



# An Interview with the Carequality Imaging Use Case Implementers

Blanca “Didi” Davis<sup>1,2,3</sup> · David S. Mendelson<sup>2,4,5</sup> · Alan Swenson<sup>1,6</sup>

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## Abstract

Imagine you had a cell phone plan that only allowed you to call other customers within the same carrier network. That is the situation most healthcare providers experience when joining a data sharing network. Carequality is a network-to-network trust framework that brings together the entire healthcare industry to overcome this challenge by providing a national-level, consensus built, common interoperability framework to enable health information exchange between and among health data sharing networks. The RSNA partnered with Carequality in 2019 to develop an implementation guide to enable the Imaging Exchange Use Case. The implementation guide was published in December 2019 for early adopters to sign up as implementers to the Carequality framework. Exchange standards must be clearly laid out so that all implementers can easily follow and be held accountable to enable interoperability of medical imaging. The guide was reviewed and tested by implementers and approved for production use in March 2021. Since the launch of the implementation guide, five Carequality Implementers have participated in Carequality’s Image Exchange Use Case: Ambra Health, Hyland, Life Image, Nuance, and Philips. These implementers recognized a gap in image interoperability and the need for change and collaboration. Carequality has asked each of the implementers to share their thoughts on issues pertinent to becoming an implementer and imaging interoperability with the hope that the reader will gain insight as to the evolution of network-based image exchange.

**Keywords** Interoperability · Imaging · RSNA · Standards · IHE · DICOM

On Dec. 2, 2019, Carequality presented the revised Carequality Image Exchange Implementation Guide Supplement, jointly developed by Carequality and the Radiological Society of North America (RSNA). Imaging data poses different challenges and is managed using different tools and different standards than clinical document data. But imaging’s place as one of the highest value pieces of clinical information underlines the importance of image data exchange. Caregivers and patients are impacted by the lack of access to medical imaging in the USA today. Expanded standards-based

exchange of medical imaging will enable innovation and improvements that benefit clinicians and patients.

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✉ Blanca “Didi” Davis  
ddavis@sequoiaproject.org

- <sup>1</sup> The Sequoia Project, Knoxville, TN, USA
- <sup>2</sup> Integrating the Healthcare Enterprise (IHE) - International, Illinois, Oak Brook, USA
- <sup>3</sup> Global Consortium for eHealth Interoperability, Chicago, IL, USA
- <sup>4</sup> Mount Sinai Health System, New York, NY, USA
- <sup>5</sup> Icahn School of Medicine at Mount Sinai, New York, NY, USA
- <sup>6</sup> Carequality, Vienna, VA, USA

## Tell Us a Little Bit About Your Company, Its Healthcare Business, and Its Involvement in Image Exchange

### Ambra Health

Founded in 2006 by a group of physicians, Ambra Health is a pioneer in the cloud digital health business. Today, Ambra stores, processes, and shares over 10 billion diagnostic

images, enabling improved patient care and research. There are more than 600,000 users in the Ambra Health network across 50+ countries, improving care for millions of patients around the world.

“Simply put, Ambra Health takes medical imaging like x-ray, CT, ultrasound and moves it to the cloud so hospitals, health systems and research institutions can get to it anytime, anywhere and doctors can focus on what matters most: patient care,” said Morris Panner, chief executive officer of Ambra Health. “In the past, this type of information was shared via CD or a dedicated VPN line, a cumbersome and time-consuming process that led to increased financial costs and delays in care.”

What started as Image Exchange is now Enterprise Imaging with more than a focus on just getting a study from point A to point B; it is about enabling telestroke, embedding AI into imaging workflows, and it is about facilitating global research and clinical trials through de-identification and advanced research capabilities. It is about leveraging imaging to improve patient care in a clinical setting and patient care globally through next-generation research.

