

## Suggested Guidelines for Pharmacotherapy Curricula in Family Medicine Residency Training: Recommendations From the Society of Teachers of Family Medicine Group on Pharmacotherapy

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*Rational drug use has increasingly received public policy attention in efforts to maintain quality health care at lower costs. Prescribing habits are developed during residency training, and education regarding rational drug use should be an integral part of the residency curricula. Considering that many medical errors in family medicine are related to incorrect medication management, there is need for a focused education in pharmacotherapy. This paper outlines suggested guidelines for pharmacotherapy curricula in family medicine residency training, as recommended by the Society of Teachers of Family Medicine Group on Pharmacotherapy. A pharmacotherapy curriculum should include common conditions managed in family medicine, as well as general principles of pharmacotherapy. This should allow for repeated exposure to core topics over a 3-year cycle and be delivered in various settings (didactic teaching, longitudinal active learning, point-of-care education, and rotations). The curriculum should apply and evaluate pharmacotherapy education according to the six core competencies of the Accreditation Council for Graduate Medical Education (ACGME). Although physician faculty can be responsible for pharmacotherapy education, a clinical pharmacist is uniquely qualified to provide this service. Overall, family medicine residents need comprehensive instruction in pharmacotherapy to develop rational prescribing habits. A structured pharmacotherapy curriculum may assist in achieving this goal and in meeting the ACGME core competencies for residency training.*

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Drug therapy is an integral part of patient care, and appropriate medication management plays a key role in improving and maintaining the health of patients. Prescribing habits are formed primarily during residency training, and these habits are carried through a physician's practice experience. In 1999, the Accreditation Council for Graduate Medical Education (ACGME) proposed six core competencies for resi-

ducing training that include patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice.<sup>1</sup> The use of medications is pertinent to each of these core competencies. Recently, the ACGME has started a long-term initiative to increase emphasis on educational outcomes (the "Outcome Project") in the accreditation of residency education programs. With an increasing focus on the ACGME Outcome Project, residency programs will need to have specific curricula and evaluation tools for all learning activities.

The issue of pharmacotherapy education in primary care residencies was previously addressed in 1997 by the American Society for Clinical Pharmacology and Therapeutics.<sup>2</sup> Their recommended curriculum included

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contributions from members representing the American Boards of Internal Medicine, Pediatrics, and Family Practice. To meet the new ACGME requirements for residency training, the Society of Teachers of Family Medicine Group on Pharmacotherapy presents suggested guidelines for a pharmacotherapy curriculum in family medicine residency programs. This paper was written by 10 members of the Group on Pharmacotherapy. It was reviewed and approved by all members of the Group on Pharmacotherapy, representing 43 family medicine residency programs in all geographic regions and included representatives from community, university, rural, and urban program settings.

## Background

Improving the quality of medication management for patients is a challenge in today's medical environment, as evidenced by recent reports from the Institute of Medicine (IOM). In the *Priority Areas for National Action: Transforming Health Care Quality* report, medication-related errors are estimated to cause more than 7,000 deaths each year and 6.5 of every 100 hospital admissions in the United States.<sup>3</sup> These errors included excessive dosage and the effects of drug interactions and drug allergies. According to the Food and Drug Administration, the most common type of fatal errors include improper dose (41%), use of wrong drug (16%), and use of wrong route of administration (10%). These errors were attributed mainly to potentially avoidable performance and knowledge deficits (44%).<sup>4</sup>

Although the majority of medication error research has been conducted in hospital systems, the problem is not limited to this setting. In a recent systematic review, errors were identified to occur in up to 11% of all prescriptions written in primary care practice, mainly related to incorrect dosing.<sup>5</sup> In 2003, a family medicine policy study found that the most common prescribing error by family physicians occurred during the process of ordering medications, especially prescribing contraindicated medicines or prescribing the wrong dose.<sup>6</sup> In a prospective cohort study of adult primary care practices, 25% of patients reported drug complications, and 63% were attributed to the physician's failure to respond to medication-related symptoms.<sup>7</sup> Therefore, it is not surprising that the IOM has identified medication management as one of its top priority areas for national action.<sup>3</sup>

A number of ways to improve medication safety have been suggested. These include system strategies, standard prescription writing, inclusion of a pharmacist in hospital rounding teams, and availability of patient information at the point of care.<sup>3</sup> Other strategies target formal education programs for prescribers. A survey of 80 primary care residents at five residency sites suggested that knowledge related to pharmacotherapy by residents may need improvement.<sup>8</sup> A recommendation from the survey was to consider a systematic, compre-

hensive pharmacotherapy curriculum in primary care residencies.

