Published in final edited form as:

Res Social Adm Pharm. 2014 ; 10(1): . doi:10.1016/j.sapharm.2013.04.009.

Exploring Information Chaos in Community Pharmacy Handoffs

Michelle A Chui, Pharm.D., Ph.D. [Assistant Professor] and

School of Pharmacy, University of Wisconsin - Madison

Jamie A Stone, M.S. [Associate Researcher]

School of Pharmacy, University of Wisconsin - Madison

Abstract

Background—A handoff is the process of conveying necessary information in order to transfer primary responsibility for providing safe and effective drug therapy to a patient from one community pharmacist to another, typically during a shift change. The handoff information conveyed in pharmacies has been shown to be unstructured and variable, leading to pharmacist stress and frustration, prescription delays, and medication errors.

Objective—The purpose of this study was to describe and categorize the information hazards present in handoffs in community pharmacies.

Methods—A qualitative research approach was used to elicit the subjective experiences of community pharmacists. Community pharmacists who float or work in busy community pharmacies were recruited and participated in a face to face semi-structured interview. Using a systematic content data analysis, the study identified five categories of information hazards that can lead to information chaos, a framework grounded in human factors and ergonomics.

Results—Information hazards including erroneous information and information overload, underload, scatter, and conflict, are experienced routinely by community pharmacists during handoff communication and can result in information chaos. The consequences of information chaos include increased mental workload, which can precipitate problematic prescriptions “falling between the cracks”. This can ultimately impact patient care and pharmacist quality of working life.

Conclusions—The results suggest that handoffs in community pharmacies result in information hazards. These information hazards can distract pharmacists from their primary work of assessing prescriptions and educating their patients. Further research on how handoffs are conducted can produce information on how hazards in the system can be eliminated.

Keywords

handoffs; community pharmacy; human factors; medication safety

© 2013 Elsevier Inc. All rights reserved.

Corresponding Author: Michelle Chui, 2513 Rennebohm Hall, 777 Highland Ave, Madison, WI 53705, T: (608) 262-0452, F: (608) 262-5262, mchui@pharmacy.wisc.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

BACKGROUND

Approximately 58,000 community retail pharmacies in the United States dispense over 4 billion prescriptions each year.¹ To dispense prescriptions safely and efficiently, pharmacists need accurate and complete information to assess the appropriateness of the medication for the patient, verify that there are no drug interactions or allergies, educate the patient, and answer questions specifically pertaining to that patient's concerns and needs. Without information that is comprehensive, accessible, timely, and correct, pharmacists experience frustration and stress, and are not able to deliver safe, efficient, and high quality patient care.

A significant number of prescriptions are dispensed from high-volume pharmacies with multiple pharmacists working in one pharmacy. A growing number of part-time or floating/relief pharmacists who may have a limited relationship with or knowledge of the patient are employed to meet the increasing demand for prescription medication. As a result, one pharmacist may accept a prescription, another may verify its accuracy, while yet another pharmacist may counsel the patient. When there is a problem such as missing or confusing information about the prescription or the patient that requires clarification, that problem must be addressed by the pharmacist prior to the medication being dispensed. If a problem is not clarified during a pharmacist's shift, the information regarding the outstanding issue must be conveyed during the shift change. We refer to this process as a handoff.

Studies examining the effect of handoffs confirm an increased risk of preventable adverse events when patients are cared for by multiple providers or providers unfamiliar with their care.^{2,3} Studies also have shown that handoffs frequently occur in a haphazard fashion.⁴⁻⁶ Given the frequency of these transitions in health care, and their susceptibility to lapses and errors in communication, handoffs have been identified as a key area for improvement in reducing medical errors and patient harm.⁷⁻¹¹

For purposes of the study, a handoff is defined as "the process of conveying necessary information in order to transfer primary responsibility for providing safe and effective drug therapy to a patient from one community pharmacist to another community pharmacist."¹² Examples of handoffs in community pharmacies include pharmacist shift changes and pharmacist sign-outs at the close of the business day. The scope of this study did not include handoffs across settings or between health care professionals or family caregivers, such as from a physician to a pharmacist.

