Assessing Barcode Verification System Readiness
in Community Pharmacies

FROM THE INSTITUTE FOR SAFE MEDICATION PRACTICES

ISMP
INSTITUTE FOR SAFE MEDICATION PRACTICES

Educating the healthcare community about safe medication practices

COMMUNITY PHARMACIES

Table of Contents

Photo on front cover courtesy of Kirby Lester, LLC.

Executive Summary

> Barcode scanning is to patient safety what wearing seatbelts is to passenger safety—not the only thing but certainly a salient thing.[1]
> —Mark Neuenschwander, Editor of *I've been thinking...*™

Community pharmacies face new challenges every day. Pharmacists are increasingly asked to optimize complex medication regimens and provide innovative patient care services while responding to demands for increased efficiency. Operational pressures such as increasing prescription volumes, workforce shortages, and shrinking third-party reimbursements are taking a toll on the pharmacist's ability to work efficiently and safely. Today, preventable adverse drug events are a leading cause of harm to patients.[2-3] Given these challenges, community pharmacies are seeking technological solutions to keep up with new market demands and reduce the risk of errors. Studies have shown that improvements in medication error rates, staff efficiency and utilization, inventory control, customer service, and cost may all be afforded through the use of pharmacy technology.[4-16]

Bar-coding technology is well-established in industries outside of the healthcare sector and is now being used within healthcare to enhance efficiency and safety, and in pharmaceutical wholesale operations to improve supply chain inventory and efficiency. Numerous studies prove the effectiveness and cost benefits of using bar-coding technology during the drug dispensing process.[2,4,7,9,11,12,17-21] About 75% of wrong drug or wrong dose errors are captured and corrected using barcode technology,[12,17] and there is sufficient evidence that barcode scanning is becoming the standard of practice in pharmacies.[22]

Goals of the Readiness Assessment

Increase awareness of the current issues associated with implementation of a bar-coding system for product verification

Explore readiness of community pharmacies for implementation of a barcode product verification system

Guide the selection of a vendor system to maximize value and meet pharmacy needs

Facilitate successful introduction of a barcode product verification system into the dispensing workflow in pharmacies that have made implementation of this technology a short- or long-term goal

Although bar-coding technology is mature with abundant evidence regarding its effectiveness, a 2006 study showed that only half (53.5%) of US community pharmacies utilize a barcode scanner for verification/identification of medications.[16] The study also revealed significantly lower adoption in independent pharmacies (11.5%) compared to chain pharmacies (62.6%). Yet, on average, independent pharmacies process more prescriptions per hour than chain pharmacies, increasing vulnerability to errors.[16]

According to a survey conducted by the Institute for Safe Medication Practices (ISMP) in 2009,[23] the most frequently reported reasons for implementing barcode scanning for product verification included a desire to improve the accuracy and safety of the dispensing process, the ease with which the technology fit with pharmacy workflow, improvement of staff efficiency and inventory control, and a belief that the technology was necessary to stay in business.[24] The most common reasons for **NOT** implementing barcode scanning for product verification—other than cost—included uncertainty regarding the 'right' vendor product, satisfaction with the current system (without barcode product verification), and perceptions that the technology would reduce staff efficiency.[24]

This tool, **Assessing Barcode Verification System Readiness in Community Pharmacies**, was developed to help address the reasons why barcode scanning has not been implemented and to facilitate the adoption of this technology in an estimated 19,000 community pharmacies that do not currently utilize it for product verification. Given the resource commitment to purchase bar-coding systems and the potential for technology to have a profound effect upon the work environment, this tool will help community pharmacy leaders better understand the issues related to barcode product verification systems. It will also help leaders assess the pharmacy's readiness for the technology, prepare for the selection of a system, and implement the technology effectively. The assessment tool will serve as a conduit to building a solid foundation upon which to install the technology.

Please see **Appendix B, Putting Bar-coding Technology into Context** for additional information. Keep in mind that this tool does not include specific tasks associated with the implementation of a barcode product verification system; however, **Appendix C, Elements to Consider during Vendor Selection** should be reviewed before purchase and implementation. ■

COMMUNITY PHARMACIES

in

Instructions for Conducting the Readiness Assessment

▷ Important Details about the Assessment Tool

> This readiness assessment has been designed to be used in any community pharmacy practice, regardless of the number of stores in the organization or staff employed. When reading the instructions for use, choose the format, teams, and individuals that makes the most sense for your pharmacy organization.

There are **two sections** to the readiness assessment: one for the **Pharmacy Leadership/Owner** and one for **Pharmacy Staff**. One **Pharmacy Leadership/Owner** assessment will be completed by each pharmacy organization. One or more **Pharmacy Staff** assessments will be completed, depending on the number of stores owned by the pharmacy organization and selected for participation. The **Pharmacy Leadership/Owner** assessment will be linked to the **Pharmacy Staff** assessment(s).

The items in the **Pharmacy Staff** assessment are the same or related to the items in the **Pharmacy Leadership/Owner** assessment, although the latter tool for pharmacy leaders includes additional items that are not on the **Pharmacy Staff** assessment.

Each assessment has items that fall into one of two categories:

Prerequisites: These are items that *should be in place* before attempting to implement a barcode product verification system.
Facilitators: These items *are not required but would make it easier* to implement a barcode product verification system. ▪

▷ **Directions for Using the Readiness Assessment Tool**
(Directions for **Entering Data and Generating Reports** can be found in **Appendix A**.)

❶ Select the Leadership/Owner assessment team.

Appoint a team to complete the **Pharmacy Leadership/Owner** assessment. The team should include key leadership staff who help design work processes and make business decisions for the pharmacy, such as:

○ Corporate leadership or the pharmacy owner   ○ Director of pharmacy services
○ Non-clinical information technology representative ○ Clinical informatics representative
○ Regional field managers/supervisors   ○ Risk management/quality/safety representative.

In an independent pharmacy, the owner may serve alone as the only member of the **Pharmacy Leadership/Owner** assessment team.

The **Leadership/Owner** team can expect to spend about 2 hours to complete the assessment.

❷ Select the frontline pharmacy staff from stores that will be participating in the assessment.

ⓐ **For individual pharmacies**, only one store will complete the assessment.

ⓑ **For independent or chain pharmacy organizations with multiple stores**, one or more stores will complete the assessment. Large chain organizations may want just a sampling of stores to complete the **Pharmacy Staff** assessment. This tool allows users to link the results of the **Pharmacy Leadership/Owner** assessment to **Pharmacy Staff** assessment(s) for up to 50 stores.

Instructions for Conducting the Readiness Assessment

For each individual participating store, the **Pharmacy Leadership/Owner** should appoint an assessment team—or one or two highly motivated **Pharmacy Staff** from selected stores if this is more practical—to complete the **Pharmacy Staff** assessment. The team(s) or individual(s) completing the **Pharmacy Staff** assessment should have first-hand knowledge of the pharmacy dispensing process and workflow in their store, and a clear understanding regarding the responsibilities of staff pharmacists and pharmacy associates.

Each **Pharmacy Staff** assessment will take approximately 1½ hours to complete.

❸ Prepare for the assessment.

Have each individual participating in the assessment read and review the applicable assessment tool in its entirety before beginning the assessment process. The **Pharmacy Leadership/Owner** should ensure that the **Pharmacy Staff** team(s) or individual(s) understand that their input is needed and valued to help guide leadership decisions associated with the purchase and implementation of a bar-coding system.

❹ Complete the Pharmacy Leadership/Owner assessment and the Pharmacy Staff assessment(s).

Consider each item in the readiness assessment and evaluate the pharmacy's success with implementing it. As necessary, investigate and verify the level of implementation with other staff. When a consensus or decision on the level of implementation for each item has been reached, place a check mark in the appropriate column using the following scoring key:

Key

① There has been **no activity** to implement this characteristic in the pharmacy/pharmacy organization or for any patients, prescriptions, drugs, or staff.

② This characteristic has been **discussed for possible implementation** in the pharmacy/pharmacy organization, but is not implemented at this time.

③ This characteristic has been **partially implemented** in the pharmacy/pharmacy organization for **some or all** patients, prescriptions, drugs, or staff.

④ This characteristic has been **fully implemented** in the pharmacy/pharmacy organization for **some** patients, prescriptions, drugs, or staff.

⑤ This characteristic has been **fully implemented** in the pharmacy for **all** patients, prescriptions, drugs, or staff.

❺ Enter your findings anonymously via the Internet and generate a report.

Go to www.ismp.org/AHRQ/barcode to enter the assessment findings into a secure, anonymous database. Once the data have been entered, a report can be generated which will identify strengths (items scored 4-5) and weaknesses (items scored 1-3) related to the organization's readiness for implementing a barcode product verification system. See **Appendix A** for detailed instructions on data submission and generating reports.

❻ Develop and execute an action plan to address assessment findings.

Form an improvement team, including representatives who participated in the **Leadership/Owner** and **Pharmacy Staff** assessments, to analyze the results, identify the organization's strengths and weaknesses, and develop an action plan to improve the organization's readiness for implementing a barcode product verification system. Discrepancies between leadership and staff assessments should be addressed in the action plan. Place higher priority on addressing items that are considered a **Prerequisite** (see page 3 for the definition of a **Prerequisite**). Execute the action plan and evaluate the organization's progress. ◼

in

Readiness Assessment for Pharmacy Leadership/Owner

▷ Demographics

About your assessment team

❶ Please indicate the number and type of individuals who participated in completing this **Pharmacy Leadership/Owner** section of the assessment tool.

