of situations will he or she be able to

monitor patients efficiently and effectively.

Similarly, assessing medical problems is an important clinical ability that must be developed and practiced. Although pharmacists are not responsible directly for establishing a patient's medical diagnosis, it is essential that the pharmacist be able to define patient-specific problems and effectively evaluate current therapy for those problems. Hence, clinical pharmacists cannot focus only on medications, but must take into account all patient-specific medical problems as well.

Designing and individualizing comprehensive drug therapy regimens also requires clinical experience. Observing patient-specific responses to medications is critical to anticipating potential outcomes of initiating and adjusting drug therapy. Sound clinical judgment should be based on a combination of in-depth knowledge of diseases, expertise in drug therapy, and practical experience involving patients' use of medications.

Collaborating with patients, caregivers, and other health professionals is another essential ability that deserves attention. Clinical pharmacists must be able to work with patients and other health care professionals to determine which treatments will best meet the patient's therapeutic needs. They must understand their roles, and the roles of collaborators, in the clinical problem-solving process.

Communication and Education

The ability to effectively communicate with and educate patients and health care professionals is integral to ensuring optimal patient outcomes. As with other abilities, communication is developed and refined throughout a pharmacist's career. Communicating with patients and other health professionals about a particular issue at the appropriate level of complexity can be challenging, and pharmacists must be aware of barriers to effective communication. Because effective communication and education are so fundamental to the provision of patient care, it is imperative that these abilities be well developed.

The clinical pharmacist must identify those issues that are particularly pertinent for patients and physicians to help optimize drug therapy. Providing accurate information alone is not sufficient. As with clinical problem solving, experience and judgment are required to advocate for a needed intervention or change in therapy. The same recommendation that was

rejected when delivered by a pharmacy student or resident may be accepted when delivered by an experienced clinician. Also, in communicating with patients, a monologue of detailed information can serve to confuse rather than educate. Assessment of a patient's level of understanding, identification of issues important to the patient, and delivery of information and advice in an understandable fashion are necessary.

Written communication is also important. One of the core tenets of clinical pharmacy is assuming responsibility for patient care.^{2,11} Like other health care providers, it is the clinical pharmacist's responsibility to document medication reconciliation, clinical problem-solving activities, therapeutic interventions, and patient education activities in the medical record. Although this may appear to be a relatively easy task, experience is required to know what information to include and how to communicate it in a manner appropriate for the patient medical record. As with verbal communication, practice is required to become proficient at writing notes in the medical record.

Medical Information Evaluation and Management

Providing quality patient care requires a knowledge base that is continuously expanding and being updated. A clinical pharmacist must be able to identify situations beyond his or her own expertise or that require new information to reach a decision. This necessitates carefully defining the question and using a variety of information sources to derive the answer. New information is then incorporated into one's existing knowledge base and integrated with prior clinical experiences to help develop sound clinical judgment.

Of course, young clinicians, students, and residents can sometimes become discouraged when they realize how much they do not know. However, recognizing the limits of one's knowledge base is an important step in the development of a mature clinician. Experience with a wide variety of information resources is essential. The new clinician may rely heavily on a limited number of resources rather than identifying the best sources of information for a given question. Fortunately, this skill is readily developed over time.

The clinical pharmacist must keep abreast of current medical and therapeutic information. A strong foundational knowledge base must first be

developed so that new information can be readily combined with prior knowledge. Students and trainees often lack the clinical experience necessary to recognize new information that should be incorporated into their knowledge base. Skills in interpreting and evaluating biomedical literature assist the clinical pharmacist in effectively integrating new information with prior knowledge. These skills, which are often discounted as unimportant by students and trainees, provide the basis not only for keeping up with the literature but also for making evidence-based decisions.

Management of Patient Populations

Many clinical pharmacists not only are involved in providing care to individual patients, but work within a health system or other organization to develop protocols and critical pathways that optimize the care of patient populations. These efforts may include analyzing drug utilization evaluations, composing protocols for disease state management, and developing organizational policies and procedures that improve patient care and resource utilization.^{9, 10} For instance, the Institute of Medicine has highlighted the importance of identifying processes within health systems that can predispose to medication errors.^{19, 20} Clinical pharmacists can apply their therapeutic knowledge and clinical experience to identify and correct problems that contribute to adverse events in patients. This may involve the collection and evaluation of information regarding how a particular medication or class of medications is being used such that changes can be implemented to improve care. Drug therapy protocols can be developed to ensure the proper use and monitoring of medications. A clinical pharmacist must possess sufficient experience and clinical judgment in the care of individual patients to effectively contribute to this process.

