

# A Case Report in Health Information Exchange for Inter-organizational Patient Transfers

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## Keywords

Medical informatics, patient transfer, health information exchange, computer communication networks, qualitative research

## Summary

**Objective:** To provide a case report of barriers and promoters to implementing a health information exchange (HIE) tool that supports patient transfers between hospitals and skilled nursing facilities.

**Methods:** A multi-disciplinary team conducted semi-structured telephone and in-person interviews in a purposive sample of HIE organizational informants and providers in New York City who implemented HIE to share patient transfer information. The researchers conducted grounded theory analysis to identify themes of barriers and promoters and took steps to improve the trustworthiness of the results including vetting from a knowledgeable study participant.

**Results:** Between May and October 2011, researchers recruited 18 participants: informaticians, healthcare administrators, software engineers, and providers from a skilled nursing facility. Subjects perceived the HIE tool's development a success in that it brought together stakeholders who had traditionally not partnered for informatics work, and that they could successfully share patient transfer information between a hospital and a skilled nursing facility. Perceived barriers included lack of hospital stakeholder buy-in and misalignment with clinical workflows that inhibited use of HIE-based patient transfer data. Participants described barriers and promoters in themes related to organizational, technical, and user-oriented issues.

The investigation revealed that stakeholders could develop and implement health information technology that technically enables clinicians in both hospitals and skilled nursing facilities to exchange real-time information in support of patient transfers. User level barriers, particularly in the emergency department, should give pause to developers and implementers who plan to use HIE in support of patient transfers.

**Conclusions:** Participants' experiences demonstrate how stakeholders may succeed in developing and piloting an electronic transfer form that relies on HIE to aggregate, communicate, and display relevant patient transfer data across health care organizations. Their experiences also provide insights for others seeking to develop HIE applications to improve patient transfers between emergency departments and skilled nursing facilities.

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## 1. Background

Problems with patient transfers between hospitals and skilled nursing facilities (SNFs) are prevalent [1], associated with medication errors [2], unplanned readmissions [3, 4], high healthcare costs [3], and poor patient outcomes [4, 5]. Although patient transfer problems exist internationally [6, 7], the problem has added urgency in the United States because Medicare no longer reimburses healthcare costs for patients with congestive heart failure, acute myocardial infarction, or pneumonia who have unplanned readmissions to a hospital within 30 days of initial discharge [8]. Moreover, beginning in 2015 Medicare will no longer reimburse unplanned readmissions for at least four additional patient conditions [9, 10].

Health information exchange (HIE) is one informatics-based approach that can address this problem. HIE can facilitate information sharing that in turn improves care coordination and reduces unplanned or unnecessary patient rehospitalizations [3, 11, 12]. However, there are known HIE barriers for inter-organizational patient transfers such as software integration issues and competing information needs [13–15].

This case report describes the efforts of the Continuum of Care Improvement Through Information New York (CCITI NY). Beginning in 2008, CCITI NY brought together healthcare organizations and a commercial software developer to implement HIE in support of patient transfers between hospitals and SNFs. Funding for the CCITI NY initiative came from New York State's Healthcare Affordability and Efficiency Law Phase 5 (HEAL 5). HEAL 5 supported State health infrastructure improvements through interoperable electronic health records and HIE. Please refer to ► Table 1 for a list of relevant terms in this case report.

### 1.1 Project History

Upon its inception, CCITI NY set out to engage multiple stakeholders who could inform the implementation of an HIE-based electronic patient transfer of care form (e-Transfer Form). The e-Transfer Form was to be a messaging application that could relay patient data including demographics and medication lists between hospital emergency departments (EDs) and SNFs. This was seen as an improvement over routinely used paper-based forms that lacked standardization or could be lost in patient transit [16, 17].