## Hyland

Hyland delivers Enterprise Content Management and Services globally to the healthcare marketplace. Hyland’s Enterprise Imaging solutions enable our customers to capture, manage, view, and share all imaging-related content across the enterprise, regardless of specialty. Hyland’s commitment to security and interoperability ensures that imaging content is available securely to support application integrations, research initiatives, and clinical access to content whenever and wherever it is required.

“Hyland has always been adopting standard and interoperability specifications as the architectural foundation of their Healthcare platforms,” said Razvan Atanasiu, chief technology officer healthcare at Hyland. “The Enterprise Imaging organization has supported IHE XDS and XDS-I for a decade, and we continue to prioritize interoperability across all aspects of the organization.”

## Life Image

Life Image is a large global medical evidence and image exchange network facilitating access to medical information to a wide ecosystem of healthcare organizations and connecting more than 13,000 facilities, 160,000 providers, 58,000 global clinics, and tens of thousands of patients, orchestrating more than 4 million clinical encounters in

the USA each week. Life Image provides an essential service for patients and clinicians that enable diagnosis and treatment. Accelerating access to medical information saves lives in addition to improving patient care, patient experiences, and reducing cost in addition to saving lives.

“Life Image was formed in 2008 to solve the toughest challenge in healthcare interoperability — the exchange of complex imaging data,” said Matthew Michela, chief executive officer and president of Life Image. “We were born inside complex academic medical centers struggling to improve patient care because of the lack of interoperability support by imaging manufacturers.”

The first interoperability facilitated by Life Image provided access to imaging inside the firewall of a hospital or system, allowing clinicians, regardless of location or clinical service, digital access to this vital clinical information. At that time, one department or clinical specialty was unable to share clinical imaging with another unless they provided the films or images on CD via interdepartmental mail or courier. Life Image was the first organization to support imaging access enterprise-wide, regardless of modality or manufacturer.

The second phase of interoperability for Life Image was facilitating image exchange outside the firewall of the system, connecting the majority of major US medical centers to their community referral partners for imaging exchange. This started as a unidirectional point-to-point exchange and evolved to a truly bidirectional exchange of imaging and reports among a broad connected network, using the first and still most robust exchange application, called LILA (Life Image Local Application).

The third phase of interoperability connected patients and other healthcare organizations, such as life sciences companies, researchers, imaging centers, and artificial intelligence companies, and federal medical facilities to providers, and each other globally.

## Nuance

Nuance is a leader in transforming patient care with AI-powered solutions for providers and patients. Used by 77% of hospitals and 10,000 healthcare organizations worldwide, Nuance unburdens healthcare teams by providing efficient ways to capture clinical information.

Nuance PowerShare helps health information exchanges (HIEs) to become image enabled. Related, but not always provided via an HIE, is leveraging available MPI services to facilitate further automation of the processes to access and exchange medical imaging data.

“As an industry leader in the radiology IT space, Nuance noticed the challenges that existed with providing access to patient images,” said Nassib Khanafer, senior product manager at Nuance. “Nuance decided to address this challenge with an electronic image exchange solution.”

## Philips

At Philips, our purpose is to improve people’s health and well-being through meaningful innovation. We aim to improve 2.5 billion lives per year by 2030, including 400 million in underserved communities. As a technology company, we — and our brand licensees — innovate for people with one consistent belief: There is always a way to make life better.

Philips sees healthcare as a connected whole helping people to live healthily and prevent disease. We provide clinicians the tools they need to make a precision diagnosis, to deliver personalized treatment, and to aid the patient’s recovery at home in the community. All supported by a seamless flow of data.

As a leader in the complete imaging value chain, from creation to long-term retention, Philips knows the importance of seamless image exchange plays in improving quality of care, enhancing processes, and reducing cost. Philips Interoperability Solutions is a leading global supplier of Integrated Health Enterprise networks, and we support all relevant IHE profiles which can be used by healthcare professionals to easily share patient information, enjoy collaborative workflows, and connect healthcare networks.

## Why Participate in the Carequality Image Exchange Use Case?

### Ambra Health

Ambra has always pursued interoperability, both via standards-based solutions such as those historically championed by RSNA, and through ad hoc DICOM connections between gateways of different image exchange solution providers.