Corporate Leadership/Pharmacy Owner _____
(number)

Director of pharmacy services _____
(number)

Regional field managers/supervisors _____
(number)

Clinical informatics representative _____
(number)

Non-clinical information technology representative _____
(number)

Risk management/quality/safety representative _____
(number)

Other:_____   _____
(type of individuals)   (number)

About your pharmacy organization

❷ Please check the one category that best describes this type of pharmacy organization.

☐ Independent pharmacy   ☐ Traditional chain pharmacy
☐ Mass merchant chain pharmacy ☐ Supermarket chain pharmacy
☐ Hospital outpatient pharmacy ☐ Long-term care pharmacy
☐ HMO Pharmacy   ☐ Mail order pharmacy   ☐ Other: _____

❸ Please check the appropriate box indicating the total number of stores in your pharmacy organization.

☐ 1   ☐ 2 to 5   ☐ 6 to 9   ☐ 10 to 49
☐ 50 to 99   ☐ 100 to 499   ☐ 500 to 999   ☐ 1,000 or more

❹ Please check the one category that best describes the type of ownership of this pharmacy organization.

☐ Privately owned, for-profit   ☐ Investor-owned, for-profit
☐ Institution owned, nonprofit   ☐ State or local government owned
☐ Military   ☐ Veterans Affairs
☐ US Public Health Service   ☐ Other: _____

Readiness Assessment for Pharmacy Leadership/Owner

▷ Readiness Assessment Tool

I. Environmental Factors

Environmental factors, such as poor lighting, cluttered work spaces, noise, interruptions, and non-stop activity contribute to medication errors when healthcare providers are unable to remain focused on the medication use process. Staffing pattern deficiencies, excessive workload, and complex work processes also contribute to a broad range of errors. In addition, building an infrastructure into the environment that supports advances in technology presents unique challenges to healthcare organizations today.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
Technology Environment								
1	F	The pharmacy has successful experience with integrating/ interfacing information system technologies.						
2	F	Barcode technology is available and already used for various functions in the pharmacy (e.g., point of sale, reordering stock).						
3	F	A network to support information transfer via radio frequency is available in the pharmacy.						
4	P	Information systems are protected with security and access control systems.						
5	P	An information system back-up process has been prepared in case of a technology failure.						
6	P	Recovery and back-up plans associated with technology failures are regularly tested in the pharmacy or pharmacies.						
7	P	Resource allocation plans for a barcode product verification system have factored in the costs associated with hardware and software requirements (including interface costs), and staffing resources needed to maintain the system.						
Physical Environment								
8	P	Consideration has been given to where to place computer terminals, docking stations, battery chargers, and other equipment associated with a barcode verification system in a manner that best supports the natural workflow of the dispensing process.						
9	P	There is adequate space in the production section of the pharmacy for computer terminals and other hardware associated with a barcode verification system.						
10	P	There is adequate space in the prescription verification section of the pharmacy for computer terminals and other hardware associated with a barcode verification system.						
11	P	There are sufficient electrical outlets in the pharmacy for charging and operating the equipment associated with a barcode verification system.						
12	P	Resource allocation plans for a barcode product verification system have factored in costs associated with changes needed in the physical environment.						
Workflow								
13	P	The processes associated with medication dispensing have been thoroughly examined through flowcharting or process mapping to promote detailed understanding of staff needs and the current workflow.						

Readiness Assessment for Pharmacy Leadership/Owner

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite:
Item should be in place before implementing bar-coding

Facilitator:
Item not required but would make it easier to implement bar-coding

I. Environmental Factors (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Workflow (continued)						
14	F	Pharmacists and pharmacy associates consistently follow existing processes for medication dispensing. *(Variations in the way prescriptions are filled, checked, and dispensed make the application of technology difficult.)*						
15	F	The impact of a barcode product verification system on time requirements, work rhythm, and job responsibilities has been evaluated by comparing a flowchart of the hypothetical dispensing process with the technology against a flowchart of the current dispensing process without the technology.						
16	P	A process has been established to make staff aware of the targeted timeline for installation of the barcode product verification system so that interruptions can be anticipated and managed.						

II. Drug Labeling, Packaging, and Nomenclature

To facilitate proper selection of medications during the dispensing process, pharmacies should ensure that all products are available in clearly labeled packages and take steps to prevent errors with look-alike and sound-alike drug names, ambiguous drug packaging, and confusing or absent drug labels.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
17	F	Wholesaler price labels on commercial products do not hide the container's barcode or portions thereof, or any other vital label information.						
18	P	Standard operating procedures ensure that auxiliary or warning labels on packages do not hide the container's barcode or portions thereof, or any other vital label information.						
19	P	Standard operating procedures ensure that the "X" used to mark open stock bottles does not cross over the manufacturer's barcode.						
20	P	The capacity to place a bar-coded label on return-to-stock items has been anticipated, and standard operating procedures for carrying out this process have been developed in accordance with applicable state pharmacy regulations.						
21	P	Procedures have been developed to test the barcode on packages from new manufacturers or for new products to ensure it is scannable and accurate.						
22	P	Procedures have been identified to address situations when commercial products arrive in the pharmacy with no barcode or have a barcode that cannot be scanned.						
23	P	Procedures have been identified to ensure accurate scanning of National Drug Code (NDC) numbers when the manufacturer does not utilize leading zeros in the NDC number on the stock label. (*A barcode system cannot directly match the pharmacy label barcode and the manufacturer's barcode if one includes leading zeros and the other does not.*)						

Readiness Assessment for Pharmacy Leadership/Owner

in

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite: Item should be in place before implementing bar-coding

Facilitator: Item not required but would make it easier to implement bar-coding

II. Drug Labeling, Packaging, and Nomenclature (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
24	F	A method has been developed to add pharmacy-compounded drug products to the drug file so that a scannable barcode on the label can be generated.						
25	P	Label printers have the capacity to produce a high-resolution barcode (C or better ANSI [American National Standards Institute] standard) on prescription labels, drug monographs, and the patients' receipts.						

III. Drug Information

To minimize the risk of errors, up-to-date drug information must be readily accessible to pharmacy staff through references and computerized drug information systems.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
26	P	Drug information updates, including NDC numbers and product images, for pharmacy computer systems are received from a database vendor and loaded at least once each quarter (every 3 months).						
27	P	Medications listed in the pharmacy computer system database include the NDC for prescription drug products (or another unique code useful in the scanning process) and the Universal Product Code (UPC) for over-the-counter products.						

IV. Staff Competency and Education

Education can play an important role when combined with system-based error-reduction strategies. However, activities with the highest leverage include ongoing assessment of healthcare providers' baseline competencies and education about new medications, non-formulary medications, new technologies related to medication use, high-alert drugs, and medication-error prevention strategies.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
28	F	The periodic use of pharmacy agency staff or per diem staff who have little or no orientation to the pharmacy systems, technology, processes, and workflow is minimized.						
29	P	In the past year, educational programs and interactive discussions have been held with pharmacy staff about the value of barcode product verification systems.						
30	P	In the past year, educational programs and interactive discussions have been held with pharmacy supervisors/leaders about the value of barcode product verification systems.						

Readiness Assessment for Pharmacy Leadership/Owner

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite:
Item should be in place before implementing bar-coding

Facilitator:
Item not required but would make it easier to implement bar-coding

IV. Staff Competency and Education (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
31	P	Capabilities have been assessed regarding the organization's ability to provide educational programs and hold interactive discussions with all potential users of the barcode system to be installed later, including float per diem staff.						
32	P	In the past year, interactive discussions have been held with frontline pharmacy staff about potential anxieties and job dissatisfaction related to the use of barcode technology, in order to reduce the risk of circumventing or ignoring the technology. (*Examples include anxieties and job dissatisfaction related to loss of control over aspects of the job that were previously important to professional staff, degradation of clinical skills that are replaced by technology, the impact of technology on the professional staff's work life, suspicions about technological capabilities, concern about potential tracking of individual medication error rates, untoward use of tracking data, and unchecked optimism and complacency due to overreliance on technology.*)						
33	P	Qualified pharmacy or corporate personnel are available for ongoing staff training and support once the barcode system is up and running.						
34	P	Resource allocation plans for a barcode verification system have factored in the costs associated with training professional staff to use the system (including indirect costs associated with staff replacement during training).						

V. Culture, Quality Improvement, and Risk Management Processes

Pharmacies need strong leadership, planning, and collaboration to improve medication safety. They need systems for identifying, reporting, analyzing, and reducing the risk of medication errors. A culture of safety must be cultivated to encourage frank disclosure of errors and near misses, stimulate productive discussions, and identify effective system-based solutions. Strategically placed quality control checks also are necessary. Simple redundancies that support a system of independent double checks for high-risk, error-prone processes promote the detection and correction of errors before they reach and harm patients.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Leadership and Planning						
35	P	Pharmacy leadership/owners are committed to expanding use of proven technologies to improve medication safety.						
36	P	A barcode product verification system fits well into the corporate/ independent pharmacy's overall clinical information system planning strategy.						
37	P	The desired goals associated with a barcode product verification system (e.g., targeted safety improvements, financial gains, productivity impacts, how the technology will be used to enhance the organization's mission and maintain its values) have been defined (and agreed upon in corporate entities) and clearly articu-lated by pharmacy leadership/owners to pharmacy staff.						

