Teaching clinical problem solving: A preceptor's guide

KRISTIN W. WEITZEL, ERIKA A. WALTERS, AND JAMES TAYLOR

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There has been an increasing emphasis on preceptor training and development in recent years in both pharmacy residency programs and schools of pharmacy.[1] As clinical preceptors take on a more significant role in educating pharmacy students and practitioners, it is clear that there is a growing need to provide support and development for pharmacists to advance their clinical teaching skills.

Changes in preceptor training are also driven by updated accreditation requirements that emphasize the need for preceptor development within residency programs and schools and colleges of pharmacy. Residency programs accredited by the American Society of Health-System Pharmacists (ASHP) and joint accrediting bodies are encouraged to use a teaching approach that emphasizes the preceptor's different roles in teaching clinical problem-solving skills. This broad model can also be applied in teaching pharmacy students. A number of teaching strategies that incorporate the educational theories and principles that underpin the ASHP-recommended model

Purpose. Instructional methods to help pharmacists succeed in their growing role in practice-based teaching are discussed, with an emphasis on techniques for fulfilling the four key preceptor roles.

Summary. The American Society of Health-System Pharmacists (ASHP) and other organizations advocate ongoing efforts to develop the teaching skills of clinician–educators serving as preceptors to pharmacy students and residents. The broad model of teaching clinical problem solving recommended by ASHP emphasizes the creative and flexible application of the four major preceptor roles: (1) direct instruction, (2) modeling, (3) coaching, and (4) facilitating. A variety of teaching methods used in the fields of medicine and nursing that can also be adopted by practice-based pharmacy educators are presented; in particular, the advantages and disadvantages of various case-presentation formats (e.g., One-Minute Preceptor, SNAPPS, patient-witnessed teaching, "Aunt Minnie," "think-aloud") are reviewed. Other topics discussed include the appropriate use of questioning as an educational tool, strategies for providing constructive feedback, teaching learners to self-evaluate their skills and progress, and integrating residents into teaching activities.

Conclusion. The ASHP-recommended approach to teaching clinical problem-solving skills can be applied within the educational frameworks provided by schools of pharmacy as well as pharmacy residency programs. A wide range of validated teaching strategies can be used to tailor learning experiences to individual learner needs while meeting overall program goals and objectives.

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have been investigated or reviewed in the medical and nursing literature.

This article provides an overview of accreditation requirements for preceptor training and development within residencies and schools and colleges of pharmacy, reviews the model of teaching clinical problem solving advocated by residency accreditation standards, and presents evidence supporting clinical teaching strategies that can be used in the practical implementation of this model.

Preceptor training and development requirements

Accreditation standards for schools and colleges of pharmacy and residency programs address preceptor training and development requirements.[2-4] ASHP (and its part-

KRISTIN W. WEITZEL, PHARM.D., CDE, FAPhA, is Director of Experiential Education and Clinical Associate Professor, Department of Pharmacotherapy and Translational Research, College of Pharmacy, University of Florida (UF), Gainesville. ERIKA A. WALTERS is Pharm.D. candidate, College of Pharmacy, UF. JAMES TAYLOR, PHARM.D., CDE, is Clinical Associate Professor, Department of Pharmacotherapy and Translational Research, College of Pharmacy, UF.

Address correspondence to Dr. Weitzel at the College of Pharmacy, University of Florida, P.O. Box 100486, Gainesville, FL 32610 (kweitzel@cop.ufl.edu).

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ners on jointly accredited residency programs) addresses preceptor development and training requirements within standards for pharmacy residency programs.[2,3] In addition to specifying operational preceptor responsibilities, such as providing input during the creation of resident learning experiences, developing resident learning activities, and providing summative evaluations of residents, the ASHP accreditation standards specify requirements for the training and development of residency program preceptors. Specifically, the standards state that the residency program director is responsible for the "evaluation and development of all other preceptors in their programs." The standards include basic preceptor requirements, such as licensure and residency and practice experience, but also specify that preceptors in accredited programs "must demonstrate a desire and an aptitude for teaching that includes mastery of the four preceptor roles fulfilled when teaching clinical problem solving (instructing, modeling, coaching, and facilitating)."

Accreditation Council for Pharmacy Education (ACPE) accreditation standards for doctor of pharmacy programs also address preceptor requirements and training.[4] Although the ACPE standards do not provide guidance on training preceptors within a specific practice-based teaching model, they do outline desired preceptor attributes and training that should be provided by schools and colleges of pharmacy. Notably, the ACPE standards stipulate that preceptors of pharmacy students "should employ active learning strategies" and be "well versed in the outcomes expected of students and the pedagogical methods that best enhance learning." In addition, the ACPE standards specify that preceptor training provided by colleges and schools of pharmacy should include a review of the institution's teaching methodologies and the specific

objectives of the pharmacy practice experience and, in addition, provide guidance on assessment of students' prior knowledge and experience to ensure that preceptors can "tailor the rotation to maximize the educational experience."

In practice, it is likely that an individual who serves as a preceptor to pharmacy residents will also be involved in teaching pharmacy students. Although ACPE does not specify a particular practice-based teaching model for preceptors of pharmacy students, the approach to teaching clinical problem solving that is advocated within the ASHP requirements for residency preceptors is useful in the instruction of pharmacy students as well. In fact, this model's emphasis on tailoring the preceptor's roles and teaching strategies to the learner's needs is ideal for preceptors who are teaching multiple types of learners, such as students and residents. However, the recommendation of specific evidence-based and practical techniques for applying and gaining experience with these teaching strategies is beyond the scope of the ASHP accreditation standards. Increased awareness of such strategies and the evidence supporting the application of the ASHP-recommended model could promote the development of teaching and learning skills, especially for preceptors who are responsible for teaching both student and resident learners.

