Pharmacy Informatics: Current and Future Roles for the Pharmacy Technician

Journal of Pharmacy Technology
2015, Vol. 31(6) 247–252
© The Author(s) 2015
Reprints and permissions:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/8755122515605517
pharmatech.sagepub.com

Carol L. White, PharmD, BCPS, CPHIMS¹,
and Kenneth C. Hohmeier, PharmD¹

Abstract

Objective: To provide a background on pharmacy informatics and the current role of the pharmacy technician, as well as to review the different technologies that pharmacy technicians utilize in routine practice and identify opportunities for pharmacy technicians to assist pharmacists in the practice of pharmacy informatics. **Data Sources:** Articles were identified through searches of MEDLINE/PubMed (1946–March 2015) with the following search terms: pharmacy informatics and technician, medical informatics and technician, and technician informaticists. Additionally, informatics resources from the American Society of Health-Systems Pharmacists were used. **Study Selection and Data Extraction:** Articles that discussed the pharmacy technician's and/or other pharmacy staff's role in medical or pharmacy informatics were considered for inclusion. **Data Synthesis:** Several roles for the pharmacy technician were identified and reviewed in the literature and subsequently categorized based on the following identified themes: pharmacy technician informaticists, health-system pharmacy technicians, and community pharmacy technicians. **Conclusions:** As the field of pharmacy informatics continues to grow, pharmacy technicians will continue to play an integral role at various levels of pharmacy practice.

Keywords

pharmacy technician, pharmacy informatics, pharmacy technician roles

Health care is rapidly changing, and the roles that pharmacy staff play in providing care are changing as well. An underlying theme in health care's evolution is the use of computers and technology to enhance care, known collectively as "informatics." Formally, medical informatics is a "field of information science concerned with the analysis, use and dissemination of medical data and information through the application of computers to various aspects of health care and medicine."¹ As a subset of medical informatics, pharmacy informatics deals with the application of pharmacy-related health data for a variety of purposes. The American Society of Health-Systems Pharmacy (ASHP) formally defines it as "the use and integration of data, information, knowledge, technology, and automation in the medication-use process for the purpose of improving health outcomes."² In more practical terms, pharmacy informatics is the use of electronic health data to support safe and effective medication use. Pharmacy informatics can include various aspects of medication management, from a drug utilization review, to the use of barcoding technology during product dispensing, to the development of alert systems to improve prescribing and dispensing of medications. Pharmacy informatics involves broad collaboration between pharmacists, pharmacy technicians, physicians, nurses, information technology personnel, and other health care professionals.³

As opportunities in pharmacy informatics develop, so do the duties and responsibilities of pharmacists and pharmacy technicians related to its provision. Health information systems already engage pharmacists and pharmacy technicians across a variety of health care settings, including e-prescribing, computerized prescriber order entry (CPOE), electronic medical records (EMRs), electronic health records (EHRs), bar code dispensing and administration systems (BCMAS), automated dispensing cabinets (ADCs), controlled substance or prescription drug monitoring program (PDMP) databases, and immunization registries. To provide clinical, technical, regulatory, and practical oversight into health information systems, pharmacists and pharmacy technicians are being recruited to fulfill more technology-driven roles. Specialists working in these roles are referred to as clinical informatics pharmacists and pharmacy technician informaticists (PTIs).³ Whether as a PTI, or a frontline pharmacy technician involved in medication dispensing,

¹University of Tennessee Health Science Center, Nashville, TN, USA

Corresponding Author:

Kenneth C. Hohmeier, PharmD, Department of Clinical Pharmacy,
University of Tennessee Health Science Center, 193 Polk Ave, Suite 2D,
Nashville, TN 37210, USA.
Email: khohmeie@uthsc.edu

the responsibility to ensure integrity of the data entered into our computer systems is shared by each individual involved in the process.

The purpose of this article will be to provide a background on pharmacy informatics and the current role of the pharmacy technician, as well as to review the different technologies that pharmacy technicians utilize in routine practice and identify opportunities for pharmacy technicians to assist pharmacists in the practice of pharmacy informatics.

In this review, publications pertaining to pharmacy technicians and pharmacy informatics were identified through a literature search of MEDLINE/PubMed (1950-March 2015). Additionally, informatics resources from the ASHP were used.