To date, one study has been published characterizing handoffs between pharmacists in community pharmacies.¹² Similar to studies conducted in emergency departments and other hospital units,^{8,13,14} this study found that the information exchanged and the format in which information is conveyed is variable and can lead to lapses and errors in communication.¹² Further, this study identified that the information conveyed and received could be variable not only in its content, but also its format and location. These information nuances required further investigation so that appropriate interventions could be developed to target specific handoff problems. Therefore, the objective of this study was to describe and categorize the information hazards resulting from handoffs in community pharmacies; this was done using the information chaos framework.¹⁵

Information Chaos Conceptual Framework

To better understand how lapses and errors in communication occur during handoffs in community pharmacies, we adapted the information chaos framework.¹⁵ This framework was first conceptualized by a team of family practice physicians and human factors researchers to understand how different information problems can collectively result in utter confusion and disorganization (e.g., chaos). This chaos can contribute to errors and

physicians' ability to provide high quality care. The information chaos framework can be used to examine the relationship between information problems or hazards experienced by a pharmacist, and the pharmacist's ability to provide safe, accurate, and timely prescriptions to their patients. The framework is grounded in the human factors and ergonomics (HFE) discipline which studies and applies information about human cognitive and physical limitations, and human abilities to the design of systems, including work processes such as handoffs. The framework defines different types of information hazards: information overload, information underload, information scatter, information conflict, and erroneous information. In pharmacy, information overload occurs when there is so much information that the pharmacist has a difficult time identifying what data is relevant. Information underload arises when necessary information is missing. Information scatter is when necessary information is located in multiple places. Information conflict occurs when a pharmacist is unable to determine which conflicting information is correct. Erroneous information is when the information is wrong, such as incorrect information in the patient profile or incorrect information that the patient tells the pharmacist.

By both acting separately and by interacting with each other, these information hazards can lead to information chaos, which may increase the mental workload, frustration, and stress of pharmacists. Studies have shown that during times of high mental workload people focus on fewer cues and consider fewer options and solutions.¹⁶ This occurs when people hone in on a narrow set of options because they mentally cannot handle more. In such situations, people are at risk of decision errors because they miss things they should have noticed. Figure 1 shows how the conceptual framework for information chaos relates to cognitive processes.

METHODS

A qualitative approach to describing and categorizing how patient and prescription information is conveyed during handoffs between community pharmacists was used. Semi-structured interviews were used for data collection. Such interviews are useful when flexibility is needed to more completely explore topics and concepts mentioned by an interviewee.¹⁷

Pharmacist recruitment involved a description of the project and solicitation through the Pharmacy Society of Wisconsin (the state's professional pharmacy association) "Fast Facts" listserv of member pharmacists. Community pharmacists who float between different pharmacy locations, or work in a pharmacy staffed with more than two full-time pharmacists were invited to participate in the study in August 2008. Pharmacists were asked to email the researcher if they were interested in participating. The first eight pharmacists who responded that met the inclusion criteria and were available were selected. Informed consent was obtained from each pharmacist. This study was approved by the institution's Institutional Review Board.

Interviews

Prior to the interview, the interview questions as well as a 'thank you' letter were sent to each participant. Each interview took place between the lead author (MC) and the interviewee. The interviews took place during September and October, 2008. During the interview, pharmacists were asked to describe their typical interaction with other staff pharmacists, and how they communicated with each other regarding patient care issues. Next, pharmacists were asked to provide their own definition of a handoff in the community pharmacy setting. Because little is known about handoffs in community pharmacy, we used the critical incident technique, a technique that broadens knowledge of poorly understood areas using an individual's observation of their own behavior or of others.¹⁸ The critical

incident technique was employed by asking pharmacists to share stories that they remembered in which they experienced a good handoff and a bad handoff. The lead author then probed for additional details that either supported or made more difficult the handoff process described in their example.

Questions about characteristics of handoffs in general, including benefits of a good handoff and characteristics of handoffs that contribute to patient harm were also asked. The last questions explored the quality of handoffs that pharmacists give and receive, followed by questions related to how they operationalize a handoff including the amount of time required to prepare a handoff and the type of information shared, and how such information is shared. Pharmacists were encouraged to respond to all issues raised by the interviewer, but were informed that they did not have to respond if they did not feel comfortable with the question(s). To minimize biased responses, the interviewer asked neutral, open-ended, questions. Each interview was audio recorded using a digital recorder. No additional interviews were conducted after the eighth interview as no new information was obtained.