Concepts and principles of cognitive learning

The broad model of teaching clinical problem solving described within the ASHP standards is based on principles first set forth by Bloom[5] and other educational theorists and discussed in relation to pharmacy by Nimmo,[6] who noted that most of the learning pharmacy residents need is *cognitive learning*: "remembering or recognizing knowledge or developing intellectual skills or abilities."

In other words, pharmacy residents should acquire the knowledge, skills, and abilities needed to provide patient care in complex situations. Interpreting the work of Bloom and others in the context of pharmacy staff development, Nimmo divided the process of cognitive learning into six distinct levels:

- Remembering new facts (knowledge),
- Understanding the meaning of new information (comprehension),
- Applying knowledge to solve a problem (application),
- Breaking down complex ideas into simpler parts and seeing the parts relate (analysis),
- Creating something new to solve a complex problem (synthesis), and
- Judging the soundness of one's own work and that of peers (evaluation).

For the purposes of pharmacy residency training, the domains of Bloom's taxonomy can be applied to guide a patient care-focused teaching process, as described by Nimmo.[7] The resulting model is the foundation of the ASHP-recommended approach to teaching clinical problem solving (eAppendix A, available at www.ajhp.org). In this model, the six levels of cognitive learning are combined in a three-stage learning process represented by a hierarchical "learning pyramid" (Figure 1), with specific preceptor roles corresponding to each stage. (The seminal idea for the learning pyramid was presented by Georgine Loacker, Ph.D., at a 1993 symposium.)

The key to successful application of Nimmo's model is understanding that every pharmacy resident will approach the process of solving complex clinical problems from a different entry point. Teaching strategies used by the preceptor should accordingly be tailored to optimize learning and progression to the mastery of new knowledge and skills.[8] eAppendix B (available at www.ajhp.org) provides an over-

Figure 1. The learning pyramid (left), representing various stages of cognitive learning in the context of pharmacy education, and (right) appropriate preceptor roles corresponding to those learning stages. Reprinted with permission from reference 7.
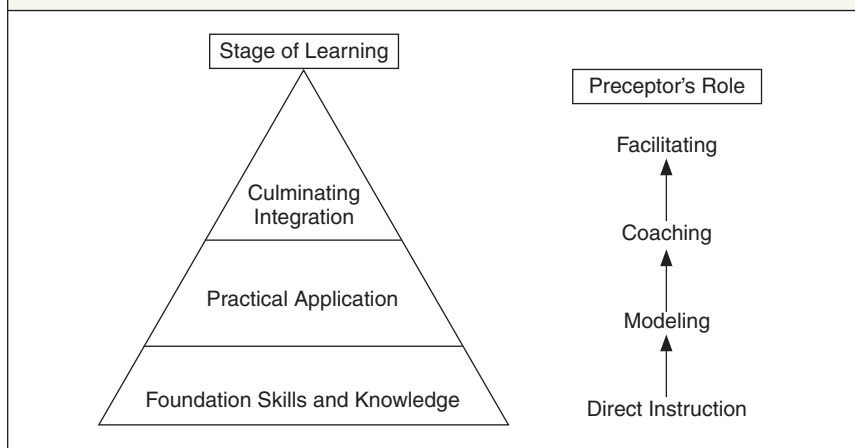
view of the four major preceptor roles and examples of teaching and learning activities for the fulfillment of each role.

Model of teaching clinical problem solving

To help envision how the constructs described above can serve as a guide to teaching clinical problem solving, consider a pharmacist who is serving as a preceptor to postgraduate year 1 (PGY1) and postgraduate year 2 (PGY2) residents in an ambulatory care clinic. The PGY1 resident may start his or her required ambulatory care experience with a basic knowledge of the diseases represented in the clinic's patient population but not fully understand how this knowledge applies to specific clinical situations that arise in the clinic. The PGY2 resident, on the other hand, likely has adequate knowledge and comprehension of patient care activities at the clinic but lacks the ability to consistently apply this knowledge to optimize patient care and evaluate the recommendations of other health care providers. Using eAppendix B as a guide, the preceptor can determine that different instructional methods will be needed for each of these learners.[6]

The PGY1 resident will likely benefit if the preceptor starts with a guided discussion about handling common clinical situations. The PGY2 resident should be ready to learn techniques for the practical application and evaluation of clinical problem-solving skills through hands-on practice-based teaching, case presentation, and case-based teaching; over time, the PGY1 resident will establish the foundation knowledge and skills needed to benefit from these types of learning activities as well.

Just as the optimal teaching strategy depends on the trainee's stage of learning and individual needs, the role of the preceptor will change as different teaching strategies are employed. Selecting the appropriate teaching strategy or preceptor role is accomplished by (1) establishing the desired endpoint of a learner's experience, (2) assessing a learner's knowledge and skills on entry into that learning experience, and (3) individualizing teaching strategies to meet a learner's specific needs in order to achieve the desired outcomes.

As preceptors practice applying this teaching model, they will begin to efficiently assess a learner's baseline knowledge and skills at the start of an experience and design a plan

that helps the learner to achieve the desired knowledge and skill levels in the appropriate time frame. It is important to note that within one teaching environment, a preceptor can employ multiple learning plans for different learners. For example, consider a drug-information (DI) preceptor within a health system where pharmacy students are completing advanced pharmacy practice experiences, PGY1 residents are completing four-week required DI experiences, and a PGY2 resident is based in the DI center for 12 months. In this scenario, the preceptor will have a different desired endpoint for knowledge and competencies that each of these categories of learners should achieve over a defined time period. Additionally, each new student or resident rotating through the site will start from a certain level of knowledge, skill, and experience and with his or her own goals for the experience. Developing an individualized learning plan that employs the appropriate teaching strategies over a defined time period helps the preceptor to efficiently optimize activities and teaching strategies for each learner. For example, in the role of lecturer, a preceptor might lead a guided discussion to increase a new PGY1 resident's knowledge and comprehension of evidence-based medicine and principles of clinical decision-making. At the same time, the preceptor may coach the experienced PGY2 resident through the process of critically evaluating a clinical trial and leading a journal club discussion with student pharmacists to assist him or her in fully understanding the practical application and analysis of principles of literature evaluation and interprofessional communication.