The History of Pharmacy Informatics and the Pharmacy Technician

Among the health professions, pharmacists have always been at the forefront of integrating new technology into health care. In the late 1800s, this meant pioneering telemedicine by connecting Capital Avenue Drugstore with local area physicians via an early version of the modern telephone.⁴ With the advent of the computer in the 1960s, the profession of pharmacy again utilized new technology to enhance the way pharmacists contributed to patient care by using the computer for drug utilization studies and identification of drug-drug interactions.⁵ Shortly thereafter, the concept of medical informatics began to appear as computer systems became more prevalent in the pharmacy, and in health care in general, through the remainder of the 1960s and into the early 1970s.

The terminology and definition associated with medical informatics has changed since the concept was first developed. In the 1980s, the first formalized structural framework of medical informatics was introduced, along with the early guiding principles of the practice of medical informatics.⁶ In the 1990s, the first research relating to pharmacy informatics was published, in both inpatient and outpatient settings.⁷ As research continued, it became evident that additional training and education would be necessary to develop a workforce of pharmacists and pharmacy technicians, for informatics-based roles.

National organizations have acutely realized the importance of preparing for future roles in informatics. As recently as 10 years ago, a survey of American colleges of pharmacy found that only 33% of schools nationwide included courses in pharmacy informatics.⁷ Although that number has increased, pharmacist training and education alone will not fill the needs of this growing field. In 2011, the pharmacy technician certification board (PTCB) officially endorsed an expanded role of pharmacy technicians in pharmacy informatics.⁸ Then, most recently, ASHP released a 2014 position statement on pharmacy technicians and pharmacy

informatics, which detailed a new technician designation, the pharmacy technician informaticists.³

Pharmacy Technician Roles Interfacing With Technology

Before we consider the role of the pharmacy technician in the field of pharmacy informatics, it is important to first understand the variety of technologies that pharmacists and pharmacy technicians utilize on a routine basis within the practice of pharmacy. Such technologies are utilized to achieve goals that may be classified into 3 general categories:

- Efficacy (quality of patient outcomes)
- Efficiency (productivity of pharmacy services team)
- Safety (error prevention)

These categories can be seen throughout the various steps of the pharmacy workflow: prescription data entry, prescription dispensing and compounding, and monitoring outcomes. Although this list is not all inclusive, for the purposes of this review we will limit our discussion to the most common areas a pharmacy technician would be exposed.

Prescription Data Entry

Modern pharmacy computer systems have clinical decision support (CDS) systems, sometimes referred to colloquially as “interaction checkers,” to assist the pharmacy in identifying drug-drug interactions (DDIs). These systems are optimally used when all medications a patient is taking are present on the patient’s medication record within the computer system. During inpatient admissions, patient consultations, patient discharge, medication therapy management (MTM) sessions, and other clinical services, pharmacists and other health care providers will often collect information on patient’s drug regimens that are not captured within the computer system. However, between these visits new therapies may be missed and drug interactions may escape the CDS, leading to sometimes serious DDIs.⁹ To ensure that CDS technology produces clinically relevant alerts for the pharmacist to assess DDIs, the pharmacy technician should always ask the patient about any new prescription, over-the-counter, or herbal drug therapies started since the last time the patient presented to the pharmacy. Any medication-related changes disclosed by the patient should be communicated to the pharmacist or health care team via a note in the patient profile or alerting the pharmacist-on-duty, depending on the pharmacy’s standard operating procedures.

As compared to CDS, CPOE and electronic prescribing have been utilized in the community pharmacy now for about 20 years.¹⁰ Although CPOE and electronic prescribing are tools to improve medication order safety, both have led

Table 1. Errors by Category¹¹.

Error Type	Number of Errors (N = 486)	Percentage of Total Errors
Omitted information	283	60.7%
<ul style="list-style-type: none"> • Duration omitted • Dose omitted • Frequency omitted • Quantity omitted • Topical form omitted • Drug Enforcement Agency number omitted • Directions omitted 		
Unclear information	75	16.1%
<ul style="list-style-type: none"> • Duration unclear • Dose unclear • Quantity unclear • Incomplete drug name • Incomplete strength • Inappropriate abbreviation • Directions unclear • Take as needed as frequency 		
Conflicting information	73	15.7%
<ul style="list-style-type: none"> • Conflicting length of treatment • Conflicting directions • Frequency unclear • Dose mismatch • Route mismatch • Frequency mismatch • Quantity does not match instructions • Conflicting information 		
Clinical error	35	7.5%
<ul style="list-style-type: none"> • Duration incorrect • Overdose • Frequency incorrect • Strength incorrect • Formulation incorrect • Route incorrect • Instructions were manually corrected • Clinical error 		

to unintended, but predictable, consequences in terms of medication errors.^{10,11} A recent study found that 1 in 10 computer-generated prescriptions included one or more errors.¹¹ Table 1 details the top errors with electronic prescribing from that study. Pharmacy technicians, who often serve as the primary pharmacy staff responsible for data entry, must be able to anticipate these common errors when inputting electronic prescription orders to improve patient safety.

