

ACCP COMMENTARY

Acute Care Clinical Pharmacy Practice: Unit- versus Service-Based Models

American College of Clinical Pharmacy

Curtis E. Haas, Pharm.D., Stephen Eckel, Pharm.D., Sally Arif, Pharm.D., Paul M. Beringer, Pharm.D., Elizabeth W. Blake, Pharm.D., Allison B. Lardieri, Pharm.D., Bob L. Lobo, Pharm.D., Jessica M. Mercer, Pharm.D., Pamela Moye, Pharm.D., Patricia L. Orlando, Pharm.D., and Kurt Wargo, Pharm.D.

This commentary from the 2010 Task Force on Acute Care Practice Model of the American College of Clinical Pharmacy was developed to compare and contrast the “unit-based” and “service-based” orientation of the clinical pharmacist within an acute care pharmacy practice model and to offer an informed opinion concerning which should be preferred. The clinical pharmacy practice model must facilitate patient-centered care and therefore must position the pharmacist to be an active member of the interprofessional team focused on providing high-quality pharmaceutical care to the patient. Although both models may have advantages and disadvantages, the most important distinction pertains to the patient care role of the clinical pharmacist. The unit-based pharmacist is often in a position of reacting to an established order or decision and frequently is focused on task-oriented clinical services. By definition, the service-based clinical pharmacist functions as a member of the interprofessional team. As a team member, the pharmacist proactively contributes to the decision-making process and the development of patient-centered care plans. The service-based orientation of the pharmacist is consistent with both the practice vision embraced by ACCP and its definition of clinical pharmacy. The task force strongly recommends that institutions pursue a service-based pharmacy practice model to optimally deploy their clinical pharmacists. Those who elect to adopt this recommendation will face challenges in overcoming several resource, technologic, regulatory, and accreditation barriers. However, such challenges must be confronted if clinical pharmacists are to contribute fully to achieving optimal patient outcomes.

Key Words: clinical pharmacist, clinical pharmacy, practice model, pharmacotherapy.

(*Pharmacotherapy* 2012;32(2):e35–e44)

The 2010 Task Force on Acute Care Practice Model of the American College of Clinical Pharmacy was charged with preparing this commentary to critically compare and contrast the “unit-based” and “service-based” acute care practice models for the delivery of clinical pharmacy services and relate these practice models to the definition of clinical pharmacy

and other relevant ACCP documents. The task force’s charge reflected concern that the unit-based model, which has evolved in many acute care settings, places the clinical pharmacist in an intrinsically reactive position in the therapeutic decision-making process. Thus, rather than having the opportunity to participate proactively in the evaluation and selection

or revision of pharmacotherapy (as is the norm in clinical service/team-based practice), the unit-based clinical pharmacist must often address issues associated with orders that have already been written or transmitted. Such a model limits the clinical pharmacist's opportunity to prospectively assess patients in a team-based setting and facilitate optimization of patient-specific pharmacotherapy before orders are written and avoidable therapeutically related misadventures occur.

For this commentary, it is assumed that a unit-based pharmacist is responsible for all patients admitted to a geographic location such as a nursing unit or units, whereas a service-based pharmacist is responsible for patients admitted to a specific medical or surgical service or team regardless of geographic location.

ACCP's definition of clinical pharmacy embraces the philosophy of pharmaceutical care, and therefore, the primary object of pharmacy practice and research is the patient.¹ The clinical

pharmacy practice model must thus facilitate patient-centered care, whereby all activities and interactions are focused on improving the care of the patient. Clinical pharmacists bring a unique set of knowledge and skills to the team responsible for direct patient care, and they are accountable for improving the medication outcomes of the patient. Hence, they must be qualified as the drug therapy experts.¹ This expertise, which comes from the knowledge, skills, and experiences gained during postgraduate residency training,² should be validated by board certification appropriate to the area of specialization.³

The University HealthSystem Consortium (UHC) task force on the pharmacy practice model for academic medical centers defined the hospital pharmacy practice model as follows:

The manner in which a pharmacy department's human resources are distributed to fulfill: (a) the departmental mission of ensuring that patients achieve optimal outcomes from the use of medicines; and (b) the departmental responsibility for leading improvements in the medication-use process. The model takes into account how pharmacists, pharmacy technicians, and other pharmacy staff spend their time and how they interface with patients, health professionals outside of pharmacy, hospital executives, information systems, devices, and vendors.^{4, 5}

The authors of the UHC practice model document state that the first goal of the practice model is to create a means for academic medical centers to deliver a desired level of clinical pharmacy services, an observation consistent with the ACCP definition.

The 2008 American Society of Health-System Pharmacists (ASHP) national survey of pharmacy practice in hospital settings described three potential practice models,⁶ and a resulting discussion defined a fourth model.⁴ These models were also restated in the UHC task force report.^{4, 5} The four models are as follows:

1. The drug distribution-centered model.
2. The clinical pharmacist-centered model.
3. The patient-centered integrated model.
4. The comprehensive model.