Clearly, there is new momentum driven by TEFCA, both in EHR data and in imaging data. As the industry pursues standards-based solutions today, and we see those standards evolve in the future, Ambra will participate to ensure that proprietary technology does not limit patient care or key research.

Furthermore, many hospitals and health systems still rely on CDs and outdated, on-premise technology for storing and transferring medical imaging. The COVID-19 pandemic ushered in a new sense of urgency. Ambra enabled facilities

to move to the cloud to establish teleradiology for field hospitals, enable cloud viewing for specialists, provide image exams directly to patients, ensure remote surgical second opinions, and even anonymize COVID imaging exams for research studies.

External forces like TEFCA and COVID-19 are accelerating the need for interoperability. “We (Ambra Health) view Carequality as an extension of the work begun with RSNA for interoperability. However, with Carequality there is a larger context of interoperability beyond imaging. Although the challenges of exchanging imaging are far different than the challenges in exchanging other types of patient data, viewing all patient data under the same umbrella makes sense for the patient, and makes sense for the healthcare providers,” said Panner.

### Hyland

A customer pushes as well as other vendors who now implement the Carequality Image Exchange. At the same time, we have always been an evangelist for basing Image Exchange on the IHE profiles, like IHE XDS and XDS-I. Hyland has embraced and will continue supporting major Healthcare exchange initiatives in North America (Sequoia’s RSNA Image Sharing Validation program) and the rest of the world (Dutch TWiN, NHS Image Exchange foundations).

“4’s commitment to standards-based interoperability in healthcare aligns with the Carequality Image Exchange Use Case,” said Atanasiu. “The adoption of and adherence to clear, well-defined standards is absolutely crucial to health data interoperability. If vendors don’t conform to agreed-upon industry standards, then the clinical information these systems manage may remain trapped in proprietary siloes.”

### Life Image

Interoperability in Imaging is one of Life Images core aims. “Life Image has a 10-year history of participating in interoperability innovation with the Radiological Society of North America (RSNA) and Sequoia. In 2011, Life Image was selected as the clearinghouse for the RSNA’s National Medical Image Sharing Project,” said Michela. “As part of its initiative to promote a standards-based workflow for populating personal health record (PHR) platforms with patients’ medical image data, the RSNA selected Life Image to serve as a digital clearinghouse for a two-year image-sharing project funded by a federal contract from the National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering. Life Image was among the first vendors that the RSNA, in collaboration with The Sequoia Project, announced as successfully completing the RSNA Image Share Validation program in 2016.”

From the start, Life Image has focused on interoperability and managing the technical complexity of imaging — all types, forms, and modalities — with some of the largest and most complex medical centers in the USA. We recognize the value in supporting 1000 s of unique workflows, multiple standards, and providing a platform that allows connectivity to other data types and networks. Life Image continues to support a number of well-established data-exchange standards which apply to complex imaging data and associated clinical information across our solution set such as FHIR, SMART, XDS, and DICOM or DICOMweb restful services.

### Nuance

As a long-time supporter of ACR and RSNA standards initiatives, Nuance believes it is important to contribute our input and expertise to the ongoing development of the Carequality Image Exchange.

“We (Nuance) consider consensus-building approaches and participation by all stakeholders an essential step for standardization to address today’s challenges while enabling the radiology community to take full advantage of the opportunities enabled by interoperability and information-sharing,” said Khanafer.

### Philips

As a leading global supplier of IHE networks, Philips is encouraged that Carequality broadened the scope of information exchange to include imaging at a national level. “For too long our customers have been limited by private image exchange networks leaving collaboration gaps and challenges” said Mike Sharland, Product Manager for Philips Interoperability Solutions. Philips will continue to invest in industry-wide standardization and interoperability programs to assist our customers in achieving the highest maturity stages on the HIMSS Analytics Digital Imaging Adoption Model and their quadruple aim goals.