Readiness Assessment for Pharmacy Leadership/Owner

V. Culture, Quality Improvement, and Risk Management Processes (continued)

COMMUNITY PHARMACIES

in

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite: Item should be in place before implementing bar-coding

Facilitator: Item not required but would make it easier to implement bar-coding

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Leadership and Planning (continued)						
38	P	Pharmacy leadership/owners are committed to allocating the resources necessary to implement a barcode product verification system.						
39	F	Pharmacy leadership/owners have taken steps to ensure that the implementation of barcode verification technology will not create problems with labor regulations or concerns if job responsibilities change.						
40	P	Pharmacy leadership/owners have involved a representative sample of frontline pharmacists and pharmacy associates (e.g., technicians) in initial discussions and planning meetings to solicit input regarding how the technology will affect pharmacy workflow.						
41	P	Criteria for evaluating potential vendors' stability, experience, service, and specific technological characteristics for a barcode product verification system have been compiled (see **Appendix C, Elements to Consider During Vendor Selection**).						
42	P	A core team comprising frontline staff, managers, clinical information technology expert, risk manager (if applicable), and corporate leaders/owner has been identified to make recommendations regarding vendor selection, clinical support requirements, and technology requirements.						
43	P	The core team plans to visit other pharmacies currently using the barcode product verification systems under consideration.						
44	P	The core team has authority to set timelines, define specifications and processes, and work closely with the users of the barcode product verification system to elicit feedback and remedy technology and workflow issues.						
45	F	Pharmacy leadership/owner(s) has assigned at least one staff member responsibility to seek out and communicate information about barcode verification systems' problems from external sources (e.g., medical literature) that might affect proper use of the barcode product verification technology.						
46	P	Resource allocation plans for a barcode product verification system have factored in the costs associated with staff time spent on the core team charged with facilitating implementation of the technology.						
		Culture						
47	P	Pharmacy leadership/owners demonstrate a commitment to patient safety by creating a safe environment for pharmacy staff to report risks and errors and by encouraging staff to report errors and safety concerns, including those related to technology.						

2011 © Institute for Safe Medication Practices

Readiness Assessment for Pharmacy Leadership/Owner

V. Culture, Quality Improvement, and Risk Management Processes (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Culture (continued)						
48	F	Reportable events include hazardous situations that *could* lead to an error as well as actual errors, including those that have been detected and corrected before they reach a patient.						
49	F	Pharmacy staff report and openly discuss errors without undue embarrassment or fear of reprisal from peers and managers/ leadership/owners.						
50	P	Pharmacy staff feel comfortable reporting and frankly discussing any barriers they encounter to following existing processes (standard operating procedures) related to medication dispensing.						
51	P	Data related to medication errors are not used by managers/ leadership/owners as a measure of employee competence or vigilance during performance evaluations. (*Score 1 if errors are used to measure competence or vigilance during performance evaluations; score 5 if errors are never used for this purpose.*)						
52	F	Discussions have been held with frontline pharmacists and associated staff to prepare them for increased error detection capabilities with barcode product verification systems, in order to prevent defensive attitudes when the data are available and reviewed.						
		Feedback Mechanisms						
53	F	A process has been established to utilize focus groups of frontline staff for "off the record" discussions to learn about perceived problems with the dispensing process.						
54	F	A system is in place to review error reports and feedback for quality improvement purposes.						
55	F	Effective mechanisms are in place to provide regular, meaningful reports to pharmacy staff about progress with medication safety objectives.						
56	F	Effective mechanisms are in place to provide regular, meaningful reports to pharmacy leadership/owner/managers about progress with medication safety objectives.						
57	F	Medication safety objectives are celebrated and widely communicated when met.						
		Using Data to Improve Medication Safety						
58	P	Pharmacy leadership/owners demonstrate strong interest in being able to intercept potential errors before they reach patients.						
59	P	Time and resources have been allocated to analyze and use averted errors data generated by the barcode technology for system enhancements and other improvements.						

Readiness Assessment for Pharmacy Staff

COMMUNITY PHARMACIES

in

▷ Demographics

About your assessment team

❶ Please indicate the number and type of individuals from your specific location/site who participated in completing this **Pharmacy Staff** section of the assessment tool.

Pharmacy associate (technician) _____
(number)

Staff pharmacist _____
(number)

Pharmacy manager _____
(number)

Other:_____   _____
(type of individuals)   (number)

About your pharmacy

❷ Please check the one category that best describes your type of pharmacy.

☐ Independent pharmacy-single store   ☐ Hospital outpatient pharmacy
☐ Independent pharmacy-one of multiple stores   ☐ Long-term care pharmacy
☐ Traditional chain pharmacy-one of multiple stores   ☐ HMO Pharmacy
☐ Mass merchant chain pharmacy-one of multiple stores   ☐ Mail order pharmacy
☐ Supermarket chain pharmacy-one of multiple stores   ☐ Other: _____

❸ Please check the one category that best describes the type of ownership of your pharmacy.

☐ Privately owned, for-profit   ☐ Investor-owned, for-profit
☐ Institution owned, nonprofit   ☐ State or local government owned
☐ Military   ☐ Veterans Affairs
☐ US Public Health Service   ☐ Other: _____

❹ What is the approximate number of prescriptions dispensed **PER WEEK** in your pharmacy?

☐ 700 or fewer (per week)   ☐ 701 to 1,500 (per week)
☐ 1,501 to 3,000 (per week)   ☐ 3,001 to 6,000 (per week)
☐ 6,001 to 12,000 (per week)   ☐ 12,001 or more (per week)

❺ Please check the one category that best describes the location of your pharmacy.

☐ Urban   ☐ Suburban   ☐ Rural

About your staff

❻ For each category below, please indicate the number of FTEs (Full Time Equivalents) working at your specific location/site where the assessment is being completed. (1 FTE represents 2080 hours of worked time per year. If a person works 16 hours every week, they work 832 hours per year which equals 0.4 FTEs.)

Pharmacist (staff) _____
Pharmacist (manager or owner) _____
Pharmacy technician _____
Pharmacy student _____

Readiness Assessment for Pharmacy Staff

▷ Readiness Assessment Tool

I. Environmental Factors

Environmental factors, such as poor lighting, cluttered work spaces, noise, interruptions, and non-stop activity contribute to medication errors when healthcare providers are unable to remain focused on the medication use process. Staffing pattern deficiencies, excessive workload, and complex work processes also contribute to a broad range of errors. In addition, building an infrastructure into the environment that supports advances in technology presents unique challenges to healthcare organizations today.

COMMUNITY PHARMACIES

in

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite: Item should be in place before implementing bar-coding

Facilitator: Item not required but would make it easier to implement bar-coding

2011© Institute for Safe Medication Practices

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Technology Environment						
60	F	The pharmacy has successful experience with integrating/interfacing information system technologies.						
61	F	Barcode technology is available and already used for various functions in the pharmacy (e.g., point of sale, reordering stock).						
62	P	Information systems are protected with security and access control systems.						
63	P	Recovery and back-up plans associated with technology failures (e.g., computer system down, Internet service interrupted, connection to third-party-payor system interrupted) are known to staff who may encounter a technology failure.						
		Physical Environment						
64	P	Consideration has been given to where to place computer terminals, docking stations, battery chargers, and other equipment associated with a barcode verification system in a manner that best supports the natural workflow of the dispensing process.						
65	P	There is adequate space in the production section of the pharmacy for computer terminals and other hardware associated with a barcode verification system.						
66	P	There is adequate space in the prescription verification section of the pharmacy for computer terminals and other hardware associated with a barcode verification system.						
67	P	There are sufficient electrical outlets in the pharmacy for charging and operating the equipment associated with a barcode verification system.						
		Workflow						
68	P	The processes associated with medication dispensing have been thoroughly examined through flowcharting or process mapping to promote detailed understanding of staff needs and the current workflow.						
69	F	Pharmacists and pharmacy associates consistently follow existing processes for medication dispensing. *(Variations in the way prescriptions are filled, checked, and dispensed make the application of technology difficult.)*						
70	F	The impact of a barcode product verification system on time requirements, work rhythm, and job responsibilities has been evaluated by comparing a flowchart of the hypothetical dispensing process with the technology against a flowchart of the current dispensing process without the technology.						
71	P	Staff have been made aware of the targeted timeline for installation of a barcode product verification system.						

Readiness Assessment for Pharmacy Staff

II. Drug Labeling, Packaging, and Nomenclature

To facilitate proper selection of medications during the dispensing process, pharmacies should ensure that all products are available in clearly labeled packages and take steps to prevent errors with look-alike and sound-alike drug names, ambiguous drug packaging, and confusing or absent drug labels.