Analysis

Audio tapes of each interview were professionally transcribed into a Microsoft Word file.¹⁹ Two researchers analyzed the data, a pharmacist (MC) who conducted the interviews, and an industrial engineer (JS) skilled in conducting thematic analysis, who was not involved in the study planning or research design. Inductive thematic analysis^{20,21} was used to analyze the data for characteristics of handoffs as well as factors that may affect the quality of handoffs. These data are reported elsewhere.¹² Following the completion of the thematic analysis it was recognized that many of the identified themes centered on information hazards. Therefore a secondary deductive analysis was undertaken to understand these themes in relation to the information chaos framework. Interpretations were discussed and consensus was reached on classification of statements into the five information hazards in the information chaos framework. Consequences of information chaos were also identified and coded.

RESULTS

Eight interviews with pharmacists were completed. A description of each pharmacist and their work setting is located in Table 1.

Results indicated that the five information hazards are exemplified during the handoff process in community pharmacies. The results below describe each of the 5 information hazard categories and potential consequences in detail, followed by a description of how the information hazards contribute to information chaos and its potential consequences.

Information Overload

Information overload occurs when there is too much data for a pharmacist to organize, synthesize, draw conclusions from, or act upon.

Dispensing prescriptions requires the pharmacist to verify that every prescription is accurate and appropriate, including verifying that the medication is appropriate for the patient, and the medication prescribed is within the physician's scope of practice. Next, the prescription must be evaluated against all known information about the patient including allergies and other prescription, herbal, and over-the-counter medications. Lastly, because prescriptions are adjudicated online in real time, financial issues such as copayments, insurance eligibility, and formulary compliance must be addressed.

Pharmacists must integrate an increasing number of patients and their prescriptions with insurance nuances. This coordination of patient care with administrative factors adds to the volume of information pharmacists must process and upon which they must act.

Although the pharmacy computer system documents and archives patient and prescription information, accessibility and organization of said information in the computer may not support pharmacists' work. One pharmacist reporting overload of handoff information archived in their computer system commented, *"It's troublesome because I put [the information] in this one area [of the computer], and I don't know if they ever get [taken] out. A lot of information goes in, but it's got to be removed too, because then it's like sensory overload."*

Information Underload

Information underload occurs when the information necessary to safely and efficiently dispense prescriptions is lacking.

A lack of sufficient and available information is common in community pharmacies. Because pharmacies typically do not have access to electronic health records, pharmacists do not receive diagnosis or laboratory values from prescribers for prescriptions that must be assessed for accuracy and appropriateness. Patients may patronize more than one pharmacy which leads to unavailable or incomplete medication histories. Patients may have poor recall when asked about details of their most recent physician office visit. Patients also may decide not to disclose sensitive information. At times, pharmacists may not be aware that information is available. For example, a physician may not inform the pharmacist that he is discontinuing a prescription and switching to another, or a patient self-initiates an over-the-counter or herbal medication without informing the pharmacist.

Importantly, information underload may occur when necessary information is not conveyed from one pharmacist to another pharmacist during a handoff. Indeed, this theme was the most popular theme, and contained the most statements made by participant pharmacists. Types of missing handoff information that pharmacists identified included: which pharmacist first worked on the problem, what the problem is and its current status, who was contacted and when, instructions for who needs to be contacted and what needs to be done to solve the issue, prescription details (e.g. insurance name, prescription number, and indication), and sense of priority and urgency. One pharmacist gave this example, *"A lot of times... 'waiting on doctor to call back' will be the issue. Uh, call back about what? You need to know what they're calling back on. If I don't know what the problem is that's, that's difficult..."*

Pharmacists frequently discussed how information underload impacts their work. In many cases, pharmacists recognized that there was an outstanding problem with a prescription but they were not provided with sufficient information that would direct them to the individual to speak to in order to clarify or address the problem, often resulting in the need to redo some of the work that the previous pharmacist did and may put them behind for the rest of the day. Pharmacists spoke about how the lack of information resulted in them feeling frustrated. For instance, one pharmacist explained, *"Just leaving something in a basket... with no notes on it. You know, well what exactly do I do with this?"*

In some examples that pharmacists shared, the previous pharmacist already had attempted to call the physician or patient for clarification and was waiting on a call back. However, pharmacists reported that if they did not have a clear sense of what the problem was or have all of the information at the time the physician or patient called back, they felt unprepared and unprofessional. This also led to frustration, and feelings of incompetence.

