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# Imaging and Interoperability: Addressing Diagnostic Imaging Dilemmas through Health Information Exchange (HIE)

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*Michigan Health Information Network Shared Services (MiHIN)*

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# Executive Summary

According to the Office of the National Coordinator for Health Information Technology (ONC), a Health Information Exchange (HIE) “allows health care professionals and patients to appropriately access and securely share a patient’s medical information electronically.”<sup>1</sup> Michigan’s statewide and state designated HIE will enable stakeholders across the health care system to efficiently retrieve diagnostic images across disparate systems and vendors to reduce provider burden, minimize patient exposure to radiation, and lessen healthcare waste due to redundant testing.

Michigan Health Information Network Shared Services (MiHIN) hosted a five-part imaging workshop series to convene key stakeholders in the state with the overarching goal of identifying current barriers to efficient image sharing and discovering paths for leveraging MiHIN to support diagnostic image sharing and ubiquitous access statewide.

Throughout the series, participants identified existing barriers to efficient imaging sharing and retrieval. Many of these cumbersome technological challenges result in clinicians completing duplicate image testing, as needed images were not available in the moment of care. Attendees identified the following three challenges as the largest barriers:

- Incompatibility of disparate systems amongst the health care spectrum
- Incompatibility of various Picture Archive and Communication Systems (PACS) within a health organization
- Workflow burden associated with locating images

In addition to identifying existing barriers, workshop participants from diverse stakeholder groups collaboratively conceived of use case enhancements that address ways of utilizing MiHIN as Michigan’s designated HIE to simplify the process of locating diagnostic images at the point of care to lessen the need for duplicate testing. Participating stakeholder groups included hospital systems, health plans, state government, health information exchanges, and more. Attendees proposed the following three actionable priorities for MiHIN:

- Creation of and posting to a statewide central registry
- Efficient diagnostic image retrieval in emergency departments
- Inclusion of metadata elements on diagnostic images and/or linkage of imaging studies within reports

To advance these ideas, MiHIN will conduct the following next steps. First, MiHIN has reviewed this white paper with its editorial team. Next, MiHIN will share this white paper with potential sponsors like the State of Michigan and various health plans to further address this statewide need. Then, MiHIN will convene its existing Imaging Use Case team to review the data sharing opportunities and the associated issues as the foundation for developing the required functionality to enhance the existing use case. MiHIN is eager to pursue solutions to solve these barriers and meet clinician, payer, and patient needs.

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<sup>1</sup> HealthIT.gov. “What is HIE?” <https://www.healthit.gov/topic/health-it-and-health-information-exchange-basics/what-hie>

## Table of Contents

Introduction .....	1
Diagnostic Imaging .....	1
Healthcare Waste from Unnecessary Diagnostic Imaging .....	1
Patient Safety and Satisfaction .....	3
Workshop Series Objectives and Goals .....	4
Workshop Accomplishments .....	5
Attendees and Participation .....	5
Topics .....	6
Stakeholder Support .....	6
Key Workshop Takeaways .....	7
Existing Barriers .....	7
Incompatibility Between Disparate Systems .....	7
Disparate PACS Within One Health Organization .....	7
Internal Organizational Challenges .....	7
Additional Identified Barriers .....	8
Opportunities .....	9
1. A Statewide Central Registry .....	9
2. Emergency Department Image Availability .....	10
3. Metadata Elements of Images .....	10
Additional Identified Opportunities .....	11
MiHIN's Current Imaging Use Case .....	12
Overview .....	12
Radiology Studies Use Case Scenario Overview .....	13
Moving Forward .....	14
Conclusion .....	14
Appendix A: White Paper Authors and Editors .....	15
About the Author .....	15
Editors .....	15
Appendix B: Works Cited .....	16
Appendix C: Workshop Attendance Report .....	17

## Introduction

### Diagnostic Imaging

Medical imaging is one of the most common and costly elements of patient care<sup>2</sup>. Medical imaging—also called diagnostic imaging— makes it possible for providers to see inside a patient’s body and look for clues about a medical condition. Myriad machines and techniques can produce images of structures and activities inside a patient’s body, and the type of imaging used depends on the part of the body being examined.

Types of imaging includes, but is not limited to, the following examples:

X-ray	Positron Emission Tomography (PET)
Ultrasound	Angiography
Computed Tomography (CT)	Mammogram
Magnetic Resonance Imaging (MRI)	Esophagogastroduodenoscopy (EDG)

Medical providers need to be able to access a patient’s diagnostic images in order to provide timely, well-informed care. Redundant imaging occurs most frequently in situations where patients are in need of urgent/emergency care, making the wait to locate and retrieve images problematic. Additionally, patients often move from system to system and from department to department, making it difficult to have comprehensive medical information available at the point of care. Duplicate diagnostic imaging is an area in which a health information exchange is an asset because redundant imaging is not only an unnecessary cost to our healthcare system, but also a burden on clinicians and an area of risk and dissatisfaction for patients.