Item #	Prerequisite/Facilitator	Element	①	②	③	④	⑤	NA
72	F	Wholesaler price labels on commercial products do not hide the container's barcode or portions thereof, or any other vital label information.						
73	P	Auxiliary or warning labels on packages do not hide the container's barcode or portions thereof, or any other vital label information.						
74	P	The "X" used to mark open stock bottles does not cross over the manufacturer's barcode.						
75	F	All pharmacy-compounded drug products are in the drug file (which allows the possibility of generating a scannable barcode).						
76	P	Label printers have the capacity to produce a high-quality barcode on prescription labels, drug monographs, and the patients' receipts.						

III. Drug Information

To minimize the risk of errors, up-to-date drug information must be readily accessible to pharmacy staff through references and computerized drug information systems.

Item #	Prerequisite/Facilitator	Element	①	②	③	④	⑤	NA
77	P	Drug information updates, including National Drug Code (NDC) numbers and product images, for pharmacy computer systems are received from a database vendor and loaded at least once each quarter (every 3 months).						
78	P	Medications listed in the pharmacy computer system database include the NDC for prescription drug products (or another unique code useful in the scanning process) and the Universal Product Code (UPC) for over-the-counter products.						

IV. Staff Competency and Education

Education can play an important role when combined with system-based error-reduction strategies. However, activities with the highest leverage include ongoing assessment of healthcare providers' baseline competencies and education about new medications, non-formulary medications, new technologies related to medication use, high-alert drugs, and medication-error prevention strategies.

Item #	Prerequisite/Facilitator	Element	①	②	③	④	⑤	NA
79	F	The periodic use of pharmacy agency staff or per diem staff who have little or no orientation to the pharmacy systems, technology, processes, and workflow is minimized.						
80	P	In the past year, educational programs and interactive discussions have been held with pharmacy staff about the value of barcode product verification systems.						

Readiness Assessment for Pharmacy Staff

IV. Staff Competency and Education (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
81	P	In the past year, interactive discussions have been held with front-line pharmacy staff about potential anxieties and job dissatisfaction related to the use of barcode technology, in order to reduce the risk of circumventing or ignoring the technology. *(Examples include anxieties and job dissatisfaction related to loss of control over aspects of the job that were previously important to professional staff, degradation of professional staff's skills that are replaced by technology, the impact of technology on the professional staff's work life, suspicions about technological capabilities, concern about potential tracking of individual medication error rates, untoward use of tracking data, and unchecked optimism and complacency due to overreliance on technology.)*						

V. Culture, Quality Improvement, and Risk Management Processes

Pharmacies need strong leadership, planning, and collaboration to improve medication safety. They need systems for identifying, reporting, analyzing, and reducing the risk of medication errors. A culture of safety must be cultivated to encourage frank disclosure of errors and near misses, stimulate productive discussions, and identify effective system based solutions. Strategically placed quality control checks also are necessary. Simple redundancies that support a system of independent double checks for high-risk, error-prone processes promote the detection and correction of errors before they reach and harm patients.

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Leadership and Planning						
82	P	The desired goals associated with a barcode product verification system (e.g., targeted safety improvements, financial gains, productivity impacts, how the technology will be used to enhance the organization's mission and maintain its values) have been clearly communicated by pharmacy leadership/owners to pharmacy staff.						
83	F	Pharmacy leadership/owners typically involve a representative sample of frontline pharmacists and pharmacy associates (e.g., technicians) in initial discussions and planning meetings regarding new technology to solicit input regarding how it will affect pharmacy workflow.						
84	P	Pharmacy leadership/owners demonstrate a commitment to patient safety by creating a safe environment for pharmacy staff to report risks and errors and by encouraging staff to report errors and safety concerns, including those related to technology.						

Readiness Assessment for Pharmacy Staff

① No activity

② Possible Implementation

③ Partially Implemented

④ Fully Implemented *Some*

⑤ Fully Implemented *All*

Prerequisite: Item should be in place before implementing bar-coding

Facilitator: Item not required but would make it easier to implement bar-coding

V. Culture, Quality Improvement, and Risk Management Processes (continued)

Item #	Prerequisite/ Facilitator	Element	①	②	③	④	⑤	NA
		Culture						
85	F	Reportable events include hazardous situations that *could* lead to an error as well as actual errors, including those that have been detected and corrected before they reach a patient.						
86	F	Pharmacy staff report and openly discuss errors without undue embarrassment or fear of reprisal from peers and managers/leadership/owners.						
87	P	Pharmacy staff feel comfortable reporting and frankly discussing any barriers they encounter to following existing processes (standard operating procedures) related to medication dispensing.						
88	P	Data related to medication errors are not used by managers/leadership/owners as a measure of employee competence or vigilance during performance evaluations. *(Score 1 if errors are used to measure competence or vigilance during performance evaluations; score 5 if errors are never used for this purpose.)*						
89	F	Discussions have been held with frontline pharmacists and associated staff to prepare them for increased error detection capabilities with barcode product verification systems, in order to prevent defensive attitudes when the data are available and reviewed.						
		Feedback Mechanisms						
90	F	Leadership/owner or designee periodically holds focus groups with frontline staff for "off the record" discussions to learn about perceived problems with the dispensing process.						
91	F	A system is in place to review error reports and feedback for quality improvement purposes.						
92	F	Meaningful reports are regularly provided to pharmacy staff about progress with medication safety objectives.						
93	F	Medication safety objectives are celebrated and widely communicated when met.						
		Using Data to Improve Medication Safety						
94	P	Pharmacy leadership/owners demonstrate strong interest in being able to intercept potential errors before they reach patients.						

Appendix A

COMMUNITY PHARMACIES

in

2011 © Institute for Safe Medication Practices

⊳ Directions for Entering Data and Generating Passcodes and Reports

Pharmacy organizations can enter the results of their completed readiness assessments using our secure web-based survey form, available on the ISMP website (www.ismp.org/AHRQ/barcode). ISMP will **NOT** be able to identify pharmacies that have submitted data, as the PASSCODES used for data entry (see below) will be generated by the web-based program and provided only to the pharmacy organization. The site can be accessed from any computer with Internet capability. The web-based survey form is a large file and may take a few minutes to access. The detailed instructions for entering the data that follow below are also available on the website and can be printed for reference before or during the data entry process.

❶ Set up a USER ID and obtain PASSCODES.

Once the assessment website (www.ismp.org/AHRQ/barcode) has been accessed, one member of the **Pharmacy Leadership/Owner** assessment team (or designee) initially will be asked to set up a USER ID and password. Please record the USER ID and password, and keep it in a safe place. The USER ID and password will allow the **Pharmacy Leadership/Owner** team to view progress with the assessment and the assessment report. Forgotten USER IDs and passwords can be sent to the **Pharmacy Leader/Owner** via email.

Once the USER ID has been established, the **Pharmacy Leadership/Owner** will be asked how many leadership/owner teams and individual pharmacies will be participating in or have completed the assessment. Once the numbers have been entered, a unique PASSCODE will be issued for the leadership/owner team and each of the participating stores. These PASSCODES will be used to enter the assessment results into the secure database and link the findings together. **ISMP will not be able to trace these PASSCODES back to identify a particular pharmacy or pharmacy organization.** The **Pharmacy Leadership/Owner** will be able to view a list of all the PASSCODES issued when logging in to the database.

❷ Distribute the USER ID and PASSCODES.

Provide the **Pharmacy Leadership/Owner** assessment team with the assigned PASSCODE. Provide each participating **Pharmacy Staff** assessment team or individual(s) with one of the assigned PASSCODES.

❸ Enter the assessment findings.

Have one representative from the **Pharmacy Leadership/Owner** assessment team and one representative from each **Pharmacy Staff** assessment team or individuals enter their findings into the database after logging in (www.ismp.org/AHRQ/barcode, then click on the designated hyperlink) and entering the asssigned PASSCODE. The special, web-based survey tool will immediately download the information into a secure database maintained solely by ISMP. Findings for each completed assessment should be entered during a single session; the PASSCODE can only be used once, and a response to each item is required before proceeding to the next screen.

Only a PASSCODE, not the USER ID and password, is required to enter the findings from the **Pharmacy Leadership/Owner** assessment and the **Pharmacy Staff** assessment(s). The USER ID and password are only used by leadership/owners to view progress and generate reports.

❹ Monitor progress and generate reports.

The USER ID and password created by the **Pharmacy Leadership/Owner** will allow authorized users to access all data from the pharmacy organization, monitor progress during the assessment process, and view/print a survey report. The report is accessible to the **Pharmacy Leadership/Owner** team only. The aggregate data submitted by **Pharmacy Staff** will be available for viewing by **Pharmacy Leadership/Owners**,

Appendix A

but only the PASSCODES used to enter the pharmacy staff data will be visible. Thus, pharmacy organizations that have included multiple stores in the assessment process will not be able to link data to a specific store unless they have manually recorded the store associated with each PASSCODE before distribution.