Clinical pharmacists routinely contribute to the development and implementation of critical pathways.^{9, 10} Because critical pathways are evidence based, the clinical pharmacist must be able to recognize and interpret relevant biomedical literature to formulate and justify valid drug therapy recommendations. Educating others about a critical pathway requires an in-depth understanding of the pathway, the evidence on which it is based, and the clinical implications for both health care professionals and patients. These skills are clearly beyond

those acquired in a doctor of pharmacy program and require development during postgraduate training and practice.

Therapeutic Knowledge

Clinical pharmacists must possess a therapeutic knowledge base of sufficient breadth and depth to effectively promote rational medication use. Appendix 1 includes a list of diseases and pharmacotherapeutic principles intended to serve as a guideline for the identification, assessment, and development of clinical pharmacist competencies. In general, to be considered a clinical pharmacist, one must be sufficiently knowledgeable about the diseases and principles in this list to effectively assess and treat these problems in the patient population one serves. It is important to emphasize that a clinical pharmacist must be competent in the therapeutic management of the many disease states that may affect a given patient, not simply those currently identified as active problems. To optimize a patient's therapy, the clinical pharmacist must be able to identify and solve new problems as they arise.

Doctor of pharmacy degree programs provide broad but relatively superficial coverage of disease states, pharmacotherapy, and general therapeutic principles. The PGY1 residencies are structured to deepen one's knowledge of many disease states, provide a supervised environment for the application of this knowledge, and promote the development of patient care skills and clinical judgment. Although preferred, a PGY1 residency is not the only way to develop the required skills and knowledge to be a clinical pharmacist. However, the content and structure of a residency should serve as a model for individuals seeking to become clinical pharmacists but who are unable to pursue formal residency training.

Although some clinical pharmacists may distinguish themselves by developing a subspecialty area of expertise (e.g., cardiology, infectious diseases), the maintenance of a sound foundation of therapeutic knowledge over a wide range of topics is necessary to meet their professional demands. Other clinical pharmacists may have a practice that focuses on a specific patient population (e.g., pediatrics). A list of therapeutic knowledge areas with similar breadth and depth to that described in Appendix 1 could be identified for those clinical pharmacists. Recognizing that such knowledge will grow and

evolve with changes in medicine, the guiding principle is that a clinical pharmacist who possesses a sufficient breadth and depth of therapeutic knowledge and experience is capable of comprehensively managing pharmacotherapy in the patient population he or she serves. If an individual's knowledge is limited to a few therapeutic classes of drugs, one's experience and clinical judgment will also be limited. This paper's goal is not to provide a definitive checklist of knowledge areas, but rather to characterize the breadth of knowledge minimally required for clinical practice.

Conclusion

These competency statements represent a current assessment of the requisite knowledge and skills of an individual actively engaged in the practice of clinical pharmacy. The knowledge areas describe the breadth of knowledge necessary for practitioners to provide appropriate levels of care for patients. Changes and advances in medicine will require periodic reevaluation and modification of therapeutic knowledge areas. Although there may be multiple paths for the development of clinical competence, further clarification of both the ideal career path and means to assess competence are needed. Then, once a practitioner has developed these competencies, methods and processes for self-assessment of clinical competence can be used to guide continuous professional development.

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Appendix 1. Clinical Pharmacist Competencies

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- I. Clinical problem solving, judgment, and decision making
- A. Monitor patients in the health care setting.
1. Collect patient-specific data to identify problems and individualize care.
 2. Perform relevant physical assessment.
 3. Interview patient, family, and other health care professionals to complement patient's medical history, medication therapy history, and review of systems.
 4. Identify additional data needed.
 5. Identify patient specific goals of therapy.
 6. Prospectively develop a plan for ongoing evaluation of progression of disease, development of disease-related complications, efficacy of drug therapy, and development of drug-related adverse effects.
- B. Assess patient-specific medical problems.
1. Organize, interpret, and analyze patient-specific data.
 2. Synthesize patient data to form an assessment.
 3. Develop a comprehensive medical problem list.
 4. Assess the status, etiology, risk factors, and complications of the patient's medical problems.
 5. Prioritize medical problems based on urgency and severity.
 6. Identify preventive and health maintenance issues.
 7. Persuasively communicate a justification for one's assessment.
- C. Evaluate patient-specific drug therapy and therapeutic problems.
1. Evaluate the appropriateness of drug therapy, including the choice of drug, and the dose, route, frequency, and duration of therapy.
 2. Evaluate the efficacy of current drug therapy.
 3. Identify potential or actual drug-induced adverse effects.
 4. Identify potential or actual drug interactions.
 5. Identify contraindications to therapy.
 6. Identify untreated problems.
 7. Assess patient compliance and factors that may influence compliance.
- D. Design a comprehensive drug therapy plan for patient-specific problems.
1. Select nonpharmacologic therapeutic measures.
 2. Select optimal drug, dose, route, frequency, and duration of therapy.
 3. Select strategies for prevention of disease.
 4. Incorporate the significance of potential drug interactions and adverse effects into the recommended plan.
 5. Persuasively justify recommendations based on patient-specific pharmacologic, pharmacokinetic, pharmacodynamic, pharmacogenomic, pharmaco-economic, ethical, legal, and evidence-based information.
- E. Collaborate with patients, caregivers, and other health care professionals.
1. Take responsibility for patient care duties.
 2. Reliably complete tasks and assignments.
 3. Manage time appropriately to be well prepared for clinical activities.
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Appendix 1. (continued)