“So if I’m coming on shift and there’s these labels in front of me and I don’t really know what’s going on, and there will just be like scribbles on it... if that patient comes in I have no idea what they’re talking about...”

Lastly, pharmacists felt resigned that information underload was “just the way pharmacy is,” and that they could not “bug” the physician for every issue that they may question. This resulted in pharmacists making assumptions about what the physician may have intended. One pharmacist admitted, *“there’s limited information, so I just tried to make the best decision.”*

Information Scatter

Information scatter refers to information being physically located in multiple places. During any given time in a community pharmacy, needed information may be located on a sticky note, a note pad with hand-written information, a computer-based text box linked to the patient’s profile, or in the patient’s or pharmacist’s mind. Pharmacists reported there was typically no central location for information on outstanding issues. Further, there may be several disparate pieces of information located in different places, so that locating one piece of information was no guarantee that the pharmacist had all of the information. One pharmacist stated, *“it is a little bit like putting a puzzle together too, ‘cause sometimes then you’ll have two or three pieces of paper...”*

Patients typically have several prescriptions that are dispensed at any given time. When questions arise regarding one prescription, this prescription is set aside from the other prescriptions in one of several areas of the pharmacy, frequently denoting the type of problem, and how long it will take to be clarified. At any given moment, several unfilled prescriptions for one patient could be in a holding pattern and be physically located at different locations in the pharmacy. Pharmacists are challenged to remember which prescriptions for any patient are outstanding, and that the prescriptions for one patient may be scattered throughout the pharmacy, depending on each prescription’s level of completeness and closure. One pharmacist who worked in a hospital outpatient pharmacy stated, *“Sometimes we’ll get a discharge, and they’re completely rushed. We had one prescription in the compounding lab that there wasn’t a note in there that said it was in the compounding lab, and they left in the ambulance and the medicine was still there.”*

Pharmacists also expressed frustration regarding information scatter while handing off information. Many pharmacists identified that the placement of unresolved prescriptions in different locations is used to denote what type of issue was associated with the prescription (e.g. prescriptions in the yellow basket we are waiting for the doctor to call back on). However, the fact that the accompanying information was stored in variable locations, including the pharmacist’s memory, can lead to confusion. Pharmacists reported that the need to search for needed information misdirected their focus away from patient care. Pharmacists also noted that there was significant variability even within one pharmacy corporation regarding placement of problem prescriptions, *“when you were talking about where to find the problems, that can sometimes be an issue, because even though they’re always within the same corporation the pharmacies are set up just slightly different. Some of them have labeled baskets for things that you need to follow up with the doctor’s office; some places don’t.”*

Information Conflict

Information conflict occurs when one or more pieces of data are not in agreement and the pharmacist is unable to determine which data are correct.

The pharmacist is often confronted with a variety of conflicting information regarding an issue. For example, the patient may think he or she is on one medication but the physician's chart stated a different medication, or the patient believes that his or her medication is for one diagnosis such as insomnia whereas the physician's nurse informs the pharmacist that the patient is taking a medication for depression. Information conflict can also arise from information underload such as when several physicians are treating a patient and are not coordinating care, or informing the pharmacist of changes in therapy. One pharmacist described an example of information conflict, *"I go to the [computer] file and I see there are four open antidepressants. There were two different doctors, so two antidepressants from one doctor, two antidepressants from another doctor. So then, I don't necessarily know what to do, then I see all these open prescriptions and, um, I faxed, what seemed like the most relevant doctor, based upon the time frame of the prescription 'Please confirm'..."*

Erroneous Information

Erroneous information is when the information is wrong. When incorrect information is contained in the computer profile record, it may be difficult to correct or purge it. Other pharmacists, not realizing that the information is erroneous, may unknowingly make decisions or convey incorrect handoff information based on said wrong information. One pharmacist who had to fix an error indicated that the reason his partner pharmacist made the error was because the information in the computer was incorrect, *"I mean, obviously, there should have been some question, it was good that this pharmacist left this note, but then it turns out that she ended up picking totally the wrong questions..."*

One pharmacist reported that an example of how erroneous information can contribute to patient harm if the pharmacist does not identify the correct patient, *"Yeah, if you just say 'Diane Johnson,' or you get the wrong [patient], and you know just [having] accurate identifiers."*

Erroneous information can also come from the patient. For example, if the patient thinks they are on one medication, but actually is on a different one; or if the patient thinks they have a medication allergy but the adverse reaction was not a true allergy such as stomach upset.

