

## The evolution and metamorphosis of the pharmacy practice model

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Evolution is generally defined as a slow progressive change occurring over a prolonged period of time. Conversely, metamorphosis is a dramatic change or even a rebirth occurring over a relatively short period. These forces have been in motion since the beginning of time and throughout all human history, and those of us born in the middle of the 20th century have probably witnessed more technological changes than has any previous generation. Our pharmacy practice model has both evolved slowly and changed rapidly. For many years, I had the opportunity to participate in guiding and stimulating practice model change and have learned, painfully at times, that change often must be evolutionary as it works against cultural and professional norms. However, if we are observant and creative enough, we may see opportunities to stimulate dramatic or even metamorphic change.

Alvin Toffler,<sup>1</sup> in his landmark book *Future Shock*, observed that “What joins [everyday matters] . . . is the roaring current of change, a current so powerful today that it overturns institutions, shifts our values and shrivels our roots.” He wrote those words in 1970, when I was using a rotary-dial phone. He may not have been able to predict that almost 40 years later, people would be walking around with mini-computer “smart” phones, but he was aware that changes were occurring at an exponential rate. “Change is avalanching upon our heads and most people are grotesquely unprepared to cope with it,” Toffler<sup>1</sup> wrote, with the intention of raising people’s awareness of this phenomenon so that they would not be shocked by the rapid arrival of the future.

I would like to explore with you some of the evolutionary and metamorphic changes in the pharmacy practice model that I have observed

and what I hope we may achieve in the future.

### The pharmacy practice model of 1974 and its evolution

Let us begin our journey in 1974, when I entered pharmacy school. I will describe through my eyes what the pharmacy practice model looked like at that time. After our trip down memory lane, we will fast-forward to present-day practice so that we can clearly see the enormity of change that has occurred. I will then speak about selective aspects of what I hope to see in the pharmacy practice model 35 years from now and how we might arrive there.

In 1974, the pharmacy practice model focused heavily on the distribution of medications. The vast majority of hospital and community pharmacists spent most of their time in the pharmacy. Pharmacy technicians were present but limited in number and had little standardized

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Abramowitz has actively combined practice, teaching, and research throughout his career. He has lectured and published extensively, focusing on the effect that quality pharmaceutical care can have on improving outcomes of care and reducing costs, developing care models, and redesigning pharmacy services.

He received his bachelor's degree in pharmacy from the University of Toledo and his doctor of pharmacy degree from the University of Michigan. He completed his residency at the University of Michigan Medical Center.

Abramowitz was a recipient of the John W. Webb Lecture Award in 2000.



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education and training. Communication between the pharmacist and other providers in the hospital predominately occurred by telephone. The unit dose system, pharmacy-prepared i.v. admixtures, and drug information centers existed in only a small number of hospitals. Pharmacy information systems were rare, and automation was all but nonexistent. Virtually all patient records were paper records, not readily accessible to the pharmacist.

Compared with pharmacy today, relatively few drugs were available. In 1974, the drugs available to treat hypertension included hydrochlorothiazide, methyldopa, guanethidine, hydralazine, reserpine, and propranolol. The most common therapy for peptic ulcer disease was an antacid regimen. Psychotropics generally consisted of meprobamate, diazepam, tricyclic antidepressants, monoamine oxidase inhibitors, haloperidol, and chlorpromazine. Second-generation cephalosporins were just being marketed, and ibuprofen was relatively new.

However, colleges of pharmacy did begin to introduce therapeutics and clinical clerkships into their curricula. The doctor of pharmacy

degree, outside of California, existed only as a limited postgraduate program. One type of residency, one in hospital pharmacy, was accredited by ASHP.

Therapeutic decision-making in the hospital was simpler, though much new information about pharmacodynamics, pharmacokinetics, drug interactions, and adverse drug effects was becoming available. It was an exciting time in pharmacy, with the practice model evolving in all sites of care. Physicians more frequently called pharmacists to obtain in-depth information about drugs. The complexity of i.v. therapy was rapidly increasing, including the use of parenteral nutrition and chemotherapy regimens, prompting the beginning of some specialization in pharmacy.