Techniques of practice-based teaching

A preceptor's level of comfort and skill in the practical and efficient use of the ASHP-recommended teaching

model will develop with practice. Once preceptors develop the habit of identifying their appropriate roles in meeting each learner's needs at particular points in the training process, the next challenge is learning to efficiently and effectively incorporate those roles into their teaching practice. An understanding of different teaching strategies that can be used when instructing, modeling, coaching, or facilitating can help preceptors select and gain experience in optimal strategies to fulfill their teaching duties. This understanding is especially important because, by definition, preceptors are practitioners who are balancing full clinical or patient care loads with their responsibilities as teachers.

The following section of this article reviews the evidence regarding the use of specific teaching and feedback strategies that support the preceptor's various roles in teaching clinical problem solving; there is some overlap, but every effort has been made to divide the teaching strategies according to the preceptor role in which they are most likely to be needed.

Direct instruction. In their most fundamental role as clinician–educators, preceptors convey knowledge directly to the learner using lectures, discussions, or required readings to help learners organize content for quick recall.[7] Practice-based or experiential learning is, by definition, a process of applying knowledge to "real-world" patient care activities. Therefore, direct instruction will rarely be the preceptor's primary teaching role during a resident's or student's experience. However, direct instruction does have an important role in the practice-based teaching environment and can help learners build a strong foundation of knowledge and understanding to apply to patient care activities.

Direct instruction is most appropriate for helping learners gain and understand foundation skills and knowledge; for instance, the preceptor might conduct a review of disease-specific guidelines at the start of an ambulatory care rotation. It is important to note that even an advanced learner will benefit from direct instruction in some situations (e.g., an experienced PGY1 resident who is beginning a specialty rotation).

Assigned readings. Practice guidelines, consensus statements, textbooks, and articles in the pharmacy and medical literature can help learners assimilate new facts and information, refresh their existing knowledge base, and identify where to quickly find information they will need to use often in a patient care environment. Learners may also benefit from the required reading of clinic or institutional policies and procedures, workflow descriptions, or other documents that help them understand how to execute their clinical responsibilities in a specific practice setting.

Preceptors can maximize the benefit of assigned readings by ensuring they are of the appropriate length, depth, and breadth for a given assignment. Preceptors should offer to discuss readings with learners to clarify any misunderstandings and discuss the application of information to the patient care practice. While reading has its place in direct instruction, it is important for preceptors to keep in mind the limitations of readings, such as potentially outdated recommendations in textbooks as compared to the primary literature. In some cases, preceptors may find that reading material on a certain topic does not exist in print; this can occur when working with a very specific patient population or clinic-specific policies and procedures. In these cases, preceptors can potentially work with successive learners over time to assign the creation of the desired materials as part of the learning experience.[6]

Lectures. Variously cited as the best way to bring a subject to life—or kill the learner's interest[9,10]—lectures can be an excellent strategy to help learners sort through a large amount of information and focus on clinically relevant facts.[6,10,11] However, preceptors can also use the lecture inappropriately, such as to replace a learner's self-directed research, or as a "crutch" to steer a conversation back to a topic that is familiar to the preceptor.[12] To be used successfully as a teaching technique, the lecture should be employed skillfully and sparingly in clinical teaching.

Lectures should enhance a learner's understanding of facts and knowledge rather than just repeat information from a reading or text.[9,10] The lecture should be carefully selected and appropriate to the learner's background and experience. In addition, preceptors should avoid common lecturing pitfalls such as speaking too quickly, assuming too much knowledge on the part of the audience, and giving too much information. Research suggests a decline in learner attention after about 20 minutes of lecture.[9] As a rule of thumb, preceptors should incorporate an audience question, a short break, a clinical-reasoning exercise, or a similar activity into the lecture about once every 20 minutes to renew the audience's attention.

Preceptors can modify the lecture format for different learners to increase comprehension and participation. Common strategies for achieving this include the use of guided discussion or interactive lecture techniques.[10] In a guided discussion, the preceptor combines a less formal discussion of a specific topic with well-developed questions to increase learner understanding. These questions allow the learners to put ideas that are being presented into their own words and demonstrate understanding and potential practice-based applications of material covered in the lecture. An interactive lecture combines techniques used in the lecture and the guided discussion

formats, combining a more formal lecture with a question-and-answer session.

Case-based teaching. An illustrative "teaching case" may be presented as part of a lecture, but it may also serve as the central component of a discussion and drive the teaching points for a particular topic. In some instances, a preceptor will present to learners a case that he or she has "solved" and provide insight into the process, patient outcomes, and lessons learned.[10] In other settings, learners may be presented with a real or simulated case and asked to analyze it and formulate an appropriate course of action to solve a specific clinical problem presented in the case scenario. Case-based teaching may take place in a formal environment with multiple learners, as in a grand-rounds presentation, or it may be a more informal discussion between the preceptor and the learner. True case-based teaching requires that the learner already be at a level of comprehension suited to the presented material, so that the case discussion builds on an existing foundation.[6] Case-based teaching can allow the preceptor to take the learner beyond the traditional lecture format and create a bridge for learners transitioning from knowledge acquisition to direct patient care.

