Barriers Associated with Medication Information Handoffs

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Abstract

Objectives: The transfer of medication information across patient care settings is an important care process handoff with major potential for adverse medical events. This paper reports the results of a recently completed AHRQ project, *IDS Solutions for Medication Information Transfer Across Patient Care Settings*. A primary objective of this research was to enhance understanding of how patient handoffs are related to risk of adverse medical events before and after implementation of an information technology solution. **Methods:** A series of key informant interviews with relevant staff was systematically conducted at two hospital facilities to understand the medication information transfer process. This led to an informed pre- and post-evaluation of an implemented information technology (IT) solution. **Results:** Based on thematic analysis of qualitative data, we identified information barriers due to work processes, role definitions, and individual discretion. Underlying these barriers are more basic technical, structural, and cultural challenges that affect the ability of IT to solve the problems inherent in handoffs across diverse settings. **Conclusions:** Results from this study can be used to inform future research, drive targeted quality improvement interventions and process redesign, and underscore the need to coordinate care across patient care settings to improve patient safety.

Introduction

This study focused on medication information transfer within integrated delivery systems (IDSs), with a particular focus on the use of information technology (IT) to help address transition problems. Our primary research questions were—

- What is the breadth and depth of the medication information transfer process across the care continuum?
- What patient safety problems arise due to ineffective transitions across care settings?

In this paper, we elucidate the root causes of the barriers uncovered, and classify these causes in an attempt to stimulate ideas for potential remedies. Realizing that clinical IT is only part of the solution, we hope to encourage a search for lasting solutions to the problems of patient safety.

Background

Transitions in care have been identified as an important risk area for patient safety.[1–3] There is a particular risk of discontinuities occurring during patient handoffs between acute and primary care.[4, 5] In these transitions, the issues of medication safety are paramount, considering the predominant role of pharmacologic therapeutics.[6–9] Patients seldom escape the hospital without changes to their drug regimen and often go home with more medications than prior to admission.[10–12] These changes are not well understood by patients and have the potential to cause adverse events.[13–15] A recent study showed 19 percent of patients had an adverse event following discharge from the hospital, with the majority related to medication management.[16] A similar study showed a 20 percent adverse event rate for medications that were discontinued during transitions in care.[17]

The issue of problems relating to transitions in care is variously called continuity,[18] coordination,[2] or clinical integration.[19] These problems are related to the current emphasis on communication, teamwork, and an open culture of safety.[2, 20–26]

A number of studies have examined patient handoffs from acute to primary care, including studies of computer-generated and structured discharge notes, faxed discharge summaries, pharmacy-to-pharmacy communications, and the use of patients to deliver discharge summaries.[27–31] Several of these trials of improved communication at discharge show increased satisfaction among providers and a potential reduction in adverse events.[29, 31]

One shortcoming of these studies is a focus on technical issues, such as information exchange methods, with less recognition of organizational and cultural differences between settings. The settings typically have different plans of care, different clinical teams, different time demands, and a different infrastructure of information support.

A broader perspective on continuity of care across settings can be found within family practice and nursing literature. Saultz advocates for continuity not only over time but also across settings, with the family physician as care coordinator.[18] Nursing literature is rich with studies attempting to bridge the acute-care-to-primary-care gap.[32–37] Studies have shown that bridging roles reduce readmissions and emergency department use.[33, 34]

In the present paper we describe technical barriers associated with informational transitions. We also discuss the interrelated structural and cultural barriers inherent in transitions across settings, with a particular focus on medication safety.

Methods

Settings

The study was conducted in one primary care practice and four inpatient facilities (one academic medical center and three community hospitals, two of which have active teaching programs) within three IDSs in Oregon, Utah, and North Carolina. Medical staff at these facilities are a mix of IDS-employed and private practice physicians. Each IDS contains primary care and either owns or is affiliated with long-term care and home services entities. The IDS in Oregon was the principal setting of interest with external validation work conducted at partner facilities in Utah and North Carolina.