### *Healthcare Waste from Unnecessary Diagnostic Imaging*

With healthcare costs in the United States rapidly growing<sup>3</sup>, identifying strategic areas to reduce costs is a crucial need. One key area to explore is redundant medical imaging, as diagnostic imaging accounts for 10% of healthcare costs, amounting to \$100 billion of total annual spending.<sup>4</sup> Even more specifically, researchers at the Brigham and Women’s

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<sup>2</sup> "How Much Diagnostic Imaging Is Inappropriate and What Does It Cost?." National Institute for Health Care Management (NIHCM). <https://nihcm.org/publications/how-much-diagnostic-imaging-is-inappropriate-and-what-does-it-cost#:~:text=Overall%20utilization%20of%20diagnostic%20imaging,on%20these%20procedures%20each%20year.>

<sup>3</sup> "Projected National Healthcare Expenditures, 2019-2028:." Centers for Medicare and Medicaid Services. Last modified December , 2020. [https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet.](https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet)

<sup>4</sup> Vreeland, Amy, Kenneth Persons, Henri Primo, Matthew Bishop, and Kimberley Garriott. "Considerations for Exchanging and Sharing Medical Images for Improved Collaboration and Patient Care: HIMSS-SIIM Collaborative White Paper." *Journal of Digital Imaging* (October 2016). PubMed Central. <https://doi.org/10.1007/s10278-016-9885-x>

Hospital in Boston, Massachusetts have concluded that nearly 9% of diagnostic image procedures are duplicative and unnecessary.<sup>5</sup>

In a 2014 study published in *The American Journal of Managed Care*, researchers sought to determine the impact of a health information exchange on repeat imaging.<sup>6</sup> Results show that within the identified patient cohort, 7.7% of imaging tests were repeated in a three-month period. If the HIE system was accessed within that 90-day timeframe after the initial imaging procedure, though, the likelihood of repeating imaging significantly lowered. Ultimately, the use of an HIE attributed to 25% lower odds of redundant imaging.

### Cost Reduction in Emergency Department Settings

Emergency Departments and inpatient settings are frequent users of redundant imaging due to the clinical urgency of those environments. While prior authorization of radiology studies is a common practice in outpatient settings, it is not needed in inpatient or Emergency Department venues. In these locations, most reimbursement occurs within the Diagnosis-Related Groups (DRG) system, which gives a designated rate from payers regardless of the number of imaging test administered. Additional imaging occurring during a DRG episode results in potential hospital revenue loss and increased length of stay.

### Cost Reduction from Incidental Findings

*Radiologic Clinics of North America* published an article in 2011 titled “The Economic Burden of Incidentally Detected Findings,” in which researchers purport that advances in and use of diagnostic imaging are leading to the additional burden of incidental findings. The researchers define incidentally detected findings as “findings that don’t have associated clinical symptoms.”

In one study cited, a cohort of patients underwent 1,426 imaging studies, and 39.8% had a minimum of one incidental finding. While these findings may lead to curing an otherwise undetected, lethal disease, many findings are “ultimately benign” or “unlikely to affect their life expectancy.” This consequent testing from incidental findings can be anxiety-inducing for patients, overwhelming for busy clinicians, and costly due to downstream expenditures.

While the researcher’s found costs associated with incidental findings varied greatly depending on the type of diagnostic imaging completed, the research suggests that a large source of cost savings will be associated with decreased incidental finding workups.

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<sup>5</sup> Bates, D.W., D.L. Boyle, E. Rittenberg, G.J. Kuperman, and N. Ma'Luf. "What proportion of common diagnostic tests appear redundant?" *American Journal of Medicine* (April 1998). PubMed Central. [https://doi.org/10.1016/s0002-9343\(98\)00063-1](https://doi.org/10.1016/s0002-9343(98)00063-1).

<sup>6</sup> Vest, Joshua R., Rainu Kaushal, Michael D. Silver, Keith Hentel, and Lisa M. Kern. "Health information exchange and the frequency of repeat medical imaging." *The American Journal of Managed Care* 20, no. 17 (November 2014). PubMed Central.

### The Health Plan Perspective on Cost Reduction

A 2015 study<sup>7</sup> published in the *Journal of the American College of Radiology* quantified the cost savings associated with utilizing a health information exchange to avoid repeat imaging.<sup>8</sup> The study sample included over 12,000 patients enrolled in two large, commercial health plans in New York State, and results show that the HIE use achieved an annual savings of \$2.57 per patient by lessening redundant imaging.

While basic imaging (radiography, ultrasound, and mammography) were the highest occurrences of duplicate imaging, reductions in duplicate advanced imaging (CT and MRI) achieved substantial cost savings. Health information exchanges can be strategically leveraged to mitigate the number of redundant advanced imaging procedures completed in many departments to achieve greater cost savings.

### Patient Safety and Satisfaction

In addition to cost reduction, efficient image exchange is associated with both patient care improvements and increased patient satisfaction. Not having access to imaging test results in the moment of care can cause delays in treatment. A 2012 study published in the *Journal of Trauma and Acute Care Surgery* demonstrated, for example, that not having images associated with trauma transfers resulted in up to 25 minutes of delayed care, negatively impacting patient outcomes in instances of urgent care.<sup>9</sup>

Researchers show, too, that access to diagnostic images increases patient satisfaction as well. In a 2016 study published in the *Journal of Digital Imaging*, researchers report that study participants found “having a measure of control over their images to be beneficial and felt that patient-physician relationships could be negatively affected by challenges related to image accessibility.”<sup>10</sup>

Patient safety is a notable area of concern with duplicate imaging, too. The National Council on Radiation Protection and Measurement reports that Americans were exposed to over 600% more medical radiation in 2006 than in 1980, posing an increase in potential future cancer risk. A 2012 study published in *CA: A Cancer Journal for Clinicians* estimated that 1 –

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<sup>7</sup> Jung, Hye-Young, Joshua R. Vest, Mark A. Unruh, Lisa M. Kern, and Rainu Kaushal. "Use of Health Information Exchange and Repeat Imaging Costs." *Journal of the American College of Radiology* (December 12, 2015). NIH Manuscript Submission (NIHMS). <https://doi.org/10.1016/j.jacr.2015.09.010>.