These model definitions primarily focus on the roles and responsibilities of the pharmacy staff as they pertain to drug distribution and clinical activities, and these are functional models. The recent ASHP Pharmacy Practice Model Initiative began the process of health system pharmacy practice model reform to better position pharmacists as direct patient care providers.⁷

This paper provides perspective on the optimal interface of the clinical pharmacist with

From the Department of Pharmacy, University of Rochester Medical Center, Rochester, New York (Dr. Haas); Department of Pharmacy, University of North Carolina Hospitals, Chapel Hill, North Carolina (Dr. Eckel); Midwestern University Chicago College of Pharmacy, Downers Grove, Illinois (Dr. Arif); USC School of Pharmacy, Los Angeles, California (Dr. Beringer); Department of Clinical Pharmacy and Outcomes Sciences, South Carolina College of Pharmacy, Columbia, South Carolina (Dr. Blake); University of Maryland, Lutherville, Maryland (Dr. Lardieri); Department of Pharmacy, Vanderbilt, Nashville, Nashville (Dr. Lobo); Department of Pharmacy, Medical University of South Carolina, Charleston, South Carolina (Dr. Mercer); Pharmacy Practice, Mercer University College of Pharmacy and Health Sciences, Atlanta, Georgia (Dr. Moye); Pharmacotherapy, University of Utah, Salt Lake City, Utah (Dr. Orlando); and Internal Medicine, University of Alabama-Birmingham, Huntsville, Alabama (Dr. Wargo).

This document was prepared by the 2010 ACCP Task Force on Acute Care Practice Model: Curtis E. Haas, Pharm.D.; Stephen Eckel, Pharm.D.; Sally Arif, Pharm.D.; Paul M. Beringer, Pharm.D.; Elizabeth W. Blake, Pharm.D.; Allison B. Lardieri, Pharm.D.; Bob L. Lobo, Pharm.D.; Jessica M. Mercer, Pharm.D.; Pamela Moye, Pharm.D.; Todd W. Nesbit, Pharm.D., MBA; Patricia L. Orlando, Pharm.D.; and Kurt Wargo, Pharm.D. Approved by the American College of Clinical Pharmacy Board of Regents on April 7, 2011.

For reprints, visit <https://caesar.sheridan.com/reprints/re-dir.php?pub=10089&acro=PHAR>. For questions or comments, contact Curtis E. Haas, Pharm.D., Department of Pharmacy, University of Rochester Medical Center, 601 Elmwood Ave, Box 638, Rochester, New York; e-mail: curtis_haas@urmc.rochester.edu.

patients and other health care professionals (unit- vs service-based) within the preferred functional practice model. The discussion that follows is particularly relevant to ASHP models 2–4.

Guiding Principles, Values, and Philosophies

It is important to appreciate that both unit- and service-based orientations within the practice model embrace ACCP's definition of clinical pharmacy. However, a practice model is a vehicle or functional construct to achieve desired outcomes, not an outcome by itself. The practice model employed in the acute care setting must be based on a forward-looking set of guiding principles, values, and philosophies for the provision of clinical pharmacy services and strive to achieve positive patient care outcomes (Table 1). The ideal practice model should use clinical pharmacists to provide safe, effective, efficient,

accountable, and evidence-based pharmaceutical care to optimize therapeutic outcomes.⁸

The provision of health care in the acute care setting is becoming increasingly complex, interprofessional,* and team-based. Clinical pharmacists are essential members of these teams. Leading health care quality organizations, including the Institute of Medicine (IOM), the National Quality Forum, the Agency for Healthcare Research and Quality, the Institute for Healthcare Improvement, and the Leapfrog Group, all support the inclusion of pharmacists in the interprofessional team approach to the provision of patient care. A decade ago in the seminal IOM report *To Err Is Human*, the contributors stated: "The pharmacist has become an essential resource in modern hospital practice. Thus, access to his or her expertise must be possible at all times." Furthermore, the authors of the IOM report stated that pharmacists are much more valuable to patient care if they are physically available at the time of decision-making as active members of the interprofessional patient care team.⁹ In the more recent IOM report on the prevention of medication errors, the authors advocate including pharmacists as members of interprofessional teams caring for patients receiving complex medication regimens to "improve substantially the quality of drug therapy and reduce the occurrence of medication errors and ADEs."¹⁰ The Society of Critical Care Medicine (SCCM) supports the interprofessional team model for the provision of critical care and, on the basis of the evidence available in 2001, concludes that the pharmacist should be an integral member of the critical care team.¹¹ This position of SCCM has been consistently stated and supported by the evidence,^{12, 13} and the mission statement of the organization expresses it. In a recently published scientific statement on medication errors by the American Heart Association (AHA), the authors conclude that the provision of care by an integrated medical team is critical to preventing medication errors during the provision of cardiovascular care. The statement recommends including clinical pharmacists as members