### The first metamorphosis: Birth of the clinical pharmacist

At some point during those early years, I realized that I was witnessing a dramatic change in the pharmacy practice model. It was a transformation that had begun slowly, approximately 10 years earlier, with the work of Whitney Award recipient Bill Smith<sup>2</sup> at the University of

California—San Francisco, but was gaining great momentum. Increasingly, hospitals, particularly those associated with colleges of pharmacy, had some pharmacists working full-time on patient care units, attending rounds, assessing and monitoring drug therapy, and teaching pharmacy students. Hospitals also began carving out time for their pharmacists to leave central and satellite pharmacies to spend time on patient care units.

These pharmacists were making significant inroads by encouraging the rational treatment of various diseases. They were individualizing drug therapy by starting pharmacokinetic services. With the marketing of many new antibiotics and an increasing recognition of bacterial resistance, some pharmacists began to focus on infectious disease. Drug information pharmacists introduced drug-use evaluations for populations of patients. Many pharmacists began to apply cost-effectiveness into medication selection and used it to justify clinical pharmacist positions. Polypharmacy and adverse drug effects were more frequently being recognized and managed. At the University of Michigan, I observed pharmacists attending rounds with internal medicine, pediatrics, and surgical teams.

These were the beginnings of the acknowledgement that a well-trained professional was needed to manage the ever increasing complexity of drug therapy. Why did a change in location of the pharmacist, from the confines of the pharmacy to the patient care unit, make such a dramatic difference? Most likely, having the pharmacist closer to the patient and to other caregivers had been a missing essential element required to create a relationship that was both personal and mutually respectful among pharmacists, physicians, and nurses. It was this personal contact that served to establish a nascent interdisciplinary team.

Thus, as a butterfly emerges from its cocoon, more hospital pharmacists were emerging from the confines of the pharmacy to practice on the patient care unit. We were in the midst of not merely an evolution in the pharmacy practice model but a metamorphosis, the birth of the clinical pharmacist. A movement that had begun in the mid-1960s was unfolding right before my eyes and getting ready to fly.

It is important to remind ourselves why this transformation was occurring. Situations in health care change because of the people who are providing the day-to-day patient care activities, coupled with visionary leaders, who ask themselves important yet simple questions. How can what we do be made more effective, more efficient, and safer? As Joseph Oddis<sup>3</sup> stated in his 1970 Whitney Award lecture, "Pharmacy must participate, and it must do so with the realization that no single element of the profession or, indeed, any single member of the profession has a monopoly on ideas."

### The pharmacy practice model of 2009

Now fast-forward to 2009. The profession has embraced the concept of pharmaceutical care conceived by Hepler and Strand.<sup>4</sup> The number of medications available has increased logarithmically. The amount of information about a drug's mechanism of action, intended and unintended effects, is voluminous. Biotechnology, genomics, proteomics, and even nanotechnology have contributed to the increasing number of therapeutic entities and the complexity of their use. Personalized medicine is becoming a reality, not merely an idea for the future. Evidence-based medicine should more frequently drive drug therapy decisions, but the amount of data available is becoming immense. Governmental, quality, and standards-setting organizations are better defining

## Harvey A. K. Whitney Lecture Award

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Harvey A. K. Whitney (1894–1957) received his Ph.C. degree from the University of Michigan College of Pharmacy in 1923. He was appointed to the pharmacy staff of University Hospital in Ann Arbor in 1925 and was named Chief Pharmacist there in 1927. He served in that position for almost 20 years. He is credited with establishing the first hospital pharmacy internship program—now known as a residency program—at the University of Michigan in 1927.

