

Early Gains from Health Information Exchange

From EHR to HIE

Today, most health care providers store and retrieve patient medical records electronically. The widespread adoption of EHRs is a testament to the myriad benefits of electronically storing and retrieving patient data. EHRs are not only about avoiding bulky patient folders and the complications therein. They allow for easy access to patient medical history, diagnostic test results, and in some cases, provide evidence-based tools that enhance provider decision-making for better care delivery. However, when necessary, the exchange of patient information stored in EHRs between medical providers (say a primary care physician and a specialist) usually involves complex, manual, time-consuming, and relatively unsecured processes that typically involve handwritten signatures, photocopying and faxing. As a result, it can take weeks or even months for providers to lay hands on such records, and a significant amount of time to comb through pages of printed medical records to make sense of such notes.

A significant proportion of Americans seek health care from multiple providers. A recent survey conducted by the Kaiser Family Foundation suggests a quarter of Americans do not have a primary doctor.¹ Accessing care from numerous providers makes it difficult to integrate pertinent medical history into care decision-making. It is also the case that some diagnostic tests and imaging results are reusable but may not be available to a current medical provider because the last visit was at a different provider. For instance, when patient advocate Casey Quinlan needed an old scan transferred, it took months of phone calls and exchange of paperwork to get it done. Such delays are not only frustrating but could negatively impact health outcomes.

Casey is currently an advocate for healthcare interoperability, yearning for a day when health information exchange will be done by the click of a button. In the meantime, Casey has her own solution - a QR code tattooed right below her neck that says "Scan Before Treatment" that providers may scan to access her password-protected medical information.^{2,3}

Health information exchange makes available a patient's medical information to a current provider, with a patient's permission, through a secured platform in a timely manner. In New York, where health information interoperability is quite widespread, the use of the technology to exchange patient information increased by more than 100% between 2016 and 2017.

Imagine a patient is involved in a motor accident and is rushed to a community emergency department at night. A CT scan is performed, but there is no neurologist available or on-call. With HIE, the CT scan is sent via a secured platform to the nearest tertiary healthcare facility within a few minutes. The neurologist accesses the CT file and calls the community ED physician to discuss the patient's condition. If the CT scan indicates no severe trauma, the ED manages the patient, and no unnecessary transfer is done. Where severe trauma is observed, the patient is transferred for immediate surgery to be performed, and the CT scan probably need not be repeated.⁴

The emergency physician is meeting Mr. J for the first time, and through HIE is immediately aware of Mr. J's allergies and current medications while Mr. J is unconscious (reduced probability of medical error!). The ED physician also has at her disposal, Mr. J's extended medical history, including recent hospital admissions to facilitate decision-making (enhanced decision-making!). Laboratory tests and imaging recently done are available and need not be repeated (reduced medical costs!). Even more, Mr. J's primary physician gets an alert about Mr. J's presence in the ED and is able to support (care coordination!), and later schedule

an appointment when Mr. J is discharged from the ED. The above scenarios give a glimpse of what HIE has to offer Americans. These and many more are the reasons why the United States government has appropriated a little over half a billion dollars to states to build health information exchange infrastructure.

What's in it for the Provider?

- **Always be in the know:** The PCP also gets alerts when the patient is admitted to the hospital or accesses care from the emergency department.
- **Emergency care:** In case of an emergency, paramedics are able to easily access a patient's information (blood type, allergies, history of heart attack, etc.) in a timely manner to save a person's life.
- **Timeliness:** Eliminate challenges associated with manually transferring and receiving patient medical information. Some doctors and patients have to wait a significant amount of time for imaging results to be sent over from another doctor. This can be very frustrating to both patients and the current doctor.
- **Enhance care coordination among multiple stakeholders:** With HIE, a primary care physician is able to follow a referred patient's progress without making a phone call to the specialist. The PCP can send the patient's test and imaging results and view progress reports with a few clicks.
- **Improve diagnoses and avoid medication errors:** Having access to a patient's complete or significantly lengthy medical history enhances treatment decisions and avoids medical errors in some instances.

What's in it for the Patient?