Table 1. Guiding Principles, Values, and Philosophies for an Acute Care Practice Model

-
- The pharmacy department is a clinical, patient-centered department.
 - Clinical pharmacists prospectively contribute a unique area of expertise in drug therapy as autonomous professionals who adhere to their scope of practice as an integrated member of the interprofessional patient care team.
 - The clinical pharmacist is recognized as the drug therapy expert on the team. This expertise should be gained through the completion of accredited postgraduate training and validated by board certification appropriate to the area of specialization.
 - All patients treated in an acute care facility must have access to clinical pharmacy services and have a clinical pharmacist involved in the management of their pharmacotherapy.
 - Clinical pharmacy services must be provided consistently to all patients regardless of time of care, point of entry to the acute care facility, or reason for admission. This care should be provided in a seamless, team-oriented environment that ensures follow-up and effective transitions across the continuum of care.
 - Clinical pharmacists must demonstrate their value to the patient, health care team, and institution, and they should document their contributions, care plans, and recommendations in the medical record.
 - Clinical pharmacists must provide patient-centered care to ensure optimal patient outcomes through the delivery of comprehensive, evidence-based, individualized, and prospective drug therapy management.
 - All clinical pharmacists, regardless of their affiliation and primary role or funding source, must practice within an interprofessional and patient-centered practice model.
 - Clinical pharmacists will be accountable for the patient's drug therapy outcomes.
-

*Throughout this commentary, the term *interprofessional* is used to describe the provision of care by a team of health care professionals working collaboratively as a patient-centered team. During the past decade, different terms including *multidisciplinary* and *interdisciplinary* have been employed in various documents cited in this commentary. In the authors' opinion, the referenced papers used these terms in a manner consistent with the interprofessional team definition, so for clarity and consistency, we elected to use only the term *interprofessional*.

of the integrated team caring for cardiovascular patients in the emergency department, intensive care unit, and inpatient wards to enhance communication and medication safety.¹⁴ Evidence cited by leading health care quality organizations and professional societies supports incorporating pharmacists in an interprofessional care model in the acute care setting. Therefore, the best practice model will provide pharmacists an opportunity to work with interprofessional teams to ensure that patients achieve the desired therapeutic outcomes,^{1, 15} which is consistent with the vision for pharmacy practice and patient outcomes expressed by the Joint Commission of Pharmacy Practitioners.¹⁶

The ideal practice model should ensure that each patient treated in the acute care setting receives care by a clinical pharmacist. Although high-risk or therapeutically complex patients will demand greater attention, time, and resources than low-complexity patients, all patients should have a comprehensive pharmacotherapy plan that is accessible by the interprofessional patient care team. This design should include all components of rational drug therapy including a monitoring plan and the desired therapeutic outcomes.¹⁵ To meet the goals of this comprehensive pharmacotherapy plan, clinical pharmacy services must be provided in a consistent and continuous manner regardless of the point of entry to the system, time of care, or reason for admission to the institution. Care must be seamless, with effective transitions across the continuum of patient care. This provides a considerable challenge to the discipline of clinical pharmacy, which has traditionally provided direct patient care to select groups of patients at limited times of the day and week. To meet this challenge, all pharmacists practicing in the acute care setting will need to be qualified to provide comprehensive pharmacy care and competent to practice within the model adopted by the institution.

The clinical pharmacy practice model for acute care should serve as a platform capable of pursuing and achieving these guiding principles, values, and philosophies that will lead to the provision of rational drug therapy for all patients during all episodes of care. Very few, if any, institutions can achieve these goals at present; however, the practice model adopted should have a structure and should strive to meet these standards given adequate resources.

Unit- Versus Service-Based Orientation Within the Practice Model

Although several pharmacy practice models exist in the United States, an accepted definition of these models is lacking.^{4, 6} Moreover, even though these models may have different definitions based on the organization's structure and culture, it is generally expected that, in a unit-based model, the pharmacist will cover a geographic area (i.e., a nursing unit). By contrast, a service-based model assigns the pharmacist to a medical service, usually independently of geographic location. In pharmacy practice, a unit-based model often involves the provision of care to a variety of patient types or services. A service-based model tends to focus more on providing care to a patient care type and allows greater specialization. Although not always true, a unit-based model usually places greater emphasis on drug distribution than does a service-based model, and unit-based models have evolved from the need to provide traditional distribution services to the unit.

The potential advantages and disadvantages of both practice models are presented in Tables 2 and 3. An important advantage of both models is the decentralization of the pharmacist, allowing more access to patient data, other members of the health care team, and patients and families.