Reports that are generated using the **Pharmacy Leadership/Owner** USER ID and password will include results from the **Pharmacy Leadership/Owner** assessment and all **Pharmacy Staff** assessment(s) that have been entered into the database. The report will align leadership and staff items that are the same or similar so differences between the groups can be easily detected and addressed. If you misplace these reports, authorized users can reenter the **Pharmacy Leadership/Owner** USER ID and password to access and reprint a report. However, changes to the data that were originally submitted cannot be made. ■

▷ Legal Protection of Readiness Assessment Data Submitted to ISMP

In addition to the usual high standard of confidentiality associated with any information submitted to ISMP, we would also like to remind participants that ISMP is a federally certified patient safety organization (PSO). If self-assessment information is collected within the pharmacy's patient safety evaluation system and submitted to ISMP as patient safety work product, the information is granted protection from discovery in connection with a federal, state, or local civil, administrative, or disciplinary proceeding. No contract with ISMP is required for this legal protection. Further guidelines regarding submitting information to ISMP as a PSO can be found on our website at: www.ismp.org/docs/PSOguidelines.pdf. ■

Appendix B
▷ Putting Bar-Coding Technology into Context

Uses and Benefits of Bar-coding Technology in Community Pharmacies

> A pharmacy cannot effectively increase its volume or business without either increasing its staff or investing in the right technology.[32]
> —Christopher Thomsen, The Thomsen*Group* Inc.

Barcode scanning to verify prescription products prior to dispensing improves the safety and quality of pharmacy care provided to patients and increases efficiency during the provision of pharmacy services. The scanning process can verify the accuracy of the product selected for dispensing by matching the stock bottle's drug-specific barcode, which encodes the National Drug Code (NDC) number, with the NDC of the prescription medication entered into the patient's medication profile. The NDC number includes the manufacturer, the name and strength of the drug, and the size of the package. Barcode scanning can also be used for product verification when filling bulk containers in automated dispensing equipment.

Some bar-coding systems used for product verification also allow the pharmacist to scan the barcode on the

label of the filled prescription.[25] This produces an image of the correct product so the pharmacist can compare it against the product in the pharmacy container before the drug is dispensed to the patient.

Other bar-coding systems allow the user to select the product from the stock shelf and scan the stock bottle barcode at the point of data entry so that the NDC number, drug name, and strength automatically populate the required data fields in the computer.[25] While this eliminates the need to choose the drug, dosage form, and strength from an alphabetical list, studies have yet to determine whether the risk of selecting the wrong product off the shelf is less than or greater than the risk of selecting the wrong product from a pick list, or incorrectly entering the drug via free text or a shorted mnemonic during data entry. Further, the degree to which previously scanned items might bias others during the checking processes is unknown.

Although scanning the barcode at the point of data entry may seem to improve efficiency, the process is not well supported by research. Anecdotal error reports point to this process as a contributing factor when the wrong medication has been entered into

Table 1. Impact of Bar-coding Technology

Study	Year	Setting	Impact of Bar-coding Technology on Pharmacy Dispensing Errors
Flynn, et al.[20]	2003	Community Pharmacy	Reduced dispensing error rate by a full percentage point
Teagarden, et al.[19]	2003	Mail Order Pharmacy	No errors associated with product dispensing utilizing bar-coding technology
Roland, et al.[11]	2004	Hospital Pharmacy	4-year study reported 82 dispensing errors, two of which were considered major errors and resulted from incorrect drug selection; however, this study relied on self-reporting to detect dispensing errors and probably underestimated the incidence of these errors
Cochran, et al.[12]	2005	Hospital Pharmacy	Over 500 reports were evaluated, which included 70 reports in which barcode product verification technology prevented an error from reaching the patient
Poon, et al.[9]	2006	Hospital Pharmacy	93-96% reduction in dispensing errors for targeted drugs with use of barcode scanning for product verification
Maviglia, et al.[18]	2007	Hospital Pharmacy	The researchers analyzed the financial benefit of one hospital's barcode–assisted medication-dispensing system and found a positive return on the investment over a 5-year period
Cohen, et al.[21]	2008	Community Pharmacy	The wrong dose was selected and dispensed when filling a warfarin prescription 9 per 10 million doses with barcode scanning, compared to 9 per 10 thousand doses without barcode scanning

Appendix B

the patient's profile. Therefore, the scope of this readiness assessment tool encompasses the use of bar-coding systems for product verification at the time of dispensing only.

Barcode scanning can facilitate other pharmacy processes. Its use can aid in drug recalls (particularly if the lot number is included in the barcode), returned goods, purchasing and inventory manage-ment (particularly if the expiration date is included in the barcode), bioterrorism preparedness (moving products to areas of need), and capture of aggregate data to monitor drug frequency distribution and possible medication safety issues based on mismatches when product barcodes are scanned.

Impact of Barcode Product Verification Systems on Dispensing Errors

> Barcode scanning introduced a new wave of possibilities not expected when barcodes first appeared on Wrigley's Spearmint chewing gum.[31]
> —Christopher Thomsen, The Thomsen*Group* Inc.

The effectiveness of barcode technology to prevent drug selection errors has been well document-ed.[2,4,7,9,11,12,18-21,26,27] Studies show that more than 5% of medications first selected to fill prescriptions are wrong,[27] and that at least 75% of these wrong drug or wrong dose errors have been captured and corrected using barcode technology.[17,18] Table 1 on page 20

highlights several important studies demonstrating that properly implemented bar-coding technology has reduced medication errors in community pharmacies, mail-service pharmacies, and hospital pharmacies.

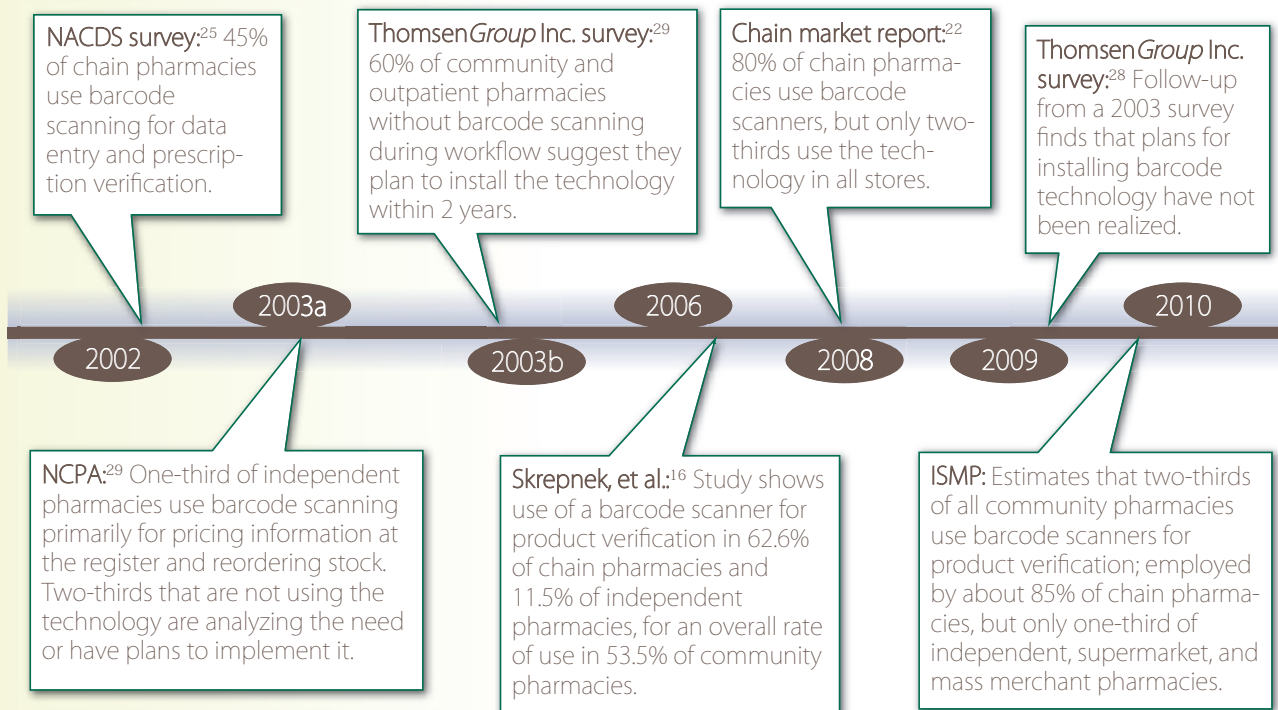## Incidence of Bar-Coding Technology in Community Pharmacies

> Data tells us first that intentions always exceed actual adoption.[33]
> —Tim Gee, Medical Connectivity Consulting

Compared to other industries, the adoption of bar-coding technology in healthcare has been slow, with the most frequent and earliest uses linked to pricing information at the register and reordering stock. Figure 1 provides a timeline that describes the progression of this technology in community pharmacies based on available information from research, surveys, community pharmacy organiza-tions, and bar-coding technology vendors.

According to a 2006 cross-sectional study of 3,000 community pharmacies from 18 different metropol-itan areas in the US, only 53.5% of US community pharmacies utilize a barcode scanner for verifica-tion/identification of medications.[16] The study also revealed a significantly lower rate of adoption in independent pharmacies (11.5%) compared to chain pharmacies (62.6%). This study, as well as a report

Figure 1. Timeline of Adoption of Barcode Scanning in Community Pharmacies

NACDS survey:[25] 45% of chain pharmacies use barcode scanning for data entry and prescrip-tion verification.

Thomsen*Group* Inc. survey:[29] 60% of community and outpatient pharmacies without barcode scanning during workflow suggest they plan to install the technology within 2 years.

Chain market report:[22] 80% of chain pharma-cies use barcode scanners, but only two-thirds use the tech-nology in all stores.

Thomsen*Group* Inc. survey:[28] Follow-up from a 2003 survey finds that plans for installing barcode technology have not been realized.