### 1.2 The e-Transfer Form System

To share data within e-Transfer Forms, CCITI NY intended to unite patient data stored within two Regional Health Information Organizations (RHIOs) based within New York City. A RHIO is an HIE organization that stores and shares patient information among authorized healthcare organizations in defined a geographical region. CCITI NY teamed with RHIOs rather than using an alternate HIE model, i.e. direct message exchange, to take advantage of this existing infrastructure. Using the RHIO infrastructure would in theory allow any hospital or SNF with Internet access to view a patient's data from a single portal, CCITI NY intended for the e-Transfer Form to adhere to existing HIE standards whenever possible and thus utilized the continuity of care document (CCD) standard to format clinical data such as patient allergies, conditions, and medications [18]. Having structured data held out the possibility for CCITI NY to build clinical decision support tools into the e-Transfer Form, such as warnings for inappropriate drug-drug and drug-condition interactions.

The CCITI NY effort would represent an ambitious, and novel, attempt at improving inter-organizational patient transfers by implementing an electronic patient transfer form on top of two existing RHIO infrastructures in New York City.

## 2. Objectives

Our objective was to determine the barriers and promoters to implementing HIE for inter-organizational patient transfers between one hospital ED and one SNF.

### 3. Methods

This study was conducted as part of the New York State (NYS) HEAL 5 evaluation process, led by researchers from the Health Information Technology Evaluation Collaborative (HITEC), which is designated to evaluate New York's HEAL NY-funded efforts. The Institutional Review Board at Weill Cornell Medical College approved this study.

Our multi-disciplinary team developed and piloted a semi-structured interview guide informed by a validated information systems model [19]. We recruited 18 participants using standardized e-mails and telephone scripts as well as participant referrals [20] (► Table 2). Repeated attempts to interview at least two ED physicians failed because for unknown reasons, e-mails and phone calls to hospital providers and administrators were not reciprocated. CCITI NY verified that it had similar experience and suggested interviewing a trainer who interacted with ED clinicians. Scheduling conflicts prevented interviews with two subjects, no participants dropped out of the study.

Interviews occurred between May 2011 and October 2011. All 16 CCITI NY participants were interviewed by telephone whereas the two SNF physicians were interviewed in person. Interviews were audio-recorded after obtaining oral consent from each participant.

Audio recordings were transcribed and analyzed using Grounded Theory and the aid of ATLAS.TI qualitative software. Grounded Theory is a qualitative method in which word-based data are iteratively collected, labeled with "codes", and interpreted in order to generate themes [22]. We used well-accepted analytic approaches that include dialoging to inductively formulate three themes:

1. Organizational Structure,
2. Technical Issues, and
3. User Considerations (► Online Supplement).

We vetted the themes with a knowledgeable participant.

### 4. Results

#### 4.1 Organizational Structure

CCITI NY members recruited representatives from SNFs, RHIOs, software developers, and third-party consultants with informatics experience. CCITI NY had difficulty gaining buy-in from hospital stakeholders, particularly ED managers and clinicians, throughout the project. Furthermore, RHIO and SNF representatives required familiarization with one another because they had not previously worked on HIE together.

CCITI NY overcame these hurdles by forming a tri-partite governance structure of "workgroups:"

1. "Finance" to oversee operations,
2. "Technical" to harmonize RHIO protocols, and
3. "Clinical" to develop e-Transfer Form data requirements.

A project manager was a critical go-between among workgroups and individuals.

#### 4.2 Technical Issues

CCITI NY succeeded in getting a stand-alone e-Transfer Form to display aggregated patient data from two RHIOs. In addition, the e-Transfer Form could deliver patient-specific drug-drug and drug-allergy CDS alerts from a third-party content provider. The alerts automatically displayed to patient transfer recipients, and could be manually accessed by a patient transfer sender.

A challenge with aggregating data from two RHIOs into a single e-Transfer Form was achieving sufficient performance. For example, aggregating RHIO patient data, generating and populating a form, and then displaying the e-Transfer Form could result in 30-second load times. Once data were received, another challenge was effectively presenting the data so that physicians could interpret results. It was reportedly difficult for physicians to discern the most current problem list from past

lists, identify which clinicians documented which problems, and determine how to inactivate outdated items on a problem list.