Table 2. Unit-Based Practice Model

Advantages	Disadvantages
Easily managed/staffed	High patient-to-pharmacist ratio
Provision of a central contact for nursing staff and providers	Less pharmacist integration into the interprofessional team
Conducive to developing a close working relationship with the nursing staff	Not conducive to developing a relationship with the interprofessional team
Emphasis on "generalist" management of patient problems	More reactionary behaviors than proactive decision-making
Compatible with an integrated clinical task-distributive pharmacist role	Clinical services are more often limited and oriented, instead of addressing patient-specific needs

Table 3. Service-Based Practice Model

Advantages	Disadvantages
Typically has a lower patient-to-pharmacist ratio	Complex scheduling/coverage needed
Pharmacist proactively involved as a member of interprofessional patient care teams	Difficult to be functional three shifts/day, 7 days/wk
Clinical activities are care plan-based and individualized to the patient	Higher staffing requirements because of a lower patient-to-pharmacist ratio
Allows the pharmacist to transcend the silos of the medication use system	Difficult to implement in the absence of teams (e.g., community hospital)
Greater development of specialized knowledge and skills	Significant overlap of clinical pharmacy services—inefficient
Facilitates pharmacist's patient advocacy role across the continuum of care	More person-specific than department-specific
Easier to precept pharmacy residents and students	May leave distribution activities to other pharmacists (environment-dependent)
Educational role of the pharmacists more easily integrated across disciplines	
Facilitates pharmacist's involvement in collaborative research activities	

Both practice models provide advantages and disadvantages related to patient-to-pharmacist ratios and scheduling/staffing requirements. A unit-based practice model typically has a higher patient-to-pharmacist ratio than a service-based practice model. A unit-based practice model is more efficient from a staffing standpoint and ensures that all patients receive a baseline level of care, but because a unit-based model covers a greater number of patients, the level of care that can be provided may be reduced. A unit-based practice model tends to become a traditional product-oriented practice when the census and patient order queues are high. The pharmacist is assigned to a physical location or locations (e.g., a pharmacy satellite, patient care units) and may often be involved in verifying provider orders, overseeing drug distribution, and supervising technician activities. Depending on where pharmacists are located on the patient care unit, they may have limited interaction with the medical team and patient. The unit-based model may at times resemble a traditional central pharmacy practice, with the only difference in this model being the location.

The service-based pharmacist is also decentralized, but unlike the unit-based pharmacist, he or she is usually responsible for patients admitted to a specific primary care team or subspecialty service. The unit-based pharmacist must often react to an order or decision and focus on task-oriented clinical responsibilities (e.g., intravenous to oral conversion, formulary management, renal dose checking, admission medication histories), whereas the service-based pharmacist functions as a member of the interprofessional team. In this interprofessional setting, the pharmacist contributes to the decision-making process, provides patient-specific pharmacotherapeutic

recommendations, and is actively involved in the development of patient-centered care plans. Integrating a pharmacist into the patient care team in a service-based model allows a proactive approach to patient care rather than the reactive approach typical of the unit-based practice model. In addition, substantial evidence of the value of clinical pharmacists is based on research generated by pharmacists practicing in service-oriented models.^{17, 18} Research evaluating the provision of inpatient care by an interprofessional team that includes a clinical pharmacist has shown reductions in adverse drug events, medication errors, cost of care, length of stay, and mortality.^{13, 19–30}

The main disadvantages of a service-based model pertain to resources, scheduling, and the potential for loss of efficiency. A high degree of specialization may mean that patients are receiving care from several consulting services involving clinical pharmacists (e.g., critical care, cardiology, nutrition support, infectious diseases), which may require collaboration and communication to develop a cogent and comprehensive pharmaceutical care plan and may significantly overuse limited clinical pharmacy resources for a single patient. In addition, limited resources lead to the potential for discrepancies in the level of pharmacy services among patients.

Of note, a “hybrid” orientation also exists that has attributes of both unit- and service-based models. For example, in the intensive care unit or emergency department, the clinical pharmacist often practices in a patient-centered, interprofessional team model, but also has many of the responsibilities typical of a unit-based model. This model exists primarily because of the alignment of the service and physical location,

providing an opportunity for some of the advantages of both models to coexist.

When considering the guiding principles, values, and philosophies (Table 1) that the pharmacy practice model must support, it is clear that a service-based practice model is more advantageous than a unit-based model and that it should be the clinical pharmacist orientation pursued for the optimal provision of acute care clinical pharmacy services.

Environmental Factors Affecting the Functional Practice Model

Several environmental factors may affect the clinical pharmacy practice model, many of which are listed in Table 4. Such factors should be considered when designing and implementing a practice model within an institution. This section will focus on some of the key institutional, departmental, and regulatory environmental factors.

Institution

The type of institution may influence the pharmacy practice model deployed. Bond and

colleagues evaluated the association between hospital demographics (including hospital ownership, teaching affiliation, and hospital size) and the number of clinical pharmacists per 100 occupied beds in U.S. hospitals.³¹ There was a statistically significant association between clinical pharmacists per 100 occupied beds and the institutional teaching affiliation (both pharmacy and non-pharmacy teaching affiliations), with teaching hospitals having more clinical pharmacists per occupied bed. Colleges and schools of pharmacy may provide clinical pharmacy practice faculty or may partly fund joint clinical positions within the hospital. A greater number of clinical pharmacists per occupied bed will facilitate a service-based model, given the greater scheduling demand of this model. In addition, teaching hospitals are more likely to have interprofessional teams than are nonteaching hospitals, which will further facilitate the deployment of a service-based model.