HIE offers many benefits to patients including:

- **Timely care:** One's primary doctor can access patient information from other providers in a timely manner to support decision-making.
- **Enhanced decision-making for better care:** One's primary doctor can access discharge history and ED treatments and if necessary, consult with a specialist on treatment modalities to enhance decision-making.
- **Safety:** Timely availability of certain patient information such as allergies, blood type, and medications can make the difference between life and death.
- **Cost savings:** Provider can request and quickly access recently conducted high-cost laboratory test and imaging results which represents cost savings to the patient.
- **Improved public health management:** HIE makes available population-level data for improved public health management and monitoring by the government which benefits the patient in the long run.
- **Reduced likelihood of hospital admission or readmission:** By accessing patient information through HIE, hospital admission or patient transfer (to another facility) may be avoided. It's also been shown that patients who receive a follow-up have less likelihood of readmission. Thus, with a patient's provider receiving an alert and scheduling review with their primary doctor, the probability of readmission is reduced.
- **Increased patient education and awareness about state of health:** Currently, patients have to login into multiple servers to access their own health records. HIE makes it easy for patients to pull together their medical history which is provided in an organized manner that is easy to read and understand their health progress.

- **Enhanced monitoring of medication:** The opioid epidemic has claimed many precious lives already. The major mechanism for monitoring and avoiding the crisis is through prescription monitoring. HIE will facilitate monitoring by providers who will prescribe the next pill. The ultimate goal is that the patient is alive and free from drugs that may harm or even kill them.

What's in it for the Payers?

Payers have a lot to gain from health information exchange.

- **Ease of communication with providers:** When multiple providers are involved in caring for a patient it can be difficult for payers to coordinate and fully understand the role of each provider so that billing and claims processing can be done without significant challenges. With HIE, care coordination is enhanced since care processes are coordinated and properly documented.
- **Reduced duplicative testing and imaging:** A diagnostic test that is not repeated by another provider (say, a specialist) represents savings to payers. Diagnostic evaluations such as computed tomography (CT) scans cost thousands of dollars. Recent estimates in Delaware indicate the deployment of HIE was associated with significant reductions in the performance of high cost scans.
- **Prevention is savings:** When patients are in charge of their health information it helps them make decisions that prevent them from exposing themselves to preventable diseases. HIEs make such information easily accessible to patients when they need it.
- **Rich pool of data:** The use of HIE also makes available to payers large pools of longitudinal health data that can be used to facilitate actuarial pricing and analysis of the cost-effectiveness of coverage options.

Proven Benefits of Exchanging Health Information

In recent times several evaluations of the impact of HIE have shown that the said technology is very beneficial. Listed below are a few areas where tremendous gain has been made so far.

1. Avoids Duplication

- A recent study found that the use of HIE significantly lowered the repetition of therapeutic medical procedures, resulting in cost savings.⁶
- Some studies have also assessed the impact of HIE on the rate of laboratory testing in the emergency department and found significant reductions in laboratory testing and cost savings.⁷⁻¹⁵
- Others have assessed the impact of HIE and radiology testing and found significant reductions in testing in the ED setting.^{10,12-18}
- The implication is that this saves patients and payers a lot of money.

2. Reduced Admissions

- The implementation and use of HIE has been associated with reduced hospital admissions for emergency department patients.¹⁹ Through HIE, relevant patient clinical information and thus avert an unnecessary admission to hospital. Researchers showed that the odds of hospital admission was 30% less when the HIE was used. With this, annual savings was estimated to be \$357,000.

3. Reduced Readmissions

- A recent study found that the use of patient information to support patient care was associated with 57% lower odds (or lower probability) of 30-day readmission.¹⁷ Total estimated annual savings associated with use of HIE was \$605,000.

- Another study found that accessing a patient’s medical history through an HIE platform was associated with a significant reduction in 7-day hospital readmissions.¹⁸

4. Public Health Reporting and Treatment

- HIE has also been associated with improved reportage of public health information to the government. A recent assessment found that about a quarter of HIV-infected persons had not had a CD4 count or VL conducted since they were diagnosed with the disease.¹⁹ Some of the others too had been out of care for more than 1.5 years. This created an opportunity for engagement with these persons to help them stay in check of their health.

