VERMONT

Agency of Human Services

Department of Vermont Health Access
280 State Drive
Waterbury, VT 05671-1010
[phone] 802-879-5901

MEMORANDUM

TO: Rep. William Lippert, Chair, House Committee on Health Care
Rep. Catherine Toll, Chair, House Committee on Appropriations
Rep. Stephen Carr, Chair, House Committee on Energy and Technology
Rep. Janet Ancel, Chair, House Committee on Ways and Means
Sen. Claire Ayer, Chair, Senate Committee on Health and Welfare
Sen. Jane Kitchel, Chair, Senate Committee on Appropriations
Sen. Ann Cummings, Chair, Senate Committee on Finance

FROM: Susanne Young, Secretary, Agency of Administration
Al Gobeille, Secretary, Agency of Human Services

DATE: November 15, 2017

RE: Health Information Technology Report per Act 73 of 2017, Sec. 15

This report is submitted to fulfill the requirements for a Health Information Technology Report pursuant to Section 15 of Act 73 of 2017. The study is supported by a review conducted by HealthTech Solutions, a well-respected consulting firm focused on state and national-level health information exchange (HIE). The study focused on the role of the State in HIE, compared Vermont's HIE structure and performance to other states, and examined the performance of the Vermont Information Technology Leaders (VITL), Vermont's statutorily designated HIE operator. This study, which follows on the State Auditor's 2016 study of VITL, raises important questions about the current state and future direction of HIE and VITL. Both studies describe a significant state financial investment in HIE, how that investment created an important public asset in the Vermont Health Information Exchange operated by VITL, and challenges related to performance and accountability.

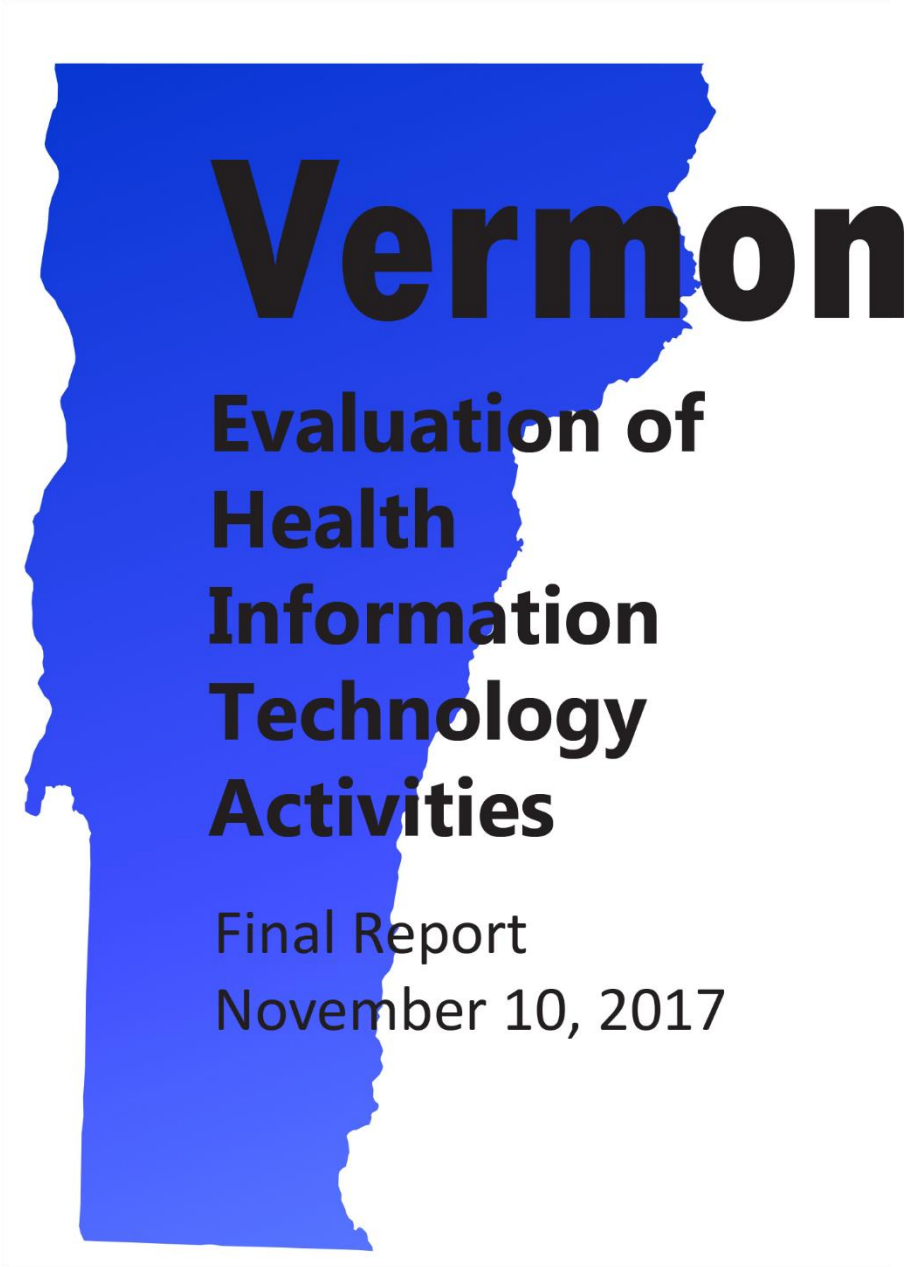
The study underscores the promise of health information technology while underscoring the importance of sound management of public programs and funds so they remain worthy of public investment. The Administration will use this study as an opportunity to re-evaluate Vermont's HIE strategy in partnership with other stakeholders. The Administration will use the time prior to the legislative session to develop a plan to implement the study's recommendations, including consideration of the conditions that must be in place for the Department of Vermont Health Access to continue its contract with VITL after the present contract expires on June 30, 2018. Additionally, the Administration anticipates engaging the legislature in a discussion of certain amendments to state law related to HIE, including revisions to Vermont law that enable Vermont to consider all options available for operation of the Vermont Health Information Exchange, create a more effective governance structure, and determine revenue sources for the HIT Fund.

Thank you in advance for your consideration. The Administration believes fully in transparency and appreciates the opportunity for closer examination of HIE and VITL.