Hospital ownership was also associated with clinical pharmacist staffing per 100 occupied beds. Federal government hospitals had a higher number of clinical pharmacists than nonfederal government hospitals, nonprofit hospitals, and for-profit hospitals. The number of clinical pharmacists per 100 occupied beds in federal government hospitals was more than 2 times higher than in for-profit hospitals.³¹ A service-based model will be easier to implement in institutions with a greater number of clinical pharmacists. These data suggest that service-based models will be affected by hospital ownership, with for-profit hospitals having the lowest number of clinical pharmacists.

Bond and colleagues also described an association between hospital size and the number of clinical pharmacists per 100 occupied beds.³¹ Staffing was greater in large hospitals (400 patients or more) than in medium hospitals (200–399 patients) and small hospitals (less than 200 patients). The number of clinical pharmacists per 100 occupied beds was almost 2 times higher in large vs small hospitals. Multivariable analysis showed that teaching affiliation (pharmacy teaching, as well as overall teaching status), ownership, and size were each independently associated with clinical pharmacy staffing numbers, indicating that each of these environmental factors affects the practice model orientation considered.

The recommendation for a service-based model depends on the presumption that every institution has service-based interprofessional teams that provide patient care. Because small commu-

Table 4. Environmental Factors Potentially Affecting the Pharmacy Practice Model

I. Institutional Factors
A. Type of institution
1. Governmental
2. For-profit vs nonprofit
3. Academic medical center
4. Community
5. Teaching vs nonteaching
6. Integrated Health Care Delivery System
B. Size
C. Technology
1. Computerized provider order entry
2. Electronic medical record
3. Sharp-end technologies (e.g., barcode medication administration, smart pumps)
4. Informatics
II. Departmental
A. Technology
1. Dispensing technologies
2. Robotics
3. Informatics
4. Mobile computing capabilities.
B. Staffing
1. Clinical specialists—number and specialty areas
2. Integrated vs nonintegrated staffing models
3. Funding sources for staff (e.g., affiliated faculty)
C. Leadership
III. Regulations and Accreditation Standards
A. Constraints on distribution model
B. Constraints on technician's role
C. Scope of clinical pharmacy practice

nity hospitals often lack an interprofessional team structure, this recommendation may not be adoptable.

Technologies available within an institution may affect the functional pharmacy practice model and the workflow of both unit- and service-based clinical pharmacists. The extent of technology implementation will differ among institutions and may include CPOE (computerized provider order entry), integrated electronic medical records (EMRs), clinical decision support, drug administration technologies (e.g., barcode confirmation and smart pumps), and mobile computing capabilities. Technology in hospitals and health systems is constantly evolving, and the recent availability of federal funding and the newly enacted health care reform measures have increased the rate and extent of technology to be introduced in the near future at many institutions. This may create opportunities to redefine the pharmacy practice model as well as the pharmacist's orientation within that model.³²

New technologies as a whole will affect the functional practice model such that pharmacists will have more time to provide direct patient care and to more easily practice in a service-based practice model. For this shift to occur, it is crucial that pharmacy adapt its practices to new technologies. By efficiently implementing integrated EMR systems, mobile computing solutions, and dispensing and drug administration technologies, pharmacists should be better positioned to provide patient-centered care that is unanchored to any given physical location.³² In addition, new clinical information systems will allow pharmacists to better document and analyze their interventions and demonstrate their effectiveness in a service-based model.¹⁵ According to the ASHP-Society for Hospital Medicine Joint Statement on Hospitalist-Pharmacist Collaboration, well-integrated and properly applied technologies (e.g., EMRs and personal digital assistants with clinical support systems) have the potential to enhance communication and collaboration among members of the health care team.³³

At both the institutional and departmental levels, the existence of informatics specialists may be an important environmental factor in developing the practice model. To fully leverage technology to support pharmacy practice, the application of rules engines, clinical decision support, and effective implementation and use of new technology and automation are necessary. These

technologies should be focused on providing patient-specific information for clinical pharmacists to enable them to be highly functioning within the practice model. In addition, the mining of data regarding patient outcomes, drug safety, and the efficiency of the drug distribution system is necessary to validate the value of a new practice model. The availability of informatics specialists may be important in the successful implementation of a patient-centered practice model and for the provision of the best pharmaceutical care to patients.^{32, 34}