Prescription Dispensing and Compounding

Automation does not remove the pharmacy technician from the dispensing process, but may improve error rates, increase prescriptions filled per full-time equivalent, and

shift pharmacy staff responsibilities away from the more technical aspects of the prescription filling process.^{7,12} The use of pharmacy “robots” often integrates with pharmacy computer software, improving inventory management to ensure appropriate stock of needed medications. However, it is important to note that, despite an increase in prescription numbers filled over a period of time, overall efficiency at pharmacies where “robots” are in use has not consistently been shown to improve.¹³ This has been attributed to workflow “choke point” shifts (the slowest point in the prescription dispensing process) and the overall increased complexity introduced by the automation.

Bar coding is another form of pharmacy informatics technology seen in the community pharmacy setting. Although expensive, the implementation of barcode technology in the pharmacy has been shown to reduce overall error rates.^{14,15} However, when pharmacy technicians deviate from barcode technology protocols, or pharmacy standard operating procedures, errors have been shown likely to occur. These deviations, termed “workarounds,” are detrimental to patient safety, despite their often time-saving or labor-saving reasons for use. The top identified reasons for workarounds with barcode technology are unreadable medication barcodes, malfunctioning scanners, nonbranded medications (medications without barcodes), and emergencies.¹⁵ Pharmacy technicians working in pharmacies with barcode technology should be aware of these pitfalls and notify the pharmacist-in-charge or supervisor immediately so that appropriate informatics support staff, including PTIs, can take the necessary steps to remedy the problem. Additionally, as all pharmacies are likely to experience high-stress, high-volume periods during a work shift, the pharmacy technician must stay especially vigilant during these times, knowing that there is a propensity to take short cuts to save time, which may lead to unintended medication errors.

Monitoring Outcomes

Pharmacies and pharmacy providers are no longer solely evaluated based on the correct medications dispensed, but also on how those medications work for the patient. This concept can be best illustrated by looking at the implementation of new, federally originated patient care services. These services include MTM computer platforms and state-run registries for immunizations and controlled substances.

As part of the 2003 Medicare Modernization Act (MMA 2003), the federal government, through the Centers for Medicare and Medicaid Services (CMS), established requirements for MTM services in the Part D section of the Medicare benefit. Pharmacy-related health outcomes from these services are tracked by these platforms and reported to the Medicare Part D prescription drug plans (MPD-PDPs), which subsequently report to CMS. In order for these MPD-PDPs to achieve their federal goals, pharmacists and pharmacy

Table 2. Pharmacy-Related Medicare Star Measures.

Measure Name	Explanation
High-risk medication	Measures the percentage of plan beneficiaries who receive prescriptions for certain drugs with high risk of serious adverse effects
Diabetes treatment	Assesses appropriate hypertension treatment for patients with diabetes
Medication adherence for diabetes medications	Measures adherence (patient taking medication as prescribed at least 80% of the time) for these 3 disease states
Medication adherence for hypertension	
Medication adherence for cholesterol	

technicians must ensure every eligible MTM patient is offered an MTM consultation with a pharmacist. The role of the pharmacy technician in MTM is still evolving, and future studies are needed to determine the best practice models of pharmacist-pharmacy technician collaboration to complete MTM cases.

Federal quality measures have grown since MMA 2003. The largest, real-world example of this measurement of quality care is the Medicare Star ratings system. This system is an annual analysis and rating of Medicare plans by the federal government based on key indicators described in Table 2. As CMS continues to expect more of the pharmacist's time spent on ensuring quality of care, pharmacy technicians will need to take on more responsibility and accountability for other aspects of prescription dispensing. At the very least, the pharmacy technician should be aware of these quality measures and the policies in place at their pharmacy that address Medicare Star ratings.