2002 — 2003a — 2003b — 2006 — 2008 — 2009 — 2010

NCPA:[29] One-third of independent pharmacies use barcode scanning primarily for pricing information at the register and reordering stock. Two-thirds that are not using the technology are analyzing the need or have plans to implement it.

Skrepnek, et al.:[16] Study shows use of a barcode scanner for product verification in 62.6% of chain pharmacies and 11.5% of independent pharmacies, for an overall rate of use in 53.5% of community pharmacies.

ISMP: Estimates that two-thirds of all community pharmacies use barcode scanners for product verification; employed by about 85% of chain pharma-cies, but only one-third of independent, supermarket, and mass merchant pharmacies.

Appendix B

from the American Society of Automation in Pharmacy,[30] also suggest that high-volume pharmacies that process more than 1,700 prescriptions per week are significantly more likely to report using barcode scanners for medication verification/identification.

In 2008, 80% of the chain pharmacies surveyed used barcode scanners in the prescription process, and two-thirds of these chains scanned medications in every store.[22]

Based on the latest available information, we estimate that adoption of barcode verification technology in 2010 during manual filling of prescriptions in all community pharmacies is hovering around two-thirds, with greater penetration in chain pharmacies (85%) and much less penetration in independent pharmacies and supermarket/mass merchant markets (one-third). Based on the sheer number of community pharmacies in the US—about 59,000—bar-coding technology for product verification has a long way to go before the market fully penetrates the nearly 19,000 remaining pharmacies.

Factors that Impact the Decision to Implement a Barcode Product Verification System

> Today, there is not a single viable pharmacy that does not have and use an automated pharmacy management system...That is just not the case, however, for automated workflow systems.[32]
> —Christopher Thomsen, The Thomsen*Group* Inc.

In the February 26, 2004 Federal Register (69 FR 9120), The Food and Drug Administration (FDA) published a final rule requiring certain human drug and biological products approved on or after April 26, 2004, to include on their packages a linear barcode that contains, at a minimum, the drug's NDC number (21 CFR 201.25) by April 26, 2006. FDA estimates that the barcode rule, when fully implemented, will help prevent nearly 500,000 adverse drug events and transfusion errors while saving $93 billion in healthcare costs over 20 years (2006-2026).[26]

After the FDA mandate to provide barcodes on drugs by 2006, many expected a rapid increase in the use

of barcode product verification systems. However, based on data regarding market penetration, it appears that the FDA rule has yet to create a tipping point that will spur more rapid adoption of the technology. Such a poor response from the healthcare sector suggests that factors beyond the initial need for pharmaceutical vendors to provide readable barcodes on products may be hindering widespread adoption of barcode technology.[33]

A 2003 survey by the National Community Pharmacy Association (NCPA)[29] showed that three-quarters (78.2%) of respondents believed that barcode technology is somewhat or very important to enhance accuracy and efficiency in pharmacy dispensing. However, of those who were not using the technology, almost half (42.2%) thought it was too expensive and one-third (30.7%) were satisfied with their current system.

As a follow up to the NCPA survey, and to inform the development of this readiness assessment, ISMP conducted a national survey of community pharmacies in the fall of 2009 to learn why they have either implemented or not implemented barcode product verification systems.[23]

According to the survey, the most common factors associated with decisions to implement the technology included:

- To improve the accuracy and safety of the dispensing process
- The ease with which the technology fit with pharmacy workflow while filling prescriptions
- To improve staff efficiency and utilization
- To gain better control of pharmacy inventory
- A belief that the technology was necessary to stay in business
- To increase profitability and gain a competitive edge within the industry
- To improve the accuracy in billing third-party-payors, and thereby decrease exposure of third-party-payor audits on payments.[24]

The most common reasons associated with decisions to **NOT** implement the technology—other than cost—included:

- Uncertainty regarding the 'right' vendor product for their practice site

Appendix B

- Satisfaction with the current system (without bar-coding technology) because respondents had not analyzed the need for this technology
- Perceptions that the technology would result in inefficient use of staff time
- Perceptions that the technology is not needed if prescription volumes are low
- Anticipated difficulties with staff training
- Concern regarding customer service impact.[24]

Challenges Implementing Barcode Product Verification Systems

> Each vendor creates its solution with little or no thought to other vendors' products that may be in use... It's a poor reflection on the healthcare industry that the federal government has to actively enter a market to drive standards and interoperability. You don't see that in other industries like IT, telecommunications, or logistics.[33]
> —Tim Gee, Medical Connectivity Consulting

In general, barcode medication verification systems tend to present fewer implementation challenges than other types of clinical technology (e.g., robotics). Challenges do exist, however, and include, but are not limited to, the following:

- **Absence of interoperability:** Interfacing the barcode verification system with legacy information technology (IT) systems may prove difficult and costly

- **Mastering workflow:** The complexity of workflow is frequently underestimated by product developers and pharmacy management; for example, barcode scanners need to be readily available and set up to be user-friendly (e.g., placed in convenient locations) to minimize disruptions in staff workflow

- **Ensuring staff training:** During staff shortages, temporary agency or floating pharmacists, technicians, or support staff may be unfamiliar with the system and its proper use and may require time to be oriented to the system

- **Suitability:** Vendor barcode scanning systems may lack one or more desirable features (see **Elements to Consider During Vendor Selection** in **Appendix C**).[33-35]

> Are pharmacists still waiting for proof of concept? Still demanding concrete evidence that they'll recoup their investment? Because the proof is here...[32]
> —Christopher Thomsen, The Thomsen*Group* Inc.

However, the biggest impediment to maximizing the usefulness of this technology is the pharmacy staff member who tries to bypass the system or use it in a way in which it was not intended. People can and will work around technology if they find it does not meet their needs or if they do not appreciate its value.

For example, if a particular product's barcode is difficult to scan and read, users could circumvent the normal procedures (i.e., perform an unauthorized workaround) by scanning a surrogate barcode rather than the one on the medication stock package. Another example is scanning the same medication container barcode multiple times when filling a prescription that requires use of more than one stock bottle of the medication. Misusing the technology this way circumvents its usefulness and returns the user to the risks present before implementing the technology.

At the community and outpatient level, we must continue to be aware that even with the best technology, things can and will go wrong. Ultimately, these systems will only perform well when the interface between people and technology is well managed and the conditions that promote and tolerate workarounds are reported and remedied. As important as it is to have and use the right technology, it is even more important to have pharmacists and technicians who buy in and want to do the right thing with that technology.[28]

> The causes of technology workarounds are neither rare nor secret. They are hiding in plain sight, obscured by faith in technology, the clinician's need to focus on patients, the medical ethos of getting the job done, limited communication among [pharmacies] with similar systems, and dispersed oversight [of staff who use the technology].[34]
> —Ross Koppel, et al.

Appendix B

Selecting the Right Barcode Product Verification System

> Each organization must evaluate its social, technological, and physical contexts when selecting and implementing IT [information technology], e.g., bar-coding technology.[34]
> —Ross Koppel, et al.

Once an organization has determined it is ready to move forward with a barcode product verification system, it still faces the daunting task of evaluating the products offered by various vendors. A detailed evaluation of those products is beyond the scope of this tool, although such a compendium is available commercially.[28] However, based on extensive user interviews and onsite observations of existing barcode verification systems, a list has been compiled of **Elements to Consider During Vendor Selection (Appendix C)**, that can be used to augment the decision-making process.

Costs Associated with Barcode Verification Systems

As a general guide, barcode systems for product verification are not purchased and installed as a stand-alone piece of equipment; rather, the barcode scanning system is embedded in the technology used to dispense medications. Depending on the desired level of integration with other technological solutions used during the dispensing process—from simple automated counting devices to sophisticated robotic dispensing equipment—pharmacies can expect to pay anywhere from $6,000 to $200,000 per site.[28] A chart with cost estimates of barcode product verification systems for various pharmacy system vendors can be found in **Appendix D**.

Conclusions

Other than tablet counting devices, barcode scanning for verification/identification of medications is the most prevalent technology available in community pharmacies today.[16] Numerous studies prove the effectiveness and cost benefits of using this technology during the drug dispensing process.[2,4,7,9,11,12,18-21] Research has clearly demonstrated that the technology not only prevents

drug selection errors, but also improves employee utilization, inventory control, customer service and satisfaction, and cost.[4-7] Efficiencies gained from use of this technology also allow pharmacists to spend less time on non-clinical tasks associated with filling the prescription and more time on clinical interaction with the patient.[36-38]

Healthcare technology failures and the organizational discord that follows are typically rooted in mismanagement and inadequacies in preparation.[39] The familiar stories are peppered with system-based problems that led staff to circumvent the technology. The direct economic loss to the organization often exceeds its initial investment, and often includes less tangible costs[39] associated with lost opportunities.

Within this context, we have created a readiness assessment to assist pharmacies with planning and implementation of a well-built foundation upon which to support barcode product verification technology. Use of the tool will increase the likelihood of success and user satisfaction, decrease technology workarounds that can lead to errors, and decrease costs associated with technology glitches and failures.