<sup>8</sup> Ding, Alexander, Jonathan Eisenberg, and Pari Pandharipande. "The Economic Burden of Incidentally Detected Findings." *Radiologic Clinics of North America* (March 2011). PubMed Central. <https://doi.org/10.1016/j.rcl.2010.11.004>.

<sup>9</sup> Emick, Dawn M., Timothy S. Carey, Anthony G. Charles, and Mark L. Shapiro. "Repeat imaging in trauma transfers: a retrospective analysis of computed tomography scans repeated upon arrival to a Level I trauma center." *Journal of Trauma and Acute Care Surgery* (May 2012). PubMed Central. <https://doi.org/10.1097/TA.0b013e3182452b6f>.

<sup>10</sup> Hiremath, Atheeth, Omer Awan, David Mendelson, and Eliot L. Siegel. "Patient Perceptions of Participating in the RSNA Image Share Project: a Preliminary Study." *Journal of Digital Imaging* (April 2016). PubMed Central. <https://doi.org/10.1007/s10278-015-9832-2>

3% of annual cancer diagnoses could be related to CT scans.<sup>11</sup> While no large-scale studies on cancer risks from diagnostic radiation exist, data from Japanese atomic bomb survivors suggest that radiation exposure may increase the likelihood of a patient developing cancer, particularly if the patient experience low levels of radiation at a young age.<sup>12</sup>

## Workshop Series Objectives and Goals

Held virtually due to the Covid-19 pandemic, this collaborative workshop was designed to identify key barriers in exchanging medical images today and prioritize data sharing scenarios based on the additional value for the community. The workshops focused on building a multi-stakeholder initiative to broaden the conversation and address barriers that are present when sharing medical images between systems.

Led by MiHIN, the Imaging Workshop Series commenced in January 2021 with the final workshop taking place in May 2021. The Imaging Workshop Series started with a handful of objectives, but as the series continued, was able to narrow down to the following objectives and deliverables:

### *Imaging Workshop Series Objectives*

1. Help frame a statewide data sharing opportunity for exchanging medical images
2. Identify key barriers to image sharing
3. Prioritize data sharing scenarios based on value to multiple stakeholder groups

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<sup>11</sup> Linet, Martha S., Thomas L. Slovis, Donald L. Miller, Ruth Kleinerman, and Choonsik Lee. "Cancer Risks Associated with External Radiation From Diagnostic Imaging Procedures." *CA: A Cancer Journal for Clinicians* (March 2012). PubMed Central. <https://doi.org/10.3322/caac.21132>.

<sup>12</sup> "Limiting Radiation Exposure." Michigan Medicine | University of Michigan. Accessed April 19, 2021. <https://www.uofmhealth.org/conditions-treatments/radiology-and-imaging/patient-resources/limiting-radiation-exposure>.



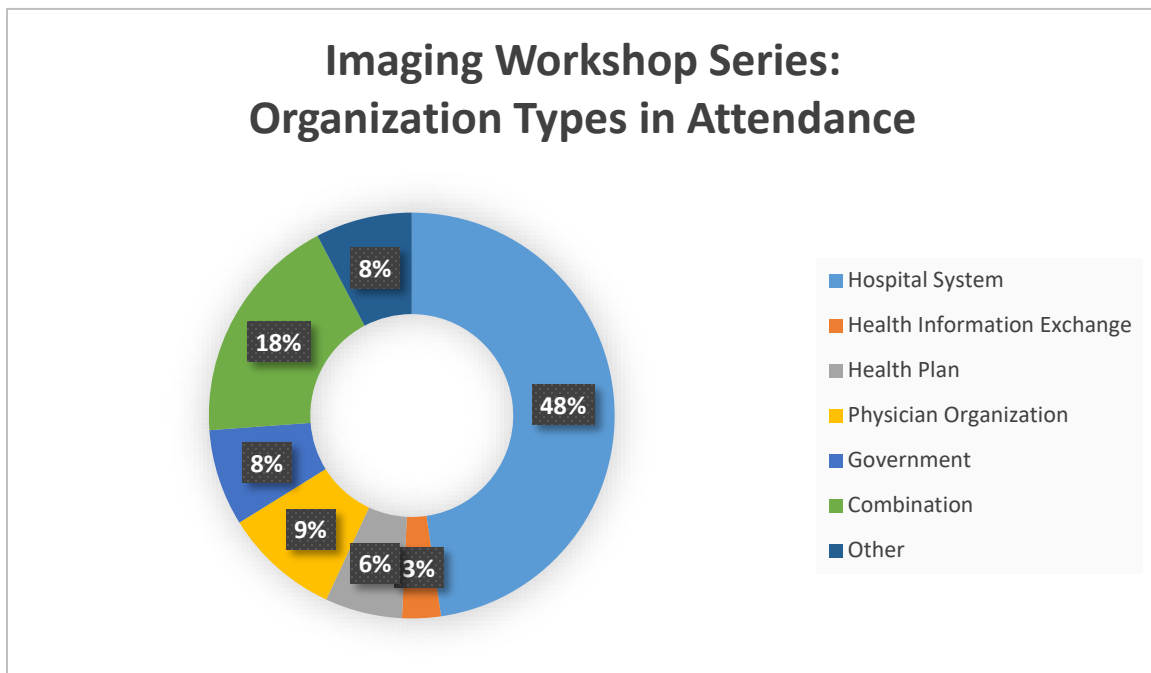
***Imaging Workshop Series Deliverables***