Sincerely,

Susanne Young, Secretary, Agency of Administration

Al Gobeille, Secretary, Agency of Human Services



Vermont

Evaluation of Health Information Technology Activities

Final Report
November 10, 2017

HealthTech Solutions

CONTENTS

I. EXECUTIVE SUMMARY

Act 73 of 2017 required the Secretaries of Administration and Health and Human Services to conduct a comprehensive review of the State's Health-IT Fund established by 32 V.S.A. § 10301, Health Information Technology (HIT) Plan established by 18 V.S.A. § 9351, and Vermont Information Technology Leaders (VITL) administered pursuant to 18 V.S.A. § 9352. The Department of Vermont Health Access (DVHA) procured an independent third-party evaluator to lead the study, HealthTech Solutions (HTS). HTS was selected following a competitive procurement process and brought in a team of experts in Health Information Exchange (HIE) technologies, relevant legal issues, operations, and research. The team conducted close to 90 stakeholder interviews, examined other state HIE structures for comparison to Vermont, and reviewed current literature on the topic. This report sets forth HTS's findings and recommendations in fulfillment of Act 73's mandate.

HIE is the transmission of healthcare related data among facilities, health information organizations, and government agencies according to national standards. HIE is often used as shorthand for programs, tools, and investments that help aggregate and exchange claims and clinical data to improve healthcare. HIE is widely thought to have the potential to allow healthcare providers, payers, and policymakers to measure and understand the impact and efficacy of clinical choices and healthcare reform efforts. Healthcare providers rely on HIE. State and federal healthcare reform efforts assume that HIE systems function and add critical value to the care delivery system.

The study comes at an important time in healthcare reform in Vermont. Reform efforts, including the Vermont All-Payer Accountable Care Organization Model, assume that providers, payers, and Accountable Care Organizations (ACOs) will use data to understand program impacts to increase quality and reduce costs. HIE is meant to be the backbone of that data. Given this critical moment, the study aimed to compare both the current state of HIE nationally, and Vermont's own stated goals and processes, to its actual performance, providing policymakers and stakeholders with a lucid view of the present and a roadmap for the future.

The Findings

In summary, the report highlights four key findings:

HIE is expensive and difficult for all states. Vermont is facing HIE challenges, but it is not alone. Around the nation, many public HIEs have failed or consolidated as they struggle with limitations in technology and challenges with developing sustainability models. Despite adversity, there are many public/private partnership models that are evolving and functioning today to meet the demands of individual providers and the healthcare system at large.

HIE systems are essential. Aggregated clinical data is central to understanding the impact of population-wide reforms, such as the All-Payer Model. And the exchange and aggregation of clinical data through a central hub makes clinical data available to providers at the bedside, which supports informed, quality decision-making for patients. Providers must also exchange clinical data to meet federal requirements to receive full Medicare reimbursement. Therefore, despite difficulties in execution, it is no surprise that 92 percent of stakeholders HTS interviewed in Vermont indicated that the state needs to continue Vermont's

HIE efforts. HIE is foundational to good healthcare and successful system reform that impacts both health and the costs of care.

Vermont is not organized in a way that increases its chances for success. Currently, no group or organization is solely responsible for the execution of HIE activities in the state, and there is no state-wide strategic plan guiding time constrained HIE investments. VITL is the main operator of Vermont's HIE system (VHIE), and although the state is the main funder of VITL, the relationship between the two is weak. This governance model and lack of strategic plan, coupled with a Board of Directors that appears to be deferential to VITL leadership, gives a high degree of autonomy to VITL with limited accountability. Better governance and planning is attainable - other states have successfully developed governance and oversight models, which Vermont could replicate.

Stakeholders lack confidence and there is clear room for improvement. Based upon responses to structured interviews, many stakeholders have lost confidence in VITL as an organization. VITL is currently seeking to provide a new set of high-value services, yet they have not met their foundational core service obligations. In the VHIE, there are issues with the number of Vermonters whose data is available, the quality of data exchanged, and the usability of provider tools.

Historically, providers have not been charged a fee to use the VHIE. The interviews indicate that it would be difficult to convince providers to pay for VITL's services without seeing it vastly improved. Because federal investments fueling this work are scheduled to end in September 2021, it is critical to achieve a sustainability model that relies on both public and private participation.

In summary, the study finds that both health reform needs and stakeholder interviews support the view that HIE is essential. The governance and structure of Vermont's HIE initiatives must evolve to meet the ever-growing need to integrate systems and services that support improving the quality of healthcare delivery.

Recommendations

HTS recommends that Vermont address the issues identified in order to have a high performing HIE. These recommendations are based on success factors exhibited by other states. HTS urges Vermont to go back to the basics, develop HIE governance, create and execute upon a HIT planning process, link financial investment to performance, and better leverage the State's relationship with VITL. Specifically, HTS recommends that Vermont take the following steps:

- Implement an effective governance model;
- Develop and manage to a strong HIE strategic plan;
- Transparently tie program goals to financial decisions;
- Define outcomes and performance measures for all HIE investments;
- Make HIE operations accountable to all customers, including the state;
- Create an HIE Board of Directors consisting of a mix of stakeholders including subject matter experts and users;
- Ensure that the HIE operator is focused and delivers upon its core mission:
    - Connecting all patient data to the system,

- Matching patients to records in the HIE,
- Producing high-quality data, and
- Ensuring ease of use of data to support quality care and health system measurement.

The State and the HIE have ambitious and forward-looking goals; however, these basic elements of HIE ought to be in place to maximize both the chances of success and ensure the proper stewardship of public dollars.

HTS provides detail on the findings and recommendations in the following full report.

II. INTRODUCTION AND BACKGROUND

This document is the Final Report required by Section 15 of Act 73 of 2017[1], to evaluate health information technology (HIT) in Vermont and what is known as the health information exchange (VHIE) operated under a contract executed between the state and the Vermont Information Technology Leaders (VITL). The Report is divided into six sections and Appendices:

- Executive Summary,
- Introduction and Background,
- The Context for Health Information Exchange,
- Vermont at the Crossroads,
- Recommendations, and
- Conclusion.

After conducting a competitive award process, Vermont's Department of Health Access (DVHA) selected HealthTech Solutions (HTS) to conduct the evaluation. DVHA then established an Executive Steering Committee (ESC), comprised of individuals representing the Agency for Human Services Central Office, the Department of Vermont Health Access, Blueprint for Health, the Agency of Administration, and the Agency for Digital Services. The HTS Evaluation Team conducted its work under the guidance of the ESC. A complete description of the evaluation approach used to meet the legislative mandates is in Appendix A.

[1] Section 15 of Act 73 of 2017 directed the Secretaries of Administration and Human Services to conduct a comprehensive review of the State's Health Information Technology Fund established by 32 V.S.A. § 10301, Health Information Technology (HIT) Plan established by 18 V.S.A. § 9351, Vermont Information Technology Leaders established by 18 V.S.A. § 9352, and the Vermont Health Information Exchange. Department of Vermont Health Access is the Agency of Administration's designated Agency for all work related to Health Information Exchange and Health Information Technology. DVHA completed the Request for Proposals process and selected HealthTech Solutions LLC to conduct the Vermont Evaluation of HIT Activities Project This report is the result of the work completed from June 2017 through November 15, 2017, the time period allowed in The Act The Act can be found at: http://legislature.vermont.gov/assets/Documents/2018/Docs/ACTS/ACT073/ACT073%20As%20Enacted.pdf, page 25.