Preceptor presentation of an actual case. Presenting all components of an actual case can provide learners with valuable insight into the clinical decision-making process and practical factors that influence patient care decisions.[13] When using this case discussion strategy, the preceptor can begin by selecting a patient whose presentation and outcomes support the communication of four or five relevant teaching points. The preceptor should avoid "simulated" cases (unless absolutely necessary) in order to ensure that the complexity, ambiguity, and unexpected developments intrinsic to actual clinical practice are communicated to the learner.

Recently encountered cases have the benefit of being fresh in a preceptor's memory, while cases from the more distant past may allow the preceptor to present the longer-term outcomes of a patient care problem.[14] The preceptor should organize the presentation of the case to model how he or she will expect learners to conduct case presentations.

Often, the biggest challenge for preceptors in case-based teaching is developing the ability to successfully communicate the reasoning and thought process they used in solving a specific problem.[6] The preceptor should provide as much insight as possible into why specific decisions were made; this will help learners grasp concepts of clinical reasoning. Missed opportunities or "near misses"—for example, the clinician's failure to ask a salient question about a particular case or a medication error that almost reached a patient—can serve as educational opportunities to help learners refine their knowledge and skills.[13,14]

Simulation with learner analysis. Presenting a simulated case for the learner to analyze allows the preceptor to customize the case content to match specific learning goals and objectives while allowing the learner to analyze and propose a solution on his or her own. This approach can also be a part of a graded exercise for learners requiring formal assessment or evaluation.

When developing a simulated teaching case, preceptors should start by selecting case content that is appropriate for the experience's required goals and objectives and clinical practice activities.[6] Preceptors should use scenarios and problems based on actual occurrences to increase the practical applicability of case content and save time. Case questions should help the learner begin to grasp the steps involved in solving the clinical problem described in the case scenario. Preceptors should obtain feedback from

learners through the repeated use of a case scenario in order to help refine the presentation and increase its applicability as a teaching tool over time.[6]

Modeling. As defined by Nimmo,[6] modeling entails providing an example for the learner to follow as the preceptor solves a direct patient care problem. In the context of teaching clinical problem solving, modeling is best used once the learner has gained foundational knowledge and skills. Modeling has also been referred to as "active observation" or "focused observation."[15] Modeling techniques include thinking aloud, sharing clinical hunches, pointing out controversial issues, and giving learners a rationale for what needs to be accomplished during a patient encounter.[6,16] Preceptors can think of modeling as providing a "conceptual scaffolding" for learners to solve problems; that is, it helps to convey the process of building a solution to a complex problem.[16]

Modeling has been shown to have tremendous value in the learning process. In one study in which senior medical students were asked to identify the single most educational aspect of a family medicine clerkship, 70% of the students cited the experience of observing a seasoned preceptor performing a complex clinical task.[15] In the approach to teaching clinical problem solving advocated by ASHP, modeling may be most effective when learners are just beginning to understand the practical application of clinical knowledge, as is typically the case with a new PGY1 resident or a more experienced PGY1 resident entering a new specialty rotation.

It is important to note that modeling differs from case-based teaching. Preceptor modeling takes place during an actual clinical encounter rather than during a lecture or discussion. Most important, modeling involves the resolution of an unfamiliar patient problem and the dem-

onstration of real-time information processing. When modeling, preceptors illustrate the process of solving complex problems in an actual practice environment rather than reflecting on decisions or actions in the care of a previously encountered patient.[14]

Specific strategies can be used to maximize the teaching impact of modeling.[16] First, preceptors should tell learners in advance about the specific behavior to be modeled. For example, if the preceptor will be counseling a patient who has had difficulties with medication adherence, the preceptor can instruct the learner to listen for the specific communication strategies he or she uses in the interview to assess the patient's medication-taking habits. This process of "priming" before an encounter differentiates modeling from the more passive "shadowing" experience and helps learners to pay close attention to the actions of the preceptor and the reactions of others.[16] It also helps learners to begin the process of breaking down complex clinical encounters into discrete elements. It is often difficult for learners to identify the specific elements of a patient interaction that contribute to its success. By narrowing the learner's focus to a specific part of an encounter, the preceptor can help the learner better understand and integrate the pieces that make up the whole of a successful clinical interaction. Successful modeling introduces learners to the importance of new skills they must gain.[16] Some preceptors may choose to model case presentations of an ideal length and format, thus providing a template for the learner's own presentations.

Second, a preceptor must be able to skillfully execute the behavior that is being modeled. Preceptors may model technical procedures, logical problem solving, empathetic interaction with a difficult patient, efficient negotiation of a treatment plan, and many other interactions.

The preceptor should be prepared to demonstrate the modeled behavior or thought process in an exemplary manner and be able to explain it fully to the learner. Preceptors may need to practice actually thinking aloud while executing a skill, as this may not be intuitive; this is often especially true of skills or behaviors that have become "automatic." As experts responsible for teaching others, preceptors should stop and think about each step in the decision-making process, why they are taking that step, and its impact on the outcome. If learners ask clarifying questions, the preceptor should try to explain fully his or her rationale and thought process to help them understand the stepwise process employed.[6]

Third, after the patient encounter is completed, modeling should include a brief discussion between preceptors and learners about what was accomplished and why it matters. Limiting this discussion to three or four learning points will help maximize time efficiency and focus learner development.[16]

Modeled behaviors should be appropriate for the level of the learner and the educational outcomes that need to be achieved in the experience. For instance, an early learner could observe the administration of an intramuscular injection in a pharmacy-based immunization service and quickly begin to practice and master this technique. PGY2 residents may be able to hone their communication and clinical teaching skills by observing a preceptor's interaction with a student who is struggling in a rotation.