1. Development of a white paper to frame the data sharing opportunity and associated issues
2. Enhancement of existing image-related use cases within Michigan Health Information Network Shared Services (MiHIN)

## Workshop Accomplishments

### Attendees and Participation

MiHIN hosted the five virtual workshops on January 27<sup>th</sup>, February 25<sup>th</sup>, April 1<sup>st</sup>, April 29<sup>th</sup>, and May 25<sup>th</sup>, 2021. Attendees represented hospital systems, health plans, health information exchanges, government entities, technology vendors, physician organizations, and more. Participants were encouraged to contribute their unique organization perspectives by participating in polls, engaging in dialogue during breakout sessions, and voicing their feedback and questions during and between workshops. Figure 1 depicts the average ratio of sectors represented in the five workshops. More information on attendees and their organizations can be found in Appendix C.



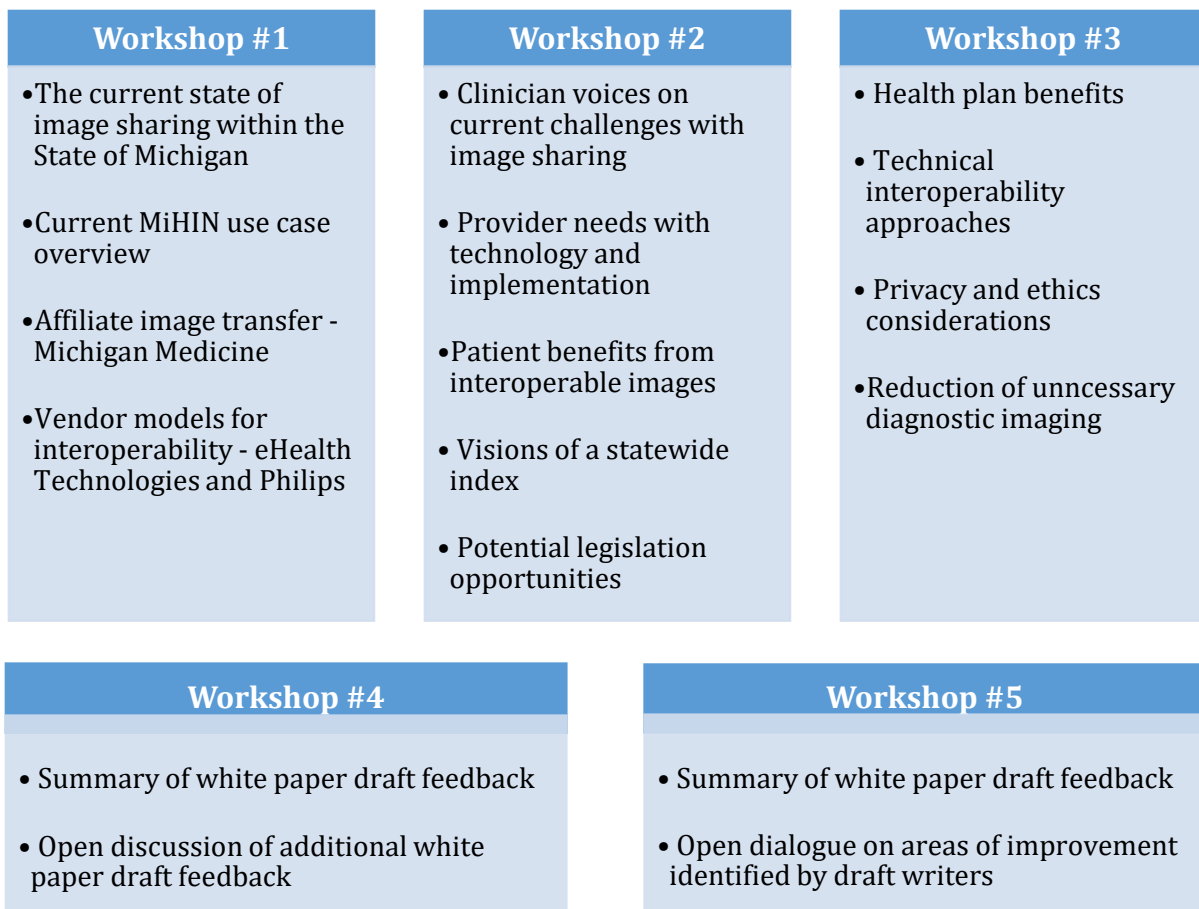
**Figure 1: Workshop Participants by Affiliation**



## Topics

Workshop topics were chosen to expose participants to a broad range of issues related to imaging sharing and retrieval and to facilitate conversation about needs amongst stakeholder groups.

Some workshop topics were explored in a presentation format. The presentations were given by various members of MiHIN’s staff in addition to guest speakers representing various stakeholder groups, including hospitals and imaging vendors. In this virtual workshop platform, topics (described in Figure 2) were discussed in facilitated breakout room sessions, polls, chat features, and traditional Q&A.