Erroneous information can lead to delays in patient care from something as simple as an incorrect fax number, as one pharmacist explained, *"... you can tell when you go into our record of faxes... it failed a week ago, it also failed when my colleague tried to do it, 3 to 4 days after that, so I did it again, yesterday. So then you think, what happened, you check the fax queue, and the fax failed, no dial tone, line busy, for something like that, and you think, 'well, maybe we have the wrong fax number?'" So sure enough you call the office and they give you the different fax number."*

Description and Consequences of Information Chaos

In many instances, pharmacists shared stories that were quite complex, with a particularly lengthy resolution or several outstanding issues for one patient. In these cases, several information hazards within one handoff process were frequently identified. An abbreviated community pharmacy vignette extracted from the examples provided by participants (Figure 2) illustrates how several different information hazards may be present during the process in which the pharmacist receives a handoff and attempts to address the outstanding issue.

Pharmacists reported numerous consequences of information chaos. These consequences were divided into pharmacist consequences and patient consequences. For the pharmacist, information chaos increased job stress, time pressure, and redundant work. One pharmacist

explained how searching for information that was not recorded can lead to redundant work for both pharmacists and physicians: *"If I'm working at a pharmacy and, I see something that doesn't seem right and I question it. That other pharmacist could have questioned it two months ago and already knows the answer...but it's locked in their head... [laughter] ...and I just wasted my time and probably the doctor's office's time saying, 'yeah, you already know that information.' Well, no I don't."*

Another pharmacist reported that the level of chaos in the pharmacy was so significant that she decided to seek work elsewhere. She stated, *"that was such a huge patient safety concern I got so stressed, I'm like, 'I can't do this anymore' so I quit that job."*

For patients, the information hazards experienced by pharmacists not receiving appropriate and timely information to process an issue, could lead to delays in getting the medication they need or getting the wrong medication entirely. This was emphasized when patients were sick or felt rushed e.g., after being discharged from the hospital, going on vacation, or needing a pain medication for an acute issue. Patient delays could be from a few hours to even longer if the pharmacist forgets to follow through to resolve the issue, such as in this case, *"I think sometimes, let's say there's a patient problem and you're not sure what doctor you need to go to, or who's in charge. If you're not clear on who can fix the problem for you or with you, I think then there's more likelihood that it gets dropped or falls through the cracks..."*

Another pharmacist described it as *"the prescription, kind of gets dead. You know, it's right there but we don't know what to do with it next."*

Delays, in addition to being an annoyance for the patient, can also lead to a patient safety concern if timely access to prescription medication is necessary to treat the patient, e.g., an antibiotic for an infection. One pharmacist shared, *"and then the problem lingers out there and the patient could get harmed by not knowing what they're supposed to do or going without their medicine."*

DISCUSSION

This project set out to characterize information hazards associated with handoff communication in community pharmacies. It is the first study known to the authors to address this issue.

Similar to studies conducted in family medicine,^{22,23} the current found information problems in community pharmacy handoffs that can contribute to the lapses and errors in communication. Breakdowns in communication can often result in errors, many of which are preventable. Indeed, an Australian study involving 28 hospitals reviewed the causes of adverse events and found that communication errors were the leading underlying cause.²⁴ In 2007, the Joint Commission identified that 60% of hospital sentinel events were caused by a breakdown in communication.¹⁰

One reason why lapses in communication can lead to errors is the amount of job stress, time pressure, and redundant work due to poor handoffs. These work characteristics have been shown to increase mental workload.²⁵ During times of high mental workload, people focus on fewer cues and are at risk of decision errors because they miss things they would normally notice.²⁶ In a pharmacy, this can inevitably lead to problematic prescriptions "falling between the cracks". It also may distract pharmacists from their primary work of assessing prescriptions and educating the patient.

Although the literature shows that the deficits in handoff communication are substantial, there is little understanding regarding how different components of information interact with each other to result in positive or negative outcomes. The HFE discipline can help to understand how different factors in the system interact with each other to result in positive and negative outcomes.²⁷ The HFE information chaos framework can specifically help us better characterize the components of information hazards to eliminate said hazards, mitigate their impact, and improve medication safety. Understanding these factors can inform the design of interventions to support pharmacists in conducting handoffs safely and efficiently.