Modeling may or may not take place in front of the patient.[17] Preceptors experienced in modeling in the patient's presence report that in addition to engaging the learner in the patient care process, this strategy can also reassure the patient that the clinician is using a thoughtful process, considering all the possibilities, and exploring appropriate labora-

tory testing or medication options before proposing a solution. If this approach is used, preceptors can help increase the patient's comfort level by explaining the process and asking for the patient's permission to proceed before introducing the learner. To physically emphasize the primary focus of attention, the preceptor should directly face the patient when speaking with him or her and then turn to face learners before addressing them.[17]

Coaching. When preceptors are acting in the coaching role, they ask the learner to execute a previously modeled task or skill and then provide feedback and direction that allows the learner to refine his or her knowledge and skill.[6,18] A preceptor can switch to the coaching role once the learner is ready to actively engage in the patient care process being taught. Teaching of the new skill or task may involve the learner performing a procedure, communicating with patients or other health care providers, or conveying knowledge in a manner that is not yet automatic to the learner, such as a patient case presentation.[18] The preceptor can provide step-by-step instruction, guiding phrases, reminders, or encouragement depending on the complexity of the task and the experience of the learner. In a coaching environment, learners gain practical, hands-on experience in a secure setting under the supervision of an expert. Providing feedback to learners shortly after the encounter reinforces good technique and prevents the development of bad habits.

In teaching clinical problem solving, coaching is most effectively used when learners have been exposed to and understand new concepts, have observed patient care activities during which this knowledge is applied, and are ready to begin practicing its application with supervision[6]—for example, a PGY1 resident beginning to make recommendations to the medical team about drug therapy

changes after first reviewing these recommendations with his or her preceptor.

As with modeling, "priming" learners before a patient encounter (i.e., orienting them to the patient and requisite tasks right before the encounter) is an important component of the coaching process, although it serves a slightly different purpose. When modeling, priming tells learners what to look for; in coaching, priming allows learners to focus their thoughts and formulate potentially appropriate interventions ahead of time.[19] Priming also allows the preceptor to target specific behaviors for learning. For example, a learner who is struggling with time management in a patient care visit can be coached to plan out a visit schedule and prioritize questions or educational points for inclusion in the patient visit.

When coaching, it is important for preceptors to preselect patients or encounters for learner participation; this helps to ensure that, when possible, the clinical activity practiced and observed will directly impact the learner's achievement of desired competencies.[20] Thoughtful case selection also allows the preceptor to choose encounters that are appropriate to the learner's level of training. The learner's assigned tasks and encounters should be increasingly difficult so that he or she continues to be challenged.[6]

Preceptors should keep in mind that they will often need to switch seamlessly from modeling to coaching because an individual learner will achieve different knowledge and skills at a variable pace. For example, the learner can be coached on taking a medication history independently, with the preceptor stepping in later during the visit to model how to educate the patient before a complicated drug therapy regimen is initiated.

Case presentation models

The coaching process will involve a significant amount of patient case discussion about the best solution for an immediate clinical problem. Such interactions may or may not take place while the patient is present.[17,20] These "hallway" or "bedside" case presentations and assessments often result in the moments when the learner begins to truly grasp the process of clinical problem solving. Selected teaching and case presentation strategies used by preceptors in other disciplines can be applied to coaching interactions in pharmacy-focused education. Efficiency and effectiveness are the keys to an optimal teaching strategy. Good preceptors adapt and combine components of various case presentation models to support their teaching efforts in a busy clinical practice environment. eAppendix C (available at www.ajhp.org) summarizes the advantages, disadvantages, and relative preceptor time demands of selected formats.

Traditional case presentation. The traditional case presentation frequently takes place after a learner has interacted with a patient to collect a chief complaint and history. Learners are asked to present pertinent findings, to assess the etiology of the problem at hand, or to propose a plan of action; preceptors then question learners to probe for details or justification. Next, a preceptor usually evaluates the patient and advises the learner on the best treatment plan.[21-23] Proponents of the traditional case presentation format note that it allows learners to practice self-directed learning and increases clinical knowledge and skills while giving learners the opportunity to improve their communication skills, gain confidence, and demonstrate the ability to collect, analyze, and summarize information.[16]

However, some preceptors have cited limitations of the traditional case presentation format, asserting that it often results in learners limiting their presentations to an overly narrow set of facts and thus does not encourage the development of clinical reasoning skills.[19,23,24] Specifically, they contend, a traditional case presentation format may not incorporate opportunities for learners or preceptors to reflect on the reasoning process and clinical problem-solving skills involved in addressing a patient case. Additionally, the use of a traditional format may be impractical in busy clinical practice environments, where efficiency in presenting and resolving patient problems is needed.