IT systems presently in use and degree of integration

Information systems in use in these IDSs are described elsewhere,[38] but none of the IDSs in the study has fully integrated systems. For our primary study site in Oregon, the IDS-employed hospitalists have access to the ambulatory electronic medical record (EMR); conversely, ambulatory physicians have read-only access to hospital discharge summaries via a Web portal. Acute care pharmacists and nurses do not have access to the ambulatory EMR.

Whether clinicians in Oregon actually access information from other settings varies with patient complexity, patient acuity, and time pressures. Despite progress toward integrated information systems, there is still a heavy reliance on paper charts because of technical constraints, equipment maldistribution, and multiple clinician access procedures.

IT solution studied

An interim IT solution was developed at the Oregon IDS. Physicians in two residency programs were trained to make the ambulatory medication list part of their admission history and physical examination (H&P). They wrote their discharge summary as a document within the ambulatory EMR and simultaneously updated the ambulatory medication list. The hospital medical records departments agreed to accept these discharge summaries for coding and billing purposes. The long-term purpose of these changes was to enable constant updating of the ambulatory medication list. Thus, the list would be more accurate and used more often as a reliable source of medication information.

Subjects and sampling

A purposive sample of focus group participants and key informants was selected in order to include a diverse range of disciplines, including nurses, nurse managers, floor pharmacists, pharmacy managers, primary care, hospital physicians, case managers, social workers, and administrators. A total of 56 staff participated in focus groups or key informant interviews.

Data collection, analysis, and validation

Focus groups and key informant interviews

Focus group sessions were led by experienced moderators at the Oregon facility and were audiotaped and transcribed. Researchers created a series of detailed care process maps that documented the flow of information from ambulatory to acute care and back again, based on analysis of these data. Thematic analyses were used to describe barriers to effective information transfer.[39]

Key informant interview guides contained open-ended questions on information transmission across care settings, based on a generic care process map, focusing on barriers and enabling factors observed at all three IDSs. Two researchers conducted all the interviews, and a trained recorder captured responses real-time in a Microsoft® Access database. Data from each site were collected independently and files were then merged to support thematic analyses both within and across sites. In order to assure the quality of qualitative analysis, we included a member-checking step in our analysis plan, whereby a liaison at each site was asked to review our results. A convenience sample of 18 recently discharged patients (within the past 6 months) participated in two focus groups (nine patients each), allowing us to followup on emergent themes from key informant interviews and focus groups with clinicians.

Failure Mode and Effects Analysis (FMEA)

Failure Mode and Effects Analysis (FMEA), one approach in the family of methods included in probabilistic risk assessment,[40] was used to describe and prioritize failures and identify their root causes. This structured approach involved assembling a team of clinical experts, identifying a trained facilitator, introducing the rating scales and process during team orientation, and collectively scoring failure modes. The group brainstormed both failures and their effects. An example would be the failure to provide complete discharge instruction, with the effect that a patient might take the wrong dose of a medication upon returning home. The probability of this failure-effect combination was rated as to frequency of occurrence, potential severity, and likelihood of detection before harm reached the patient. Frequency, severity, and detectability were each given a score from 1 to 10. Risk priority numbers (RPNs) were calculated as the product of the frequency, severity, and detectability scores. Failure mode scores could range from 1 to 1000.

It should be noted that the probability of a failure-effect combination is generally lower than for the failure itself. For example, discharge instructions may frequently be incomplete, but less frequently result in the patient taking a wrong dose. Our method for rating failure-effect combinations therefore results in somewhat lower frequency scores than methods that simply rate the frequency of failure alone. A complete description and justification for this approach is provided elsewhere.[41] The FMEA was repeated by the same group, under similar

guidance, but with the assumption that the IT solution described above was put in place.

