Health Information Exchange Evaluation

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Table of Contents

EXECUTIVE SUMMARY

On March 14, 2010, the State of Nebraska received a four-year $6.8 million cooperative agreement from the U.S. Department of Health and Human Services' Office of the National Coordinator for Health IT. The Nebraska Health Information Initiative (NeHII) has served as the state's lead health information exchange and is one of the largest statewide health information exchanges in the country, growing from 464 users in 2010 to over 3,500 users in 2014.

This project was a first comprehensive evaluation of utilization and usage of HIE in Nebraska. The purpose of this evaluation was to conduct a comprehensive assessment of Nebraska HIE including the opinions of providers and consumers, prescription drug monitoring program, errors associated with e-prescribing, radiology and laboratory data, and pharmacists' perspectives.

To evaluate providers' barriers and reasons to adopt HIE, we surveyed Nebraska healthcare providers. The most common reasons for adoption were improvement in patient care as well as receiving and sending information in the referral network. Also, accessing a comprehensive patient medication list was identified as the most important HIE feature. Participants' major barriers to adoption were cost and loss of productivity.

Consumer participation is a necessary component of HIE utilization. We evaluated consumers' opinions by conducting 8 focus groups across Nebraska. Consumer concerns focused on privacy and security of medical information, lower quality of care, inconsistent provider participation, and potential cost. Positive feedback included accuracy and completeness of information, improved communication, coordination and access to information between health care providers. Enhanced

HIE features may allow consumers to become fuller participants in their own healthcare management and increase HIE utilization.

Also, we estimated the prevalence of unintended discrepancies by comparing prescriber's notes, electronic prescriptions, and dispensed medications. The discrepancy rate between the prescriber's note and the e-prescription ranged from 0.6% to 3.9%. The discrepancy rate between the e-prescription and the prescription label ranged from 0.9% to 4.2%. Difference between directions for administration was the most common type of discrepancy identified. To reduce outpatient medication errors, a better understanding is needed of the sources of discrepancies that occur within the prescriber's clinic, and those that occur between the clinic and pharmacy.

Our final evaluation project focused on the emergency room prescriber utilization and satisfaction with Nebraska's Prescription Drug Monitoring Program (PDMP). Participating emergency room physicians received training and four months of free access to the PDMP. The utilization of HIE was lower than expected. Incomplete information and impact on workflow were reported as barriers to HIE utilization for PDMP purposes. In addition, low perceived need for PDMP and prescriber preparedness to manage abusers may also have reduced utilization.

Knowledge of the existing barriers to implementation and desired features may help policymakers facilitate HIE expansion in Nebraska and across the US.

INTRODUCTION

As the potential financial and medical benefits of Health Information Exchange (HIE) continue to be explored nationally, the roll out of such systems has been met with both optimistic expectation and resistance due to the perceived barriers.[1,2] Widespread use of HIE systems around the country is a key aspect of the American Recovery and Reinvestment Act with the goals of more efficient information sharing, and ultimately the formation of a National Health Information Network (NHIN).[3] Since 2009, HIE in Nebraska has been provided by the Nebraska Health Information Initiative (NeHII) and currently includes 2,186 healthcare professionals.[4]

Evaluation of NeHII implementation barriers among physicians and assessment of the desired NeHII features are needed to facilitate usage and implementation. Other states have discovered that while many physicians see HIE as likely to have positive impact on patient care, payment for access to the system is a common concern. Utility is associated with the willingness of patients and physicians to contribute information into the data sharing systems. Practitioners' rating of a HIE's helpfulness is associated with the completeness of the available data. In addition, completeness of data is contingent on the belief that system security is maintained adequately. Thus, data sharing is linked intrinsically with patient privacy.[5]

The purpose of this evaluation was to conduct a comprehensive assessment of Nebraska HIE including the opinions of providers and consumers, prescription drug monitoring program, errors associated with e-prescribing, radiology and laboratory data, and pharmacists' perspectives. This is the first such study in Nebraska. Knowledge of the existing barriers to implementation and desired features may help policymakers facilitate HIE expansion in Nebraska and across the US.

HEALTH INFORMATION EXCHANGE IN NEBRASKA – PROVIDER SATISFACTION

Health Information Exchange (HIE) systems are implemented nationwide to better integrate patient health information and facilitate communication among healthcare providers. The HIE in Nebraska is provided by the Nebraska Health Information Initiative (NeHII). The objectives of this study were to evaluate provider satisfaction with HIE in Nebraska and to determine utilization barriers.