5. Identification of Frequent ED Users

- Previous studies have found that frequent ED users have social and behavioral issues that need special attention. Many of these patients do “crossover” visits which cannot be tracked in a traditional EHR. HIE makes it easy to track frequent users of ED. A study²⁰ by Shapiro and colleagues found that HIE use was associated with the identification of 20.3% more frequent ED users. They also found that 29% of these high utilizers visited multiple EDs in a twelve month period.

6. Real time Alerts and Timely Data Exchange

- Healthcare professionals can receive patient care alerts and perform patient record queries through HIEs. Using data from three of New York’s eight regional health information exchange networks, researchers found that subscription alert services where participating health professionals receive real-time notifications when a patient is admitted to or discharged from a hospital or emergency department, increased by 95% from 2016 to 2017. During this same period, query-

based exchanges prompted by alerts, where providers request patient records at the time they are needed, increased by 102%.

Case Studies – DELAWARE AND NEW YORK

A. DELAWARE HEALTH INFORMATION NETWORK (DHIN)

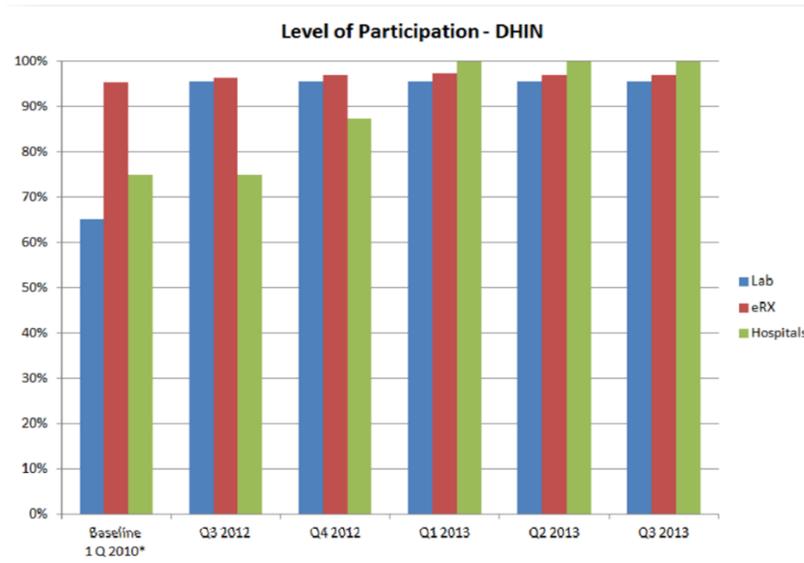
The Delaware Health Information Network (DHIN) was the first statewide HIN in the country. As at 2014, 98% of medical providers and many other health service providers (e.g. 100% of acute care hospitals, 100% of skilled nursing facilities) placed clinical orders through DHIN. The Network has become so popular phrases such as “DHINing the patient” and “Did you DHIN it?” have become common terminology in daily care processes in Delaware.²¹

DHIN has proven very successful since it was launched in 2007. An independent review by Maestro Strategies in 2011 monetized the value of DHIN as follows:

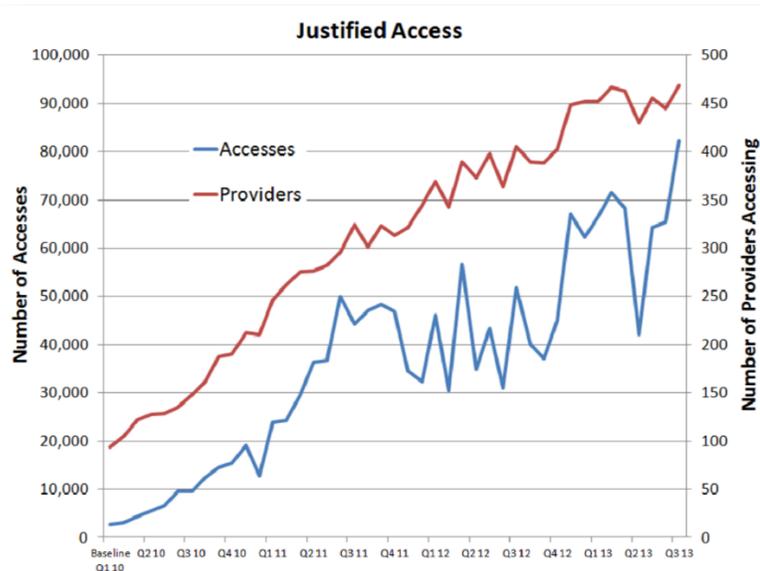
- Saved data senders an estimated \$6,967,338 in data delivery (to enrolled providers) costs results to in 2013 alone
- Saved enrolled practices a total of \$885,000 in EHR interface implementation
- \$10 million in annual savings from reduced duplicate radiology and lab tests

DHIN IN NUMBERS

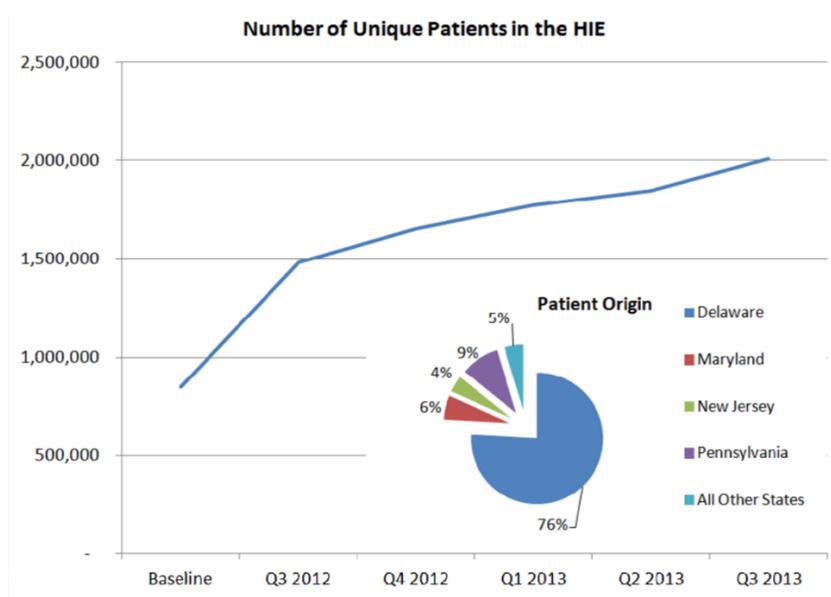
1. **Participation: Everyone is involved**



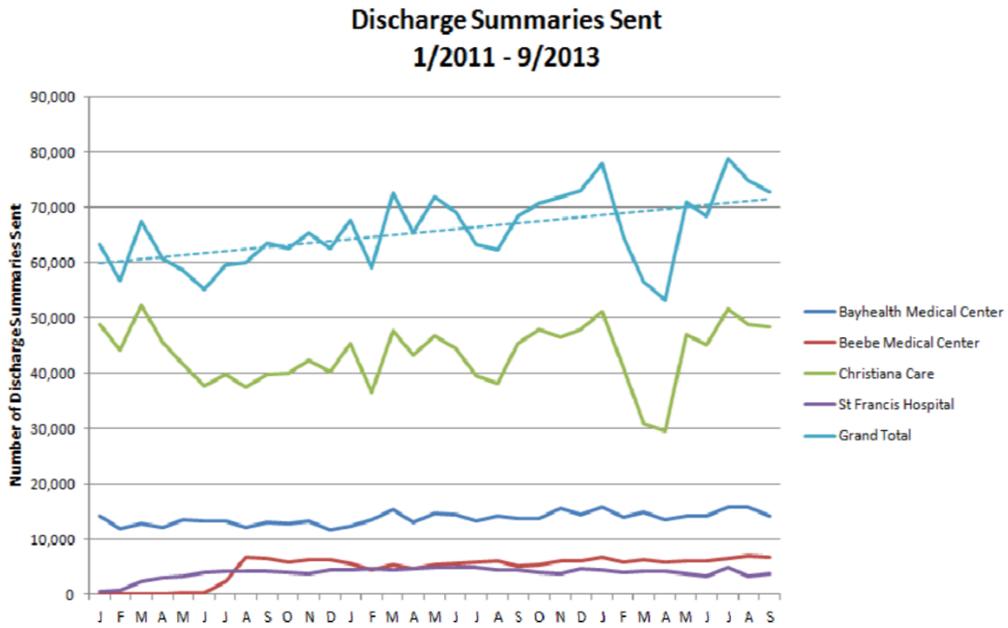
2. **Justified Access:** Providers that have justified access can access relevant patient information through DHIN quickly as opposed to making phone calls to other providers to get such information. The graph below shows trends in number of providers and accesses.