Harvey A. K. Whitney was an editor, author, educator, practitioner, and hospital pharmacy leader. He was instrumental in developing a small group of hospital pharmacists into a subsection of the American Pharmaceutical Association and finally, in 1942, into the American Society of Hospital Pharmacists. He was the first ASHP President and cofounder, in 1943, of the *Bulletin of the ASHP*, which in 1958 became the *American Journal of Hospital Pharmacy* (now the *American Journal of Health-System Pharmacy*).

The Harvey A. K. Whitney Lecture Award was established in 1950 by the Michigan Society of Hospital Pharmacists (now the Southeastern Michigan Society of Health-System Pharmacists). Responsibility for administration of the award was accepted by ASHP in 1963; since that time, the award has been presented annually to honor outstanding contributions to the practice of hospital (now health-system) pharmacy. The Harvey A. K. Whitney Lecture Award is known as "health-system pharmacy's highest honor."

best-drug-therapy practices and core measures, are requiring data-reporting outcomes, and are linking such concepts to reimbursement.

**Pharmacy education, training, and certification.** All pharmacy schools now provide the doctor of pharmacy degree. Curricula include introductory pharmacy practice experiences and a full year of advanced practice experience. Therapeutics coursework now dominates the curriculum. In addition, wellness prevention and chronic disease management are being emphasized. Our curriculum is now an integrated plan of study, providing an in-depth knowledge of all aspects of medication use, from selecting drug therapy to achieving optimal effects. In 1974, pharmacy students were often told they were being educated to be “drug experts”; today that is closer to becoming a reality.

Postgraduate training in pharmacy has expanded to include postgraduate year 1 (PGY1) and postgraduate year 2 residencies, with the second year focused on specialization. Multiple research fellowships are also offered. Max Ray and Donald Letendre spent many years at ASHP envisioning and carefully guiding residency training forward to this point, and Janet Teeters continues to advance this work. Both ASHP and the American College of Clinical Pharmacy (ACCP) have called for all pharmacists providing direct patient care to complete, at minimum, a PGY1 residency by 2020.

The Board of Pharmaceutical Specialties certifies pharmacists in pharmacotherapy, nutrition support, oncology, psychopharmacy, nuclear pharmacy, and, soon, ambulatory pharmacy practice. Pharmacotherapy specialists can also receive advanced credentials in infectious disease and cardiology. We also have many pharmacy specialists practicing in critical care, pediatrics, primary care, organ transplantation, pain management, drug information, and emergency

medicine, to mention just a few areas of specialization. Pharmacists working in sterile-product pharmacies and informatics have evolved to the point that they might be called specialists in their own right.

Pharmacy technician certification is widely available, and formal technician training programs are growing in numbers. States have begun to adopt laws requiring technician certification and are considering minimum educational requirements. Technicians are responsible for most or all of the drug preparation and distribution activities in hospitals and community pharmacies. Several major pharmacy chains require all technicians to complete ASHP-accredited technician training programs.

**Collaborative practice.** Collaborative pharmacy practice models (a form of dependent pharmacist prescribing) have been established and now exist in at least 43 states.<sup>5</sup> Broadly, these models have given pharmacists the ability to initiate, modify, and discontinue drug therapy based on protocols developed with their physician partners. These models often include authority to order laboratory tests, conduct physical assessments, and change medications within a therapeutic class.<sup>6,7</sup> Their development started slowly but increased with dramatic speed, due in part to leaders like Janet Carmichael, who recognized the opportunity to push pharmacists forward.

Collaborative models have evolved even further in Canada and the United Kingdom. In the Canadian province of Alberta, there are three levels of collaborative models: adapting a prescription, prescribing in an emergency, and independent prescribing based on a collaborative relationship.<sup>8</sup> Two models exist in the United Kingdom: supplemental prescribing and independent prescribing across all classes of drugs in the area of the pharmacist's expertise.<sup>9,10</sup>