Chart reviews

FMEAs were complemented by two chart reviews. The first was of 100 consecutive charts from one medical center, to estimate more precisely select failure probabilities. The second was a review of charts within the residency program implementing the IT solution, to determine whether discharge medication information transfer from acute care to primary care physician (PCP) actually improved. In this study, medication information transfer using Oracle® Logician for a small sample of residency patients (n = 46) was compared to traditional dictation for previously unassigned patients (n = 40) who later became ambulatory care residency patients.

Results

Detailed results are provided in an extensive report showing extensive detail of all focus group data, FMEA tables, and ratings.[41] The most important findings are summarized below.

Admission and discharge information transfer steps

In simplified terms, six steps—which are remarkably similar at all three IDSs studied—are used to gather, organize, and communicate clinical information at admission and discharge.

At admission—

1. the admitting physician writes admitting medication orders;
2. nurses document the patient's historical medications; and
3. inpatient pharmacists create a medication administration record (MAR).

At discharge—

4. the discharging physician develops discharge instructions for the patient;
5. nurses educate the patient about the discharge instructions; and
6. the new medication regimen is transmitted to the followup physician in a discharge summary.

Although the steps appear straightforward, the process is not always linear or without iteration. Indeed, nurses and physicians often gather patient information in parallel. However, these steps establish a framework for assessing risks inherent in the process.

Important generalized process variations

Patient complexity, acuity, and treatment category influence the degrees to which these transfer procedures vary. For complex patients, more attempts are made to access historical medication information from the family, ambulatory records, past hospitalizations, and even from community pharmacies. Patients are sometimes asked to bring all their medications in a bag.

Additional communication channels may also be used for complex patients. For example, a physician may dictate a discharge summary, fax the summary to the PCP, and follow up with a telephone call. For patients discharged to nursing homes, a complete medication list is typically written within a set of transfer orders.

Patient acuity, the immediate severity of the patient's condition, also modifies information gathering. For example, emergency department physicians reported that they tend to focus on a few high-risk medications and significant allergies versus a complete medication history. This reflects their focus on immediate treatment and stabilization of an acute illness or injury.

Respondents reported that less attention is paid to chronic disease medications for surgical patients, citing frequent use of the term, "continue medications as at home" on both admitting and discharge orders. Discharge instructions from surgeons can be very brief, covering only new medications for pain. Also of note is a patient perception that specialty units have higher quality medication information transfer than do general medical units with diverse patient populations.

Although there are six simple steps in medication information transfer, variation occurs in (1) the amount of historical information that is sought; (2) the sources of information used; (3) the comprehensiveness of medication orders; and (4) the communication channels used. Though variability often depends on patient complexity, acuity, or treatment type, respondents consistently reported that a great deal of variation occurs because of individual discretion and time constraints.

Failures associated with medication information transfer

The major failures associated with medication information transfer are (1) wrong or incomplete admitting orders; (2) inadequate discharge orders; (3) insufficient explanation of discharge medications; and (4) poor communication with the PCP regarding discharge medications.

Summary scores from the FMEA are presented in Table 1, which shows the relative risk for each step as it is currently performed in one IDS.

Admission failures include omitted medications, altered doses, or missed allergies. Most failures are attributed to inadequate understanding of the patient's previous medication history, which is caused by poor information sources and channels, a lack of time to search for better medication information, or reference

Table 1. RPN scores for current process

Process step	RPN score
1. MD admit order	203
2. Admit nurse form	109
3. MAR initiated and Rx begun	113
4. MD discharge med orders	192
5. Discharge Rx explained	190
6. Discharge Rx transmitted	180
Overall average	164

These summary scores are based on a long list of specific failures and causes enumerated in *IDS Solutions for Medication Transfer Across Patient Care Settings*, available from the corresponding author (see "Author affiliations").

to an out-of-date medication list. Inadvertent conflicts among multiple physicians treating the patient were also identified as contributing causes.