Limitations

This study had several limitations. First, eight pharmacists from one state participated in this study. While participants were float, staff, and managing pharmacists from both chain and independent settings, the extent to which other community pharmacies may experience information hazards is unknown. Second, pharmacists were unaware of studies regarding handoffs in other health care settings. Indeed, as the term “handoff” was foreign to some of them, many of the pharmacists were trying to describe a process that they had never seriously considered before. Therefore, information provided about handoffs was based on potentially newly formed perceptions. Finally, this information was not validated by direct observation.

CONCLUSION

The present study represents an initial effort to better understand the handoff process in community pharmacies. The results suggest that handoffs in community pharmacies are unstructured and variable, and often result in information problems. These information problems are not simple nor uni-dimensional, but are multifaceted in nature due to the variability of information available and the complex pharmacy environment. As such, there is a need for further detailed investigations of mechanisms by which handoffs are conducted, specifically focusing on how hazards in the system can be eliminated. Future studies also can be conducted to identify the impact of information hazards in handoffs on patient harm and pharmacist quality of working life. Development and testing of interventions that focus on system factors and human performance should ultimately lead to best practice recommendations.

Acknowledgments

The project was supported by the University of Wisconsin Graduate School and the Clinical and Translational Science Award (CTSA) program, previously through the National Center for Research Resources (NCRR) grant 1UL1RR025011, and now by the National Center for Advancing Translational Sciences (NCATS), grant 9U54TR000021. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

REFERENCES

1. IMS Health. The use of medicines in the United States: Review of 2011. 2012 http://www.imshealth.com/ims/Global/Content/Insights/IMS%20Institute%20for%20Healthcare%20Informatics/IHII_Medicines_in_U.S_Report_2011.pdf.
2. Peterson LA, Brennan TA, O'Neill AC, Cook EF, Lee TH. Does housestaff discontinuity of care increase the risk for preventable adverse events? *Annals of Internal Medicine*. 1994; 121:866–872. [PubMed: 7978700]
3. Zinn C. 14000 preventable deaths in Australian hospitals. *BMJ*. 1995; 310:1487. [PubMed: 7787586]