**Figure 2: Workshop Topics by Session**

## Stakeholder Support

The workshop series confirmed that key stakeholders—particularly clinicians and other medical professionals—are highly supportive of MiHIN’s vision for an enhanced imaging use case and have vested interest in this work moving forward.

## Key Workshop Takeaways

***What are the biggest challenges you face as it relates to sharing images?***

*– Tracy Webb, Outreach Manager at MiHIN*

To generate actionable use case enhancements for improving diagnostic imaging sharing and retrieval, workshop participants were first asked to expound on existing challenges around diagnostic imaging. Additionally, participating stakeholders were prompted to identify situations in which redundant imaging is most likely to occur and illuminate the reasoning behind redundant imaging.

### Existing Barriers

#### *Incompatibility Between Disparate Systems*

One of the biggest takeaways from the workshop series is that different facilities use a number of different systems, making it challenging to exchange images between them. In addition, clinics and vendors may follow different protocols when exchanging images.

System, in this sense, broadly refers to the various technology platforms used to fulfill different professional needs. Systems include, but are not limited to, PACS, EHRs, RIS, messaging systems, and more.

Workshop participants explained how, in some facilities, their experiences include sending images using one system, but receiving them through another, which places burden on staff and patients coming into the office.

Lastly, participating stakeholders emphasized the lack of uniformity in the way that images are stored and documented across systems poses significant challenges to those needing those images.

#### *Disparate PACS Within One Health Organization*

Many workshop attendees representing hospitals explained that even within one health organization, different departments may utilize different PAC systems, making it challenging to share necessary images even within one entity. Other workshop participants communicated similar struggles within their own health organizations, expressing that it's not as simple as it should be across all imaging sectors within a health system because of different departments using different PACS.

#### *Internal Organizational Challenges*

Workshop participants communicated that providers utilizing image exchange solutions don't always have the proper training or knowledge of how to use the services they have available to them. Some participants included feedback that the current solutions in place

at a lot of facilities are often too complex. Professionals are not easily able to find images because of a lack of understanding on how to navigate current services.

### *Additional Identified Barriers*

#### **Low Adoption**

Another identified barrier to successful image sharing is that not all hospitals are currently connected to a central service, making more images available. The lack of participation in a single solution makes it difficult to determine where images may exist, who may have needed images, and so on. The number of utilized vendors in use today points strongly to the need for MiHIN, as a health information network (HIN), to communicate between these disparate solutions.

#### **Generated Revenue in a Fee-for-Service Model**

Fee for Service is a method where healthcare providers are paid by payers for each service they perform. A service in this case could be a medical test, procedure, or an office visit, as examples. Participants raised the point that a significant portion of hospital revenue is generated by Radiology, so imaging impacts hospitals' bottom line. This presents a good reminder that financial considerations must be considered when pursuing data sharing enhancements.

#### **Ethics and Privacy Concerns**

Shreya Petal, MiHIN's Chief Privacy and Policy Officer, spoke to stakeholders in the third session (April 1<sup>st</sup>, 2021) regarding the ethics and privacy concerns of sharing patient images.

One common misconception regarding patient consent, for example, is that patients must approve the sharing of images. While that is often what the current process looks like with patients having to retrieve and share their images with physical CDs themselves, the HIPAA Privacy Rule allows covered entities the ability to exchange images without the patient's consent for the purposes of treatment, payment, or operations.

Hospitals and health systems need to consider factors that promote patient autonomy and awareness while also using image sharing to better workflow, decrease duplicate testing, and navigate in the best interest of the patient. Some ethical and privacy concerns around image sharing include the following:

- If patients have the right to know who images are being shared with;
- Allowing patients to dictate how their images are shared;
- Considering how image sharing may deviate from the norm of patient-directed exchange with CDs;
- Mindfulness around any area of potentially sensitive information that may warrant patient consent (ex: reproductive health).

## Rural Health Needs

Organizations in rural health areas are seeking any means of sharing technology and resource costs, and this need extends to diagnostic image sharing and retrieval. Healthcare providers in less populated areas of Michigan send patients to various locations around the state for radiology studies, for example. Typically, HL7 and/or faxed reports are received following testing, and the images themselves are usually only available via a CD that's mailed to the provider or carried to the provider by the patient. Rural health facilities may keep their own studies locally and utilize a vendor neutral archiving (VNA) system for back up; however, those VNA archives may be scattered in different locations due to increasing size and cost, and retrieving data from the large tapes in which data are stored is inefficient and difficult. Additionally, delays in patient care occur as patients are needed to transfer from one facility to another due to the lack of image exchange.

## Opportunities

*What would make sharing, accessing, and utilizing images easier for you within your system and beyond?*

- Jason Vismara, Product Marketing Manager at MiHIN

In conjunction with identifying existing barriers, workshop attendees came up with use case ideas that will ease provider burden, reduce patient exposure to radiation, and lessen waste associated with unnecessary testing. Workshop participants identified the following three use case ideas as the highest needs:

### *1. A Statewide Central Registry*

There is the potential to develop a statewide index of imaging facilities and the types of images they have in addition to where a professional can go to find those images. Participants determined that the index would serve as a "one stop shop" where professionals can go to MiHIN and identify where to find an image or imaging study, what support is available, and garner a better understanding of how to make use of what is available with existing infrastructure to support workflow.

Participants communicated that the process of finding images and making efficient use of various systems is extremely burdensome for a lot of facilities throughout the state. Posting to a central registry is determined to be a significant need following the first three workshops.