3. **Almost a Quarter of Patients are from outside the state of Delaware**

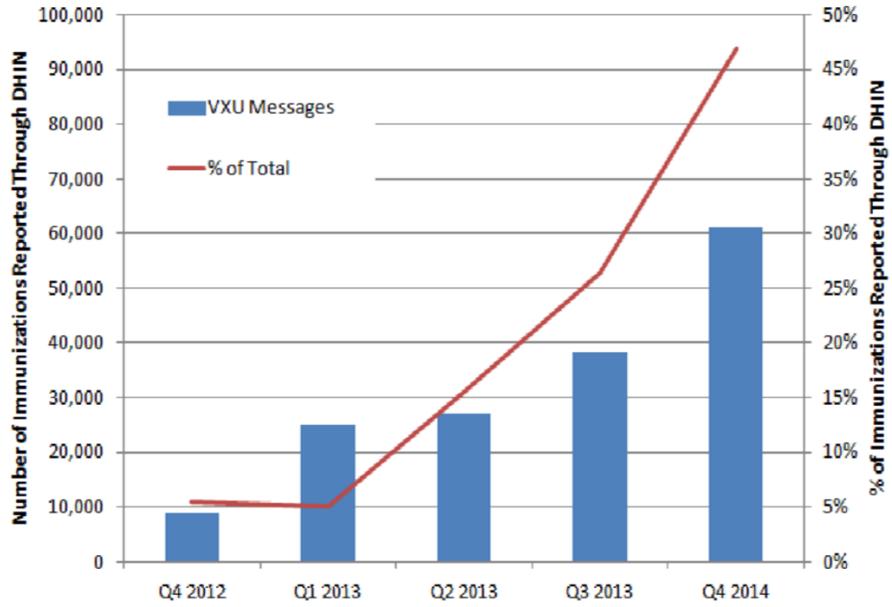


4. Delivering discharge summaries



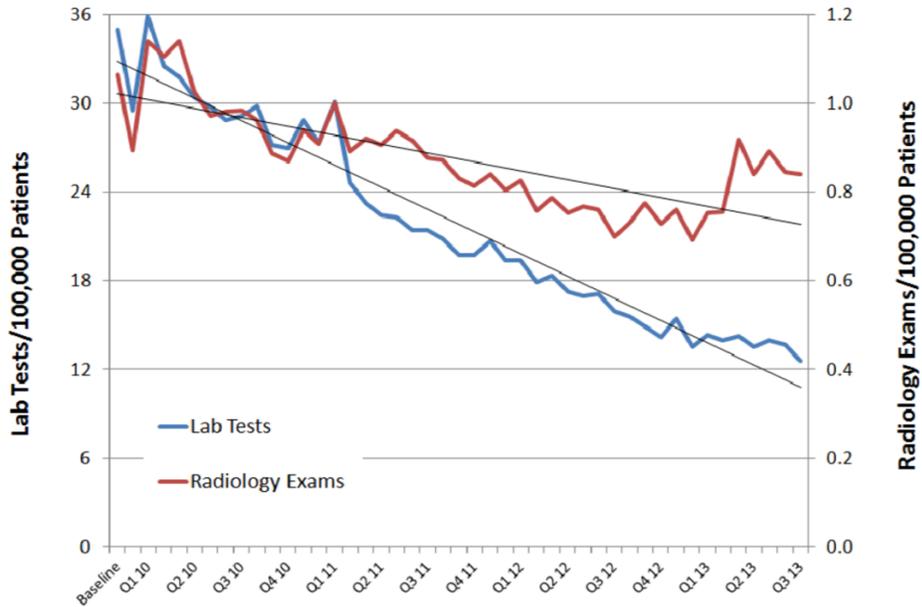
5. Immunization Reporting

Immunization Reporting



6. Number of high cost tests

Number of High Cost Tests



B. STATEWIDE HEALTH INFORMATION NETWORK – NEW YORK (SHIN-NY)

The Statewide Health Information Network for New York (SHIN-NY) connects regional networks, each of which consists of several participating healthcare providers and professionals. SHIN-NY currently connects all hospitals and over 100,000 medical providers in New York State. With patient consent, enrolled entities on SHIN-NY can quickly access patient health information electronically and securely exchange data statewide.

In a recent press release, New York eHealth Collaborative, manager of New York’s HIE, announced that “use of the Statewide Health Information Network for New York (SHIN-NY) is reducing unnecessary healthcare spending in New York State by \$160-\$195 million annually—including significant savings to Medicaid and Medicare.”²² New estimates project savings at \$1 billion once the system is fully leveraged.

Use of the SHIN-NY to access patient information is associated with the following:

- (1) \$2 million in potentially avoided readmission costs in the Bronx for Medicare fee-for-service beneficiaries over a three-year period.
- (2) Physician follow-up after hospital discharge has been associated with reduced odds of hospital readmission.²³ Event notification system alerts medical providers when their patient is admitted at the hospital. They may then schedule a follow-up with patient on discharge from the hospital.
- (3) 95% increase in event notification system alerts from 2016 to 2017
- (4) 102% increase in query-based exchanges resulting from patient data request alerts (to support treatment) between 2016 and 2017
- (5) 52% reduction in estimated number of laboratory tests
- (6) 36% reduction in estimated number of radiology examinations
- (7) 50% reduction in the rate of hospital readmissions
- (8) 26% reduction in the rate of emergency department admissions
- (9) Timely and comprehensive information on sexually transmitted infection (STI) treatment available to public health staff to act upon

References