III. THE CONTEXT FOR HEALTH INFORMATION EXCHANGE

A. Overview

Health information exchange is the transmission of healthcare related data among facilities, health information organizations, and government agencies according to national standards.

Health information exchange is the transmission of healthcare related data among facilities, health information organizations, and government agencies according to national standards. Interoperability is the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged. The federal Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 promoted heath information exchange across the United States, with a significant portion of providers, particularly hospitals, participating in those efforts as part of the Medicare and Medicaid EHR Incentive Program, commonly known as the Meaningful Use (MU) Program[2]. Meaningful Use is defined by the Centers for Medicare and Medicaid Services (CMS) as the set of standards that governs the use of EHRs by setting specific criteria for eligible providers. Providers must engage in specific clinical workflow and security activities, and meet thresholds in certain measures, in order to achieve and demonstrate Meaningful Use.

The State HIE Cooperative Agreement Program, part of the HITECH, received federal funding from 2010 through 2014, and fostered a variety of state- or region-specific approaches to developing and supporting health information exchange through public organizations or public-private partnerships. As described by the Office of the National Coordinator for Health IT (ONC) in 2015, "a variety of electronic health information sharing arrangements will continue to exist as they serve important market and clinical functions that meet the unique needs of many different communities."[3] The result is alternative approaches in different regions and states in providing exchange services.

Funding under the Cooperative Agreement was prorated based upon the size of the state's population. In addition to the Cooperative Agreement Program, some states have funded exchange technologies and activities through Implementation Advance Planning Documents (IAPD) for services to the Medicaid population, and through State Innovation Model (SIM) Grants, both offered via CMS. The result is further heterogeneity to the structure of publicly funded exchange services across states.

[2] Julia Adler-Milstein and Ashish K. Jha C HITECH Act Drove Large Gains In Hospital Electronic Health Record Adoption Health Affairs 36, no.8 (2017):1416-1422.

[3] *Connecting Health and Care for the Nation A Shared Nationwide Interoperability Roadmap,* Final Version 1.0. The Office of National Coordinator for Health Information, October 6, 2015. www.healthit.gov/policy-researchers-implementers/interoperability

At the same time, private HIEs have developed within Integrated Delivery Networks (IDN) and Accountable Care Organizations (ACO), vendor networks, and payer networks. These networks are limited to specific organizations or customers in the case of vendor networks. Examples are Care Everywhere, the health information exchange solution provided by Epic Systems Corporation, an electronic health record (EHR) vendor, and SureScripts which provides more than 90 percent of ePrescribing services across the country. Private HIEs can be seen as both complementary and competitive to public HIEs, and more recently are being viewed as data aggregators or data nodes in states and regions embracing a "network of networks" approach to exchange. "Network of networks" refers to connecting various health information organizations to each other versus a single centralized HIE. This approach is similar to how the Internet is organized.

The website, HealthIT.gov, lists the following HIE benefits:[4]

- Provides a vehicle for improving quality and safety of patient care by reducing medication and medical errors
- Stimulates consumer education and patients' involvement in their own healthcare
- Increases efficiency by eliminating unnecessary paperwork
- Provides caregivers with clinical decision support tools for more effective care and treatment
- Eliminates redundant or unnecessary testing
- Improves public health reporting and monitoring
- Creates a potential loop for feedback between health-related research and actual practice
- Facilitates efficient deployment of emerging technology and healthcare services
- Provides the backbone of technical infrastructure for leverage by national and state-level initiatives
- Reduces health related costs
- Allows community based providers to coordinate care with other providers and caregivers

In evaluating the health information exchange approaches, understanding the context under which exchange occurs is critical. Organizations have attempted to provide for the electronic exchange of digital health information between the clinical systems of non-affiliated providers for almost 30 years, beginning with Community Health Management Systems in the early 1990s. These initiatives have consistently faced technical, economic, and political challenges limiting both interoperability and sustainability.[5]

[4] HIE Benefits. HealthIT.gov. Office of the National Coordinator for Health Information Technology. http://www.healthit.gov/providers-professionals/health-information-exchange/hie-benefits

[5] Joshua R Vest, Larry D Gamm; Health information exchange: persistent challenges and new strategies, *Journal of the American Medical Informatics Association*, Volume 17, Issue 3, 1 May 2010, Pages 288–294.

1. The Challenge of Sustainability

Public HIEs continue to face challenges related to financial sustainability, particularly with the State HIE Cooperative Agreement Program ending.

Public HIEs continue to face challenges relative to financial sustainability, particularly with the State HIE Cooperative Agreement Program ending. A survey of public HIE organizations found that only 17 of the 35 organizations responding (49 percent) considered themselves to be sustainable, defined as having revenues that exceed operational costs. While 60 percent of CEOs interviewed were confident their organization would survive over the next five years, nearly nine percent of participating organizations were in some phase of divestiture or exit from the market.[6]

A larger Robert Wood Johnson (RWJ) Foundation funded study found the number of operational public HIE efforts in 2016 as 106, down from 119 in 2012, representing the first decline observed since the tracking of these efforts began in 2006. Only half of operational efforts reported being financially viable, and all efforts reported a variety of barriers to continuation. The authors stated that "these findings raise important questions about whether the current vision for HIE efforts will allow for the broad exchange of clinical data, or whether alternative approaches would be more successful."[7]

Across the states and regions, revenue sources for public HIEs vary and include transaction fees, provider subscription fees, fees for health plans and insurers, special taxes, general state funds, and fees for specialized value-added services. In addition, IAPD and SIM funds may be used to support particular initiatives within HIEs.

Based upon the interviews for this assessment, HIEs that receive a significant portion of their funding from subscription or usage fees self-identified as having close relationships with their stakeholder/customers to understand their needs. Likewise, they indicated that when providers "have skin in the game" by paying a fee to the HIEs, this closer collaboration results in lower use of public funds and the development of use cases directed at solving the specific needs of paying customers. This market-driven approach could also potentially support a higher degree of technological progressiveness. On the other hand, it could focus the HIE on short-term solutions that may not support the larger goals of healthcare reform within a state.

[6] Langabeer, James and Tiffany Champagne. 2016. "Exploring Business Strategy in Health Information Exchange Organizations" Journal of Healthcare Management: 61(1)

[7] Julia Adler-Milstein, Sunny C. Lin, and Ashish K. Jha. *The Number Of Health Information Exchange Efforts Is Declining, Leaving The Viability Of Broad Clinical Data Exchange Uncertain.* Health Affairs 35, no.7 (2016):1278-1285.