## Pharmacotherapy Education

Many medical schools integrate education about medications into other sciences, but the majority of this education relates to clinical pharmacology, rather than pharmacotherapy,<sup>9</sup> and medical school training in pharmacology is typically at the basic science level. Further, clinical pharmacology relates to the principles and process of rational prescribing, whereas pharmacotherapy relates to the application of this rational process to specific problems or diseases,<sup>10</sup> which is key to clinical practice. Although teaching basic pharmacology is necessary to build knowledge, residents in family medicine training programs need comprehensive, applicable instruction in pharmacotherapy.<sup>11</sup>

Currently, the Residency Review Committee (RRC) for Family Practice integrates the requirements for pharmacotherapy education within the learning about each disease state.<sup>12</sup> Although the RRC does not require a formal curriculum in pharmacotherapy, given the fact that nearly two thirds of all office visits end with a prescription being written, it is reasonable to have a structured curriculum.<sup>13</sup> Despite this, a recent survey of family medicine residency programs demonstrated that only 38.5% had a formal pharmacotherapy curriculum. In most cases (82.4%), a clinical pharmacist primarily coordinated these curricula.<sup>14</sup> Although a clinical pharmacist is ideally suited for this responsibility, another faculty member dedicated to pharmacotherapy instruction can design and implement a formal curriculum.

## Implementation

Content, delivery, and accountability are essential components needed to implement a successful pharmacotherapy curriculum in a family medicine residency program. Curriculum content should comprehensively include topics related to general pharmacotherapy in family medicine. An ideal curricular structure allows for repeated exposure to core topics over a 3-year cycle of residency training. The curriculum should be flexible to allow incorporation of new drug therapies, clinical research, and practice guidelines as well as conform to the ACGME guidelines.

Table 1 lists a suggested pharmacotherapy core curriculum for family medicine residency training. The medical conditions listed in the table are based on previously published curricula as well as the top 25 diagnosis clusters from a direct observation study of primary care.<sup>2,15-17</sup> Basic pharmacotherapy principles should, as applicable to the specific medical conditions, also be included. Each residency program will need to determine the specific content of the pharmacotherapy curriculum, but residents should be able to apply basic pharmacotherapy principles for each medical condition.

Table 1

Pharmacotherapy Core Curriculum<sup>2,14-16</sup>**Core Medical Conditions**

- Cardiology (hypertension, ischemic heart disease, dyslipidemia, heart failure, atrial fibrillation, thromboembolism)
- Dermatology (acne, skin infections)
- Endocrinology (diabetes mellitus, thyroid disease)
- Gastrointestinal (peptic ulcers, gastroesophageal reflux disease, dyspepsia, constipation, diarrhea, cirrhosis)
- Infectious diseases (otitis media, urinary tract infections, acute upper/lower respiratory illness)
- Mental health (depression, anxiety, bipolar disorder)
- Musculoskeletal (arthritis, gout, acute and chronic pain management)
- Neurology (headaches, stroke, Parkinson's disease, dementia, epilepsy)
- Prevention (immunizations, smoking cessation, substance abuse, common poisonings/antidotes)
- Pulmonary (asthma, chronic obstructive pulmonary disease, sinusitis, chronic rhinitis)
- Women/men's health (contraception/pregnancy care, osteoporosis, menopause, sexual dysfunction)

**Basic Pharmacotherapy Principles**

- Establish individualized therapeutic goals and evaluate therapeutic outcomes
- Practice cost-effective pharmacotherapy
- Recognize, avoid, and manage adverse drug reactions; drug allergies; drug-drug, drug-herb/supplement, and drug-food interactions
- Prescribe based on considerations in special populations (pediatrics, geriatrics, obstetrics)
- Dose appropriately according to renal and hepatic function
- Therapeutic drug monitoring (when and why to measure drug concentrations)
- Consider the use of complementary and alternative medicine
- Critically evaluate scientific literature and practice evidence-based medicine (discuss practice guidelines if available)
- Discuss sources for accessing unbiased drug information
- Provide patient education as necessary
- Understanding the process of developing an individual and institutional formulary
- Appropriately interacting with pharmaceutical representatives and obtaining useful information from them
- Pharmacy regulations (prescription writing, controlled substances, collaborative drug therapy)

Our recommendation for implementing pharmacotherapy training within the ACGME guidelines, along with suggested evaluation methods, are found in Table 2. Descriptions of the suggested evaluation methods are found in the ACGME Toolbox of Assessment Methods.<sup>18</sup> If the principles of this curriculum are modeled and reinforced by all faculty during precepting and patient care, graduating residents should acquire the ability to provide quality health care through rational pharmacotherapy.