Interviewees lauded CCITI NY's priority to base the e-Transfer Form on CCD standards in the face of technical difficulties. However, interviewees noted the standard did not fully account for data that were pertinent to patient transfers and, particularly, SNFs (e.g. incontinence or mental status). Therefore, CCITI NY had to augment the standard to support data requirements.

Notably, the CCITI NY project began before the Patient Transfer CCD standard was finalized; therefore, it was reportedly a monumental task harmonizing the e-Transfer Form's clinical data to the CCD. Although the standard was finalized by the time of the study, interviewees were not uniformly aware of this and had no plans to engage standards-making bodies about the CCITI NY experience.

### 4.3 User Considerations

CCITI NY focused more on e-Transfer Form standards and less on understanding user requirements for rapid information access that was viewable by both physicians and non-physicians, particularly in the ED. By the end of the pilot project, SNF staff used the form when transferring a patient to the ED, but the ED did not use the form in return. Eventually the e-Transfer Form had to be redesigned so that the ED received a paper fax that was then handled by a nurse and subsequently a physician. This workflow was much different than what the developers had envisioned, which was that a single ED physician would directly access the patient data online.

User training was considered critical for achieving user buy-in as well as effective use of the technology. However, SNF physicians expressed frustration at their inability to find the e-Transfer Form within the user interface. An interviewee also noted particular challenges training ED physicians because those physicians did not have occasion to use the e-Transfer Form enough to ingrain any training. Given these limitations, system administrators estimated very low usage (up to 5 uses a week) in the two months after the 2011 implementation.

## 5. Discussion

This case report demonstrates partial success at implementing an HIE tool to support patient transfers between a hospital and a SNF; and provides a microcosm of potential organizational, technical, and user challenges that arise when operationalizing HIE for inter-organizational patient transfers (► Table 3). Research has traditionally focused on safety within the context of intra-hospital patient transfers, but it is becoming increasingly clear that inter-organizational patient transfers requires new solutions that foster cross-institutional collaboration and feedback loops. Given our results, effort should be directed at understanding the technical, organizational, or user barriers to sharing patient transfer data, particularly from the hospital perspective.

Gaining involvement and sustaining involvement in HIE initiatives has long been a barrier to implementation and sustainability [26, 27]. Yet CCITI NY was able to develop a governance structure using financial, technical, and clinical workgroups that enabled administrators, physicians, and outside consultants to agree upon and operationalize technical as well as data standards. The confluence of perspectives, skills, and know-how spoke to the importance of support provided by NYS to assemble and sustain CCITI NY. CCITI NY would do well to share what it has learned regarding patient transfer data standards to HIE standards-bodies. Successfully piloting inter-organizational HIE was no small feat and demonstrates that multi-disciplinary stakeholders can, and likely must, work together to sustain an initiative. CCITI NY's effort provides a model with which stakeholders in communities outside of New York can leverage to potentially improve inter-organizational communication in support of patient transfers.

Engaging end users from the beginning is important for mitigating the barriers to implementation and use of an inter-organizational e-Transfer Form. This research revealed that ED nurses and ancillary staff are just as likely to rely on patient transfer data than physicians, if not more so. Therefore ED-based informatics interventions must account for group-based information delivery as opposed to single point delivery.

Developers considered physicians' needs but admittedly did not conduct sufficient workflow analyses or user testing during the software development process opting instead to rely on available standards. This is somewhat surprising given that informatics research has consistently shown the importance of first understanding user requirements in addition to technical requirements. Our findings provide a cautionary lesson: Meaningful Use Stage 2 technical standards meant to support care transitions, e.g. generating summary of care records, only partly address care transition challenges.