2. The Business Case: Linking Value Propositions to Specific Use Cases

The principal challenge to health information exchange continues to be defining the business reason for using a public health information exchange. The exchange of data may not be in the perceived business interest of the stakeholder. For example, providers may not want to exchange patient data with their competitors. This is consistent with the research literature that suggests exchange was not common among competing organizations, but exchange between organizations within the same for-profit healthcare system was more likely. [8] [9] Research suggests that provider consolidation or network expansion may be associated with more exchange. [10]

The principal challenge to health information exchange continues to be defining the business reason for using a public health information exchange. The exchange of data may not be in the perceived business interest of the stakeholder.

In approaching this problem, health information exchanges have begun offering specific high value services linked to specific use cases (or problems to be solved) to their customers either to justify a subscription fee to the HIE or to purchase on a stand-alone basis. Examples include Admission, Discharge, Transfer (ADT) alerting systems, electronic clinical quality measure reporting, provider directories, patient attribution services, and analytics. These services are in addition to what have become standard HIE services, often associated with MU, such as labs, immunizations, and view-only provider portals that provide access to a patient's record. Standard HIE services assume that robust Master Patient Indices (MPI) exist with a low percentage of mismatches and ensuring that the interfaces are receiving 'clean' data from providers. As described in the section below, HIEs face a challenge in trying to normalize, map, and provide terminology services (i.e., manipulate data for use) due to poorly specified standards and data from disparate sources.

HIEs face a challenge in trying to normalize, map, and provide terminology services due to poorly specified standards and data from disparate sources.

A focus on use cases provides a direct link to value propositions, which assists in the marketing of the HIE and results in a clearer understanding of the services provided. The comparable state assessment below identifies the use cases provided by the HIEs in their respective states.

[8] eHealth Initiative. 2013. "Result from Survey on Health Data Exchange 2013. The Challenge to Connect", https://www.ehidc.org/resources/results-survey-health-data-exchange-challenge-connect.
[9] Fontaine, Patricia, Therese Zink, Raymond G. Boyle, and John Kralewski. 2010. "Health Information Exchange: Participation by Minnesota Primary Care Practices." Archives of Internal Medicine 170 (7): 622-9.
[10] Opoku-Agyeman, William, and Nir Menachemi. 2015. "Are There Differences in Health Information Exchange by Health System Type?" Health Care Management Review 41 (4): 325-33.

3. HIE Technical Challenges

Nationwide, HIEs experience technical challenges related to:

- Connecting systems using poorly specified standards
- Identifying unique patient records and attributing patients to providers
- Leveraging new technical innovations as workarounds

HIEs require technical interoperability between the internal technology solutions used within the exchange and between the provider's EHR. Interoperability continues to be a challenge under the current standards, which have been a challenge to implement. A key issue appears to be the high degree of optionality provided under the current consolidated clinical document architecture (CCDA) national standards, which has resulted in different approaches to implementing the standards in different EHR systems, thus complicating exchange and creating issues with data reliability.[11] Such variation makes the cost of interconnection to HIEs relatively expensive and requires a high degree of customization of interfaces (connections between an HIE and an EHR system). It can also cause problems with the quality of data exchanged through the HIEs. Therefore, using a single vendor's system to exchange the data is more cost effective and technically easier and produces higher reliability in results. This situation is one of the alleged causes of "information blocking" as identified by the ONC.[12]

An additional technical problem continues to be patient matching through MPIs.

An additional technical problem continues to be patient matching through MPIs. An MPI stores information about all patients within the system to identify like patient records and a provider directory stores data on providers such as demographics, addresses, credentials, specialty information, and relationships. In the absence of a national identifier, patient identifiers continue to be aggregated in attempts to ensure a match between the health record and the patient. Reliable, robust MPIs continue to be a challenge for HIEs and for providers.[13] Once again, this challenge may provide an advantage to provider networks because they are closer to the patient and able to receive first-hand data for reconciliation. Thus, the MPI performance of an individual HIE can be a barrier to adoption.

Technical solutions are being developed to augment or work around the existing technological solutions. These include the use of open source application programming interfaces (API). An API is a set of subroutine definitions, protocols, and tools for building application software and has a set of clearly defined methods of communication between various software components. A current standard under development that is API-based is Fast Healthcare Interoperability Resources (FHIR). APIs can support the

[11] D'Amore, J. D., Mandel, J. C., Kreda, D. A., Swain, A., Koromia, G. A., Sundareswaran, S. Ramoni, R. B. (2014). Are Meaningful Use stage 2 certified EHRs ready for interoperability? findings from the SMART C-CDA collaborative. *Journal of the American Medical Informatics Association: JAMIA, 21*(6), 1060-1068. doi:10.1136/amiajnl-2014-002883 [doi]

[12] *ONC report to congress*, 2015, https://www.healthit.gov/sites/default/files/reports/info_blocking_040915.pdf

[13] Lintz J (2017) Master Patient Index (MPI): Are we there yet? MPI Records Challenges at the Primary Care Clinic of North Texas. J Health Med Informat 8:256. doi: 10.4172/2157-7420.1000256

exchange of discrete high-value data elements or templates as compared to the complexity of large documents.[14]

Technological innovation is an additional criterion for evaluating HIEs. Other technical problems that are barriers to adoption of HIEs involve the workflow of providers, such as the degree of workflow interruption and whether providers see a low yield of valued information for the amount of time needed to access and find the data.[15] Other technical barriers include:

- The need for a provider to undertake a "second sign-on" to access the HIE, meaning the provider needs to enter login information numerous times in different systems to access information;
- The data only being available in a multipage (often over 50 pages) CCD with no indexing and limited search capability;
- The inability to parse the data exchanged into the receiving EHR which means that the received data cannot be parsed into the appropriate fields;
- Missing or incomplete data resulting in low utility of the information; and
- Unsuccessful patient matching through the Master Person Index, with the result that a patient's data is not displayed in the EHR or found during an HIE query for information.

Some HIEs and EHRs are advancing their development far enough and are supporting consolidation, indexing, and consumption of structured data that is presented to it through queries to an external data source. This new functionality eliminates one or more of the first three technical problems above. However, this is not yet the norm.

EHR capabilities are constantly changing and must be discussed with each individual HIE product or EHR vendor to determine if the capability currently exists or is planned in a future release. For example, the latest versions of the Cerner and Epic EHRs can utilize standards to query an HIE and return the results back to the provider within the EHR eliminating the need for a second sign-on. Cerner is working on the consumption of the parsed data for a version that is not yet available at the time of this report. The personal health record product, Microsoft Health Vault, correctly parses 90 percent or more of valid CCD data sent to it. Informatics Corporation of America's community HIE product can deliver the patient's data in standard health data sections (allergies, medications, immunizations, etc.) when using their portal for easier location of specific information.

