

TECHNOLOGY INTEGRATION AT LEADING HEALTH SYSTEMS VENDOR NEUTRAL ARCHIVES AT DUKE HEALTH

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ENVIRONMENT FOR LEADING HEALTH SYSTEMS AND VNAs

The continued transformation of the healthcare landscape has resulted in the rapid evolution of health systems, with networks growing in both in scale and complexity. Since 2010, healthcare mergers and acquisitions have increased 55% as hospitals and health systems combine to form ever larger integrated delivery networks (1). Currently, two-thirds of community hospitals nationwide are owned or operated by a health system (2).

This rapid growth rate presents unique challenges for health systems, one of which is the coordination and integration of newly acquired entities. As additional hospitals, ambulatory centers, physician groups and outpatient clinics are absorbed into larger health networks, they bring legacy systems, technologies and applications which may not always function within the health system's existing platforms.

Additionally, as healthcare becomes more consumer-centric, creating a seamless and coordinated care experience as well as a true sense of system-ness is a priority for the Leading Health Systems. However, traditional operational silos within the health system pose similar integration difficulties. This interoperability challenge is one of the foremost issues for Leading Health Systems, as it can impact a system's operational efficiency, as well as quality of care and care management (3).

As Leading Health Systems work to increase efficiency while improving quality of care, organizations are implementing technological solutions, such as Vendor Neutral Archives (VNAs), to improve interoperability.

STUDY BACKGROUND & INTRODUCTION

Through exploratory interviews with executives from four Leading Health Systems, The Health Management Academy (The Academy) examined the process and impact of implementing and utilizing a VNA at large integrated delivery networks. The Academy then conducted site visits, involving in-depth interviews with C-suite executives and key stakeholders, at two health systems that have successfully implemented a VNA. The purpose of this study is to identify successful methods of adoption and integration of a VNA, and highlight the challenges and successes experienced by the participating health systems.

This report reviews the overall findings of the exploratory interviews and presents a case study describing the process and impact of VNA implementation at Duke University Health System.

KEY FINDINGS FROM DUKE HEALTH

- VNA implementation allowed Duke Health to more accurately track storage growth over time, predict future needs, and gain leverage in price negotiations with vendors.
 - With the adoption of the VNA, Duke Health consolidated medical images into one archive and simplified IT operations.
- The VNA has resulted in improved cross exposure between clinical specialties.
 - The VNA allowed physicians to access and view images that were previously difficult to share due to storage silos in disparate PACS.
- Close collaboration between IT and physician stakeholders was crucial to designing the clinical workflows for the successful integration of the VNA into the EHR.
- The primary reasons for implementing the VNA was to improve medical image storage and archiving efficiency, as well as a desire to be able to share and access medical images across the health system.

VENDOR NEUTRAL ARCHIVES AT LEADING HEALTH SYSTEMS

PROFILE OF PARTICIPATING HEALTH SYSTEMS



LEADING HEALTH SYSTEMS AND VNAs

As Leading Health Systems work to improve interoperability and care coordination, a new focus has been placed on utilizing medical images. Technological evolution has resulted in an explosion of diagnostic image collection, reaching over 600 million medical images produced annually by healthcare providers in the U.S. (4). With increased image production also comes increased storage requirements, leading to medical image archives growing 40% each year (4). As the volume of medical imaging continues to grow, health systems are looking at new solutions that can archive and store vast amounts of data that is generated by a variety of sources and technologies and stored in multiple formats.

In order to better manage the volume of medical imaging data, health systems are developing and adopting enterprise imaging strategies to govern the management, storage, and access of medical images (5). One strategy employed by some Leading Health Systems is the adoption of a VNA, which can archive and store medical images from multiple sources in a standard format and in a single location. A VNA allows users to view all medical images regardless of format or origin, eliminating traditional imaging storage and viewing silos (5). VNAs have been gaining popularity among health systems – with over one-third of US hospitals having already implemented a VNA – for their ability to store both DICOM and non-DICOM (e.g., JPEG, PDF, MP4, etc.) images, and utilize a universal viewer to allow providers to access images generated from different applications in the same viewer (5, 6).

The Academy conducted initial exploratory phone calls with stakeholders at four Leading Health Systems at various stages of VNA implementation. Discovered during The Academy's exploratory interviews, health systems commonly elected to implement a VNA as a response to rapidly increasing storage requirements, as well as a desire to archive images in an intelligent manner. As health systems are confronted with aging picture archiving and communication systems (PACS) requiring upgrades, they must undertake massive data migrations to move image data from one PACS system to another. (7) Participating health systems noted that this moment was ideal for VNA implementation, as a VNA would require the health systems to migrate imaging data only once. Additionally, health systems opted to implement a VNA in order to facilitate the easy access and sharing of images throughout the health system and streamline IT operations.



We live in a digital world where any given patient has a number of digital objects associated with them and we needed a place with standards to be able to store and retrieve objects – we needed some universal filing for digital objects.” (Clinical Leader)

Across participating health systems, VNA adoption was primarily championed by informatics and positioned as an IT project. However, multiple systems noted the importance of involving clinical stakeholders in the process as well, especially regarding designing workflows when integrating the VNA into the electronic health record (EHR).

Most health systems emphasized benefits delivered from the VNA, such as streamlined IT image management and consolidated storage. While one health system viewed the VNA as purely an IT project with no clear benefits beyond a storage solution, others reported additional benefits such as improved workflow, increased care coordination and standardization of care practices, and efficiency gained from storing data in one consolidated location. Many health systems noted the benefit of being able to share and view images easily across traditional PACS storage silos.