Although some influences are beyond a pharmacy's control, most elements of technology readiness can be improved with planning and thoughtful contemplation about vendor selection and the implementation process. It also helps to be receptive to change—to make the necessary adjustments to meet the challenges ahead. Readiness assessments coupled with implementation of an action plan based on the results have been an effective strategy for building a resilient foundation and culture before adoption of technologies in healthcare.[35] ■

> Although technology should not be seen as a panacea, it can be a useful tool when used appropriately and combined with other patient safety strategies.[35]
> —Carl W. Armstrong, Pathways for Medication Safety

Appendix C

▷ Elements to Consider During Vendor Selection

This document is not intended to be a comprehensive checklist of all things to be considered when selecting a barcode product verification system vendor. Instead, it is a list of elements that have frequently been overlooked during the selection process, as reported by current users of the technology and consultants who evaluate the systems. The document will be updated regularly based on reports received from the field. To report possible additions to the list, please send a message to ismpinfo@ismp.org.

Item Category	Item Details	Yes	No	Comments
Getting Started				
Readiness assessment	Assessing Barcode Verification System Readiness in Community Pharmacies has been completed to identify social, technological, procedural (workflow), and physical areas that are most and least supportive of barcode product verification technology implementation.			
Getting Acquainted with Barcode Verification Systems				
Potential vendors identified	All possible vendors offering barcode verification technology have been identified.			
Search for innovations	A search has been completed to determine the latest innovations being offered by various vendors.			
Search for potential workarounds	A literature search has been completed to determine workarounds that are occurring in pharmacies using this technology.			
Each system evaluated	Each potential vendor's product has been evaluated in terms of features, benefits, and possible workarounds.			
Tours to user pharmacies	Tours have been arranged with pharmacies having similar characteristics to your pharmacy organization, and which have had their barcode verification system in operation for greater than six months.			
Narrowing of fit	Companies whose offerings suit your pharmacy's needs have been identified through market research, and information has been requested from each vendor whose options match the targeted solutions for the pharmacy.			
Tours to device manufacturers	The manufacturing facility will be visited to understand the technology device company's commitment to quality in the processes, as it reflects the reliability and durability of the equipment.			

Appendix C

Item Category	Item Details	Yes	No	Comments
Specific Systems Capabilities—Printing Labels with Readable Barcodes				
Owed quantities/ products on order	The system prints individual labels with barcodes for all 'owed quantities' or 'on order' medications, and barcode product scanning is enabled and mandated before dispensing these products.			
Unit-of-use products dispensed in quantities greater than one	The system has the capability of printing duplicate labels for unit of use products dispensed to the patient in quantities greater than one; the system prompts, enables, and mandates scanning of each label to match it with each stock product for verification. For example, dispensing of three albuterol inhalers would require printing and scanning of three individual bar-coded labels and three separate albuterol inhaler package barcodes.			
Return-to-stock products	The system has the capability of printing labels with barcodes for pharmacy-prepared, returned-to-stock products (filled prescriptions not picked up by the patient and returned to shelf for future dispensing to other patients).			
Pharmacy-compounded products	The system has the capability of printing labels for pharmacy-compounded prescription products.			
Medications no longer dispensed from automated devices	The system has the capability of printing labels with barcodes for medications no longer stocked in and removed from automated dispensing devices (i.e., Baker cells) or counting devices so the medication can be returned to pharmacy shelves with main stock for future drug selection using barcode verification.			
Specific Systems Capabilities—Scanning Barcodes				
Scanner specifications (minimum of two scanners needed)	The scanners chosen for use can read 90% of barcodes and all symbology used by pharmaceutical manufacturers; purchasers realize that RFID (radio-frequency identification) technology is separate and distinct from barcode scanning technology and may need to be addressed in the future.			
Scanning multiple containers	The system has the capability to scan multiple stock bottles when more than one stock bottle is needed to fulfill an order.			
Fit with workflow	Systems have been evaluated to determine if the scanning process fits with the current workflow.			
When scanning will occur	Systems have been evaluated to determine if scanning will occur before or after the label is printed.			

COMMUNITY PHARMACIES

2011© Institute for Safe Medication Practices

Appendix C

continued

Item Category	Item Details	Yes	No	Comments
User Reports for Monitoring				
Forced functionality	Consideration has been given as to whether or not barcode scanning will be a forced function for each pharmacy site.			
Mismatch reports	Applications can be created to generate individual user reports with detailed information such as when the incorrect medication (mismatch) was scanned or when staff used an override to manually enter the medication information, and when scanning has been bypassed.			
Activation for monitoring	Reporting capability can be activated to enable managers to monitor the impact of the technology on the quality of care and to discover emerging problems in workflow as they arise. The purpose of monitoring is to allow managers to see when staff chooses to override the bar-coding process and to determine which situations are most likely to prompt such behavior (e.g., not scanning medications in curved bottles because the barcode was difficult to scan).			
Integration With Other Technology				
Integration with existing technologies	Applications that are interoperable with other IT systems (i.e., an integrated application) have been considered along with a stand-alone, best-of-breed application. (With best-of-breed systems, users may experience difficulty and unexpected cost associated with building interfaces between products from different vendors, including the challenges of incentivizing the different vendors to collaborate.)			
Robotics	Automated dispensing devices that incorporate robotics use barcode verification technology.			
Tablet counter	If barcode scanning technology is connected to automated counting devices, an optional scanner validates every product each time an NDC barcode is scanned prior to counting.			
Planned approach for additional technology	A stepwise approach has been considered for additional technology enhancements after bar-coding technology.			
Details in the Vendor's Response to a Request for Proposal (RFP)				
Training by vendor	Training will occur through multimedia vehicles, hard copy manuals, and CDs that offer training highlights for user operation.			

Appendix C

COMMUNITY PHARMACIES

continued

Item Category	Item Details	Yes	No	Comments
Details in the Vendor's Response to a Request for Proposal (RFP) (continued)			
Software installation plan and timeline	Vendor has provided an estimate regarding the amount of time software installation requires, including server maintenance, customization, and error correction.			
Implementation plan and timeline	Vendor has offered a plan regarding how the technology will be rolled out—both in terms of the order of implementation and the location of and timing for the roll-out.			
Ongoing and hidden costs	Pricing proposals have been requested to include ongoing maintenance, consumable costs, and other hidden costs (e.g., additional shipping and installation, interface charges).			
Pilot test of scanner	Vendor proposal includes an opportunity to pilot test scanners to ensure that they will meet the needs of the organization (e.g., read all barcodes encountered in a given facility). *(Pilot testing of the scanner before fully committing to its purchase helps reduce the risk of abandoning the initial scanner in pursuit of a more appropriate one.)*			
Service contracts	Service contracts to include replacement options have been considered.			
Delineation of responsibilities	Determination as to who is responsible for installation—vendor or pharmacy organization—has been discussed and agreed upon prior to purchase.			

Appendix D

▷ Direct Costs Associated with Barcode Verification Systems

The Tables below, compiled by the The Thomsen*Group*, Inc., provide estimates from vendors regarding typical costs associated with implementation of a barcode product verification system. The costs provided in the Tables are applicable to one pharmacy site; discounts are typically offered for pharmacy organizations with multiple sites. The Tables will be updated regularly based on reports received from the field. To report possible additions or changes to the list, please send a message to: ismpinfo@ismp.org.

KEY

A/R
Accounts receivable

IVR
Integrated voice response

LTC
Long-term care

MTM
Medication therapy management

PMS
Pharmacy management system

POS
Point of sale

Typical Costs Associated with Barcode Scanning and Product Verification Systems

Pharmacy Management Vendors and Systems

	ATEB	Best Computer Systems	Carepoint	Cerner Etreby	Computer-Rx	DAA Enterprises	HCC
Pharmacy Management Systems (PMS)	■IVR ■Workflow ■Outbound notification ■Will-call bin management	■PMS ■POS ■e-signature	■PMS ■POS ■e-signature	■PMS ■POS ■e-signature ■Workflow ■MTM ■A/R e-prescribing	■PMS ■POS ■e-signature	■PMS ■POS ■e-signature	■PMS ■POS ■e-signature ■Workflow ■Inventory management ■e-prescribing
Price/Cost	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000

	Keycentrix	McKesson Pharmacy Systems	Micro Merchant Systems	Opus-ISM	Speed Script	Transaction Data - RX30	
Pharmacy Management Systems (PMS)	■PMS ■POS ■e-signature	■PMS ■POS ■e-signature ■Workflow ■LTC ■IVR ■A/R e-prescribing ■Inventory management	■PMS ■POS ■e-signature	■PMS ■IVR ■POS ■e-signature	■PMS ■POS ■e-signature ■Workflow ■MTM ■A/R e-prescribing	■PMS ■POS ■e-signature ■Workflow ■LTC ■IVR ■A/R e-prescribing	
Price/Cost	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	$5,000 to $25,000	

Pharmacy Automation Vendors and Systems

	AutoMed	Innovation	Kirby Lester	Parata	QS/1	ScriptPro
Counting	FF64	Eyecon, SmartCabinet	KL15e, KL20, KL30	MINI	QDM	NA
Price/Cost	$65,000	$7,900, $45,000	$5,800, $9,900, $14,900	$55,000	$25,000	NA
Robotics	FF120, FF220	RxRobot	KL60	MAX	QS/1 RxMedic	SP 50, SP 100, SP 200
Price/Cost	$130,000 to $190,000	$150,000	$79,995	$180,000	$180,000	$125,000, $140,000, $190,000
Automated Workflow	Efficiency Pharmacy	Symphony	KL20, KL30, KL60	Pharmacy 2000	See PMS	SP Central
Price/Cost	$60,000	$45,000	Included	See McKesson Pharmacy Systems	NA	$65,000

Advisory Panel

The Institute for Safe Medication Practices (ISMP) thanks the following members of our voluntary Advisory Panel, who provided input into the development and reveiw of **Assessing Barcode Verification System Readiness in Community Pharmacies**.