When using a traditional case presentation model, preceptors can help learners develop clinical reasoning skills by allowing them to verbalize their reasoning process. Preceptors should avoid speaking too quickly to coach a learner after he or she presents subjective and objective information about a patient. Instead, learners should be allowed time to think and verbalize an assessment and proposed management plan. Preceptors can prompt learners to engage in and focus their learning by asking them to report "one thing"—a single point or general rule highlighting broadly applicable principles—they learned from a patient encounter.[19]

One-Minute Preceptor model. To help maximize the effectiveness of learner–preceptor case discussions, the One-Minute Preceptor model, also referred to as the Five-Step Microskills model (eAppendix D, available at www.ajhp.org), has been advocated as an alternative to the traditional case presentation format.[25-28] In this model, the preceptor encourages the learner to present his or her assessment and thought processes as they relate to potential solutions to the case. The use of specific open-ended questions (e.g., What do you think is going on with this patient?) is an important component of this model. Advocates of the One-Minute Preceptor model note that it puts the focus on learners' developing, verbalizing, and getting feedback on

their own clinical reasoning process rather than passively observing the preceptor's thought process (as in a traditional case presentation). It may also help learners move from simply recalling facts to actually applying knowledge in clinical situations.[20] The One-Minute Preceptor model can easily accommodate other teaching elements, encouraging preceptors to concisely teach one point as a "general rule" exemplified by the patient case and then close with positive and constructive feedback. When compared with traditional case presentations involving less emphasis on the learner's role in the decision-making process, the One-Minute Preceptor model has been shown to be more efficient and more effective (for both preceptors and learners) and to result in more specific and constructive feedback.[26-28] As noted by Irby and colleagues[29] in their published comparison of the use of the One-Minute Preceptor model versus a traditional teaching model by medical educators, preceptors using the former model conveyed more specific, higher-order information to learners. The use of the One-Minute Preceptor model requires preceptor training and practice in the skills necessary to navigate easily through the steps and questions.

SNAPPS model. A learner-centered framework for student preparation and delivery of case presentations to preceptors has been described by Wolpaw and colleagues.[21,23] This framework, known by the acronym SNAPPS, consists of a six-step process that culminates in a concise, complete overview of a patient encounter, an assessment, and an action plan (eAppendix E, available at www.ajhp.org). Proponents of the SNAPPS model often cite its learner-centered structure as preferable to the One-Minute Preceptor model, noting that the former pushes learners to question their preceptors and independently identify topics for self-study.[21,23] Wolpaw

et al. have noted that learners using the SNAPPS model instead of traditional or comparable models of case presentation have been shown to give more concise case presentations than comparator groups; SNAPPS-trained learners were more likely to express uncertainties and questions, initiate management discussions, and volunteer for self-study.[21,23] Wolpaw et al. have observed that the structured framework of the SNAPPS model makes each step of case presentation and follow-up—and the need for further study—clear for learners, which may potentially shorten case presentation time and help learners identify weaknesses and develop interpretive skills. Training is required for both learners and preceptors before using the SNAPPS model, and it may be a challenge for beginners to execute all six tasks succinctly and completely.

Patient-witnessed teaching. Preceptors may also choose to use a case presentation and coaching model that actively and purposefully involves the patient, such as the "patient-witnessed precepting" model that has been used in physician teaching practices.[17] This approach requires learners to deliver case presentations (in a traditional or other format) to the preceptor and the patient inside the patient's room. In this model, the learner begins the patient encounter independently and conduct a history and examination; then the preceptor enters the room for the case presentation and discussion of the learner's assessment. A preceptor then turns his or her attention fully to the patient for further questioning, examination, or negotiation of a management plan. The preceptor should encourage the patient to ask questions, provide feedback to the learner, and cooperate in the development of a plan.[17]

Proponents of teaching in the patient's presence maintain that teaching "with the patient" rather than "about the patient" should be

a vital part of the learning process.[30] They contend that learners benefit from spending time independently with the patient, and patients have increased satisfaction when they spend more time with the supervising clinician and can participate in thoroughly conveying their history.[17,20,30] Additionally, preceptors experienced in the use of this model assert that it saves time and enables them to actively teach while carrying out their clinical patient care responsibilities.[17,30]

The patient-witnessed precepting model has not been prospectively evaluated in a controlled setting, and its effective use may depend on the comfort level of both the preceptor and the targeted patient population. It is important that the preceptor respect patients' rights and obtain their consent to participate, ensure patients' understanding of the information discussed, and directly engage patients in the care process if teaching in their presence.[30]

Teaching with patients entails some disadvantages when applied within the clinical pharmacy care model. For example, it may be difficult for learners to express their views to a preceptor if an assessment involves questioning the appropriateness of currently prescribed drug therapy or focusing on a negative patient behavior that is impacting outcomes, such as suspected nonadherence to a drug therapy regimen.

"Aunt Minnie" model. Developed for use in coaching and teaching medical students and residents, the Aunt Minnie model is based on the principle of pattern recognition in clinical problem solving.[12,22] (Its name derives from a general truth: If a woman walks, talks, and dresses like your Aunt Minnie, she probably *is* your Aunt Minnie.) This model emphasizes the notion that many patient care problems share a common pattern of signs, symptoms, and risk factors. Preceptors skilled in pattern recognition can often identify an

Aunt Minnie—the most likely problem and solution—based on common, predictable factors.[12,22]

Preceptors can apply the Aunt Minnie model to clinical teaching in many ways. Although this model has not been prospectively compared with other case-based teaching methods, it has been described in the literature.[22] In one variation of this model, learners are required to briefly present only a patient's chief complaint and their assessment of the problem. The preceptor then evaluates the patient independently while the learner begins writing up the assessment and therapeutic plan. After both the learner and the preceptor have evaluated the patient, they discuss the case again and finalize the patient care plan. Proponents of the model have reported that learners generally present the appropriate assessment; if not, preceptors have the opportunity to quickly correct and teach.[22]

Preceptors using the Aunt Minnie model have cited its efficiency and effectiveness in promoting early development of clinical reasoning skills.[22] Others with experience using this model have stated that it is most effective if used in straightforward cases when time is limited. Practitioners also have cited the potential benefit of exposing learners to more patients and more directed feedback about a correct or incorrect assessment within a specified amount of time.[12] It is important to note that if using this model, the preceptor's teaching emphasis may be to help learners quickly classify problems as representative of different types rather than considering each problem as if for the first time.[6] In this context, pattern recognition can also be taught within other case presentation models; for instance, learners can be directed to look for drug interactions or dietary changes as common drivers of the variability of International Normalized Ratio values often seen in patients receiving warfarin.