Placing the priority on standards above the appropriateness of the technology may have ultimately limited the e-Transfer Form's usefulness in the ED. CCITI NY quickly encountered future challenges: aggregating data across RHIOs into CCDs within sub-second speed; developing user interfaces that effectively present aggregated RHIO data; integrating ED and SNF clinicians' information needs into the e-Transfer Form; and developing an e-Transfer Form that supports team-based information access that predominate in ED settings. Today, CCITI NY provides the HIE tool to 52 post-acute care facilities and 6 acute care facilities [29].

Limitations include no ED physician interviews despite repeated attempts. The lack of response supports assertions that ED buy-in was a consistent barrier and highlights the need for effective outreach strategies. In addition, state-level funding is unlikely available for most organizations. Nonetheless, we believe the results from this case report provide important insights into the barriers and promoters of HIE for inter-organizational patient transfers.

## 6. Conclusions

This case report demonstrates that stakeholders with appropriate resources and expertise can operationalize HIE for inter-organizational patient transfers. Participants demonstrated they could successfully leverage patient transfer CCD standards, despite limitations. The findings support continued standards harmonization, greater technical sophistication, more thorough inter-organizational use cases, and better understanding of provider information needs. Informatics interventions, coupled with payment incentives, will likely spur greater acceptance among stakeholders. With greater acceptance, institutions will be able to quantify the impact that HIE has on inter-organizational patient transfers.

### Clinical Relevance

Problematic information exchange between hospitals and SNFs can contribute to high rates of unplanned patient readmissions, which can risk patient safety and significantly burden healthcare organization resources. This article reveals the experiences from one initiative that endeavored to improve hospital-SNF information sharing through HIE and associated informatics techniques. The investigation provides lessons that may benefit organizations that are exploring and seeking to use HIE and informatics interventions to improve hospital-SNF patient transfers.

### Conflicts of Interest

The authors declare that they have no conflicts of interest in the research.

### Protection of Human and Animal Subjects

The study was performed in compliance and with approval from the NYS Department of Health and the Institutional Review Board of Weill Cornell Medical College.

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**Table 1** Terms and Definitions

Acronym	Term	Definition
CCD	Continuity of Care Document	A standard that formalizes the structure of patient information so that the information may be exchanged among different types of health IT
CCITI NY	Continuum of Care Improvement Through Information New York	An organization that received New York State grant funding to develop and implement health IT that leverages RHIO patient data for hospital-SNF patient transfers
e-Transfer Form	e-Transfer Form	A CCITI NY-developed health information technology that imports and presents patient data from a RHIO to registered clinicians in hospitals and SNFs
ED	Emergency Department	A department that is a hospital's first point of contact for acute care cases
HEAL 5	New York State's Healthcare Affordability and Efficiency Law Phase 5	State-supported health infrastructure improvements through interoperable electronic health records and HIE
HIE	Health Information Exchange	The process by which patient information is electronically and securely sent and received among a community of authorized users
NYS	New York State	A state that includes New York City, the most populated city in the United States
RHIO	Regional Health Information Organization	A type of health information organization (HIO) that aggregates, stores, and distributes patient data to and from multiple member stakeholders (including hospitals and SNFs)

**Table 2** Interview Participants

Role	Definition	Total
CCITI NY Administrators	Co-chairs who oversee clinical technical, and finance workgroups	6
CCITI NY Intermediaries	Contract and CCITI NY workers who bring content, project management, and training expertise	4
Software Vendor Representatives	Administrators and developers responsible for building the e-Transfer Form to CCITI NY specifications	6
SNF Physicians	On-site physicians responsible for the care of patients	2
<b>Total</b>		<b>18</b>

**Table 3** Inter-organizational HIE Barriers and Promoters

Domain	Barrier	Promoter
Organizational	Meeting the needs of competing stakeholders	Embed the end-user perspective into financial, technical, and clinical aims
Technical	Information overload	Aggregate patient record data from multiple HIE sources in sub-second time
User	Efficiently admitting a patient into an ER	Distribute patient status data to a clinical team rather than an individual clinician

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