### **Community pharmacy practice.**

Today, in select community pharmacies, the preferred practice model includes the provision of complete pharmaceutical care, with much more patient information being available to the pharmacist. Community pharmacists now utilize pharmacy information systems, providing them with the data to better advise their patients and physician colleagues. Medication-use evaluation, outcomes assessment, and enhanced collaboration with the patient's physician occur to the extent that time and reimbursement allow. Select community pharmacists provide advanced medication therapy management services<sup>11,12</sup> and give vaccinations.<sup>13</sup> They truly work to help patients get the best outcomes from their medication therapy and are readily accessible primary health care providers. In the Asheville Project, community pharmacists demonstrated significantly improved outcomes in the management of patients with diabetes, reducing total direct medical costs.<sup>14</sup>

**Hospital and clinic pharmacy practice.** In hospitals and health systems, the practice model now includes extensive use of automation, robotics, smart infusion pumps, computerized prescriber-order-entry (CPOE) systems, bar-code-assisted medication administration, and software that can apply and retrieve information to assist in the prescribing and monitoring of drug therapy. New generations of clinical information systems are evolving to provide a complete accessible electronic medical record, integrate all care information, and apply rules-based decision-making tools. Newly and soon-to-be marketed automation puts into sight a reality where all i.v. admixtures may soon be made with little or no human manipulation.

Pharmacists now provide clinical pharmacy services hospitalwide in many institutions. They design drug therapy regimens and closely

follow patients to ensure therapeutic outcomes. They incorporate the fundamental elements of pharmacy care, including medication adherence and appropriateness and complete monitoring of drug therapy, with medication safety permeating every aspect of what they do.

While these pharmacists are caring for individual patients, the role of the drug information pharmacist has evolved to one of population-based care, including drug protocol design, drug policy design, and the effective implementation of rational drug use across populations of patients. Some of these pharmacists have migrated to the community, applying these principles to even larger populations covered by health insurers, pharmacy benefit management companies, and corporations.

Pharmacists are more frequently practicing in the ambulatory clinics of hospitals. They incorporate wellness and management of chronic disease into their practices, and some cross acute and ambulatory care boundaries, providing further continuity of care. While the groundwork laid by these practitioners is impressive, participation by pharmacists in clinics nationwide is still very limited.

Pharmacists have demonstrated that when participating on the health care team in hospitals, they can improve outcomes of care, reduce adverse drug events, reduce patients' length of stay, and reduce total health care costs. I refer you to several studies by Chester Bond and Cynthia Raehl,<sup>15-20</sup> along with a 2008 review article summarizing and evaluating the economic benefit of clinical pharmacy services in published studies.<sup>21</sup>

Our current pharmacy practice model is now quite comprehensive, evolving from the very limited one I observed in 1974. If you doubt this, travel to Columbus Regional Healthcare System in Georgia and visit the Department that Burnis Breland directs. He described his model and

vision for practice model design and change in his 2006 John W. Webb lecture.<sup>22</sup>

### **The second metamorphosis: The pharmacy generalist and the pharmacy specialist**

In comparing today's pharmacy practice model to the one I first observed, we have now evolved to the point that the activities of the person we called the clinical pharmacist in 1974 have become so commonplace that these activities are performed by all pharmacists. Thus, the 1974 clinical pharmacist who was seen as a specialist has become the pharmacy generalist of today. Furthermore, we have witnessed a second important metamorphosis of our practice model: many of today's pharmacists have emerged as pharmacy specialists. I wonder if Harvey A. K. Whitney could have foreseen the monumental changes that so many of us have witnessed in just 35 years?

What can we expect over the next 35 years as the pharmacy practice model continues to evolve? Will we see another metamorphosis? Will a greatly increased pace and volume of change cause an avalanche and bury us? They will not if we collectively embrace change, question accepted practices, and use the data available to us. As Paul Pierpaoli<sup>23</sup> suggested in his 1995 Whitney Award address, we should not be afraid to be iconoclasts, nor should we be afraid of advocating change, especially change that will lead to better medication therapy outcomes.

### **Future practice model design concepts**

So what form should our new pharmacy practice models take? No one knows for certain, but based on trends and patient care needs that now exist, I would like to offer 10 concepts we should keep in mind when designing and implementing these future models of care.