We surveyed 5,618 Nebraska healthcare providers in 2013 and received 615 completed questionnaires (11%). One hundred providers (16%) were NeHII users and 19 providers (3.1%) indicated intention to use NeHII within the next 12 months. Of the 100 providers currently using NeHII, 63 (63%) indicated satisfaction with NeHII. The most common reasons for adoption among those who have ever used HIE (N=198) were improvement in patient care (N=111, 56%) as well as receiving (N=95, 48%) and sending information (N=80, 40%) in the referral network. Cost (N=233, 38%) and loss of productivity (N=220, 36%) were indicated as the "major barriers" to adoption by all participants. Accessing a comprehensive patient medication list was identified as the most important feature of the HIE (N=422, 69%).

Because cost and loss of productivity were identified as the primary areas of concern among providers, streamlining HIE access through integration with Electronic Medical Records to minimize workflow interruption, as well as keeping costs reasonably low for providers may increase participation. More efficient access to laboratory values and medication information were indicated as important features for providers and emphasizing these benefits may also help increase participation. Finally, additional education for providers on HIE practice integration may alleviate perceived barriers

in the areas of technical support and staff training, which may move provider expectations toward the

benefits that HIE can offer.

CONSUMER OPINIONS OF HEALTH INFORMATION EXCHANGE IN NEBRASKA

Consumer satisfaction is a crucial component of Health Information Exchange (HIE) utilization, as high satisfaction is expected to increase HIE utilization among providers and to allow consumers to become full participants in their own healthcare management. The main objective of this study was to identify consumer perspectives on HIE, e-Prescribing, and use of Personal Health Records as well as concerns surrounding health information security and privacy.

Eight focus groups were conducted in seven towns and cities across Nebraska. There were 67 participants, 18 (27%) were male. Concerns included privacy and security of medical information, decreases in quality of care, inconsistent provider participation, and potential cost. Positive feedback included accuracy and completeness of information, improved communication, coordination and access to information between health care providers.

Improvements in patient care were expected due to easy physician access to consolidated information across providers as well as speed of sharing and availability of information in an emergency. In addition, participants were optimistic about patient empowerment in convenient access to and control of personal health data. Consumer concerns focused on privacy and security of the health information, as well as technology, cost, and quality of care. While negative perceptions present barriers for potential patient acceptance and use of HIE in Nebraska, benefits such as speed and convenience, patient oversight of health data, and safety improvements may provide counter-balance.

FROM PHYSICIAN INTENT TO THE PHARMACY LABEL: EVALUATION OF ELECTRONIC PRESCRIPTIONS

The objectives of this cross-sectional study were to estimate the prevalence of unintended discrepancies between three sources of prescription information and to describe the types of electronic prescribing system vulnerabilities identified.[6] Staff from community pharmacies identified approximately 200 new prescriptions written at three participating ambulatory care clinics (2 adult, 1 pediatric). Unintended discrepancies were identified by comparing three sources of prescription information: (1) the prescriber's note as documented in the patient's chart; (2) the electronic prescription (e-prescription) entered into the clinic's electronic prescribing software; (3) the medication that was ultimately dispensed by the pharmacy as indicated on the prescription label. The discrepancy rate was calculated by dividing the number of discrepancies identified by the number of prescriptions evaluated.

A total of 602 prescriptions written by 33 prescribers were evaluated from the 3 ambulatory care clinics. The discrepancy rate between the prescriber's note and the e-prescription was 1.7%, 0.6% and 3.9% for the three clinics. The discrepancy rate between the e-prescription (clinic) and the prescription label (pharmacy) was 4.2%, 0.9% and 1.5%. Difference between directions for administration was the most common type of discrepancy identified. Discrepancy rates between the prescriber's note and the e-prescription were similar to the discrepancy rates between the e-prescription and pharmacy label. To reduce outpatient medication errors, a better understanding is needed of the sources of discrepancies that occur within the prescriber's clinic, and those that occur between the clinic and pharmacy.[6]

RADIOLOGY AND LABORATORY DATA

The objective of this project was to determine if access to results of diagnostic laboratory and radiology tests through the health information exchange reduces the rate of redundant testing. This was intended to be one of the first true outcomes studies related to HIE utilization. Completion of this project required both access and utilization of the HIE to be at high levels and for access to data using Optum's data analytics tool.

While there has been steady growth in the number of laboratory test results and radiology reports (radiology images are not yet available) available through NeHII, the team was unable to secure access to the data analytics tool. Without that information, it was not possible to determine how often laboratory and radiology results were utilized. The lack of utilization data limited the ability of the evaluation team to compare rates of redundant testing. Because reduced redundancy is one of the major purported benefits of HIEs, the evaluation team has committed to completing this project when the data become available.