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- II. Communication and education
- A. Educate patients.
1. Identify appropriate patient educational needs.
 2. Recognize patient education barriers.
 3. Use appropriate educational methods to educate patients regarding drug therapy.
 4. Use language appropriate for the patient.
 5. Assess patient's level of knowledge and skill acquisition.
- B. Educate other health care professionals.
1. Identify the educational needs of health care professionals.
 2. Establish rapport with other health care professionals.
 3. Communicate recommendations or relevant information to health care professionals in a manner appropriate to their training, skills, and needs.
 4. Provide background information and primary literature to health care professionals as needed.
- C. Communicate effectively.
1. Effectively communicate at a level appropriate to the audience.
 2. Interpret verbal and nonverbal cues.
 3. Use specific, clear, and appropriate terminology.
 4. Maintain appropriate eye contact.
 5. Communicate in an organized, logical, and concise manner.
 6. Display an appropriate level of confidence.
 7. Demonstrate tact.
 8. Answer questions clearly and completely.
- D. Document interventions in the patient medical record.
1. Clearly document drug therapy reconciliation and other patient-related interventions.
 2. Effectively communicate assessment, including supporting subjective and objective data.
 3. Effectively communicate the therapeutic plan.
- III. Medical information evaluation and management
- A. Demonstrate the motivation and commitment to become a lifelong learner.
1. Effectively self-assess knowledge and limitations.
 2. Define the question to be answered or problem to be solved.
 3. Demonstrate habits of self-learning.
- B. Retrieve biomedical literature using appropriate search strategies.
- C. Interpret biomedical literature with regard to study design, methodology, statistical analysis, significance of reported data, and conclusions.
- D. Integrate data obtained from multiple sources to derive an overall conclusion or answer.
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Appendix 1. (continued)

IV. Management of patient populations

- A. Patient safety and drug therapy evaluation^{6,8}
 1. Collect data to characterize or identify health system–related problems in providing optimal health care.
 2. Interpret data to characterize health system–related problems.
 3. Design a plan to improve the delivery and quality of pharmacotherapy.
 4. Develop a justification for and garner support for implementation of the plan.
 5. Design measures to monitor the success of the plan during and following implementation.
 6. Collaborate to implement the plan.
 7. Monitor the plan and implement appropriate modifications.
 8. Educate appropriate audiences on results of health system–related pharmacotherapy problem assessment and recommended solutions.
 - B. Critical pathways^{9,10}
 1. Identify diagnoses, procedures, or drugs that involve high risk, high patient volume, high process variability, and/or high cost.
 2. Select a multidisciplinary health care team based on likelihood of involvement in the pathway.
 3. Identify appropriate outcome measures based on review of the current medical literature and assessment of current processes.
 4. Document processes and outcomes for current practice and compare with current literature-based standards (benchmarking).
 5. Elucidate discrepancies between current literature-based standards and current practice.
 6. Develop the pathway with clearly defined goals and outcomes, patient education criteria, patient safety documentation, and monitoring.
- V. Therapeutic knowledge areas⁶
- A. Apply disease-oriented knowledge of the following areas.
 1. Anatomy, physiology, and pathophysiology
 2. Epidemiology, etiology, risk factors, and signs and symptoms
 3. Natural course and prognosis
 4. Laboratory and diagnostic test interpretation
 - B. Demonstrate competence in the pharmacotherapy of the following medical problems.
 1. Bone and joint
 - a. Degenerative joint disease
 - b. Osteoporosis
 - c. Gout
 2. Cardiovascular
 - a. Hypertension
 - b. Heart failure
 - c. Coronary artery disease
 - d. Acute coronary syndromes
 - e. Atrial fibrillation
 - f. Thromboembolic disorders
 - g. Dyslipidemias
 - h. Cardiopulmonary resuscitation
 - i. Peripheral arterial disease
 - j. Shock (hypovolemic, cardiogenic, and septic)
 - k. Stroke