HIE staff must work with each vendor to determine if any of these advances are part of their product roadmap and to prioritize it. Providers must work with their EHR vendors in the same way.

[14] *Connecting and Accelerating a FHIR App Ecosystem.* Techlab Innovation, Office of National Coordinator. www.healthit.gov/techlab/innovation/connecting-accelerating-fhir-app-ecosystem.

[15] Joshua R Vest, Larry D Gamm; Health information exchange: persistent challenges and new strategies, *Journal of the American Medical Informatics Association*, Volume 17, Issue 3, 1 May 2010, Pages 288–294.

B. Approaches to Health Information Exchange in Other States

As described, the ONC has recognized that states and regions have unique characteristics and it is appropriate that there are individualized approaches organizing health information exchange. Policymakers should be aware that each state needs to determine:

- A general economic model or approach to sustainability
- The funding relationship of the HIE to the state, including contractual relationships to specific state agencies
- The governance model for the HIE
- The decision-making authority and processes relative to what services to provide, technological approaches to these services, and funding priorities between the services

1. States Selected for Comparable Analysis

Nine states were chosen to be evaluated and compared with the VHIE. It should be noted that although Vermont only has one HIE perhaps due to its size, other states have used different approaches such as multiple HIEs in the state that work together formally or informally. An explanation of the rationale for including each state in the evaluation and a description of their HIE governance and services offered follows.

Maine

Maine is specifically identified in the legislation that called for this study. It has a number of similarities with Vermont, such as: the states' HIE environments have had a similar timeline and implementation. Maine's HIE was established outside of state government by a private non-profit company, but was not under mandate of legislation. It has however charged user fees since its inception. The Maine HIE sees the state of Maine as a strong customer and partner, yet certainly one of many customers.

Maine's HIE governance consists of a 19 member private Board of Directors. Maine's HealthInfoNet is a private organization and is not part of state government. HealthInfoNet described their board as a stakeholder board having representation from hospitals, physicians, consumers, government, business, and payers. No one group has a majority. Three of the 19 members must be public according to their bylaws. One member is the commissioner of Health and Human Services. One member is the Director of Maine Center for Disease Control & Prevention (CDC) and one is an at-large member that the Governor appoints.

HealthInfoNet is the decision-making authority in Maine for the HIE activities it undertakes. Like many HIEs in the comparison study, this gives them significant flexibility to adjust as they see fit but also means that decisions must be in line with the current and future needs of their stakeholders. Great lengths are taken to ensure that the future direction lines up with stakeholder needs. To minimize this, leadership is focused on the organizational relationship with each customer including the state of Maine.

Michigan

Michigan is also identified in the legislation. Michigan has a high level of statewide focus and strong cooperation between the state's Medicaid agency and the state designated entity. The latter is a requirement of ONC's State HIE Cooperative Agreement Program. States were asked to name a state designated entity (SDE) to oversee HIE activities in their state.

The HIE governance in Michigan includes four levels of Oversight Boards, and four Advisory Committees. The state created an HIT Commission that sets policies that the Michigan Health Information Network (MiHIN) Board of Directors acts to ensure are implemented by MiHIN. MiHIN also has an Operations Advisory Committee (MOAC) and technical working committees consisting of subject matter experts as depicted in Figure 1 below.

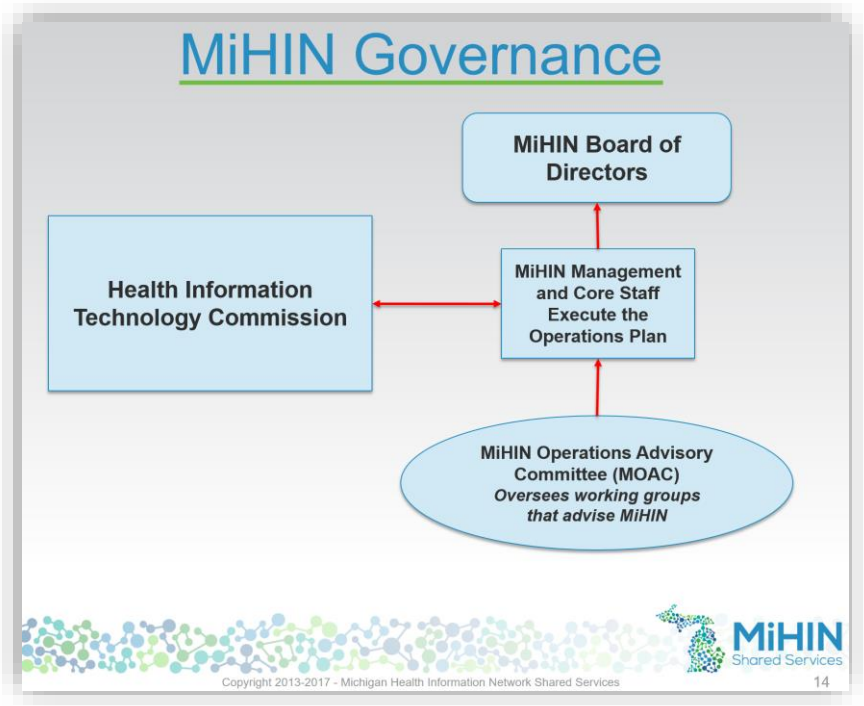


Figure 1 – MiHIN Governance

The MOAC workgroups consist of the following areas:

- Identity Management Work Group
- Use Case Work Group
- Productions and Operations/Integration and Architecture (PROPS/I&A) Work Group
- Security Work Group
- Privacy Work Group
- Health Directory (Provider Directory) Data Governance Work Group

Specific members of the governance committees can be found in Figure 2 below:

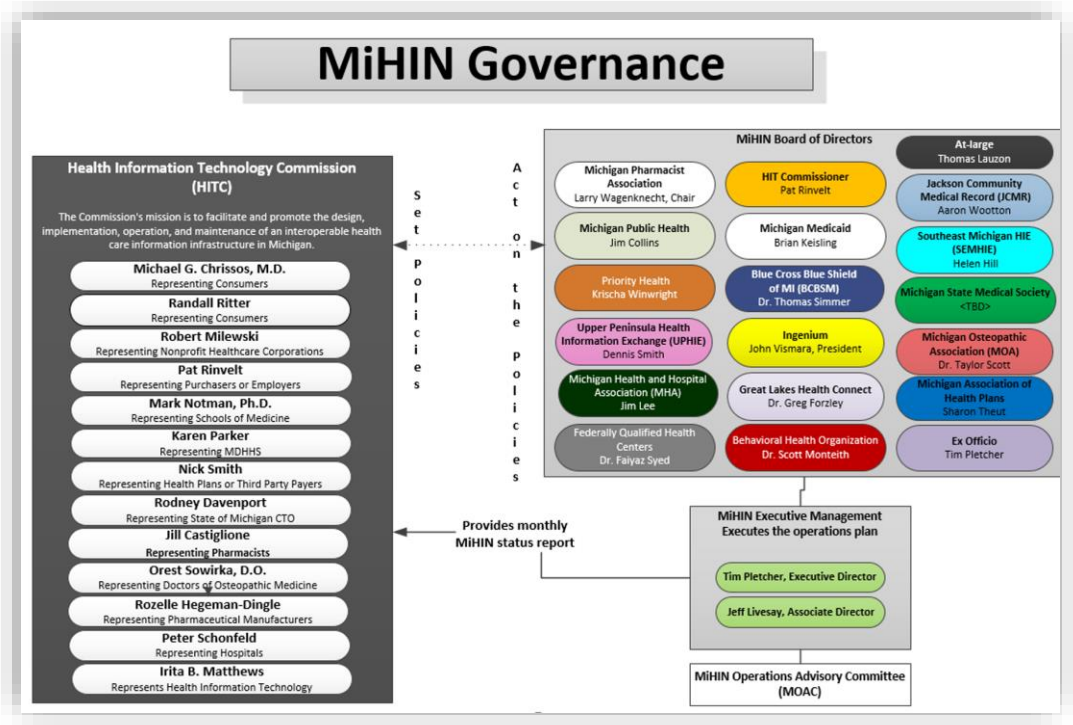


Figure 2 – MiHIN Work Groups

The decision-making authority in Michigan is shared between the Health Information Technology Commission which sets policies, the MiHIN Board of Directors whichacts on the policies, and the executive management at MiHIN which executes an operational plan. This includes monthly status reports from MiHIN to both the Commission and Board.

The operating strategy is based upon MiHIN operating a statewide network of networks to:

- Manage a statewide legal trust framework that provides for legal interoperability and technical integration through Trusted Data Sharing Organization Agreements
- Connect Michigan Department of Health & Human Services to healthcare organizations across the state
- Align incentives and regulations to fairly share data and promote standardization via use cases
- Maintain a statewide master data sharing infrastructure
- Convene stakeholder groups to identify data sharing barriers, reduce provider burdens, engage consumers, and enable population health

Colorado

Colorado is included in the comparison due to recent state level HIE activity, which was commenced to improve the quality and connection between Colorado's two private HIE entities together. The two prominent HIEs in the state are the Colorado Regional Health Information Organization (CORHIO) in the east and Quality Health Network (QHN) on the western side of the state. Until 2014, CORHIO was considered the state designated entity and was the recipient of the federal funding from the ONC. However, neither of the two HIEs in Colorado has a complete statewide reach although both do cover the state, have a high degree of cooperation between them, share patient data, and both provide robust HIE services that are highly used. They are both connected to the state's Medicaid and Public Health agencies. The state created a new commission, the Governor's Office of eHealth Innovation (OeHI), which is now considered the SDE, and is planning to implement a statewide index of patients (Master Patient Index and a master Provider Directory service to be able to easily match patients and providers across data sets).

Previously, the SDE and chief coordinating entity was CORHIO which is one of two functioning HIEs in the state and which covers the largest geography and population of the state of Colorado. Both CORHIO and QHN agreed to the transition and were appointed by the Governor to participate on the eHealth Commission.

Colorado's HIE governance now consists of a two person Office of e-Health Innovation (OeHI) with input from the eHealth Commission. In 2015, the state directed that to support health transformation, a coordinated HIT governance structure was necessary to align health programs, unify technology investments, and advance data integration among state agencies and private health partners. The state combined input from all possible stakeholders and, through Executive Order B 2015-008, created the e-Health Commission and the Office of e-Health Innovation under the Office of the Governor. OeHI is led by a director selected by the Governor and supported by the State HIT Coordinator. The eHealth Commission is responsible for creating and coordinating specific initiatives and workgroups, including those essential to establish eHealth standards (e.g., privacy and security, interoperability, information, technology) that will provide a foundation for each strategic initiative.

The state's Medicaid Agency will continue to serve as the fiscal agent managing funding requests, procurements, contracts, and payments to vendors on behalf of the SDE.

Colorado's governance landscape is shown in Figure 3 below:

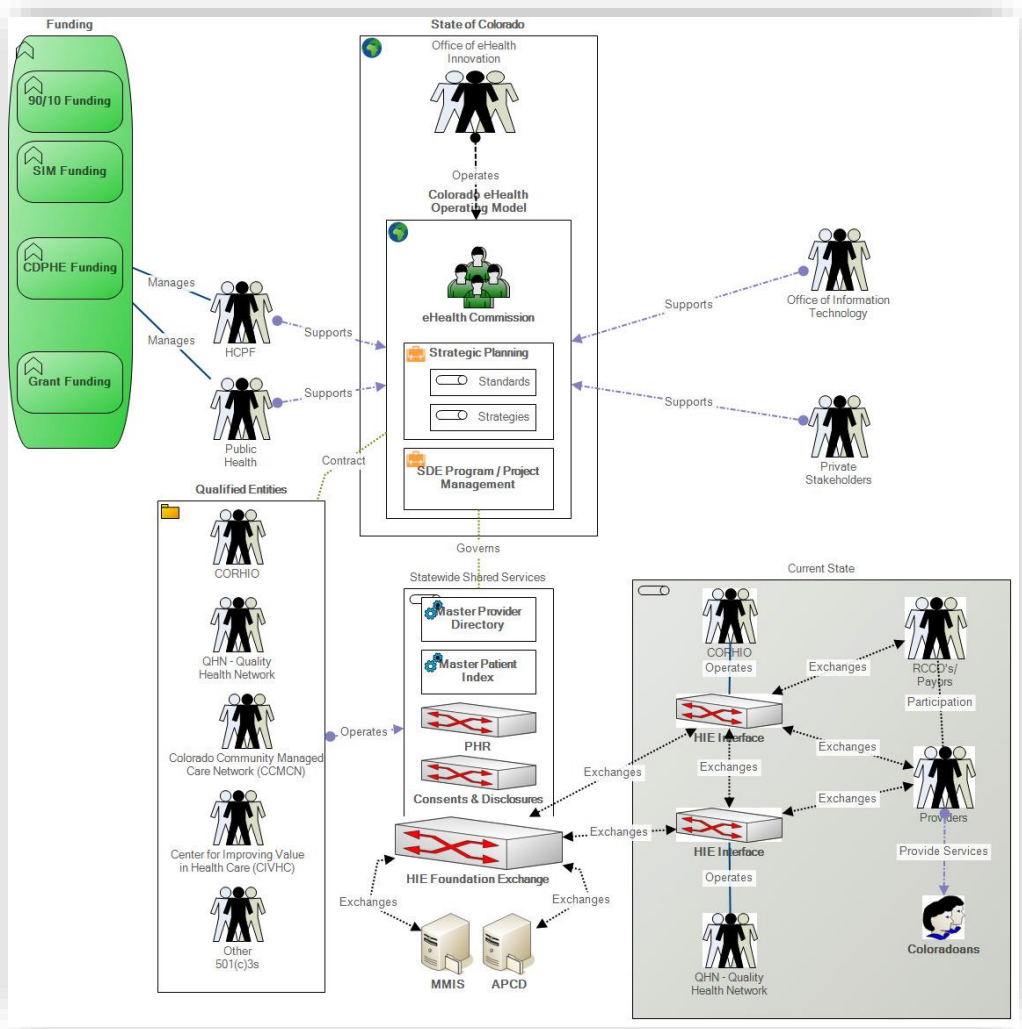


Figure 3 – Colorado Governance Landscape

Colorado's decision-making authority for statewide services is combined between the Office of eHealth Innovation with input from its eHealth Commission stakeholder group and the state's Medicaid department who issues contracts. Strategic planning is a large part of OeHI's responsibility using the eHealth Commission. This is then vetted through the state departments.

Delaware

Delaware is included because it has a self-sustaining HIE that has a close relationship with the state. The public/private model developed by Delaware Health Information Network (DHIN) receives revenues from public funding sourced from payers and from subscription and service fees from stakeholders. Although not dependent upon grant funding, DHIN has been the recipient of substantial federal grants. VITL management also suggested the inclusion of Delaware.

Ubiquitous delivery of results into an EHR through a single connection continues to be a top strategic priority for DHIN which provides the value-add to provider organizations. Since its inception, a major goal of DHIN has been to centralize connectivity for the provider community to create efficiencies for their organization and those who support them.

Delaware's HIE governance is a private organization with a 19 member Board of Directors. Delaware's DHIN has a mix of all stakeholder types in the state. Their board has remained consistent since inception. Their board membership is listed on their annual report for transparency and they encourage involvement from all in the DHIN open meetings.

The Board of Directors of DHIN along with its leadership is the decision-making authority for the HIE in Delaware. They seek input from a broad stakeholder group. They have a strong relationship with the state so there is strong state support. The HIE in Delaware also has a strong user community who stay involved in the stakeholder discussions to ensure that their voices are heard.

Maryland

In Maryland, the Chesapeake Regional Information System (CRISP) operates the SDE, in addition to operating the HIE for West Virginia (awarded through a Request for Proposal), and is one of two HIEs serving Washington D.C. As a sustainable and growing HIE, CRISP was selected because of its use case and customer-driven business model. As a private/public partner, CRISP is driven by its relationship with the state and by services it provides to providers, ACOs, and in support of a CMS Medicare Waiver.

The Maryland Health Care Commission (MHCC) is an independent regulatory agency with wide-ranging authority over health systems in the state. The MHCC established an HIE Policy Board which has oversight authority for establishing policies that govern statewide HIE. All entities that provide services for the exchange of health information with non-affiliated entities must be certified by the Policy Board, including IDNs.

In coordination with the MHCC, CRISP developed a governance model consisting of a Board of Directors of senior executives from across stakeholder groups and a Board of Advisors to provide guidance and input to the Board of Directors. There are more than 30 organizations represented across five Committees on the Board of Advisors. The Committees are:

- Clinical Advisory Board
- Technology Advisory Board
- Finance Advisory Board
- Privacy & Security Advisory Board
- Reporting & Analytics Advisory Board

Under state law all entities exchanging data between unaffiliated providers, including IDNs, must be certified as HIEs. As such, CRISP's approach with all stakeholders is to create opportunities to cooperate while recognizing that healthcare organizations still compete in other ways. Central to the strategic approach is the CMS waiver for Medicare reimbursement to a population health model which shapes the competitive nature of healthcare delivery in Maryland, including the exchange of data. The strategy rests

in an incremental approach to use cases with a manageable scope. The result has been that 14 use cases have been approved by the Board and introduced incrementally.

CRISP has expanded services into Washington D.C. and has developed a partnership with the West Virginia HIE to provide services in that state. CRISP has had great success with its ADT alert service branded as Encounter Notification Service (ENS). This service has been leveraged as a point of entry to HIE services. The solution has also been commercialized and is being marketed by a private company. This represents an additional revenue source for CRISP.

While having commercial success, CRISP continues to be funded roughly 75/25 by public funds with $33.8 million in revenues. The breakout is 25 percent user fees, and the other 75 percent consists of state assessment through a set-aside and federal funding through an IAPD and various grants.

Nebraska

In Nebraska, the Nebraska Health Information Initiative (NeHII) was developed independently of the state and sponsored by providers and health insurers. NeHII is in the process of closer integration with the state, beginning with operating the Prescription Drug Monitoring Program (PDMP) network. The rationale for the inclusion in the analysis are the lessons learned from reliance upon stakeholder funding and the approach to integration with the state at a time of greater HIE maturity.

NeHII is a 501(c)3 non-profit with its own 16 member board with representation from government, hospitals, payers, associations, and consumers. The broad selection of stakeholders is purposeful and not legislatively mandated. NeHII began as a payer funded entity which then began to focus on provider services to charge fees once up and operational. State involvement began much farther down the road as the HIE started to mature. NeHII is continually and very actively seeking input from the state now as well as its stakeholder community. This provides for lean operations of NeHII and the ability to remain nimble. NeHII has an executive committee, a finance committee, a consumer advisory council, professional association advisory council, technical committee, and others as needed. This equates to too many stakeholder meetings which take numerous hours to operate but build strong stakeholder engagement. NeHII holds annual meetings to inform stakeholders and publicize their strategic direction which is included in documents publicly available online. NeHII had an outstanding 2016 annual meeting with more than 150 people in attendance. The HIE has held numerous meetings to develop the future plans which contain broad opinion.

Oklahoma

Oklahoma is included due to the close integration with providers and customers, support of payment reform models, and the efficiency of the HIE. It was requested as a comparable entity by DVHA. MyHealth Access Network is operated by the Greater Tulsa Health Access Network, Inc. and provides health information exchange and related services across Oklahoma.

There is not an SDE in the state of Oklahoma. The relationship between the state and MyHealth Access, is a client/business relationship. MyHealth Access evolved from being a regional HIE through expansion across the state following the failure of two other non-profit HIEs and in response to business opportunities acting as a trusted third party. This includes services provided to Medicaid. The HIE is

primarily supported through subscription and service fees (67 percent). The Board primarily consists of stakeholders linked to these services across various regions. In addition, more than 100 members across the state with varied technical skills and interests serve on advisory committees to the HIE.