Although Medicare Star ratings are federally tracked, at the state level there are other forms of measurement tracked in the form of registries. The most common state-run registries are controlled substance registries and immunization registries. The purpose of these registries is to give state health officials a more comprehensive view and understanding of state-specific population health, creating health care initiatives focused on populations needing additional interventions. Additionally, registries may be used by the pharmacy in the care of their patients. Due to the vast quantity of data transmitted to state registries every day, the task of correctly entering data into the registry is the responsibility of the health care provider administering the immunization, writing the prescription, or dispensing the medication. Thus, correct prescription order entry is vital to the integrity and utility of these registries.

Current Roles of the Pharmacy Technician in Pharmacy Informatics

Despite the recent naissance of the pharmacy technician's involvement in pharmacy informatics, and official endorsement from national pharmacy organizations, the pharmacy technician already has several important roles within pharmacy informatics—some roles simply using technologies as a means to complete daily tasks, while others use informatics as the sole focus of their responsibilities. On review of the currently published literature (MEDLINE/PubMed [1946-March 2015]) regarding articles related to pharmacy informatics and the pharmacy technician, medical informatics and the pharmacy technician, and technician informaticist, several themes emerged discussing roles of pharmacy technicians and other pharmacy support staff in pharmacy informatics. These roles vary depending on the pharmacy technician's practice setting and can be generally categorized into 3 main themes:

1. Health-system Pharmacy Technicians
2. Community Pharmacy Technicians
3. Pharmacy Technician Informaticists

Health-System Pharmacy Technicians

In the health-system environment, pharmacy technicians can serve in a variety of roles. While historically, pharmacy technicians have served in dispensing roles, new technology creates new functionality for well-trained technicians. For example, pharmacy technicians can now operate and stock ADCs, focusing on daily upkeep, while also streamlining delivery of medications within the hospital.¹⁶ In addition, pharmacy technicians can assist in BCMA utilization, by developing training, working with pharmacists to create usable reports, and creating process improvements in the bar-coding technology and how it is used within the health system.¹⁷ Another opportunity for pharmacy technicians is in the use of technology in the sterile IV room environment, particularly in settings where pharmacist oversight is needed but may be geographically challenged. For example, a pharmacy technician can prepare a sterile compound and receive oversight and final check off from the pharmacist via videoconferencing. As individuals utilizing the technology on a regular basis, the pharmacy technician may provide valuable feedback about usability and interoperability between other pharmacy systems and pharmacy-related workflows.

Community Pharmacy Technicians

The community pharmacy technician's role in utilizing technology in daily activities is unique due to the location and relative lack of formal integration of the community

pharmacy in relation to a health care system. As community pharmacies are typically physically located outside of a health system, they consequently have less interaction with other health professionals, and use different information systems. This presents a distinct opportunity to experiment with information technology systems that can bridge communication gaps and increase continuity of care. However, the technology to seamlessly link different electronic health systems in the community pharmacy setting is still in development, creating a barrier in the integration of pharmacy informatics into the community pharmacy practice. However, as described above, the community pharmacy technician plays an important role in utilizing technology to assist in the order entry, preparation, dispensing, and monitoring of medications within the community setting. As community pharmacists continue to expand clinical services, the pharmacy technician can leverage their skill set and the technology available to help maintain patient safety and improved care.

Pharmacy Technician Informaticists

In contrast with the health-system pharmacy and community pharmacy technician, the PTI is technically referred to as an informaticist. This means that their role expands beyond using technology in their daily workflow, but rather focuses on development, maintenance, and utilization of systems and databases. According to ASHP, “a specially trained pharmacy technician can assume important supportive roles in pharmacy informatics.”³ However, just as pharmacy informaticist roles continue to evolve based on the needs of the practice site and technologies and resources available, the roles that a PTI may play within an organization may vary widely from one pharmacy practice site to the next. As health care continues to integrate technologies to improve patient care, there is a great need for pharmacists to assist in the development, testing, education, and deployment of medication-related technologies. As pharmacists work to help fill that role, the need to have pharmacy technicians, with their unique knowledge base and capabilities, continues to increase. PTIs can play an important role in developing streamlined workflows, testing of technologies and reporting functionalities, and creating education specific to use of technologies by other health care providers. Under the direction of a pharmacist, a pharmacy technician may receive training and certification needed to build clinical content and maintain databases within the EMR or EHR systems, develop and run reports specific to medication management, and help create rules for CDS tools. In addition, the PTI may be involved with automation and technology systems management, focusing on efficiencies with IV room technologies, ADCs, BCMA, or infusion pumps. As a vital member of the pharmacy informatics team, the PTI may also be engaged in the creation and maintenance of

medication use safety policies and governance that relate to the health information technology available. The PTI may also be a resource for testing and maintaining billing integrity within the EMR or EHR system as well. In short, this specialty area of pharmacy technician training coincides with the growing demand for pharmacy informatics in general, and the role of the PTI will continue to expand.