One of the major issues with a Vendor Neutral Archive (VNA) for images is file size. Often, Chief Information Officers of health systems don't want the overhead of storing lots of images (or outside images) due to the file size and transfer times. File storage size is a

stressor on any healthcare system that maintains and stores its own archive in a non-Cloud-based solution, as there is primary storage and a secondary storage for backup. A statewide, comprehensive image registry may address this concern about file storage size by mitigating the need for file storage and provide individual imaging files at a more manageable, compressed size.

In a similar vein as a statewide registry, workshop participants echoed the need of a universal viewer and image storage within the HIN to alleviate the process of retrieving and downloading images for smaller hospital systems who often do not have the internet bandwidth needed for this task.

MiHIN has not been working towards its own universal viewer solution due to the following factors:

- Many well-established vendors offer unique aspects to their viewers that MiHIN can leverage so stakeholders can access the images they need with the viewer that best suits their needs
- Each image file can be tens of gigabytes, making duplicate storage at a statewide level extraordinarily expensive

MiHIN believes the stakeholders' needs regarding universal viewers can be met with the use of a statewide image index.

### *2. Emergency Department Image Availability*

Attending radiologists and Emergency Department clinicians highlighted that Emergency Departments would strongly benefit from making images from outside facilities readily available, as providers in those settings often call for duplicate testing as a necessary, speedier alternative to tracking down previous image studies. Additionally, it would be advantageous for emergency department providers to know if patients have had recent image studies completed.

Workload urgency suggests, though, that providers are not able to preemptively review documents thoroughly in an Emergency Department setting. To facilitate this needed awareness, multiple workshop participants suggested there needs to be a best-practice alert within the EHR when someone orders a test, and it is critical that the EHR are HIE-aware and integrated with a list of previous tests within the last six-to-twelve months. This time period is flexible, workshop participants explained, but does communicate the need for more data, as historical comparisons can make a huge impact on downstream imaging and diagnostic workup utilization, especially for older patients with chronic diseases.

### *3. Metadata Elements of Images*

Many contributors felt that being able to explore the metadata elements of radiologic procedures, including the anatomical region of the study, would be a high value-add in regard to provider workflow. Associated with this commentary was the general belief that variability in how, and how much, metadata is attached to a study makes it difficult to rely

on metadata elements for clinical decision making. Contributors noted that outside of the recently added ability to transmit a thumbnail of the study via DICOMweb, clinicians often have no choice but to download the full DICOM study file in order to determine exactly what information it contains, and downloading a full DICOM file may take up to 20 minutes depending on file size. In summary, participants felt an accessible, robust, and standardized set of anatomic and modality metadata, to include the possibility of compressed image representations, would be of great help in finding or filtering radiology studies.

### *Additional Identified Opportunities*

#### **Patient Access**

Participant feedback suggests that patients would like more control of their image transfers as well as the ability to direct transfers, especially in scenarios where a patient wants another opinion or to see a specialist they feel more comfortable with.

Shreya Patel— MiHIN’s Chief Policy and Privacy Officer— confirms that bioethicists tend to lean towards patients having the right to access their own images and dictations on the image readings. The largest barrier to this right now is that this process is not yet fully electronic, which then requires a lot of effort from the patient to acquire images and dictations in the form of a physical compact disc (CD).

#### **Exchanging Images Between Disparate Vendors**

Based on expressed workshop participant needs, the ability to exchange images between multiple systems will be a key value add for connected facilities. This is an area of focus MiHIN will continue to dive deeper into to see how MiHIN can best move the information between vendors at a statewide level, knowing that facilities use varying setups.

Feedback from stakeholders to advance this opportunity included requiring a unified registry of DICOM header file data for every study done on patients similar to a prescription drug monitoring program (PDMP), but with radiology “dispensation” data rather than prescription data. Another discussed opportunity for exchanging images between disparate vendors included a MiHIN-hosted and managed interoperability hub that can act as a go between for systems that have invested in different technology. In the end, stakeholders proposed, a DICOM file should be easily found in the registry and then just as easily pulled from one system and inserted into another using simple API (application programming interface) calls.

These suggestions from stakeholders demonstrate the need for further vetting and test spaces for MiHIN to explore these ideas from a statewide perspective.

#### **FHIR Standards with Image Query**

Workshop participants expressed interest in continuing to want to dive into Fast Healthcare Interoperability Resources (FHIR®) standards around imaging and related



studies. FHIR is a standard owned by Health Level 7™ (HL7™). This interest means continuing to go down the path of using more widely-adopted interoperability standards by aligning with FHIR to further assist with moving those images across the state more seamlessly within the query process.

### Reference Information Within CCDs

Stakeholders offered the potential to enhance Continuity of Care Documents (CCDs) with reference information for an image and the radiology sections, emphasizing that having the location of an image included in a report would eliminate the burden of searching, ultimately mitigating the potential of duplicate testing.

### Legislation

There currently is no legislation in Michigan requiring organizations to share images and study information into a central repository like there is legislation for some other use cases and services across the state of Michigan. Workshop participants explained how this is another area of value to explore, especially if this includes a standardization on how images and headings are stored and shared, as legislation would force this standardization to become more of a priority.

### Flagging High Users of Imaging

Some workshop attendees discussed how a few hospitals have piloted and utilized a scoring system to identify patients who are outliers with overall imaging usage through an aggregate score that served as an alert or flag to explicitly point out patients who have been exposed to large amounts of radiation, prompting a reason for providers to look deeper into their previous procedures.