## What Have Been the Challenges of the Carequality Use Case Implementation?

### Ambra

“Ambra is still early on the path towards full implementation of the Carequality Use Case, and we are the first vendors to pursue this implementation, so there are a few structural issues that need to be worked through, but those roadblocks have been minimal. I think it will be even easier for vendors that come to the party now as some of those initial bumps have been identified and removed. The IHE protocols are

complex, but the specification is generally complete though often distributed across many different documents. The maturity of the test tools has been a small challenge, but we are working through that with the Sequoia Project,” said Panner.

### Hyland

“Hyland supports all the Carequality IHE transactions, but we are just beginning to test the Carequality Use Case with other vendors. The XCPD transactions are so far Hyland’s biggest challenge. Hyland has passed XCPD at numerous IHE North American and European Connectathons, however XCPD updates were required after reviewing the Carequality Use Cases which are more complex than the IHE Connectathon XCPD test cases,” said Atanasiu.

### Life Image

“Life Image continuously evaluates which interoperability standards and transactions to support as we innovate. Life Image is still in the early stages of implementing the Carequality Use Case. Working with the top Academic Medical Centers in the country, we recognize it’s not deployment of the standards themselves that pose a challenge but rather the business and clinical processes surrounding those transactions that continue to present a challenge. Privacy and patient safety are of the utmost concern.”

“Until healthcare providers and their Privacy, Compliance, Legal, Health Information Management and Security officials have confidence in automated patient-matching and that the data being released is being consumed by an authorized healthcare entity, providers will remain highly reluctant to release clinical imaging based on endpoint transactions without manual review and authorization for release,” said Cristin Gardner, Vice President of Product at Life Image.

“We must also consider the performance strain on technical systems or archives that require high availability, such as PACS. Information Technology support teams are rightfully protective of these systems which cannot be queried constantly, at random, and at high volume while simultaneously performing at the level needed for Radiologists to detect cancer or Trauma Surgeons to view the vital images they need in an emergent situation. Many hospital systems expect a level of control or gating which allows them to load balance and ensure these critical systems are not compromised. Any interoperability solution focused on imaging specifically must address this unique requirement.”

## Nuance

“XDS and XCA show both the promise of enabling interoperability as well as the challenges of achieving it as technologies change and advance. The SOAP technology underlying XD\* itself illustrates the opportunities as well as limitations,” said Khanafer.

## Philips

“As one of the first vendors to test and implement the Care-quality Use Case, we are solving initial challenges interpreting and implementing comprehensive IHE profiles that can lead to testing tools and make broader adoption easier for vendors that follow,” said Shaland. Philips Interoperability Solutions platform is based on open, established standards, such as XDS, XDW, XCPD, XCA, HL7, FHIR, and DICOM, making our solution multi-vendor positive, and we welcome and support vendors at every level.

## **This Program Promotes Network-Based Exchange and Exchange Between Disparate Networks. What Other Exchange Services Do You Offer (i.e., Image Enabled PHR) or See Emerging? What Are Your Customers Asking for?**

## Ambra

Though we started as an exchange vendor, Ambra is a full Cloud PACS offering. We see exchange as the foundation for numerous other enterprise imaging workflows — imaging archive, patient portals, referring physician portals, AI algorithm facilitation, de-identification for research, and/or algorithm development. Replacing the CD in getting imaging from point A to point B is a necessary first step, but the secondary workflows that come after exchange unlock much larger value for our customers.

These are still early days for interoperability. Most of the IDNs are interested in securing the imaging for optimal patient care and are less concerned about the standards that are used.

The healthcare providers want the imaging they need, but they also want to avoid the imaging that might be extraneous (for example, filtering by body part or modality in prefetching). They are tied to their existing PACS and EMR infrastructures, so it is not enough just to bring imaging to their doorstep. Exchange providers need to allow imaging to work through the IDN in the way that works best for the IDN, and that can vary greatly from IDN to IDN.