**Delivery**

Using multiple methods of delivery will facilitate the successful implementation of a comprehensive pharmacotherapy curriculum. Recommended educational methods for delivery include didactic teaching, longitudinal active learning, point-of-care education, and pharmacotherapy rotations. There is no evidence that one method of education is more effective in delivering specific pharmacotherapy topics, so this should be determined by individual residency programs based on faculty expertise, preferences, and resources.

Didactic teaching involves formal instruction in a group setting. Grand rounds, morning reports, and core conference lectures are examples of this educational method.

Longitudinal active learning engages residents in the

educational process, such as case-based sessions, interactive workshops, problem-based learning, and medical literature evaluations. This method of learning requires a dedicated time allocation on a regular schedule such as weekly or monthly sessions. Examples include a 1-hour monthly pharmacotherapy conference to review a common condition in primary care, new medications, or a practice-changing clinical trial.

Point-of-care education occurs at the time of the patient encounter. It can be accomplished through routine precepting in the office with a pharmacotherapy focus and through scheduled consultation with a clinical pharmacist or physicians with special interest in pharmacotherapy (ie, resident evaluates patient concurrently with a clinical pharmacist).<sup>19-21</sup> Teaching rounds in the hospital or nursing home are another example of point-of-care education.

Rotations in pharmacotherapy may be offered to provide an intense experience in pharmacotherapy or to improve core competencies for residents with significant deficits or special interests. Activities may include discussion of specific patient cases or topics; evaluation of clinical trials, guidelines, or scientific reviews; using appropriate drug information sources; and obtaining a comprehensive medication history. Pharmacists and residents review prescription-writing skills using the electronic medical record or by discussing

Table 2

Suggested Application of Pharmacotherapy to ACGME Core Competencies<sup>1,18</sup>

<i>ACGME Competency</i>	<i>Recommended Pharmacotherapy Objective</i>	<i>Suggested Evaluation Methods</i>
Patient care	<ol style="list-style-type: none"> <li>1. Treat all patients with respect, value diversity, and commit to confidentiality and ethical practice.</li> <li>2. Make informed pharmacotherapy decisions that are patient focused, evidence based, cost-effective, and clinically sound.</li> <li>3. Obtain an accurate and complete medication history.</li> <li>4. Develop and carry out medication management plans.</li> <li>5. Counsel and educate patients and their families about proper medication use.</li> <li>6. Demonstrate proper use of common medications that require correct procedures.</li> <li>7. Provide pharmacotherapy aimed at health maintenance and prevention.</li> <li>8. Value expertise of other health professionals and collaborate in interdisciplinary teams.</li> </ol>	<ol style="list-style-type: none"> <li>1. Checklist, SP</li> <li>2. Chart-stimulated recall, OSCE</li> <li>3. Checklist, OSCE</li> <li>4. Chart-stimulated recall, record review, simulations, and models</li> <li>5. Patient survey, SP, OSCE</li> <li>6. Checklist, simulations, and models</li> <li>7. Medical record review, OSCE</li> <li>8. 360° global rating</li> </ol>
Medical knowledge	<ol style="list-style-type: none"> <li>1. Demonstrate an investigatory and analytic approach to pharmacotherapy.</li> <li>2. Know and apply the basic principles of pharmacology and clinical pharmacotherapy. (See core curriculum, Table 1)</li> </ol>	<ol style="list-style-type: none"> <li>1. Oral exam, chart-stimulated recall</li> <li>2. Exam MCQ, oral exam, simulations, and models</li> </ol>
Practice-based learning	<ol style="list-style-type: none"> <li>1. Analyze own medication prescribing habits and perform practice-based improvement activities using a systematic method.</li> <li>2. Locate, appraise, assimilate, and use evidence from scientific studies on drug therapy.</li> <li>3. Obtain and use information about own patient population and their communities that would affect pharmacotherapy decisions.</li> <li>4. Apply knowledge of study designs and statistical methods to the appraisal and effectiveness of drug clinical studies.</li> <li>5. Use information technology to manage and access drug information.</li> <li>6. Facilitate the pharmacotherapy learning of others.</li> </ol>	<ol style="list-style-type: none"> <li>1. Portfolios, medical record review, SP</li> <li>2. Medical record review, chart-stimulated recall, exam MCQ, oral exam, portfolios</li> <li>3. Medical record review, OSCE</li> <li>4. Portfolios, chart-stimulated recall</li> <li>5. 360° global rating, portfolios</li> <li>6. 360° global rating, checklist</li> </ol>
Interpersonal and communication skills	<ol style="list-style-type: none"> <li>1. Create and sustain a patient-provider relationship that is therapeutic, ethical, and promotes patient participation in health care.</li> <li>2. Cultivate listening skills that will promote patient communication and high-quality pharmaceutical care.</li> </ol>	<ol style="list-style-type: none"> <li>1. SP, OSCE, patient survey</li> <li>2. SP, OSCE, patient survey</li> </ol>
Professionalism	<ol style="list-style-type: none"> <li>1. Respect patient individuality and recognize social issues that affect optimal pharmacotherapy.</li> <li>2. Demonstrate a commitment to ethical principles when interacting with the pharmaceutical industry.</li> <li>3. Demonstrate sensitivity by recognizing the influence of the patient's culture, age, gender, and disability on their health beliefs.</li> </ol>	<ol style="list-style-type: none"> <li>1. OSCE, patient survey</li> <li>2. 360° global rating, simulations, and models</li> <li>3. 360° global rating, OSCE</li> </ol>
Systems-based practice	<ol style="list-style-type: none"> <li>1. Practice cost-effective pharmacotherapy.</li> <li>2. Advocate for quality patient care and assist patients in navigating the health system.</li> </ol>	<ol style="list-style-type: none"> <li>1. Checklist, 360° global rating</li> <li>2. Patient survey, 360° global rating</li> </ol>