Critics of the Aunt Minnie model contend that it reinforces snap judgments in case assessment and delays the development of reasoning skill.[22] Another potential disadvantage is that it emphasizes assessment and planning skills instead of history taking and patient education; therefore, its efficient use is likely limited to busy clinical environments serving a patient population with consistently straightforward (i.e., relatively easy to diagnose and treat) problems. The Aunt Minnie model is perhaps best used in training more experienced learners who have practiced basic patient care and assessment skills and are ready to begin recognizing patterns in clinical problems.[6,12]

"Think-aloud" model. Another teaching model that can be used with traditional or other case presentation formats essentially involves challenging learners to describe their thought process—to think aloud—when discussing patient cases or other clinical scenarios.[31] This model can be considered a hybrid of previously discussed models, with an emphasis on expressing clinical reasoning and not as much focus on a structured presentation framework. Its proponents assert that encouraging learners to think aloud reveals clinical reasoning: the ability to apply knowledge to a newly encountered patient care scenario.[31] Unlike the One-Minute Preceptor and SNAPPS models, thinking aloud in an unstructured environment challenges learners to explain themselves as fully as possible in responding to a general question or in presenting a patient case.

The biggest limitation of the think-aloud model is time efficiency. When this model is used, it is important that learners be allowed to speak without interruption, express uncertainties, and ask questions. When possible, learners may be encouraged to think as long as they need to or start over to improve the organiza-

tion of their presentation; in this way, proponents assert, logical thought processes and clinical reasoning are strengthened.[31]

Notably, the think-aloud method can be applied to help fulfill all of the four major roles of the preceptor (direct instruction, modeling, coaching, and facilitating) because it challenges learners at all levels to organize and articulate their knowledge. Using this method, a pharmacy student may demonstrate clinical reasoning by restating didactically acquired knowledge as it relates to a clinical scenario, whereas a pharmacy resident may discuss treatment options and describe how the efficacy of each strategy can be measured. The think-aloud method is also easily applied to practice settings in which the coaching process may not involve a traditional patient visit and case presentation structure. For example, a preceptor discussing inpatient treatment recommendations may gain insights on the learner's clinical reasoning process by asking evocative questions (e.g., How would you treat this patient's infection if we did not have culture results? What would you look for in order to streamline treatment?) followed by specific coaching and feedback to the learner. Alternatively, a learner in a dispensing role may be encouraged to think aloud about all the possible causes of a recent medication error that occurred in the hospital by discussing sequential checkpoints in drug preparation and delivery, with subsequent specific feedback and questions from the preceptor.

Questioning

Structured question-and-answer or oral defense sessions before, during, and after a patient encounter have long been used as part of the clinical teaching and coaching process.[16] Questioning may also be used in conjunction with lectures and to assess learning after assigned readings.[6] During the coaching process,

structured questions can be used to guide a learner down a clinical-reasoning path during case presentation or discussion when the preceptor is already aware of the appropriate outcome and action. The preceptor can use successively narrower open-ended questions to help pinpoint where the learner is straying from the appropriate clinical-reasoning path and to help the learner better organize the reasoning process.

When employed appropriately, the use of objective, effective questioning to promote reflection has been shown to enhance student learning and promote clinical reasoning.[16,32] Before beginning the questioning process, preceptors should identify the "destination" (i.e., the teaching point).[16] For example, if the preceptor deems that a certain laboratory test value for a given patient is in the appropriate range, questions can be arranged in such a way as to lead the learner to the same conclusion; this may involve asking a sequence of questions about the patient's current laboratory test values, which tests the learner would recommend, what medications the patient is taking, what monitoring is required and why, and so on until the learner realizes what he or she initially failed to deduce. This process can help the learner develop a strategy of clinical problem solving to apply to future patients. Such structured questioning can also help learners deduce relationships between information that might seem unrelated (e.g., the interrelationship of chronic pain and depression, how cultural beliefs may affect medication adherence).[6] Whatever the purpose of a questioning session, it is best to begin with and primarily use open-ended questions that will require learners to explain and synthesize information and make new connections in the clinical-reasoning process.[12]

Questioning can also be detrimental to the learning process if it is overused or used punitively or inap-

propriately. Some preceptors may use questions as a way to repeatedly point out knowledge gaps, leading to frustration and embarrassment on the learner's part. It is important for preceptors to maintain a balance in the questioning process that allows learners to demonstrate what they know but still stretch their clinical-reasoning skills.

Preceptors must also take care to avoid pushing the learner past his or her ability. Preceptors can watch for visual clues that learners are being pushed too hard, such as a consistent lack of response, a neutral facial expression, and a lack of follow-up questions[12]; if such clues are noticed, preceptors can switch to questions that will help the learner demonstrate what he or she *does* know or redirect the learner to do some research and be prepared for a similar discussion the next day.