The standards we are using today will work quite well, but we all know they will evolve, and we as trusted imaging partners need to commit to interoperability in whatever form it takes today and in the future.

## Hyland

With a vast product portfolio at their disposal, our customers have built image exchange solutions leveraging either the Acuo VNA functionality and/or the NilRead advanced visualization platform, which both support a large number of IHE profiles used for interoperability and document sharing. Hyland’s support of FHIR and the IHE FHIR profiles: MHD, PIXm, PDQm, and PMIR delivers modern interoperable web services for cloud deployments. These solutions can be deployed on prem or in a public or private cloud.

Hyland also offers a patient portal (Hyland NilRead Patient Portal). Many customers are looking for integration with Epic Care Everywhere, which we endorse due to our extensive support for IHE profiles embedded in our Healthcare platforms.

## Life Image

Patient access and ownership of clinical data will continue to be a focus for Life Image, and we expect to see a shift in industry focus around this over the next 24 months. Most patient portals, including EHRs, cannot assemble, store, and share complicated diagnostic images that are critical to treating chronic and complex conditions. For patients with conditions such as oncological, neurological, COVID-19-related conditions, as well as musculoskeletal illnesses, diagnostic images are especially important. With these conditions, imaging exams taken over time must be compared to be clinically useful for diagnosis, treatment, therapy evaluation, and post-acute patient monitoring. “Unfortunately, most patients in the United States must wait to obtain their own imaging data via CD, which is often unusable, and a burden to obtain,” says Gardner. “This data should be patient owned, and mobile in order to meet the demands of patients today. Under HIPAA, providers are required to give patients, upon request, access to their protected health information in the form and format of the individual’s choosing, including an electronic format and via a third-party application. To address ongoing industry resistance and barriers to interoperability, new regulations released in March 2020 from The Office of the National Coordinator for Health Information Technology of the 21st Century Cures Act are mandating that patients be allowed greater control and access to their health data and are targeting technologies that block information access.”

Clinical support teams working with complex imaging data will continue to push for integration with legacy workflows, systems, and portals. The industry is getting portal fatigue; HIEs and hospitals are no exception. Imaging data is not as straightforward as EHR data or clinical documents in terms of workflow enablement and clinical usability. Complex clinical workflows and the usability of the data

must be considered when planning for the future of imaging interoperability. Simply exchanging the data from one provider to another does not make the data usable for clinical or administrative teams as part of their existing workflows and downstream system integrations. Data delivery that results in large-scale process change or inefficient manual workarounds for clinicians or clinical support staff will yield low to no adoption.

How the information is received, processed, accessed, viewed, tagged, normalized, and integrated all play a role in clinical usability.

## Nuance

Nuance PowerShare helps health information exchanges (HIEs) to become image enabled. Related, but not always provided via an HIE, is leveraging available MPI services to facilitate further automation of the processes to access and exchange medical imaging data.

We are seeing requests from HIEs, IDNs, and other third parties to image-enable their applications via APIs, typically based on simple REST services.

## Philips

Philips Interoperability Solutions is a leading global supplier of IHE XDS networks, and we facilitate patient documents and imaging data exchange at local, regional, and national levels.

“Our partners look to Philips to help them remain current with legislative requirements, standards, and technology; however, more importantly they are asking to provide their users with relevant patient information to make the best clinical decisions at the point of care. Additionally, customers

expect to be able to analyze the flow of data across their environment to drive operational improvements and performance,” said Sharland.

“In the era of precision diagnosis, healthcare professionals need a comprehensive patient medical record that includes the patient’s imaging studies. This complete patient record is critical to improve quality of care, to enhance processes and reduce cost,” said Frank Laarakker, Product Management Lead for Interoperability Solutions at Philips.

**Availability of Data and Material** Not applicable.

**Code availability** Not applicable.

## Declarations

**Ethics approval** Not applicable.

**Consent to participate** Not applicable.

**Consent for publications** Not applicable.

**Competing Interests** The authors declare no competing interests.

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