1. Health care will become increasingly interdisciplinary and team based, as will education and training. The American health care system will demand more of us.
2. Medication preparation and distribution should become more highly centralized and automated in our hospitals and in the community.
3. The vast majority of all pharmacist time should be spent providing direct patient care in all practice settings. Health information technology will provide the necessary interconnectivity.
4. A trained, certified, and potentially licensed technician work force will be responsible for additional and more complex roles in the medication-use process.
5. Increased definition and standardization of pharmacy direct care services offered for all patients is required. We must also identify additional services required for high-risk and therapeutically complex patients.
6. Allocation of health care resources will be heavily driven by metrics. New benchmarking systems, incorporating measurements of medication therapy outcomes, medication safety, and total care costs related to medication therapy, will be necessary.
7. Every patient should receive a comprehensive, multidisciplinary, accessible, and transferable pharmacotherapy plan encompassing all defined components of therapy with desired outcomes, therapeutic goals, and monitoring methodology. Primary responsibility for this should be placed with the pharmacist.
8. Expect the public to insist on additional requirements for credentialing and privileging of pharmacists in general and specialty practice areas.
9. In the community, most pharmacy care will be provided by pharmacists located in interdisciplinary ambulatory clinics of all sizes.
10. Collaborative practice will evolve to include pharmacist-independent prescribing as part of coordinated health care teams in hospitals and clinics.

### Redesigning rather than accommodating

Let me first address directions we might take to create future practice models in hospitals and health systems. We know that automation will increase at an accelerated pace along with more sophisticated robotics and clinical information systems. As these systems further evolve, they will make our medication-use systems safer and more efficient and will provide integrated information on which to base therapeutic decisions.

There are, however, two ways to utilize the new technology that is rapidly descending on us. The first is what we often do: adapt it to fit our existing models of care. The second is what we must do: change and redesign our care models to capitalize on these technological advances. In this way, we can maximize our resources rather than allow technology to absorb them. For example, by redesigning practice models with CPOE, wireless systems, electronic prescribing, and automation, we should be able to move even more pharmacists and technicians out of pharmacies to patient care units and clinics. In addition, new clinical information systems will provide a tool to document and analyze data demonstrating the pharmacy practitioner's effectiveness.

### Specifically defining the components of direct pharmacy patient care services

As Burnis Breland<sup>22</sup> stated in his 2006 Webb lecture, "The practice model should be specifically described, understood, visualized, and emphasized to pharmacy staff and others within the organization." I would add that we can no longer rely on such broad terms as *review*, *assessment*, and *monitoring* of drug therapy. The specifics of this review should be articulated and standardized.

National accrediting bodies, quality-assurance organizations, pro-

fessional associations, and standard-setting bodies are recognizing the importance of providing evidence-based health care and are defining the types of care that should be provided. For example, the Centers for Medicare and Medicaid Services (CMS) continues to add required core medication measures in select patient populations, such as those with cardiovascular, pulmonary, and infectious diseases. We also have various guidelines for treating thromboembolic disease, hypertension, and other diseases. Unfortunately, these guidelines are not universally followed. Why is this? I would argue that we have reached the point in medication therapy complexity that we need a designated professional, the pharmacist, to take ownership of it.

Yes, the care currently provided by our pharmacy generalists and specialists goes far beyond these nationally identified measures and guidelines. However, our services have not been well cataloged or universally offered to each patient. I am suggesting that we specifically define the medication therapy services necessary for each patient admitted to hospitals. This should be the first step in practice model redesign.

For example, every patient might receive a structured pharmacist-directed medication history, followed by the assessment of every medication for complete appropriateness, application of all best drug therapy practices and collaborative protocols, targeting of drugs that require enhanced attention for appropriate use, cost-effectiveness review, outcomes monitoring, patient education, and so on. Furthermore, specific services would be defined for each identified high-risk and therapeutically complex patient type, such as oncology, critical care, cardiology, and transplantation patients.