UTILIZATION OF MEDICATION HISTORY

The objective of this project was to determine whether access to formulary and eligibility information improves medication adherence and generic utilization rates by making such information available at the time of prescribing. This study represented an outcomes study, which required both access and utilization of the HIE to be at high levels and for access to data using Optum's data analytics tool.

The results of other project within the evaluation demonstrated that medication histories or queries are viewed as an important part of a HIE though its use seems to be related more to medication reconciliation and prescription drug monitoring, than to formulary or eligibility information.

Our inability to access the data analytics tool and the gap in availability of medication histories from January to May 2013, made it impossible to compare medication adherence or generic utilization rates between patient groups. With the notable exception of the gap in availability, medication queries have increased significantly over time.
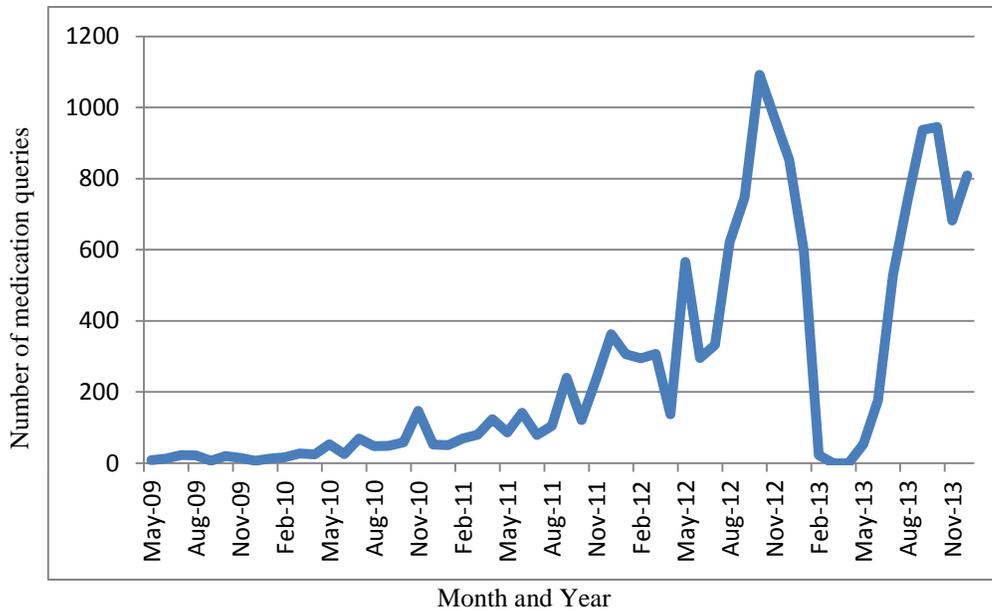
Figure 1. The number of medication queries per month and year, NeHII, 2009-2013

The current lack of medication histories in NeHII makes the evaluation difficult. Until the medication histories and analytics become available, the evaluation team is considering other projects to address the value of medication histories.

**VALUE OF HEALTH INFORMATION EXCHANGE IN THE EMERGENCY DEPARTMENT –
PRESCRIPTION DRUG MONITORING PROGRAM**

Nebraska is the first state to incorporate its Prescription Drug Monitoring Program (PDMP) into its statewide Health Information Exchange (HIE).   The objective of this study was to conduct a preliminary evaluation of emergency room (ER) prescriber utilization and satisfaction with Nebraska's PDMP.

ER prescribers were provided training and four months of free access to the PDMP. Prescribers were surveyed every two weeks to estimate the number of times they looked for and found PDMP related information. A final survey was administered to evaluate satisfaction, usefulness, and barriers to utilization.

Seventeen providers from three emergency rooms agreed to participate. Six providers completed fourteen of the 119 (13%) bi-weekly surveys. Five of the 17 (29%) participants completed the final survey. Providers accessed the HIE for 65 of 347 (19%) ER patients. Participants reported that prescription history was available for 3% of queries. Problem lists, clinic or hospital notes, and laboratory reports were reported to be available 60% of the time.

Barriers to HIE utilization for PDMP purposes were incomplete information and impact on workflow. Low perceived need for a PDMP and prescriber preparedness to manage abusers may also have reduced utilization. Financial and human resources are rarely allocated by a provider's institution for HIE implementation. Many HIEs are struggling to achieve sustainability and have limited resources to

support training. Minimizing missing information is necessary to increase utilization. Financial and

human resources are required for training and integration of a HIE based PDMP in the ER.