Conclusion

Over the years, the definition of medical informatics has evolved to encompass many different aspects of care. As we consider the future of pharmacy informatics, we must integrate pharmacy technicians in the development of pharmacy roles. Thus, pharmacy technicians as a whole must understand the practical applications of technology at their practice site today, as well as the integration of pharmacy informatics, the history of how pharmacy informatics developed, and what their future roles will be based on current pharmacy informatics trends. Pharmacy technicians should acknowledge the prevalence and utility of technology in their daily activities and seek ways to learn more about the technology systems currently used in their practice. In addition, as pharmacist informaticists continue to further define their role on clinical and technical teams, PTIs will be needed to help support those pharmacist roles. Therefore, it will be important to encourage national pharmacy technician organizations, like PTCB, to develop an informatics-focused certification for pharmacy technicians, dedicated to helping develop PTIs with the training and certification to make them successful in a challenging technology-focused health care environment.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. National Library of Medicine. Collection development manual: medical informatics. www.nlm.nih.gov/tsd/acquisitions/cdm/subjects58.html. Accessed February 11, 2015.
2. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in informatics. *Am J Health Syst Pharm*. 2007;64:200-203.
3. Smestad NR, Trinh L, Quansah-Arku A, Gumpfer KF, Laegeler A. ASHP statement on the pharmacy technician's role in pharmacy informatics. *Am J Health Syst Pharm*. 2014;71:247-250.
4. Fox BI, Flynn AJ, Fortier CR, Clauson KA. Knowledge, skills, and resources for pharmacy informatics education. *Am J Pharm Educ*. 2011;75:1-13.

5. Keresztes JM. Role of pharmacy technicians in the development of clinical pharmacy. *Ann Pharmacother*. 2006;40:2015-2019.
6. Haux R. Medical informatics: past, present, future. *Int J Med Inform*. 2010;79:599-610.
7. Flynn AJ. The current state of pharmacy informatics education in professional programs at US colleges of pharmacy. *Am J Pharm Educ*. 2005;69:490-491.
8. Mohr ME. PTCB hosts CREST summit. *J Pharm Technol*. 2011;27:141-143.
9. Olesen C, Harbig P, Barat I, Damsgaard EM. Absence of "over-the-counter" medicinal products in on-line prescription records: a risk factor of overlooking interactions in the elderly. *Pharmacoepidemiol Drug Saf*. 2013;22:145-150.
10. Ammenwerth E, Schnell-Inderst P, Machan C, Siebert U. The effect of electronic prescribing on medication errors and adverse drug events: a systematic review. *J Am Med Inform Assoc*. 2008;15:585-600.
11. Nanji KC, Rothschild JM, Salzberg C, et al. Errors associated with outpatient computerized prescribing systems. *J Am Med Inform Assoc*. 2011;18:767-773.
12. Angelo LB, Christensen DB, Ferreri SP. Impact of community pharmacy automation on workflow, workload, and patient interaction. *J Am Pharm Assoc (2003)*. 2005;45:138-144.
13. Walsh KE, Chui MA, Kieser MA, Williams SM, Sutter SL, Sutter JG. Exploring the impact of an automated prescription-filling device on community pharmacy technician workflow. *J Am Pharm Assoc (2003)*. 2011;51:613-618.
14. Poon EG, Cina JL, Churchill WW, et al. Effect of bar-code technology on the incidence of medication dispensing errors and potential adverse drug events in a hospital pharmacy. *AMIA Annu Symp Proc*. 2005;2005:1085.
15. Koppel R, Wetterneck T, Telles JL, Karsh BT. Workarounds to barcode medication administration systems: their occurrences, causes, and threats to patient safety. *J Am Med Inform Assoc*. 2008;15:408-423.
16. Lathrop K, Lund J, Ludwig B, Rough S. Design, implementation, and evaluation of a thrice-daily cartfill process. *Am J Health Syst Pharm*. 2014;71:1112-1119.
17. Oldland AR, Golightly LK, May SK, Barber GR, Stolpman NM. Electronic inventory systems and barcode technology: impact on pharmacy technical accuracy and error liability. *Hosp Pharm*. 2015;50:31-41.