Based on these required direct patient care services, teams of our care providers and pharmacy lead-

ership can begin to design new systems and practice models, allocating resources for their consistent provision. If we do this effectively, what we now broadly call the monitoring of drug therapy will be much better defined and more firmly woven into the fabric of interdisciplinary health care.

### The medication-effectiveness dashboard and future metrics

To ensure that we have the resources to provide the pharmacy care that our patients deserve, it is critical that we also develop the appropriate metrics and measurement tools. The concepts of "balanced scorecards"<sup>24</sup> and "dashboards"<sup>25-28</sup> might be applied. I suggest that we develop a "medication-effectiveness dashboard" (MED) based on a balance of different indicators measuring the effectiveness of the entire medication-use system.

The MED should summarize sophisticated aggregate data related to pharmacy care yet be presented in a simple format. I suggest that this dashboard consist of four gauges: (1) a pharmacy personnel productivity index, (2) a medication therapy outcomes index, (3) a medication safety index, and (4) a total medication therapy cost index. Each would have a weighted score, which could be compared to other peer hospitals, and thus produce a very comprehensive picture of our effectiveness. In short, the MED is a tool that presents and quantitatively balances care efficiencies with care outcomes.

The pharmacy personnel productivity index might include relative value units for all important specific pharmacy services designated as necessary for patient care and defined in our new practice models. Clinical information systems can then be designed to document and report these services. Our existing personnel productivity measurement systems have come a long way, but

if we redesign our practice models, these measurement systems will need to be redesigned to reflect the new services provided. The new information generated and tracked could also be used to assist with scheduling and provide quantitative information to assign patient care loads to each pharmacist.

Likewise, effort should be directed to design a medication therapy outcomes index, the second gauge of this dashboard. Each of the CMS core measures related to medication therapy might be included in this index. In addition, other measures, such as the percentage of patients on defined antimicrobial regimens matching culture and sensitivity results, percentage of patients reporting effective pain management scores, and percentage of patients achieving goal glycosylated hemoglobin levels, might be included and weighted accordingly. This gauge would give us a relative quality index to complement our productivity index.

The third dashboard gauge would provide a medication safety index. Components of this index might include the number of reported adverse events causing significant patient harm (with a goal of zero), number of adverse drug events prevented or intercepted, presence or absence of important safety systems such as bar coding and CPOE, percentage of total patients provided direct pharmacy care services, and others that we believe should be standardized in all hospitals.

Finally, the fourth gauge on the MED would be a total medication therapy cost index. It would take into account not only drug costs but the total costs for treatment of types of patients heavily dependent on effective medication therapy. This would account for length of stay, adverse drug effects, and therapeutic failures. The University HealthSystem Consortium maintains a large clinical database of cost information for many

specific patient types and might serve as a source of information to help build this index. ASHP might engage more extensively in the development of these productivity and clinical database systems for the MED.

### **The comprehensive, multidisciplinary, and transferable pharmacotherapy plan**

To assume increased responsibility and accountability for medication therapy, the development of a pharmacotherapy plan<sup>29</sup> that is comprehensive, multidisciplinary, accessible, and transferable is a must. The plan should contain all desired outcomes, therapeutic goals and endpoints, timelines, and monitoring criteria. I am suggesting that this formal pharmacotherapy plan be a required module in every new clinical information system. Too often, pharmacotherapy plans are hidden, not accessible to those other than the pharmacist, or appear only in the traditional medication profile format, with additional information spread throughout the medical record. New clinical information systems that can create and present complex care plans provide an excellent opportunity to facilitate the development of a new pharmacotherapy plan. The pharmacist, in partnership with the health care team, should have the responsibility and accountability for the development and implementation of each patient's plan.