Departmental

Dispensing robotics, drug preparation technologies, and informatics at the departmental level will have an important impact on the pharmacy practice model. The availability and implementation of drug use technology varies widely across institutions. To implement a practice model that is service-based and patient-focused will necessitate decreasing the pharmacist's role in the traditional drug distribution and order verification functions while not sacrificing the quality and safety of these processes. The deployment of technologies that affect all steps in the drug use process, from drug procurement and storage to administration to the patient, can facilitate this transition of the pharmacist from overseer of drug distribution to active member of the patient care team focused on the safety and quality of medication use. In addition, the use of clinical decision support and order triage systems can reduce the need for and value of pharmacists directly reviewing all orders, further facilitating a service-based model of clinical pharmacy practice.³²

The staffing structure of the pharmacy department may also be an important environmental factor that influences the pharmacy practice model adopted by an institution. The number and practice focus of clinical pharmacy specialists, the specialist-to-staff pharmacist ratio, the availability and skill level of technicians, and the presence of faculty from affiliated schools of pharmacy all have a potential impact on the practice model used. In addition, the staffing model employed may affect the practice model. An integrated team staffing model may facilitate mentoring by clinical specialists within the team and extending coverage hours for service-based models by a team coverage approach. The separation of distribution and clinical activities with a traditional nonintegrated staffing model may

limit the extent and hours of service-based clinical pharmacy practice models. The involvement of clinical pharmacy faculty may create a useful symbiotic relationship at a reduced operating cost for the institution. However, faculty members often have varying scheduling commitments, priorities, and time demands that differ from those of pharmacists fully employed by the institution.³⁵ All of these staffing variables may have an important impact on the decision about the definition and successful implementation of a pharmacy practice model.

Leadership within the department is a vital factor that will influence the characteristics of the pharmacy practice model. An effective leader must have a vision, be able to articulate that vision, and be able to organize the staff to achieve the goals established. A leader will not compromise his or her values and standards and will stay focused on the goals, even when resistance to the model develops. The effective leader will acquire the resources necessary and create opportunity for the pharmacy staff. Without this leadership, the implementation and maintenance of a patient-centered practice model will not be successful.³⁶ A recent survey of hospital pharmacy directors raises significant concerns about the necessary vision and leadership at some institutions. Only 35.8% of directors (n=508) believed that the prospective development of pharmaceutical care plans was essential, and the inclusion of pharmacists as members of interprofessional teams for managing drug therapy was not considered essential for noncritically ill and critically ill patients by 25% and 20% of directors, respectively.⁶

Regulations and Accreditation Standards

Regulations that limit pharmacy practice or operations, as well as medication management accreditation standards, can lock pharmacist resources into traditional distributive roles and limit the ability to adopt an alternative pharmacy practice model that is patient-centered.³² Regulations that limit the scope of pharmacy practice, provide narrow definitions for collaborative practice agreements or do not recognize them at all, place limitations on the use of pharmacy technicians, and restrict the optimal use of technology, informatics, and robotics are important barriers to the complete adoption of a preferred pharmacy practice model. In addition, accreditation standards for medication management may limit the scope of pharmacy practice

by consuming significant pharmacist resources for traditional distributive and reactionary practice models.

As of March 2011, 42 states had regulations in place that allowed some form of collaborative drug therapy management by pharmacists; however, the specifics of these regulations vary widely (J. McGlew, written communication, March 2011). This variability in collaborative practice agreement standards may affect the practice model and the way in which it is deployed. Hospitals in states without proactive and progressive regulations may be limited in the type of functional practice model they develop. Existence of a collaborative practice agreement may make it easier for an institution to develop a service-based practice model with the assurance that pharmacists' activities are within their scope of practice. Without regulations that support the expanded scope of pharmacy practice, many institutions may be hesitant to expand clinical pharmacy services for fear of increased liability.

The availability of clinical pharmacists with postgraduate education in pharmacy is one factor that may affect the functional practice model. It is ACCP's position that in the foreseeable future, clinical pharmacists involved in direct patient care will have completed formal, postgraduate residency training.² The current lack of Centers for Medicare and Medicaid Services (CMS) pass-through funding for PGY2 pharmacy residency programs is a regulatory factor that will limit the availability of specialty-trained pharmacists, thereby slowing the successful development of a preferred pharmacy practice model. The evolution of pharmacy services to a service-based practice model with increased pharmacist accountability for outcomes will strengthen the argument for CMS funding if PGY2 training becomes an essential qualification to practice in this model.