A significant failure at discharge is the chance that medications held during the stay are not resumed, particularly chronic disease medications that have long-term survival value but are not critical in the acute stage of illness. Causes of this failure include a lack of time at discharge, the fact that the home medication regimen may have been incompletely gathered at admission, and reluctance by the hospitalist to suggest long-term changes in regimen. It is assumed that medications will be corrected at an immediate followup appointment with the PCP. A final type of failure involves prescriptions for medications that are unavailable or unaffordable in the ambulatory setting.

Insufficient patient education at discharge was also rated as a high-probability, high-severity failure. Causes include rushed discharges, low patient cognition, and sparse discharge orders. If the physician writes, "resume home medications," nurses are hesitant to provide a detailed list because legally this could be seen as a form of medication prescribing.

The final high-priority failure was the inability of ambulatory care providers (including nursing homes) to receive discharge medication information. Transmission errors include discharge summaries sent to wrong physicians, wrong clinics, or not sent at all. Paper documents sometimes do not make their way into the chart. Delays were described as common, and specialists can be left out of the loop. Respondents also believed that PCPs might not carefully review discharge orders when they are received.

Several of the failures emerging from the FMEA were corroborated via chart review. Of the 100 charts reviewed, 19 percent contained discharge notations to "resume home meds." The nursing admission form was missing information on medications 26 percent of the time and over-the-counter (OTC) or herbal medications 33 percent of the time.

Patient focus group findings corroborate other risks identified in the FMEA. None of the 18 participating patients could identify a single health care provider that was aware of all their medication information. Discharge education was described as inadequate and frustrating. Patients attempting to minimize the risks of poor information transfer reported being hampered by brand substitution or the use of generics with different names and different dosages from setting to setting.

IT solutions to reduce these risks

The FMEA results for the IT solution show significantly reduced risks on the highest risk steps. There is minimal impact on the nursing information and the MAR. Table 2 shows RPNs side-by-side with risk scores for the existing process. Across all steps, risks were estimated to decrease by 45 percent.

Table 2. RPN scores with and without IT intervention

Process step	RPN for existing process	RPN for IT intervention	RPN difference	% Risk reduction
1. MD admit order	203	83	120	59%
2. Admit nurse form	109	101	8	7%
3. MAR initiated and Rx begun	113	73	40	35%
4. MD discharge med orders	192	80	112	58%
5. Discharge Rx explained	190	78	112	59%
6. Discharge Rx transmitted	180	90	90	50%
Overall average	164	84	80	45%

The chart review at one residency program confirmed the risk reduction potential of the IT solution. All 448 discharge medications prescribed to the study group members were accurately listed in the appropriate patient's ambulatory record, while only 232 of 288 (81 percent) were accurately listed for the comparison group. Only 55 percent of comparison group patients had 100 percent accuracy in information transfer of medication information.

Unfortunately, interview data suggest that these benefits are not captured across the IDS. The key difference between residents and hospitalists is that residents see the same patients in hospital and ambulatory settings and must write medication lists for both settings. They save time by doing so only once (within the ambulatory record). Elsewhere in the IDS, hospitalists do not see patients in the ambulatory setting and do not make changes in ambulatory medication information.

Discussion

The similarity of care process steps corroborated at three different IDSs suggests that medication information transfer into and out of acute care is a fairly

generalizable process. Variation due to patient factors such as acuity level and treatment type (surgical, nonsurgical) is similar. Just as notable is the variation due to nonpatient factors, such as individual discretion and time constraints in all three IDSs. The presence of this type of variation can make process improvement more difficult.

The current study does not show whether failure modes and risk levels are generalizable across systems, although interviews with key staff at three IDSs suggest that risks are comparable. Risks are likely to depend on the level of IT infrastructure and previous efforts to address the problem through medication reconciliation or patient discharge education.