1. Kaiser Health Tracking Poll. <https://www.kff.org/health-reform/poll-finding/kaiser-health-tracking-poll-july-2018-changes-to-the-affordable-care-act-health-care-in-the-2018-midterms-and-the-supreme-court/>
2. QR Code Tadoo. <https://cancerforchristmas.com/qr-code-tattoo/>
3. New York Times. <https://www.nytimes.com/2016/09/08/upshot/release-your-medical-records-first-you-must-collect-them.html>
4. Vreeland AJ, Bishop M, Brown D, et al.: Considerations for exchanging and sharing medical images for improved collaboration and patient care: HIMSS-SIIM collaborative white paper. J Digit Imag in press.
5. <https://www.healthit.gov/topic/health-it-and-health-information-exchange-basics/what-hie>
6. Eftekhari, Saeede and Yaraghi, Niam and Singh, Ranjit and Gopal, Ram D. and Ramesh, Ram, Do Health Information Exchanges Deter Repetition of Medical Services? (May 20, 2017). University of Connecticut School of Business Research Paper No. 17-03. Available at SSRN: <https://ssrn.com/abstract=2971503> or <http://dx.doi.org/10.2139/ssrn.2971503>
7. Frisse Mark E, Johnson Kevin B, Nian Hui, Davison Coda L, Gadd Cynthia S, Unertl Kim M, Turri Pat A, Chen Qingxia. The financial impact of health information exchange on emergency department care. J Am Med Inform Assoc. 2012;19(3):328-33.
8. Tzeel A, Lawnicki V, Pemble KR. The business case for payer support of a community-based health information exchange: A humana pilot evaluating its effectiveness in cost control for plan members seeking emergency department care. Am Health Drug Benefits. 2011 Jul;4(4):207-216.
9. Carr CM, Gilman CS, Krywko DM, Moore HE, Walker BJ, Saef SH. Observational study and estimate of cost savings from use of a health information exchange in an academic emergency department. J Emerg Med. 2014 Feb;46(2):250-256.
10. Winden TJ, Boland LL, Frey NG, Satterlee PA, Hokanson JS. Care everywhere, a point-to-point HIE tool: Utilization and impact on patient care in the ED. Appl Clin Inform. 2014;5(2):388-401.
11. Lammers EJ, Adler-Milstein J, Kocher KE. Does health information exchange reduce redundant imaging? Evidence from emergency departments. Med Care. 2014 Mar; 52(3):227-234.
12. Tzeel A, Lawnicki V, Pemble KR. The business case for payer support of a community-based health information exchange: A humana pilot evaluating its effectiveness in cost control for plan members seeking emergency department care. Am Health Drug Benefits. 2011 Jul;4(4):207-216.