Pharmacy technician roles and responsibilities significantly influence the type of practice model that is feasible in an institution. Bond and colleagues showed a strong statistical association between the clinical pharmacist staffing ratio and the extent of technician staffing, leading to their conclusion that one of the most effective ways to increase clinical pharmacist staffing is to increase the number of pharmacy technicians.³¹ State regulations regarding the use of pharmacy technicians vary widely, and in many states, there is no formal recognition of this role beyond references to unlicensed individuals. Limitations on the use of technicians for nondis-

cretionary aspects of managing drug dispensing and distribution in the acute care setting may restrict the availability of pharmacist resources to effectively implement a service-based practice model. Research has shown that technicians can accurately perform nondiscretionary dispensing activities in ways that are at least comparable to those of pharmacists.³⁷ Moreover, the implementation of automated systems for product verification at both the time of dispensing and administration can enhance the safety of the drug distribution system independently of “end-of-the-assembly line” pharmacist verification.³² In recent years, there has been a shift from the distributional component of pharmacy, provided by pharmacists, to a distributional model, heavily supported by automated dispensing and pharmacy technicians. The extent of this shift and the resultant redeployment of pharmacists to patient-centered practice models are heavily influenced by the regulatory environment in the state of the institution.

Conclusion

A service-based pharmacy practice model is most consistent with the definition of clinical pharmacy, positions the clinical pharmacist as a member of the interprofessional team proactively involved in developing and monitoring the pharmacotherapeutic plan, and best uses the clinical pharmacist as the drug therapy expert. National quality and safety organizations and professional associations (e.g., SCCM, AHA) advocate for including the clinical pharmacist as a member of the interprofessional patient care team. The evidence also shows improvements in the quality of care and patient outcomes, while achieving a reduction in the cost of care for acutely ill patients, when the pharmacist is included as a team member. The service-based orientation of the pharmacist in the acute care pharmacy practice model is consistent with the practice embraced by ACCP's founding members and continues to be supported by the College, as reflected in its definition of clinical pharmacy.¹ We strongly recommend that institutions pursue a service-based pharmacy practice model to optimally deploy their clinical pharmacist workforce. Those who elect to adopt this recommendation will face several challenges, including redesigning pharmacists' roles; ensuring that all patients have adequate, consistent provision of clinical pharmacy services; using effective and sophisticated technologies; leveraging technician

resources for nondiscretionary drug distribution roles; and navigating regulatory and accreditation barriers.³⁸ Nonetheless, such challenges must be addressed if clinical pharmacists are to contribute fully to achieving optimal patient outcomes. Defaulting to a unit-based practice model fails to fully leverage the value that clinical pharmacists can contribute to patient care.

Acknowledgment

The task force members would like to thank Lawrence J. Cohen, Pharm.D., our Board of Regents liaison, for his critical evaluations, constructive criticisms, and thoughtful insights during the preparation and revision of this commentary.

References

1. American College of Clinical Pharmacy. The definition of clinical pharmacy. *Pharmacotherapy* 2008;28:816–7.
2. Murphy JE, Nappi JM, Bosso JA, et al. American College of Clinical Pharmacy's vision of the future: postgraduate pharmacy residency training as a prerequisite for direct patient care practice. *Pharmacotherapy* 2006;26:722–33.
3. Saseen JJ, Grady SE, Hansen LB, et al. Future clinical pharmacy practitioners should be board-certified specialists. *Pharmacotherapy* 2006;26:1816–25.
4. University HealthSystem Consortium. Pharmacy practice model for academic medical centers. Oak Brook, IL: University HealthSystem Consortium, 2010.
5. Bush PW, Ashby DM, Guharoy R, et al. Pharmacy practice model for academic medical centers. *Am J Health Syst Pharm* 2010;67:1856–61.
6. Pedersen CA, Schneider PJ, Sheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: dispensing and administration—2008. *Am J Health Syst Pharm* 2009;66:926–46.
7. American Society of Health-System Pharmacists. Pharmacy practice model summit executive summary. *Am J Health Syst Pharm* 2011;68:1079–85.
8. Woods TM. Practice model challenge [editorial]. *Am J Health Syst Pharm* 2009;66:1167.
9. Kohn LT, Corrigan JM, Donaldson MS, eds. *Committee on Quality of Health Care in America, Institute of Medicine. To err is human; building a safer health system.* Washington, DC: National Academy Press, 2000:194–5.
10. Aspden P, Wolcott J, Bootman JL, Cronenwett LR, eds. *Committee on Identifying and Preventing Medication Errors, Institute of Medicine. Preventing medication errors: quality chasm series.* Washington, DC: National Academy Press, 2007:248–50.
11. Brill RJ, Spevetz A, Branson RD, et al. Critical care delivery in the intensive care unit: defining clinical roles and the best practice model. *Crit Care Med* 2001;29:2007–19.
12. Durbin CG. Team model: advocating for the optimal method of care delivery in the intensive care unit. *Crit Care Med* 2006;34(Suppl):S12–7.
13. Kim MM, Barnato AE, Angus DC, Fleischer LF, Kahn JM. The effect of multidisciplinary care teams on intensive care mortality. *Ann Intern Med* 2010;170:369–76.
14. Michaels AD, Spinler SA, Leeper B, et al. Medication Errors in Acute Cardiovascular and Stroke Patients. A Scientific Statement from the American Heart Association. *Circulation* 2010;121:1664–82.
15. Abramowitz PW. The evolution and metamorphosis of the pharmacy practice model. *Am J Health Syst Pharm* 2009;66:1437–46.