4. Volpp KGM, Grande D. Patient safety - Residents' suggestions for reducing errors in teaching hospitals. *N. Engl. J. Med.* 2003 Feb.348:851–855. [PubMed: 12606742]
5. Singer JI, Dean J. Emergency physician intershift handovers - An analysis of our transitional care. *Pediatr. Emerg. Care.* 2006 Oct.22:751–754. [PubMed: 17047478]
6. Solet DJ, Norvell JM, Rutan GH, Frankel RM. Lost in translation: Challenges and opportunities in physician-to-physician communication during patient handoffs. *Acad. Med.* 2005 Dec.80:1094–1099. [PubMed: 16306279]
7. Patterson ES, Roth EM, Woods DD, Chow R, Gomes JO. Handoff strategies in settings with high consequences for failure: lessons for health care operations. *Int. J. Qual. Health Care.* 2004 Apr. 16:125–132. [PubMed: 15051706]
8. Arora VM, Manjarrez E, Dressler DD, Basaviah P, Halasyamani L, Kripalani S. Hospitalist handoffs: a systematic review and task force recommendations. *J Hosp Med.* 2009 Sep.4:433–440. [PubMed: 19753573]
9. Coleman EA, Berenson RA. Lost in transition: Challenges and opportunities for improving the quality of transitional care. *Annals of Internal Medicine.* 2004 Oct.141:533–535. [PubMed: 15466770]
10. Joint Commission on Accreditation of Healthcare Organizations. 2010 National Patient Safety Goals (NPSGs). 2007 <http://www.jointcommission.org/patientsafety/nationalpatientsafetygoals>.
11. World Health Organization. [Accessed September 16, 2011] Assuring medication accuracy at transitions in care standard operating protocol fact sheet. 2010. http://www.who.int/patientsafety/implementation/solutions/high5s/ps_medication_reconciliation_fs_2010_en.pdf.
12. Chui MA, Stone JA. The Prescription Handoff in Community Pharmacy: a Study of its Form and Function. *Journal of the American Pharmacists Association.* in press.
13. Ong MS, Coiera E. A systematic review of failures in handoff communication during intrahospital transfers. *Jt Comm J Qual Patient Saf.* 2011 Jun.37:274–284. [PubMed: 21706987]
14. Riesenber LA, Leisch J, Cunningham JM. Nursing handoffs: a systematic review of the literature. *Am J Nurs.* 2010 Apr.110:24–34. [PubMed: 20335686]
15. Beasley JW, Wetterneck TB, Temte J, et al. Information Chaos in Primary Care: Implications for Physician Performance and Patient Safety. *J. Am. Board Fam. Med.* 2011 Nov-Dec;24:745–751. [PubMed: 22086819]
16. Hancock P, Szalma J. Operator stress and display design. *Ergon Des.* 2003; 11:13–18.
17. Kvale, S. *InterViews: an introduction to qualitative research interviewing.* Thousand Oaks: Sage Publications; 1996.
18. Gremler DD. The critical incident technique in service research. *J Serv Res.* 2004; 7:65–89.
19. *Microsoft Word* [computer program]. Version. 14.0.6112.50002010.
20. Braun V, Clark V. Using thematic analysis in psychology. *Qualitative Research in Psychology.* 2006; 3:77–101.
21. Patton, M. *Qualitative Research & Evaluation Methods.* Thousand Oaks: Sage; 2002.
22. Kuo GM, Phillips RL, Graham D, Hickner JM. Medication errors reported by US family physicians and their office staff. *Quality & Safety in Health Care.* 2008; 17:286–290. [PubMed: 18678727]
23. Phillips RL, Dovey SM, Graham D, Elder NC, Hickner JM. Learning from different lenses: Reports of medical errors in primary care by clinicians, staff, and patients. A project of the American Academy of Family Physicians National Research Network. *Journal of Patient Safety.* 2006; 2:140–146.
24. Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L, Hamilton JD. The Quality in Australian Health Care Study. *Med J Aust.* 1995 Nov 6.163:458–471. [PubMed: 7476634]
25. Bertram DA, Hershey CO, Opila DA, Quirin O. A measure of physician mental work load in internal medicine ambulatory care clinics. *Med Care.* 1990:458–467. [PubMed: 2338843]
26. Kahneman, D.; Slovic, P.; Tversky, A. *Judgment under uncertainty.* Cambridge University Press; 1982.
27. Carayon P, Hundt AS, Karsh BT, et al. Work system design for patient safety: the SEIPS model. *Quality & Safety in Health Care.* 2006 Dec.15:I50–I58. [PubMed: 17142610]

Figure 1.
Information Chaos and Resulting Impacts.

Aaron Smith, the relief pharmacist, arrives at XYZ pharmacy when it opens at 9:00 a.m. and finds various faxes and handwritten notes in a notebook and on sticky notes near the computers regarding outstanding issues from the previous evening. Aaron starts to address the issues one by one by calling physicians or clarifying other issues. At 10:00 a.m., Ms. Jones rushes into the pharmacy and asks for her heart medication. Ms. Jones does not remember the name of her heart medication. She thinks it might be the blue capsule. Aaron finds the prescription in the bins where completed prescriptions are kept, but upon close inspection, sees that it is not a blue capsule, but a pink pill. After searching, Aaron finds a sticky note that says the previous pharmacist filled the most current heart medication but that he needs to call the physician because there were numerous cardiac prescriptions with authorized refills on Ms. Jones' profile and it was unclear which medication Ms. Jones was currently taking. The note did not state that Ms. Jones was leaving town to attend a wedding and urgently needed her medication. When the nurse returned the telephone call later that day, she reported that the physician discontinued one heart medication (blue capsule) last month due to side effects, and Ms. Jones was provided with a new prescription for a different heart medication, after being informed to stop taking the first medication.

Information overload & scatter

Information underload

Information conflict

Information underload

Erroneous information

Figure 2.

Community pharmacy vignette illustrating how a pharmacist may experience several information hazards during a handoff process

Table 1

Pharmacist, Work Setting, and Job Description

Pharmacist	Work Setting	Job Description
A	Grocery Store Pharmacy	Floating pharmacist
B	Independent Pharmacy	Staff Pharmacist
C	Independent outpatient pharmacy	Staff Pharmacist
D	Independent Outpatient Pharmacy	Managing Pharmacist
E	National Chain Pharmacy	Floating Pharmacist
F	National Chain Pharmacy, 24 hours	Staff Pharmacist
G	National Chain Pharmacy	Staff Pharmacist, 2 stores
H	National Chain Pharmacy	Managing pharmacist