13. Bailey JE, Wan JY, Mabry LM, Landy SH, Pope RA, Waters TM, Frisse ME. Does health information exchange reduce unnecessary neuroimaging and improve quality of headache care in the emergency department? *J Gen Intern Med.* 2013 Feb;28(2):176–183.
14. Bailey JE, Pope RA, Elliott EC, Wan JY, Waters TM, Frisse ME. Health information exchange reduces repeated diagnostic imaging for back pain. *Ann Emerg Med.* 2013 Jul; 62(1):16–24.
15. Vest JR, Kaushal R, Silver MD, Hentel K, Kern LM: Health information exchange and the frequency of repeat medical imaging. *Am J Manag Care* 20(11 Spec No. 17): eSP16–eSP24, 2014
16. Vest JR, Kern LM, Champion TR, Silver MD, Kaushal R. Association between use of a health information exchange system and hospital admissions. *Appl Clin Inform* 2014; 5(1):219-231
17. Vest JR, Kern LM, Silver MD, Kaushal R. The potential for community-based health information exchange systems to reduce hospital readmissions. *J Am Med Inform Assoc* 2015 Mar;22(2):435-442.
18. Ben-Assuli O, Shabtai I, Leshno M. The impact of EHR and HIE on reducing avoidable admissions: Controlling main differential diagnoses. *BMC Med Inform Decis Mak* 2013; 13:49
19. Magnus M, Herwehe J, Gruber D, Wilbright W, Shepard E, Abrams A, et al. Improved HIV-related outcomes associated with implementation of a novel public health information exchange. *Int J Med Inform* 2012 Oct; 81(10): e30-e38.
20. Shapiro JS, Johnson SA, Angiollilo J, Fleischman W, Onyile A, Kuperman G. Health information exchange improves identification of frequent emergency department users. *Health Aff (Millwood)* 2013 Dec;32(12):2193-2198.
21. Delaware Statewide Strategic and Operations Plan for Health Information Exchange available at <https://dhin.org/wp-content/uploads/2015/06/Delaware-Strategic-and-Operations-Plan-INCORPORATING-ONC-FEEDBACK-Clean-Version.pdf>
22. Press Release: <https://www.nyehealth.org/statewidenetworkreducescosts/>
23. Hernandez AF., Greiner MA., Fonarow GC. et al. Relationship between early physician follow-up and 30-day readmission among Medicare beneficiaries hospitalized for heart failure. *JAMA.* 2010; 303:1716–22.