16. **Joint Commission of Pharmacy Practitioners.** Future vision of pharmacy practice. November 2004. Available from <http://www.aacp.org/resources/historicaldocuments/documents/JCPPFutureVisionofPharmacyPracticeFinal.pdf>. Accessed on December 15, 2011.
17. **Kaboli PJ, Hoth AB, McClimon BJ.** Clinical pharmacists and inpatient medical care: a systematic review. *Arch Intern Med* 2006;166:955–64.
18. **Chisholm-Burns MA, Lee JK, Spivey CA, et al.** US pharmacists' effect as team members on patient care. Systematic review and meta-analyses. *Med Care* 2010;48:923–33.
19. **Haig GM, Kiser LA.** Effect of pharmacist participation on a medical team on costs, charges, and length of stay. *Am J Hosp Pharm* 1991;48:1457–62.
20. **Boyko WL, Yurkowski PJ, Ivey MF, Armistead JA, Roberts BL.** Pharmacist influence on economic and morbidity outcomes in a tertiary care teaching hospital. *Am J Health Syst Pharm* 1997;54:1591–5.
21. **Leape LL, Cullen DJ, Clapp MD, et al.** Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. *JAMA* 1999;282:267–70.
22. **Scarsi KK, Fotis MA, Noskin GA.** Pharmacist participation in medical rounds reduces medication errors. *Am J Health Syst Pharm* 2002;59:2089–92.
23. **Kopp BJ, Mrgan M, Erstad BL, DUBY JJ.** Cost implications of and potential adverse events prevented by interventions of a critical care pharmacist. *Am J Health Syst Pharm* 2002;64:2483–7.
24. **Kucukarslan SN, Peters M, Mlynarek M, Nafziger DA.** Pharmacists on rounding teams reduces preventable adverse drug events in hospital general medicine units. *Arch Intern Med* 2003;163:2014–8.
25. **Jain M, Miller L, Belt D, King D, Berwick DM.** Decline in ICU adverse events, nosocomial infections and cost through a quality improvement initiative focusing on teamwork and culture change. *Qual Saf Health Care* 2006;15:235–9.
26. **Patel NP, Brandt CP, Yowler CJ.** A prospective study of the impact of a critical care pharmacist assigned as a member of the multidisciplinary burn care team. *J Burn Care Res* 2006;27:310–3.
27. **Ng TMH, Bell AM, Hong C, et al.** Pharmacist monitoring of QTc interval-prolonging medications in critically ill medical patients: a pilot study. *Ann Pharmacother* 2008;42:475–82.
28. **MacLaren R, Bond CA, Martin SJ, Fike D.** Clinical and economic outcomes involving pharmacists in the direct care of critically ill patients with infections. *Crit Care Med* 2008;36:3184–9.
29. **Kalina M, Tinkoff G, Gleason W, Veneri P, Fulda G.** A multidisciplinary approach to adverse drug events in pediatric trauma patients in an adult trauma center. *Pediatr Emerg Care* 2009;25:444–6.
30. **Weant KA, Armistead JA, Ladha AM, Sasaki-Adams D, Hadar EJ, Ewend MG.** Cost effectiveness of a clinical pharmacist on a neurosurgical team. *Neurosurgery* 2009;65:946–51.
31. **Bond CA, Raehl CL, Franke T.** Clinical pharmacist staffing in United States hospitals. *Pharmacotherapy* 2002;22:1489–99.
32. **ASHP Section of Pharmacy Informatics and Technology Executive Committee 2008-9.** Technology-enabled practice: a vision statement by the ASHP Section of Pharmacy Informatics and Technology. *Am J Health Syst Pharm* 2009;66:1573–7.
33. **Cobaugh DJ, Amin A, Bookwalter T, et al.** ASHP-SHM joint statement on hospitalist-pharmacist collaboration. *Am J Health Syst Pharm* 2008;65:260–3.
34. **Matsuura GT, Weeks DL.** Use of pharmacy informatics resources by clinical pharmacy services in acute care hospitals. *Am J Health Syst Pharm* 2009;66:1934–8.
35. **Birtcher KK, Mallow-Corbett S, Pass SE, et al.** Symposium on roles of and cooperation between academic- and practice-based pharmacy clinicians. *Am J Health Syst Pharm* 2010;67:231–8.
36. **Breland BD.** Believing what we know: pharmacy provides value. *Am J Health Syst Pharm* 2007;64:1284–91.
37. **Ambrose PJ, Saya FG, Lovett LT, Tan S, Adams DW, Shane R.** Evaluating the accuracy of technicians and pharmacists in checking unit dose medication cassettes. *Am J Health Syst Pharm* 2002;59:1183–8.
38. **Knoer SJ, Pastor JD, Phelps PK.** Lessons learned from a pharmacy practice model change at an academic medical center. *Am J Health Syst Pharm* 2010;67:1862–9.