The fact that FMEA risk scores were somewhat higher at discharge than at admission is probably not due to a greater severity of errors or greater probability of error. FMEA raters called attention to the longer "risk window" at discharge, when the patient would not be closely monitored (for compliance or ill effects). A medication error in the hospital has many chances to be detected through physiological measures and lab work. The risk window for an incomplete or incorrect discharge medication order extends until the patient has primary care followup.

The promise and challenges of clinical IT

The FMEA demonstrates that IT can help solve problems of medication information transfer. The FMEA predicted that the IT strategy implemented in one IDS reduced risk scores in the highest risk steps, and there was some confirmation by chart review. Many failures, such as those associated with illegibility, miscommunication, and limited information access, can be ameliorated by the use of clinical IT.

Challenges still remain. First, the medication list is always changing, so no single information source can be considered definitive even if it is electronically accessible. While the patient might be considered a definitive source, failures in information gathering at admission partially reflect the weakness of patient self-report. Hospitalized patients may be too ill to accurately report, may suffer memory lapses, be confused over medication names, and lack appreciation for the importance of reporting OTC and herbal medications.

Second, the speed of decisionmaking required in the acute setting often precludes reconciling information sources. Decisions must often be made before complete information is gathered. In some settings (e.g., emergency department) the need for speed is so great that delay means doing without. When minutes matter, searching for information will not be done, conflicts among information sources will not be resolved, and delays (missing faxes) will be equivalent to no information, because decisions cannot wait.

Complicating reconciliation is the fact that incomplete or inconsistent information is often transmitted without clarification or context, such as the source of information, the date of information, or the transmitter's confidence in the credibility of the information. These "meta data" are often important to

understand whether a medication list is out-of-date or a secondary source (e.g., the patient's family) should be consulted to determine the real medication regimen.

Finally, fully integrated information systems are challenging to design, expensive to build, and difficult to implement and maintain.[42–44] They can be repositories for both accurate and inaccurate information.[45] To date, there has been more progress on optimizing information systems within settings than across them. This is likely due to the better-defined uses and smaller number of users of these systems, which in turn makes it easier to show a return on investment.[2, 46] Indeed, the challenge and cost of building interfaces among systems has been a key barrier for capturing the benefits of IT.[47–49]

These technical challenges pose important questions for further research:

- How can specialized ancillary information systems be designed with integration in mind?
- What are the short-term strategies for bedside clinicians to use with nonintegrated IT?
- What factors lead to increased trust and use of computerized information?
- Can "meta-data" help deal with information inconsistencies?
- What are setting-specific requirements for speed of information access?

Role definitions

At times, good information is available but does not travel across settings. One reason is that many providers define their practice scope very narrowly. Examples include the surgeon who does not attend to chronic disease medicines during an inpatient stay, the internist who believes that consultants should control medication decisions, or the hospitalist who is reluctant to intrude into primary care medical management.

Second, providers may be overly concerned with the immediate situation and not the long-term setting, in which a patient may have to administer his or her own medications. Post-hospitalization conditions may not be conducive to medication access or adherence. Formulary and cost issues have already been cited.

Finally, many providers have a narrow concept of "team." They communicate mostly with the people in their current setting, rather than the series of providers that follows the patient. When they communicate across settings, they may communicate only within their discipline (e.g., physician to physician, pharmacist to pharmacist, etc.). Finally, they may fail to make the patient or family an active part of the team.

Narrow role definitions are not personal failures as much as imperatives caused by the organizational structure and the pressures of the settings in which providers operate. Employers of health care providers require them to be efficient within their setting. This narrows their focus and willingness to follow the patient's care into the next setting. Providers are unlikely to ask key questions necessary for an effective transition, including—

- What will conditions be like in the next care setting?
- What information will be needed?
- Who needs to know about the care I have provided and decisions I have made?