NEBRASKA LAB CENSUS

As part of the ongoing evaluation by to the Office of the National Coordinator (ONC), all State Health Information Exchanges are required to conduct a census of hospital and independent laboratories within their respective states. The primary objective of the report was to determine the number of labs sending electronic results to ambulatory providers outside of their organization in a structured format in 2011, 2012, and 2013. In addition, the ONC required data on whether labs were complying with the Logical Observation Identifiers Names and Codes (LOINC) standards.

A telephone survey of all laboratories in Nebraska was conducted by a trained caller using a structured script.

Summation of Key findings between 2011 and 2013:

Labs sending results to ambulatory providers outside of their organization electronically in a structured format

	2011	2012	2013	% Change 2011-2013
Hospital Labs	17/93 (18.3%)	35/93 (37.6%)	55/93 (59.1%)	+223%
Independent Labs	25/37 (67.6%)	26/37 (70.3%	26/37 (70.3%	+4%
All Labs	42/130 (32.3%)	61/130 (46.9%)	81/130 (62.3%)	+92%

Labs following LOINC standards for test results sent to ambulatory providers outside of their organization

	2011	2012	2013	% Change 2011-2013
Hospital Labs	13/93 (13.9%)	25/93 (26.9%)	42/93 (45.2%)	+225%
Independent Labs	3/37 (8.1%)	3/37 (8.1%)	3/37 (8.1%)	0%
All Labs	16/130 (12.3%)	28/130 (21.5%)	45/130 (34.6%)	+181%

BARRIERS TO ELECTRONIC PRESCRIBING: NEBRASKA PHARMACISTS' PERSPECTIVE

Electronic prescribing (e-prescribing) and its accompanying clinical decision support capabilities have been promoted as means for reducing medication error and improving efficiency and there has been a coordinated effort to increase the utilization of e-prescribing and other healthcare information technologies the United States. The objectives of this study were to identify the barriers to adoption of e-prescribing among all non-participating Nebraska pharmacies and to describe how the lack of pharmacy participation impacts the ability of physicians to meet meaningful use criteria. We used open ended questions and structured questionnaire to capture participants' responses.[7]

Of the 23 participants, 10 (43%) reported planning to implement e-prescribing sometime in the future due to transaction fees and maintenance costs as well as demand from customers and prescribers to implement e-prescribing. Nine participants (39%) reported no intention to e-prescribe in the future citing startup costs for implementing e-prescribing, transaction fees and maintenance costs, happiness with the current system, and the lack of understanding about e-prescribing's benefits and how to implement e-prescribing.[7]

The barriers to e-prescribing identified by both late adopters and those not willing to accept e-prescriptions were similar and were mainly initial costs and transaction fees associated with each new prescription. For some rural pharmacies, not participating in e-prescribing may be a rational business decision. To increase participation, waiving or reimbursing the transaction fees, based on demographic or financial characteristics of the pharmacy, may be warranted.[7]

NEBRASKA STATE HIE MATRIX

Metrics for the Nebraska State HIE Cooperative Agreement for 2010- 2014 can be found below:

NeHII	March 2010	March 2014	% Change
Number of Clients			
• Number of Clients in the Master Patient Index	1,544,570	2,703,439	75%
• Total Patients That Have Opted Out	27,032	69,020	155%
• Total Patients Opting Back In	2,092	4,372	109%
Provider Information			
• Total Number of Users	464	3,590	674%
Hospital Information			
• Number of Nebraska Hospitals Participating	8	22	175%
• % of Nebraska Hospitals Participating	8%	23%	188%
• Percent of Nebraska Hospital Beds Covered	36%	52%	44%
Public Health Information			
• State Public Health Systems Connected to NeHII	0	1[1]	
• Local Health Departments Participating in NeHII	0	2	
Payers			
• Number of Payers Participating	1	2	100%
Total Number of Results Sent to Exchange			
• LAB	6,633,699	38,411,495	479%
• RAD	1,838,874	7,399,077	302%
• Transcription	947,739	16,623,562	1654%

[1] In 2011, NeHI implemented the immunization gateway.

eBHIN	March 2010	March 2014
Number of Clients		
Number of Clients in the Master Patient Index	0	18,326
Percentage of Clients That Have Opted Out	0	32%
Percentage of Clients Opting Back In	0	6%
Provider Information		
Total Number of Users	0	565