Radiologists present in the workshops explained that downstream imaging utilizations may be impacted by best-practice alerts (BPA) for previous patient testing within the last six-to-twelve months. This time frame for alerts was supported by other workshop attendees.

## MiHIN's Current Imaging Use Case

### Overview

The goal of MiHIN's current imaging use case is to support provider workflow improvements by providing access to their patient's images through a central service. This exchange of images can help improve the quality, efficiency, and cost of healthcare.

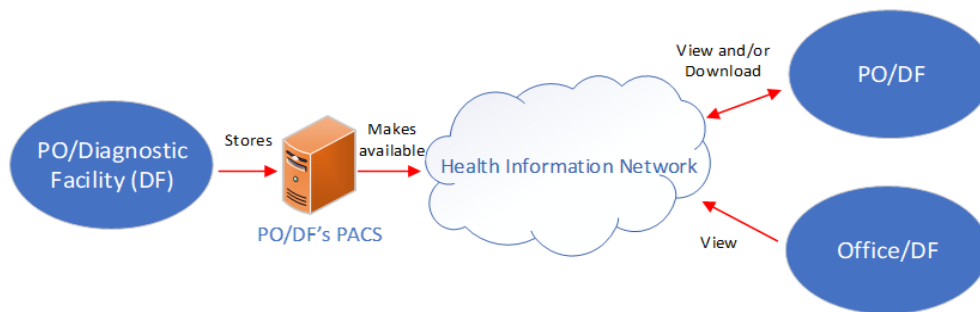
It's well accepted that the coordination of care across the healthcare continuum can be challenging and can have a negative impact on healthcare costs as well as patient care if data is unavailable. This is especially true for imaging, for example, because duplicating certain imaging studies exposes patients to unnecessary doses of radiation, which should be avoided when possible.



The reality is that providers don't always know a prior study was done, which is why there is redundancy in imaging. Additionally, not all providers can access necessary images in the crucial moment of care, and it's often faster and less cumbersome to have duplicate studies done than it is to acquire outside images. This duplicative imaging, though, results in healthcare waste and potentially exposes patients to unnecessary radiation.

MiHIN's use case leverages the image view based on an imaging report and historical source system images from the organization's PACS. This feature offers high resolution images available for viewing at the point of care without the need for additional storage. These images can be viewed or downloaded into an organization's PACS using their own native tools.

### Imaging Use Case Scenario Data Flow



**Figure 3. Imaging Use Case Data Flow Sample**

The basic data flow where we have a participating organization (PO) or a diagnostic facility (DF) where the image is stored in their PACS, which holds its standard DICOM format. Those images are then made available to the health information network (MiHIN) where other connected entities can either then view the historical images for the patient and/or download those historical images into their own system.

Going through the health information network negates the need for participating organizations to make their own individual connections to each facility across the state. MiHIN serves as a central point of connection between these systems and across infrastructure.

### *Radiology Studies Use Case Scenario Overview*

The primary utilization of MiHIN's imaging use case to date has been with radiology documents (also referred to as radiology results). In this scenario, providers, participating organizations (POs), and other healthcare professionals have a critical need to easily send and find radiology results to with clinical decision support, trending analysis, population health management, medication management, and numerous other care activities.



## Imaging and Interoperability: Addressing Diagnostic Imaging Dilemmas through Health Information Exchange (HIE)

Successful coordination of radiology result delivery across organizations means that radiology results must be presented in a timely manner and in a usable, actionable format so recipients can deliver efficient and effective patient care

An electronic, statewide exchange of radiology results through an interconnected network of provider organizations (overseen by MiHIN) helps improve the quality, efficiency, and cost of healthcare.

As radiology results become available, MiHIN is able to route those to the applicable providers using its patient-provider attribution service called ACRS (Active Care Relationship Service), delivering results to all care team members. For those also participating in the imaging use case, MiHIN makes a query to append the link to the image so providers are able to find the image swiftly without the need to bounce around between systems and search for it. Having the image location included in an ADT event notification improves provider workflow and is a feature in which participants in this use case find immensely useful.

### *Moving Forward*

MiHIN is appropriately positioned as Michigan's state designated HIE to enhance this existing use case using the imaging workshop findings to connect all of those who benefit from image sharing and alleviate the current burden placed on these different stakeholder groups.

## Conclusion

The state of Michigan has the opportunity to address clinician, payer, and patient concerns regarding redundant diagnostic imaging by pursuing recommendations proposed by workshop participants that enhance MiHIN's existing imaging use case.

The results of MiHIN's virtual workshop series on imaging will be shared with Michigan's Health Information Technology Commission. Next, the Imaging Use Case team will come together to begin reviewing the actionable use case ideas and provide insight into the development process. The goal is to translate stakeholder recommendations into more defined projects and deliverables that can be sponsored by various organizations.

MiHIN would like to thank all of the professionals from different organizations across that state that participated in the imaging workshop series and offered their expertise, experience, and insight to the formation of this white paper.

## Appendix A: White Paper Authors and Editors

### About the Author

MiHIN is a public and private nonprofit created for the purpose of coordinating and building the bridges between the healthcare providers throughout the state. From hospitals to pharmacies, MiHIN is creating the technology and resource needed to make sure that the electronic health records of Michigan citizens are available for all that provide care.