These issues of constrained responsibility are held in place by the underlying incentives and financing mechanisms in health care, a priority area identified by the Institute of Medicine.[2]

Second, few primary care providers follow patients across settings due to the inefficiency of travel and the small number of patients in a hospital or nursing home at any one time. Greater efficiency is one of the reasons many health systems have implemented hospitalist care.[50, 51] However, concerns about discontinuities in care arising from this system continue to surface.[52]

Third, continuing specialization means that multiple providers are often involved in a patient's care. This increases the chance that no single provider will have all relevant medication information. The situation is exacerbated by the need for physician cross coverage and shift work among various disciplines. This decreases the likelihood that patient medications and therapeutic response will be shared accurately across time. However, it does increase the probability that multiple people will gather the same information from the patient.

Finally, health care is team-based. Information must be transmitted from one team to another team, a more complex task than a simple person-to-person exchange. Should information go from team leader to team leader? Team-to-team communication approaches had great variability within the IDSs we studied.

Research questions on organizational issues include the following:

- How can employment contracts be structured to promote collaboration across settings?
- What are the best ways for PCPs and specialists to share medication information?
- What is the potential (and the limitations) for patients to be the repository of medication information?
- What are the most effective team-to-team communication strategies?
- When should redundant data collection be maintained for patient safety reasons?

Role discretion

There is great variability in the ways providers apply their role to the individual case at hand. Some of this is beneficial—e.g., the clinician adapting to the individual circumstances of the patient. However, variability is detrimental when it is not based on the patient but rather on forced adaptation to someone else's practice style or simple day-to-day variability. Variability of work processes and prescribed roles causes clinicians to scatter their energy by dealing with complexities beyond the individual circumstances of the patient. Variability also becomes a barrier to good information transfer. Health care workers we spoke to reported that this variability has the following effects:

- Creates uncertainty: "I'm not always sure the information will be there."
- Erodes trust: "I'm afraid these data aren't always accurate."
- Causes duplication of effort: "It's just easier to gather the information for myself."

At the root of this variability is a culture of individuality prevalent in health care, which extends to the use and control of information. For example, many primary care providers do not keep their electronic medication lists up to date. While they personally know which medications have been tried and abandoned for each patient, they may not realize that someone from another setting may access information in the electronic record. Instead, we need to build a culture that supports shared medication information.

There is growing recognition that changes in culture may be needed to improve medication management.[53, 54] For example, the different levels of power and authority affect nurses' willingness to question or clarify orders.[2, 55] Distrust between physicians and hospitals, and its impact on slowing the implementation of clinical information systems, has also been cited.[2] Nurses, pharmacists, and other clinicians have their own professional cultures and may think first to transmit information within their discipline, where there is a common language and professional familiarity. Decisionmaking styles and the use of information vary even within physician specialties. General practitioners, when compared to hospitalists, have been found to place greater value on their historical knowledge of the patient.[56] Finally, it will take a cultural shift for many patients to take an active role in their own care. Efforts are underway to teach patients how to keep themselves safe and to be reliable conduits for medication information.[15, 57, 58]

Research questions include—

- Can training (e.g., in situation awareness) overcome cultural communication barriers?
- Which treatment decisions are most sensitive to historical patient information?
- How does the Health Insurance Portability and Accountability Act (HIPAA) affect the broader sharing of medication information?

Conclusion

This paper provides an indepth understanding of the types of barriers encountered in transferring accurate and timely medication information as patients are handed off across care settings and the impact of an implemented IT solution. Such knowledge provides insight for organizational policy and work process redesign, as well as contributing to the direction of future health services research.

Patient safety risks associated with transitions in care settings are receiving increasing attention. The Joint Commission on the Accreditation of Healthcare Organizations is considering new standards in 2005 for medication reconciliation at admission to a new setting and identification of a practitioner who is responsible for coordinating care.[59] The need for data standards and portability to increase information flow has been reinforced by the Institute of Medicine and more recently noted by national leaders.[2] Finally, IDSs have pursued a variety of strategies to address problems of transitions in care. Prevalent among these is the use of clinical IT; however, IT is not a panacea and may introduce new barriers in medication information transfer as patients move across the care continuum.[60]

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