As we reflect on the Mirror to Hospital Pharmacy at the 50th anniversary of its publication, there are several contemporary goals for health-system pharmacy practice that should be highlighted if an updated version of the Mirror were to be written today. These goals are critically important for the profession of pharmacy to achieve its desired impact on producing positive patient outcomes.

Effective and standard approach to the role of pharmacy technicians

The first goal would be to establish an effective and standard approach to developing the role of pharmacy technicians within the pharmacy workforce. This goal is not new. Donald Francke identified this as a critical action approximately 40 years ago.1 Clearly, pharmacy technicians have been integrated within many pharmacies as critical participants in the pharmacy work force. They are widely involved in drug distribution activities, often in an attempt to reallocate pharmacist time to activities that require clinical judgment or to facilitate pharmacist involvement in direct patient care. Technicians have also been used in a variety of nondistribution-related activities.2 Nevertheless, we still lack a standard national approach to the education, certification, and licensure of these individuals. Despite the critical and high-risk nature of technician activities, some states still permit technicians to practice with no more than on-the-job training. Particularly with the advancement of technology, the education and roles of pharmacy technicians must be clearly defined and standardized to enable optimal integration into the pharmacy practice model. Pharmacy as a profession cannot serve the public well unless technicians have adequate education and training and are driven by professional values. In order to advance as a pharmacy profession and to meet the societal needs for safe drug distribution, it is imperative that we move forward with the establishment of national standards in the education, certification, and licensure of these critical personnel. The stage has been set through vision statements that call for technicians to complete accredited training programs before taking their national certification examination.3,4 In addition, there is growing recognition of the need for advanced education and certification requirements for pharmacy technicians who practice in areas that might require specialized skills (e.g., parenteral drug preparation, chemotherapy or hazardous drug handling).

Enhanced utilization of informatics and automation

A second important goal is related to capitalizing on health informatics and automation to advance quality and safety in the use of medicines. Despite the significant investments in information systems in the United States, the anticipated benefits have not yet been realized. One of the key reasons for this is that there are significant deficiencies in the sophistication and use of these systems and in underlying clinical decision-support rules to advance quality and safety. Often, these deficiencies lead health systems to either turn off or significantly limit the clinical decision-support functionality. When such functionality is used, alerts are often ignored (commonly referred to as “alert fatigue”) due to the lack of context and sophistication in their presentation.5,6

Part of the rationale for the significant investments in electronic health records (EHRs) and related technologies was the hope that we could improve the quality and safety of medication use by rapidly analyz-

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ing and applying health information prospectively and retrospectively at both the individual patient and the population levels. Unfortunately, the abilities to easily interact with the EHR as an information resource, mine it for useful information, and present the information in a relevant and actionable form remain elusive. Despite the enormous investment in health information technology, the promise that it will enhance quality and safety while reducing costs has not yet been realized to the extent desired.7

The suboptimal performance of health informatics and technology can be attributed to several factors, including the reality that systems are neither interoperable nor easy to use, our lack of understanding about how to make digital information actionable in an efficient manner, and the failures of healthcare providers and institutions to reengineer processes to take advantage of informatics.5

In order to realize the potential of informatics and technology in the medication-use system, EHRs must be redesigned to afford providers more access and control over data. Drug information knowledge bases must present information in a manner that better accounts for the context of the individual patient situation. Furthermore, the primary causes of human errors—calculation mistakes, failed visual checks, and workflow interruptions that break concentration—a must be mitigated with a goal of zero systematic human errors. Providers must reengineer processes to take full advantage of informatics and automation, something that has been notoriously difficult to do. In addition, our profession needs to drive the development of new technology and functionality within systems to meet our practice needs. We must not allow our practice advancement and impact as a profession to be limited by the lack of adequate functionality in currently marketed information systems.

### Pharmacogenomics and personalized medicine

A third key goal is for pharmacy to develop expertise, as well as practice and leadership roles, in personalized medicine utilizing pharmacogenomic data. The amount of data on pharmacogenetic customization of drug therapy is growing exponentially. Currently, approximately 10% of Food and Drug Administration-approved medications contain labeling that refers to testing for genetic markers to help optimize patient outcomes.8 Furthermore, there are increasing examples of the usefulness of pharmacogenetic services in optimizing the selection and dosing of a variety of medications, and the amount of information that will be available in the future will undoubtedly be staggering. Pharmacists must position themselves to be key participants and leaders in organized programs that take advantage of these advances to improve the outcomes of medication use. This will require the acquisition of knowledge in pharmacogenomics, the ability to apply this knowledge in the appropriate selection of medicines—improving dosing and monitoring to achieve optimal outcomes and decrease the potential for adverse effects based on pharmacogenetic factors—and the ability to create clinical decision-support rules within our information systems in order to identify patients and scenarios in which pharmacy involvement is required.

### New organized systems of care and population health

A fourth contemporary goal that should be pursued is for pharmacists to play a leadership role in optimizing medication use within the context of population health. The healthcare system is implementing new models of care and reimbursement that incentivize better coordination of care and reward quality, safety, and cost outcomes.9 These systems necessitate breaking down the traditional barriers between inpatient and outpatient pharmacy practice and are encouraging enhanced communication between pharmacy providers in all care settings. Since medication use is a key component of care and medication-use process indicators are common metrics in the assessment of organized systems of care (e.g., patient-centered medical home) or within accountable care organizations, pharmacists will play a critical role in meeting the “triple aim” of improving the patient experience of care, improving the health of populations, and reducing the per capita cost of health care. This goal will also be enabled by advances in biosensors, point-of-care testing, electronic communications, and EHRs.

### References