Appendix 1. (continued)

3. Dermatologic
 - a. Acne
 - b. Urticaria
 - c. Psoriasis
 - d. Eczema
4. Endocrine
 - a. Diabetes mellitus
 - b. Hypothyroidism, hyperthyroidism
 - c. Adrenal disorders
 - d. Hormonal contraception
5. Gastrointestinal
 - a. Gastroesophageal reflux disease
 - b. Nausea and vomiting
 - c. Stress ulcer disease
 - d. Peptic ulcer disease
 - e. Upper gastrointestinal hemorrhage
 - f. Hepatitis
 - g. Cirrhosis
 - h. Pancreatitis
 - i. Inflammatory bowel disease
 - j. Cholelithiasis
 - k. Diarrhea and constipation
6. Genitourinary
 - a. Prostate hypertrophy
 - b. Urinary incontinence
7. Hematologic
 - a. Anemias
 - b. Clotting factor deficiencies
 - c. Sickle cell disease
 - d. Disseminated intravascular coagulopathy
 - e. Thrombocytopenias
8. Immunologic
 - a. Hypersensitivity reactions
 - b. Allergic rhinitis
 - c. Organ transplantation
 - d. Human immunodeficiency syndrome
9. Infectious diseases
 - a. Meningitis
 - b. Endocarditis
 - c. Fungal infections
 - d. Gastrointestinal infection
 - e. Intraabdominal infection
 - f. Opportunistic infection
 - g. Osteomyelitis
 - h. Otitis media
 - i. Peritonitis
 - j. Pneumonia
 - k. Prostatitis
 - l. Septic arthritis
 - m. Sexually transmitted diseases
 - n. Sinusitis
 - o. Skin and soft tissue infections
 - p. Surgical prophylaxis
 - q. Tuberculosis
 - r. Upper respiratory tract infections
 - s. Urinary tract infections
 - t. Viral infections

Appendix 1. (continued)

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10. Neurologic
 - a. Epilepsy, status epilepticus
 - b. Pain management
 - c. Stroke
 - d. Headache, migraine
 - e. Peripheral neuropathy
 - f. Parkinson's disease
 - g. Dementia
 - h. Delirium
 11. Oncologic
 - a. Melanoma
 - b. Breast cancer
 - c. Colorectal cancer
 - d. Leukemia
 - e. Lung cancer
 - f. Lymphoma
 - g. Prostate cancer
 12. Psychiatric
 - a. Drug and alcohol abuse
 - b. Anxiety disorders
 - c. Attention-deficit-hyperactivity disorder
 - d. Depressive disorders
 - e. Schizophrenia
 - f. Bipolar disorders
 13. Pulmonary
 - a. Asthma
 - b. Chronic obstructive pulmonary disease
 - c. Respiratory distress syndrome
 - d. Respiratory failure
 - e. Cystic fibrosis
 - f. Pulmonary hypertension
 14. Renal
 - a. Acute renal failure
 - b. Chronic renal failure
 - c. Renal replacement therapies (hemodialysis, peritoneal dialysis, continuous renal replacement)
 - d. Nephrolithiasis
 - e. Glomerulonephritis
 - f. Fluid and electrolyte disorders
 15. Rheumatologic
 - a. Polymyositis
 - b. Scleroderma
 - c. Systemic lupus erythematosus
 - d. Sarcoidosis
 - e. Rheumatoid arthritis
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Appendix 1. (continued)

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- C. Apply the following principles in the setting of each disease state, patient population, and/or therapeutic category.
 1. Pharmacokinetics
 2. Pharmacodynamics
 3. Pharmacoeconomics
 4. Pharmacogenomics
 5. Toxicology
 6. Empiric antibiotic therapy
 7. Health screening
 8. Health maintenance
 9. Drug interactions (drug-disease, drug-drug, drug-laboratory, drug-nutrient)
 10. Nondrug therapies and nonprescription remedies
 11. Herbal products
 12. Immunizations
 13. Geriatric considerations
 14. Pediatric considerations
 15. Nutrition (enteral and parenteral)
 16. Fluids, electrolytes, acid-base balance
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