ACGME—Accreditation Council for Graduate Medical Education

SP—standardized patients

OSCE—Objective Structured Clinical Examination

MCQ—multiple-choice questionnaire

duplicate prescriptions.<sup>22</sup> Since many pharmacists in family medicine are responsible for a pharmacotherapy clinic, rotations may allow the resident to provide patient care for specific medication-related issues such as anticoagulation, insulin use, or providing patient education.

### Evaluation

Not only is it important to establish who is responsible for the design and implementation of the pharmacotherapy curriculum, but there is also a need for evaluation of the curriculum that is consistent with the ACGME Outcome Project. Numerous methods are available to evaluate individual residents in the Toolbox.<sup>18</sup> The Toolbox “checklist” method evaluates specific activities or behaviors such as obtaining com-

plete medication histories, performing drug information searches, evaluating specific patient medication profiles, and providing patient education. Standard oral examinations and evaluation of live performance can be used to assess pharmacotherapy knowledge of individual residents. For evaluation of a curriculum, a comparison of a written examination before and after may be instituted. A review of the resident's patient panel can provide feedback on individual and group performance with respect to pharmacotherapy indicators. Finally, a satisfaction survey of residents regarding the pharmacotherapy curriculum may be used. In general, there is no standard method of program evaluation, but it should involve all participants (residents, faculty, etc) and is necessary to continuously improve any curriculum.

### Pharmacotherapy Faculty

Each residency program should identify a faculty member to be responsible for the pharmacotherapy curriculum. In the program requirements for residency education in family medicine, the RRC states that "Additional teaching staff will be needed to provide training in . . . the use of drugs and their interaction."<sup>12</sup> A physician with special interest in pharmacotherapy can serve in this role; however, a clinical pharmacist is uniquely qualified to fulfill this responsibility. The benefits of clinical pharmacist collaboration with family medicine residency programs have been documented in the past. In addition to improving the quality of physician prescribing, clinical pharmacist participation has led to improved patient care.<sup>23-26</sup> Several residency programs have incorporated clinical pharmacists as faculty members to enhance pharmacotherapy education. A recent survey observed that 26.7% of all family medicine residency programs in the United States had a clinical pharmacist working with their program and participated mainly in teaching (42.7%) and patient care (37.1%).<sup>14</sup>

Funding for clinical pharmacists as faculty members in family medicine residency programs can come from a number of sources, including schools of medicine and pharmacy, clinical income from residency practices, research/teaching grants, or departments of pharmacy in hospitals affiliated with the residency program. For example, pharmacists who are faculty members in a school of pharmacy might practice in family medicine clinics with the understanding that their pharmacy trainees will engage in clinical rotations in the residency program. Pharmacists employed by hospital pharmacy departments may provide inpatient pharmacotherapy teaching as a means to reduce medication errors and improve patient care. Ideally, a clinical pharmacist fully funded by the residency program or school of medicine will be able to serve the educational mission of the program without competing obligations. Currently,

32% of clinical pharmacists in family medicine are fully funded by the residency program.<sup>14</sup>

### Summary

Although residents have been taught basic pharmacology in medical school, they need comprehensive instruction in pharmacotherapy to develop rational prescribing habits. Structured pharmacotherapy education may assist family medicine residency programs in meeting the ACGME core competencies for residency training. In addition, a structured pharmacotherapy program may assist in evaluating the best methods for teaching pharmacotherapy to family medicine residents. Therefore, the Group on Pharmacotherapy provides these recommendations for a formal pharmacotherapy curriculum.

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