Comprehensive and visible pharmacotherapy plans should lead to a further evolution in collaborative drug therapy, including additional pharmacist prescribing. I believe that the growing trend of employing hospitalists to manage patient care will further assist in this, as the hospitalist and the pharmacist, both permanently assigned to the patient care unit, will know each other's capabilities well and rely heavily on each other. While this often occurs today, medication-use processes still remain distinctly segmented, with

the pharmacist most often checking or reviewing physician prescribing after the fact. I believe that as we move into the future, more and more of drug therapy decision-making will be done by the pharmacist in collaboration with the physician.

How can we possibly afford enough pharmacists in our hospitals to be present on all care units and still safely manage the drug distribution process? I believe that we can do so if we effectively incorporate automation, clinical information systems, and a highly trained technician work force that assumes additional and more complex activities. It will require extensive practice model redesign and effective measurement and documentation of the effect of our services. Care costs will become better controlled, and resources to provide these services will follow. Furthermore, when we have designed a more standardized approach, we will raise the level of care expected of pharmacists by both our colleague practitioners and, most importantly, our patients.

### **The next metamorphosis: Ambulatory care pharmacy**

I would like to briefly discuss future pharmacy practice models in ambulatory care. For some time now, we have seen an increasing number of pharmacists and specialists practicing in the clinics of our hospitals and health systems. These practitioners take with them the knowledge and skills that they had provided to their inpatients. They have extended the management of acute medication therapy to the management and prevention of chronic disease. Although the literature documents the value of pharmacists,<sup>21,30-36</sup> only a relatively few patients are seen by a pharmacist during their clinic visit.

I believe that the next metamorphosis in pharmacy will be seen in ambulatory care. The community pharmacists of today will become the ambulatory care pharmacists of

tomorrow. Their practice sites will be in all types of clinics—large, small, hospital based, health-system based, and independent. In addition, large ambulatory care pharmacy centers providing most of drug product dispensing, distribution, and other centralized functions will become commonplace. Bill Zellmer<sup>37</sup> addressed these thoughts in his 2005 article entitled, “Unresolved Issues in Pharmacy.”

**Facilitating ambulatory care pharmacy practice model change.** We have an important opportunity to facilitate this transformation by redesigning hospital-based clinic practice models. E-prescribing, interconnected clinical information systems, automated prescription filling, and enhanced use of technicians will assist us in moving more pharmacists from hospital outpatient pharmacies and community pharmacies into clinics. As Rita Shane<sup>38</sup> stated so well in her 1995 Webb lecture, “If we are ‘built to last,’ we will move outside the walls within which we have created the practice of pharmacy.”

In the late 1980s, Koecheler et al.<sup>39</sup> developed and tested indicators that could target ambulatory care patients who might benefit from a pharmacist’s intervention in a clinic, such as numbers and types of drugs prescribed, therapy changes, disease states, and compliance history. These indicators were applied in a study by Lobas et al.<sup>40</sup> and suggested that the provision of comprehensive pharmaceutical care in an ambulatory care clinic can reduce medication costs and improve quality of care. Ellis et al.<sup>41,42</sup> later used these indicators in the IMPROVE study and found that pharmacists can identify and resolve drug-related problems and improve care for ambulatory patients with various chronic diseases.

In designing future pharmacy clinic practice models, we should make use of the data available. New clinical information systems may help us identify patients with spe-

cific diseases, drug-related problems, polypharmacy, preventable adverse drug events, and previous suboptimal outcomes of medication therapy. A study of patient flow and processes used in clinics could then assist in determining when during the patient clinic visit the pharmacist intervention should occur and with which patients.

**The future pharmacy clinic practice model.** Consider an ambulatory care model where one of the first providers to see a patient in a clinic is the pharmacist to obtain or oversee a comprehensive medication history and assess the patient’s past response to medication. The pharmacist would have access to the complete electronic health care record and communicate with the patient’s acute care pharmacist and ambulatory care pharmacy center. The patient’s detailed pharmacotherapy plan would be prepared or updated and be electronically available for use by all practitioners throughout the visit. This pharmacist might also see the patient at the end of the visit to determine if drug therapy should be prescribed or changed in conjunction with the team, along with setting monitoring parameters.