E-Prescribing	Jan. 2011	Feb. 2014	% Change
Pharmacies Participating			
Pharmacies on Surescripts Network	363	429	18%
Total Number of Community Retail Pharmacies	436	446	2%
% of Community Retail Pharmacies on Surescripts Network	83%	96%	16%
Pharmacies Enabled for E-Prescribing for Controlled Substances	0	Over 35	
Provider Information			
Total Prescribers	1,399	4,095	193%
MDs Prescribing	1,006	3,042	202%
Estimated Percent of MDs Prescribing	31%	91%	194%

Labs Sending Results in Structured Format	Dec. 2011	Dec. 2013	% Change
% of Labs Sending Electronic Lab Results to Providers in a Structured Format	32%	62%	92%
% of Labs Sending Electronic Lab Results to Providers Using LOINC	12%	35%	181%

LESSONS LEARNED

The main objectives of this evaluation focused on HIE utilization and outcomes. Six evaluation projects were developed to assess different aspects of HIE. We planned to evaluate perspectives of all key participants such as consumers, physicians, pharmacists, and emergency department physicians. All studies found low familiarity with HIE and subsequently utilization of HIE. The lower than anticipated utilization may be attributed to several potential barriers.

First, incomplete information is a significant barrier for HIE utilization and may discourage future attempts to utilize HIE among providers.[8-10] Participants in the PDMP study reported that relevant PDMP information was available for only 2 patients out of 65 queries. Medication history and radiology images were ranked as 'very important' features in the provider satisfaction survey. The radiology images feature is absent from the current HIE functionality and the medication feature was temporarily unavailable at the time the survey was conducted. Dissatisfaction with incomplete information was reported in the survey comments. These highly important features of HIE must be continuously enhanced to provide value for providers.

Second, there must be efficient workflow integration for the HIE system to be useful for providers. Providers ranked loss of productivity as a major barrier to HIE implementation and single sign-on as very important in HIE. It is possible that nurses or office managers may be better positioned than physicians to review HIE and collect information on the patient's medication history. In addition, an indicator of the HIE record availability will alleviate unsuccessful information queries and delays in patient care. Clinical practices always strive to operate more effectively and a single sign-on with efficient workflow integration are crucial for HIE adoption and utilization.[10-14] Although cost of HIE was previously reported as a utilization barrier, free HIE access did not result in

widespread usage in our PDMP study, indicating that other factors may serve as stronger barriers to utilization.

Third, education and training are necessary to demonstrate the utility of HIE in the clinical setting. Specialty-specific use cases can be developed to demonstrate the utility of HIE. Also, use cases available online can help educate providers on the HIE benefits more efficiently than in-person training sessions currently conducted. Such use cases could also address the low perceived need of using HIE when another system EHR is readily available. For example, use case of searching and locating PDMP information in HIE will be useful for ER physicians when a patient presents with acute pain.

Fourth, privacy and confidentiality in sharing medical information are major barriers to widespread consumer utilization.[15-17] This may be especially applicable for older consumers who are uncomfortable with using technology. As with other medical record systems, appropriate safeguards and firewalls must be in place for HIE systems to be effective. In addition to the general privacy safeguards, access for only authorized providers, documentation of access, and patient portal to check for the accuracy of own medical information were reported as desired HIE features in the consumer focus groups. Sufficient education of consumers and providers will help address these concerns and ensure consumer participation. Consumers expressed their preference to learn about HIE from their providers.

Continuous evaluation is crucial in any system for benchmarking and quality improvements. It is necessary to monitor utilization on a system-wide scale to adequately evaluate HIE performance. The HIE usage analytics were not available at the time of this study was conducted and could not be incorporated in this comprehensive evaluation. Inability to monitor utilization prevents identification of

system strengths and required areas for improvement. In addition, readily available utilization data

can show the impact of various education and training programs as they are being implemented.

RECOMMENDATIONS

Addressing identified barriers may increase utilization and improve patient outcomes. Policy makers working to develop and implement HIE programs should focus on increasing completeness of the available medical information, education and training including use cases, clinical workflow analysis and integration, technological improvements, and continuous evaluation to ensure successful HIE implementation and usage.

In the future, we will focus on the value of HIE by looking beyond participation of health systems, providers, and consumers to reviewing how the information is used in practice. Improvements in evidence-based practice that are based on HIE will move us in the direction of being able to assess if HIE leads to significant changes in outcomes. While HIE adoption in the Emergency Department setting and for Prescription Drug Monitoring are very important use cases, we need to demonstrate that HIE is useful for management of patient referrals with acute and chronic diseases over the continuum of care. Patient and family/caregiver involvement related to their priorities for access to information for decision making and communications with providers will form a central focus of future evaluation studies.

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