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DUKE HEALTH | IMPLEMENTATION AND DIFFUSION OF A VNA

Located in Raleigh-Durham, North Carolina, Duke University Health System is the second-largest private employer in North Carolina and one of the largest health systems in the country, with almost \$3 billion in annual Net Patient Revenue (NPR) (8, 9). Duke University Health System is comprised of three hospitals, and is widely recognized as one of the top academic health systems in the nation. In Fiscal Year (FY) 2016, Duke University Health System recorded over 66,000 inpatient admissions and over 2 million outpatient visits (8).

As a large integrated delivery network with multiple hospitals and many outpatient clinics and physician offices, Duke Health's motivation for implementation of a VNA primarily focused around consolidating and streamlining IT systems for storing and managing medical images.



As we look to the future of healthcare, streamlined data integration and timely information access are essential. A key part of our enterprise IT strategy is to consolidate onto a few flexible platforms that will bring measurable value to the business.”

– Jeffrey Ferranti, M.D., M.S., Chief Information Officer & VP for Medical Informatics, Duke Health

Beginning VNA implementation in 2013, Duke Health has fully migrated their image archive into TeraMedica's Synapse VNA, and is in the process of integrating viewers into the electronic health record (EHR). While C-suite and senior leadership are involved in overall decision making and governance, implementation and integration of the VNA primarily occurs at the department level involving key IT and physician stakeholders.

Strategic deployment was a key aspect of the Duke Health approach. Seeking to create a successful example use case for the VNA, Duke focused on early-adopter physicians and clinical specialties that would be receptive to pilots as well as those that would provide the greatest yield for their efforts. These parameters led Duke Health to begin with anesthesiology, and quickly expand to obstetrics, urology, and endocrinology, among others.

“We started first with a group that was interested in working with us. First, we proved the concept and developed a system to move ahead. We now have a level of confidence that it will be successful in each area we go to.” – Christopher Roth, MD, Vice Chair, Information Technology and Clinical Informatics, Director of Imaging Informatics Strategy, Duke Health

From the beginning, Duke's viewer implementation strategy was to create a 'toehold' in multiple clinical specialties by standing up a pilot site and developing a starter workflow in one unit, and later expanding to additional units. A crucial aspect of successful implementation was the support of a physician champion within each specialty. Going forward, Duke plans to continue their strategic approach to diffusion, developing a multidisciplinary imaging governance committee that will oversee a structured approach to selecting which clinical specialty they will expand to next. As Duke has successfully created their 'toeholds' and integrated the VNA into the EHR at the early-adopter sites, the strategy moving forward can be focused on areas of greatest need, specifically those areas that have the greatest financial or compliance risk. With the early success of the VNA, the Duke Health Technology Solutions (DHTS) team expects to see accelerated demand for the VNA from other clinical specialties.

One of the most significant challenges in the VNA implementation was designing various workflows for the clinical specialties. The DHTS team quickly realized collaboration with physician end users was necessary to develop the workflows; however, identifying and involving the correct stakeholders, balancing specificity with the need to be able to scale, educating physicians and changing the culture, and standardizing the clinical workflows for each specialty all presented challenges that had to be worked through in order to successfully integrate the VNA.

With the adoption of the VNA, Duke Health is moving towards consolidating their medical images into one archive to improve the simplicity and efficiency of managing IT operations. Additionally, although storage requirements continue to grow, having a consolidated archive in the VNA has allowed Duke to more accurately track storage growth over time and predict future needs, which has proven beneficial in storage price negotiations with vendors. Additionally, the VNA has allowed physicians to access and view images that were previously difficult to share due to being siloed in different PACS, resulting in streamlined workflows and improved cross exposure between specialties.

Eventually, as the viewers are fully deployed and physicians can easily access images generated throughout the continuum of care, the VNA is likely to improve care coordination while the creation of standardized clinical workflows is likely to result in greater standardization of care. Furthermore, image sharing may reduce duplication and improve efficiency, which can impact both provider and patient satisfaction.

As one of the top medical research organizations in the country, Duke Health is using



The VNA doesn't necessarily change clinical care pathways, but it makes doing the right thing far easier."

– *Christopher Roth, M.D., Vice Chair, Information Technology & Clinical Informatics, Director of Imaging Informatics Strategy, Duke Health*

the VNA and enterprise viewer to facilitate in-depth research studies utilizing medical imaging data. Medical images are typically difficult to utilize for research, as many are siloed in disparate storages and physical disc media throughout health systems. In the future, physicians at Duke hope to be able to conduct longitudinal studies as well as large-scale and macro-historical research using Duke's VNA.

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METHODOLOGY

Beginning in September, 2016, The Academy conducted exploratory interviews with executives at four Leading Health Systems around the process and impact of implementing and utilizing a VNA. Organizations participating in the exploratory interviews included Inova Health System (Falls Church, VA), University of Texas MD Anderson Cancer Center (Houston, TX), Duke Health (Durham, NC), and Indiana University Health (Indianapolis, IN).

In January, 2017, The Academy conducted site visits at two health systems that have successfully implemented a VNA. Site visits were conducted at Duke Health and Indiana University Health. Site visits involved in-depth interviews with C-suite executives and key stakeholders at each health system.

The purpose of this study is to identify successful methods of adoption and integration of a VNA, and highlight the challenges and successes experienced by the participating health systems.

THE HEALTH MANAGEMENT ACADEMY

The Academy is a leading research and analysis company serving the largest 100 health systems that own or operate 1,800 hospitals. The Academy provides services to the C-suite, including research, analytics, health policy, consumer research, fellowship programs, and collaboratives.

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