Select patients would also receive communication from the pharmacist between clinic visits to monitor and change therapy as necessary. This communication might come from the clinic-based pharmacist or the ambulatory care pharmacy center pharmacist, as elucidated in the patient’s pharmacotherapy plan. Thus, adherence to medication therapy, detection of adverse drug events, and earlier determination of therapeutic success or failure would be facilitated.<sup>43-45</sup> The pharmacists in the clinic and in the ambulatory care center pharmacy would work as a team and jointly define their patient care responsibilities, facilitated by the common electronic clinical information system. Practice models will certainly be influenced by business plans and

reimbursement mechanisms provided by health care payers.

### Further evolution in pharmacy education, training, and certification

Earlier, I briefly described the pharmacy education and training offered in 1974 when I was a student and the dramatic changes in the curriculum today. What might our education and training look like 35 years from now? I cannot fully answer that question, but I do know that we will need to rapidly incorporate additional coursework in physical assessment, informatics, and molecular and genetic therapeutics if we are to move ahead in the directions we so desire. Harold Godwin<sup>46</sup> was prophetically aware of this when he stated the following in his 1991 Whitney address: “To meet the challenges of being responsible for optimal therapy outcomes, our practitioners are going to need more training and confidence in patient assessment techniques.” To achieve these additions to the curricula, some additional basic science courses might need to be moved from the four-year professional program to the preprofessional years, possibly prompting a need to require a four-year degree before entering pharmacy school. Several pharmacy schools already require a bachelor’s degree for entrance. Furthermore, the first two years of professional study should offer at least some combined coursework, particularly with students in medicine, to begin the process of seeding interdisciplinary care and acquainting each other with how the two professions are interdependent and work together. Finally, we should consider offering interdisciplinary advanced practice experiences in the third and fourth years of the professional experience.

Henri Manasse,<sup>47</sup> in his 2007 Whitney lecture, discussed the need for credentialing and licensure of pharmacists providing advanced practice. In its 2006 vision paper,



ACCP stated that in 20–30 years, most clinical practitioners will be board-certified specialists.<sup>48</sup>

### Conclusion

While preparing for this presentation, I read through lectures of my predecessors and realized that currents of change was an underlying theme in many of them. My distinguished colleagues recognized the importance of looking ahead and searching out all the possibilities our collective imaginations might allow. When we make ourselves ready to ride those turbulent currents, we will be better able to steer our own course and adapt to the evolutionary and metamorphic changes that come rushing in.

When I look back and compare the practice model that I observed in 1974 to the one that we have today, I am overwhelmed by the immensity and rapidity of the changes I have witnessed. We have gone from a model predominately focused on one aspect of medication use to one focused on all aspects of medication use, from prescribing to controlling effectiveness. We have come from a model with limited use of pharmacy technicians to one where trained and certified pharmacy technicians provide most aspects of drug preparation and distribution. We have come from a model of typewriters to one of robotics and sophisticated clinical information systems incorporating decision-making tools. We have come from a model where a handful of pharmacists were at the bedside to one where both pharmacy generalists and specialists are present in large numbers. We have seen the metamorphosis of the pharmacist into the clinical pharmacist, the clinical pharmacist into the pharmacy specialist, and the migration of pharmacists to ambulatory care clinics.

Who knows what might happen in the future? To push ahead, we must believe that we can accomplish even greater advances over the next

35 years. This will require significant practice model redesign in hospitals and in the community. It will require a heavier dependence on an even more highly educated and trained technician work force. It will require that our practice models be designed to fully embrace technology and enhanced interconnected information systems and not simply accommodate them. It will require a large movement of pharmacists to ambulatory care clinics, both large and small. It will require measures of productivity and outcomes achieved to justify resources in an everchanging health care system.

The future of our profession depends on our willingness to exert ourselves to achieve our full potential as pharmacists. It will take true interdisciplinary care, creativity, perseverance, and a professionwide acceptance of change.

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