Delaware HIN Testimonials

1. “The information on DHIN is so helpful to our practice. We have patients come into the office that can’t remember where they had lab/radiology work done. Utilizing the DHIN system, we log onto DHIN, type in the patient’s name and we can see where the patient had reports done. It really does help us from having to call around and track down that information.”
– Debbie McGinnes, Nurse – Bijan Sorouri, MD, PA
2. “I think it has saved a lot of money particularly for my practice. I’m not getting duplicate faxes sent to me and from other facilities and that’s been a huge resource in terms of time. My staff is not spending time on the phone trying to get results sent. Instead we can just log onto DHIN, verify the patient, and have access to all of that in less than 30 seconds.”
– Sherin Ibrahim-Howett, DO, Sleep and Internal Medicine – The Pearl Clinic
3. “On a daily basis, DHIN proves to be an useful tool with maintaining continuity of care, it’s truly made a difference in the level of care we provide.”
– Tony Knight, RN, Veterans Administration, Dover CBOC
4. “At Nanticoke, we believe that electronic medical records and health information networks are core quality initiatives and truly enhance patient quality of care and patient safety. We are extremely delighted to be a member of the Delaware Health Information Network.”
– Steven A. Rose, President and CEO – Nanticoke Memorial Hospital
5. “DHIN has been a great partner in our on-going fight against cancer. The information on DHIN supports the collective effort for finding better ways to diagnose and treat the various cancers, thus improving survival outcomes. DHIN has helped fill in the diagnostic, treatment and follow-up

gaps in order to present a complete picture of the patients' clinical cancer journeys, which in turn, furthers the war on cancer."

- Mary Sorrell, CTR; Cancer Registry Coordinator, Union Hospital of Cecil County

6. "As a primary care physician, information is vital to the delivery of patient--centered care. Without accurate records, the patient--physician relationship is never properly cemented. DHIN has bridged this gap by bringing clinically relevant information to providers in Delaware. Easy to access during an office visit, DHIN has provided a vital tool to all participants. The leader in health technology is DHIN -- a model program that has set the example for the future."

- Teshina N. Wilson DO; Chief Medical Officer, Henrietta Johnson Medical Center

7. "We totally love DHIN! It is such a time saver and I can get ACCURATE information, as opposed to getting a nurse at the hospital who may not have the time for me. Sometimes it even saves me from going to the hospital to see the patient, and it saves the resident from getting unnecessary labs if they have already had them done in the hospital. We LOVE DHIN! Use it almost daily!"

- Zandra Sauers, RN; Resident Care Director Emeritus at Dover

8. "Delaware patients and providers are lucky to have DHIN. The operational efficiencies created by the Delaware Health information Network are truly unparalleled. Where else can you go for one stop shopping for all your patients' test results and reports? DHIN is a must have for managers looking to create operational efficiency in private practice."

- Joshua D. Vaught; Chief Executive Officer, Delaware Orthopedic Specialists

9. “DHIN has really been accepted by our providers because they see the value of getting info from multiple sources right to their desktop so they can make that informed decision.”

- David Walczak, MBA; Chief Information Officer, Bayhealth Medical Center

10. “I think the most important currency in health care is communicating information. So, if you can communicate effectively and efficiently, it’s a valuable resource. What DHIN’s doing for us is that DHIN is getting us information that we never had access to before. If you get it from other hospitals and other providers and get it in a timely fashion, it can make a big difference.”

- Brian P. McDonough, MD; Chair, Department of Family Medicine, St. Francis Hospital

11. “The Medical Society of Delaware has long supported the DHIN and recognizes the critical importance of health information exchange as a foundation to high quality and coordinated care. Ensuring that Delaware physicians have the critical information they need at their fingertips and enabling them to coordinate care across providers is a critical step toward supporting positive health outcomes and healthier Delawareans – a goal we are all working toward.”

- Mark Meister; Former Executive Director, Medical Society of Delaware

12. “Connecting Delaware’s nursing homes with DHIN is a critical milestone and a key component to eliminating medication errors. By enabling access to discharge summaries and other information, we can ensure seamless transitions of care for residents in these facilities. We want to ensure the right care, at the right time, at the right place, whether for those in our skilled nursing facilities, our Medicaid recipients or others in the state’s care, and we want to provide these positive outcomes in the most cost-effective manner possible.”

- Rita Landgraf, Former Secretary of Delaware Health and Social Services

13. “A statewide health information exchange gives Delaware the ability to improve the quality of care while managing the cost of care. With this exchange, doctors across the state have information that enables them to make quicker and better medical judgments for people. This is the fundamental technological foundation we need to build a system of focused and managed healthcare that keeps people healthy. The use of technology in health care is vital to improved quality and reduced costs.”

- The Honorable Jack Markell, Former Governor of Delaware