John Beckner, RPh
Director of Pharmacy and Health Services
Ukrop's Super Markets, Inc.
Richmond, VA

L. Preston Hale, R.Ph.
National Manager, Strategic Accounts
Qs/1
201 West St. John Street
Spartanburg, SC 29306

Howard Kramer, RPh
Director Pharmacy, Human Resources, and Government Affairs
Sears Holdings Corporation
Kmart Pharmacy
Royal Oak, MI

Brian Morris, RPh, MBA
Product Management, Regulatory and Professional Affairs Director
McKesson Corporation
McKesson Pharmacy Systems
Atlanta, GA

Gregory Shaeffer, RPh, MBA, FASHP, FASCP
Vice President
Pharmacy Healthcare Solutions, Ltd. (PHS)
Harrisburg, PA

Christopher Thomsen
President
The Thomsen*Group*, Inc.
Kansas City, MO

References

COMMUNITY PHARMACIES *(sidebar)*

1) Neuenschwande M. Handwriting on the wall for America's hospitals. *I've been thinking…* February 2007. Accessed on October 15, 2010 at: www.hospitalrx.com/handwritingonthewall.html.
2) Aspden P, Wolcott JA, Bootman JL, Cronenwett, LR. Preventing medication errors: quality chasm series. Institute of Medicine, Committee on Identifying and Preventing Medication Errors 2007; The National Academies Press, Washington, DC.
3) Kohn LT, Corrigan JM, Donaldson MS. To err is human: building a safer health system. Institute of Medicine, Committee on Quality of Health Care in America 1999; The National Academies Press, Washington, DC.
4) Posey LM. Drug distribution: options for enhancing efficiency. *Consult Pharm.* 1996;11:1219-25.
5) Chrischilles EA, Fulda TR, Byrns PJ, et al. The role of pharmacy computer systems in preventing medication errors. *J Am Pharm Assoc.* 2002;42:439-48.
6) Lockwood W. Automating at the ends of pharmacy. *Computertalk for the pharmacist.* 2003;23(2):12,14-5.
7) Hartman C. Medication error-reduction methods in the pharmacy. *Pharm Times.* 2004;70(1):34,38,43.
8) Baker GE, Grussing PG, Stewart JE. Pharmacist work activities before and after pharmacy department computerization. *Am J Hosp Pharm.* 1992;49:382-6.
9) Poon EG, Cina JL, Churchill W, Patel N, et al. Medication dispensing errors and potential adverse drug events before and after implementing bar code technology in the pharmacy. *Ann of Int Med.* 2006;145(6):426-34.
10) Puckett F. Medication-management component of a point-of-care information system. *Am J Health Syst Pharm.* 1995;52:1305–1309.
11) Roland P. Occurrence of dispensing errors and efforts to reduce medication errors at the central Arkansas Veteran's Healthcare System. *Drug Safety.* 2004;27(4):271-82.
12) Cochran GL, Jones KJ, Brockman J, Skinner A, et al. Errors prevented by and associated with barcode medication systems. *Joint Comm J Qual Pt Safety.* 2007;33(5):293-301.
13) Rupp MT. Pharmacy automation: technology-related needs of community pharmacists. *America's Pharmacist.* 2002;124(1):11–3.
14) Rascati KL, Kimberlin CL, Foley PT, Williams RB. Multidimensional work sampling to evaluate the effects of computerization in an outpatient pharmacy. *Am J Hosp Pharm.* 1987;44:2060–7.
15) Baker GE, Grussing PG, Stewart JE. Pharmacist work activities before and after pharmacy department computerization. *Am J Hosp Pharm.* 1992;49:382–6.
16) Skrepnek GH, Armstrong EP, Malone DC, Abarca J, et al. Workload and availability of technology in metropolitan community pharmacies. *J Amer Pham Assoc.* 2006; 46(2):154-160.
17) Ukens C. New study sheds light on medication errors. *Drug Topics.* 2002;146(21):33.
18) Maviglia SM, Yoo JY, Franz C, Featherstone E, et al. Cost-benefit analysis of a hospital pharmacy barcode solution. *Arch Intern Med.* 2007;167(8):788-794.
19) Teagarden JR, Nagle B, Aubert RE, Wasdyke C, Courtney P, Epstein RS. Dispensing error rate in a highly automated mail-service pharmacy practice. *Pharmacotherapy.* 2005;25:1629-1635.
20) Flynn EA, Barker KN, Pepper GA, Bates DW, Mikeal RL. National observational study of prescription dispensing accuracy and safety in 50 pharmacies. *J of Am Pharm Assoc.* 2003;43(2):191-200.
21) Cohen MR, Smetzer JL, Horn DM, Comden SC, Westphal JE, Lawlor TP. Using risk models to improve safety with dispensing high-alert medications in community pharmacies. 2007-2008. Final report submitted to the Agency for Healthcare Research and Quality on March 31, 2009; funded under contract # 1P20HS017107-01.
22) Lockwood W. The chain market report. *Computer Talk for Pharmacists.* 2008. Accessed on October 15, 2010 at: www.computertalk.com/content/view/208/.
23) Institute for Safe Medication Practices. ISMP survey on barcode scanning technology for medication selection verification. *ISMP Medication Safety Alert!* Community/Ambulatory Care Edition. September 2009;8(9):4.
24) Institute for Safe Medication Practices. ISMP survey on barcode scanning technology for medication selection verification. Unpublished results. December 2009.
25) Rosato E. Statement on bar code label requirements for human drug and biologic products. National Association of Chain Drug Stores. Submitted to the Food and Drug Administration on July 26, 2002. Docket Number: 02N-0204-67. Accessed on October 15, 2010 at: www.fda.gov/ohrms/DOCKETS/dailys/02/Oct02/102102/800346ac.pdf.

References

26) US Department of Health & Human Services. HHS announces new requirements for bar codes on drugs and blood to reduce the risk of medication errors. News Release. February 24, 2004. Accessed on October 15 at: http://archive.hhs.gov/news/press/2004pres/20040225.html.

27) Koutnik E. Bar coding: working toward error-free pharmacy. *Pharmacy Times.* Sept 1, 2003.

28) The Thomsen*Group* Inc. Negotiating the maze: a review of prescription filling technologies and automation for retail and outpatient pharmacies. 2009; A Thomsen*Group* Inc. Report. Kansas City, MO.

29) West DS, Carper B, Hoey D, et al. 2003 NCPA-Pfizer digest. National Community Pharmacists Association and Pfizer Inc. 2003. Accessed on October 15, 2010 at: www.ncpanet.org/members/pdf/2003digest.pdf.

30) American Society for Automation in Pharmacy (ASAP). Report on findings pharmacy technology assessment for paperless labeling initiative. Conducted by ASAP for the Pharmaceutical Research and Manufacturers of America. June 2008.

31) Thomsen C. Robotics white paper. The Thomsen*Group* Inc. America's Pharmacist. April 14, 2004. Accessed on October 15, 2010 at: www.thethomsengroup.com/TTGI%20Pages/Articles%20Studies%20&%20Presentations/20040415%20White%20Paper%20on%20Robotics.pdf.

32) Thomsen C. Pharmacy automation and technology: what is holding you back? *Insights.* 2005;3(7):2.

33) Gee T. Barcoding: implementation challenges. *Patient Safety & Quality Healthcare.* March/April 2009. Accessed on October 15, 2010 at: www.psqh.com/marchapril-2009/189-barcoding-implementation-challenges.html.

34) Koppel R, Wetterneck T, Teles JL, Karsh BT. Workarounds to barcode mediation administration systems: their occurrences, causes, and threats to patient safety. *Journal of the American Medical Informatics Association.* 2008;14:408-423. Accessed on October 15, 2010 at: www.jamia.org/cgi/content/short/15/4/408.

35) American Hospital Association, Health Research and Educational Trust, Institute for Safe Medication Practices. Pathways for medication safety: assessing bedside bar-coding readiness. 2002. Accessed on October 15, 2010 at: www.ismp.org/selfassessments/PathwaySection3.pdf.

36) Lee MP. Automation and the future practice of pharmacy—changing the focus of pharmacy. In: Wilson AL, ed. Issues in pharmacy practice management. Gaithersburg, MD: Aspen Publishers, Inc; 1997:79–91.

37) Koutnik E. The pharmacy of tomorrow. *Pharm Times.* 2003;69(8):42–4.

38) West DS, Hastings J, Earley A. An economic justification of the use of dispensing technologies in independent community pharmacies. *America's Pharmacist.* 2001;123:17–25.

39) Sliverstein S. Examples of common, costly, and preventable information technology failures. Hospital Information and Communication Technology Projects. 2007;Drexel University, PA:Philadelphia. Accessed on October 15, 2010 at: http://www.ischool.drexel.edu/faculty/ssilverstein/cases/.