Another common mistake preceptors make when questioning learners is rushing to "fill in the blanks" or "take over" the case discussion if learners do not immediately give the correct response.[12] The danger in this sort of behavior is that it can quickly turn a thought-provoking exchange into a teacher-centered lecture or monologue. Research has shown that if preceptors simply prolong the wait time for a response from one second to three seconds, the learner's responses tend to be more detailed, contain more logical arguments, and reflect more speculative thinking.[33]

Feedback

A key element of success in any preceptor role, feedback is especially important during the coaching process, when learners are practicing the independent application of new knowledge and skills.[6] Without delivering feedback to learners at this stage to guide their development, there is a danger that the learners could develop and repeatedly engage in a pattern of incorrect choices in interactions with patients and

health care providers or in their drug therapy recommendations. In other words, practice without feedback is simply repetition—of either good or bad behaviors. Feedback is imperative if learners are to develop and hone specific knowledge and behaviors that will improve patient outcomes.[34] Learners consistently identify feedback as one of the most desired and valued aspects of practice-based learning and associate the provision of feedback with high-quality teaching.[35-37]

By definition, feedback consists of specific information about performance that is given by an informed source. In its most simple form, feedback occurs when preceptors provide insight about what a learner did in a given interaction and the consequences of those behaviors.[34] Feedback is usually delivered informally, as soon as possible after an interaction, most often orally, and in a manner intended to improve future performance. It is a formative process that reinforces strengths, identifies and corrects weaknesses, and helps the learner identify strategies for future skills development.[38]

Feedback should not be confused with evaluation or reflection. Evaluation is a summative process that measures the acquisition of a skill relative to a set standard, similar to a written evaluation at the end of a student's or resident's learning experience.[34-38] Reflection examines not only concrete behaviors but also their social, ethical, and moral consequences.[37] Ultimately, all three strategies encourage self-assessment, which helps learners to identify their strengths, weaknesses, and uncertainties.[5,38] In turn, learners develop an appropriate degree of confidence and learn how to become their own source of feedback.[5,39]

eAppendix F (available at www.ajhp.org) provides strategies for delivering effective feedback in the teaching clinical problem-solving model.[6,15,33,35,39–42]

Preceptors often cite various barriers to providing useful feedback. These barriers include an inaccurate understanding of what feedback is (e.g., confusion with evaluation), inappropriate or inadequate expectations of learner performance, and inadequate time to observe learners as a prerequisite to providing meaningful feedback.[38] For a number of reasons, many preceptors are uncomfortable giving negative feedback. Preceptors may fear that it will make them appear overly critical and damage their relationship with the learner. Other preceptors feel guilty about giving negative feedback when they have neither the time nor the resources to help the student correct identified deficiencies. Developing and adhering to a specific plan for delivering frequent, constructive, and specific feedback can help both learners and preceptors become accustomed to its delivery and receipt.

Facilitating

According to Nimmo,[6] a preceptor acting in the role of a facilitator helps learners grow and develop knowledge and skills by offering direct practice experience and opportunities for evaluating their own clinical decisions and those of others. Self-evaluation helps learners to develop self-direction and promotes professional growth and the cultivation of problem-solving skills.

Preceptors can begin the process of facilitating by incorporating learner self-assessment into the ongoing feedback process, which will help learners develop a habit of critically examining their own behaviors and clinical decisions. Most learners will be ready to begin self-evaluation once they have been coached on and are practicing a skill or providing a service autonomously or with limited supervision. For example, learners who are independently rounding with a medical team, seeing patients in an ambulatory care environment,

or delivering lectures to pharmacy students with limited supervision should be self-evaluating their own knowledge and performance. More-experienced learners, such as pharmacy residents, will likely engage in self-assessment more than less-experienced learners, such as pharmacy students.

Self-evaluation is a learned skill that preceptors will need to teach in most cases. The six steps of self-evaluation, as described by Nimmo,[6] are as follows: (1) establish criteria, (2) collect data, (3) compare the data with the criteria, (4) make a judgment, (5) make a decision, and (6) take appropriate action.

One good example of the practical use of self-assessment skills is provided by ASHP's online Residency Learning System (RLS). Residency programs using the RLS establish performance criteria in the form of outcomes, goals, and objectives that residents are expected to achieve.[2,3] Throughout the training experience, the resident engages in direct patient care under the preceptor's guidance, feedback is provided about the resident's knowledge and skills, and the resident is given an opportunity to benchmark his or her performance against the established criteria and judge progress through periodic self-evaluation. The preceptor promotes the development of the resident's self-evaluation skills by objectively assessing the resident's progress, providing feedback to the resident on his or her progress in achieving goals, and assessing his or her ability to accurately self-evaluate that progress. As learners become more skilled in self-evaluation, they will be able to be actively involved in making decisions about their progression through the program and any appropriate action needed as a result of an identified deficiency.[2,3]

Residents as preceptors

As preceptors' responsibilities for teaching both students and residents

have increased, two important shifts in teaching practices have occurred: the inclusion of formal training in clinical preceptorship skills in residency programs and the integration of residents into the teaching process (e.g., PGY1 residents teaching students, PGY2 residents teaching PGY1 residents). Formal resident teaching certificate programs provide a valuable infrastructure for helping residents develop much-needed teaching and preceptorship skills.[44-46] Preceptors instructing residents who are participating in a teaching certificate program should be aware of the program goals and content, as well as the resident's exposure to the program, to ensure that residents are properly trained to teach and provide feedback to learners. Preceptors can also help the resident gain teaching skills while developing clinical skills and knowledge. Residency preceptors are encouraged to involve trainees in the teaching process and apply the same basic clinical teaching strategies used to help residents increase their preceptor skills. For example, the principles of priming before a teaching encounter, modeling feedback and other teaching skills, debriefing after a tense student encounter, coaching the trainee through a difficult learning situation, and facilitating are all applicable as residents learn to develop and hone their skills in teaching and communicating with learners in different situations. As more residents enter the work force in hybrid clinical–academic positions, this training and experience will prove invaluable as they assume independent roles in a clinical teaching practice.

Conclusion

The ASHP-recommended approach to teaching clinical problem-solving skills can be applied within the educational frameworks provided by schools of pharmacy as well as pharmacy residency programs. A wide range of validated teaching

strategies can be used to tailor learning experiences to individual learner needs while meeting overall program goals and objectives.

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