This sharing of patient information between legally authorized healthcare providers is known as a Health Information Exchange. The information is stored and transmitted securely. MiHIN represents a growing network of public and private organizations working to overcome data sharing barriers, reduce costs, and ultimately advance the health of Michigan's population.

Learn more about MiHIN at <https://mihin.org/>

### Editors

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- **Dr. Kenneth Buckwalter**, Associate Chief Medical Information Officer – Michigan Medicine
- **Dr. Jim Huizenga**, President and Physician Leader – CliniCentric
- **Dan Boyle**, HIE Analyst – Upper Peninsula Health Care Solutions & UPHIE
- **Tyler LaPlaunt**, Assistant Director – Upper Peninsula Health Care
- **Michael Talley**, Director and Treasurer – Southeast Michigan HIE

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## Appendix C: Workshop Attendance Report

Name	Title	Organization
Chad Waggoner	IT Manager – Clinical Imaging	Ascension
Chris Manthey	Technology Director	Ascension
Evita Singh	Radiologist	Ascension
Jeff Way	IT Director	Ascension
Scott Anderson	Team Lead	Ascension
Katie Goulette	National Product Owner State/Public HIE	Ascension
George S. Kipa, MD	Deputy Chief Medical Officer	Blue Cross Blue Shield Medical
Kimberly Hubbard	System Imaging Director	Bronson Healthcare
Lang Thai	Radiology Imaging Informatics	Bronson Healthcare
Jim Huizenga	President	CliniCentric
Gary Larson	Executive Management	eHealth Technologies
Marie Wendt	Director of Clinical Quality	Great Lakes Physicians Organization (GLPO)
Cheryl Martin	Vice President of Radiology	Henry Ford Health System
Jim Ciarelli	Manager of Radiology IT	Henry Ford Health System
Jessica Zadorzny	Senior Management Engineer	Henry Ford Health System
Julie Lowry	HIE Manager	Henry Ford Health System
Erik Badgero	Manager	Holland Hospital
Steve Sorenson	AVP Diagnostic Services	Holland Hospital
Karen Ruffner	Director, IT Clinical and Business Applications	Holland Hospital
George Lundin	Business Analyst	Lake Huron PHO
Chris Common	Manager Clinical Information	McLaren Health Care
Laura Kilfoyle	Telemedicine Policy Specialist	Michigan Department of Health and Human Services
Lisa DiLernia	Policy Specialist	Michigan Department of Health and Human Services
Margo Sharp	Policy Specialist	Michigan Department of Health and Human Services
MaryAnne Sesti	Health Policy Specialist	Michigan Department of Health and Human Services
Andrew Kureka	Director of Innovation	MedNetOne
Mark Lazar	Director of Corporate Affairs	MedNetOne
Jacquelyn Souder	Clinical Systems Manager, Information Services	Memorial Healthcare
Tom Kurtz	Chief Information Officer	Memorial Healthcare
Renee Smiddy	Policy	Michigan Health and Hospital Association
Sean Sorenson	Government Relations Manager	Michigan Health and Hospital Association
Dania Berjaou	Strategist	Michigan Medicine
Ken Buckwalter	Associate Chief Medical Information Officer	Michigan Medicine
Jessica Fried	Assistant Professor of Radiology	Michigan Medicine
Lauren La Barge	Business Analyst	Michigan Medicine



## Imaging and Interoperability: Addressing Diagnostic Imaging Dilemmas through Health Information Exchange (HIE)

Rosalyn Beene-Harris	Senior Business Analyst	Michigan Medicine
Sam Wang	VP Clinical Architecture	Michigan Medicine
Taylor Dunn	Analyst	Michigan Medicine
Tricia Niedbala	Administrative Manager Associate	Michigan Medicine
Monica Frick	Clinical IT Operations Manager	Michigan State University
Andy McLeod	Clinical Analyst	Michigan State University
Brandon Cornellier	PACS Administrator	Michigan State University
Patrick Homminga	Telecommunication Systems	Michigan State University
Lynn Hagan	Program Manager	Molina Health Care
Nadine Khan	Director	Molina Health Care
Vinita Saran	Business Relationship Manager, IT	Molina Health Care
Dan Fly	System Director of Radiology	Munson Healthcare
William Kimmel	Officer	PA Department of Human Services
Benjamin Stover	Manager	Philips
Bram Kievit	Solution Consultant	Philips
Lisa Geffros	Medical Director	Reliance Healthcare
Didi Davis	Vice President, Informatics, Conformance, and Interoperability	Sequoia Project
Eric Nguyen	Application Analyst	Sparrow Health System
Katie Starkweather	Application Analyst	Sparrow Health System
Mary Wyatt	IT Analyst	Sparrow Health System
Spring Hoover	IT	Sparrow Health System
Amy Chown	Director of Radiology	Sparrow Health System
Jasmine Holloway	IT Application Analyst Senior/PACS Admin	Sparrow Health System
Tamara Skok	Manager IT	Sparrow Health System
Aaron Dieterman	Architect	Spectrum Health
Jason Hoult	Manager, Radiology PACS	Spectrum Health
Michael Wright	Senior Business Systems Analyst	Spectrum Health
Steve Lawrence	Senior Domain Architect	Spectrum Health
Mike Gleeson	Manager, Digital Content	United Physicians, Inc
Michael Talley	Director and Treasurer	Southeast Michigan Health Information Exchange
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