The decision-making authority for MyHealth Access rests with the organization's 21 member Board of Directors and executive leadership as informed by committees and workgroups consisting of more than 100 individuals across the state. The state government does not have any representatives on the Board of Directors. The operating strategy is based upon the needs of customers/stakeholders by acting as a trusted third party. Services include:

- Core HIE services such as alerts, patient-centered record, portal access, hub message services, single sign-on
- Analytics, gap analyses, community level measurement, and active panel monitoring
- Quality measure reporting on patients and populations, Qualified Clinical Data Registry (QCDR), cross-community longitudinal measurement
- Initiatives focused on behavioral health, social determinants, and early childhood education data

The relationship to the state is that of a contractor for specific services responding as a commercial entity.

Oregon

In Oregon, the Oregon Health Authority (OHA) relies upon a network of networks approach with a use case strategy to develop high value services. The state has pursued public/private partnerships for service development, acting at times as both a general and lead partner. Stakeholders including OHA, have just launched an "HIT Commons" to govern, coordinate, and accelerate priority statewide initiatives including the core infrastructure to support payment reform.

Oregon's HIE governance includes an oversight council, three specialized committees, and a health industry group. The governance is organized through the OHA, a state agency that includes most of the state's healthcare programs including Public Health and Medicaid. The OHA is overseen by a nine member citizen Oregon Health Policy Board.

The Office of Health Information Technology (OHIT) was established in 2011 as part of the OHA with responsibility for supporting the adoption of EHRs, health information exchange, and the achievement of Meaningful Use. Oversight is provided by the Health Information Technology Oversight Council (HITOC) who is tasked with setting goals and developing a strategic HIT plan for the state, as well as monitoring progress in achieving those goals and providing insight for the implementation of the plans. The HITOC members are appointed by the Oregon Health Policy Board.

The OHIT also collaborates closely with the Oregon Health Leadership Council. This organization consists of senior executives from health plans, hospitals, and physician groups. This Council was established by the Oregon business community in 2008.

The HIE strategy implemented by OHIT is to support a network of networks approach to leverage existing public and private HIEs. To coordinate that effort, OHIT has established the Health IT and Health

Information Exchange Community and Organizational Panel (HCOP). The HCOP is comprised of representatives actively engaged in implementing HIT and HIE programs with the following responsibilities:

- Facilitate communication and coordination among health information exchanges (HIE), coordinated care organizations (CCO), and other healthcare organizations
    - Identify and share best practices
    - Identify common barriers to HIT and HIE implementation progress
    - Identify opportunities for collaboration amongst entities implementing and operating HIT and HIE
- Provide strategic input to HITOC and OHA regarding ongoing HIT and HIE strategy, policy, and implementation efforts

HITOC has also established use case specific advisory groups of subject matter experts for two statewide projects. These are a Provider Directory Advisory Committee (PDAC) and a Common Credentialing Advisory Group (CCAG).

The overall strategy in Oregon is to leverage existing public and private HIEs by facilitating communication and coordination. This partnership model includes the development of an "HIT Commons" for the following objectives:

- Spread access to health information and a core set of patient data
- Shared data use agreements, principles, and common rules of the road
- Financial support and technical assistance for providers who lack resources
- Accelerate and support a few high value statewide technology services
- Coordinate and support key initiatives

The approach will be continued reliance on public funding with possible fees for high value statewide technology services.

Utah

Utah is included because of the successful integration of the Utah Health Information Network (UHIN) with a large academic medical center and large regional IDNs. UHIN provides fee based payer and provider services and HIT solutions. The oversight by UHIN is by the state agency that also oversees Medicaid.

UHIN is a private, community based HIE which is now statewide. UHIN has a 29 member Board of Directors who, together with the leadership of the organization, decide the future direction of the organization. This is done through stakeholder involvement and support. The state provides input through two state members on the board (one from administration and one from the Department of Public Health) and also through HIE funding discussions for funding through the state's IAPD.

UHIN has decision-making authority through the Board of Directors and leadership of the organization. They have built the organization over years meeting the needs of their customers starting with the claims

clearinghouse part of the business. They seek input on new services to deliver and use state funding and their relationship with the state to embark upon some of the new services and use cases planned.

2. Economic Model Approaches

In this section, we will describe the different economic models for health information exchange. They consist of Public Funding to a Public/Private Partnership to a Client Model where the state is a customer similar to other stakeholders as shown in Figure 4 below.

There is a continuum of economic models for health information exchange: public funding, public/private partnership, and client model.

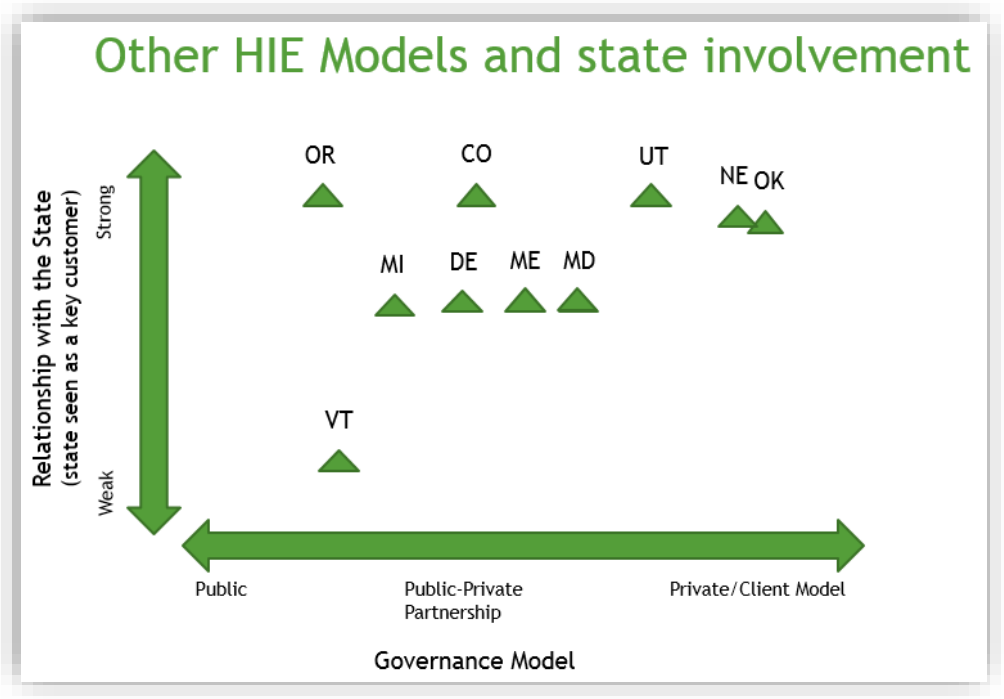


Figure 4 – HIE Economic Model Continuum

Public Model

Of the states included in this assessment, Colorado Office of eHealth Innovation (OeHI), Michigan Health Information Network (MiHIN) and Oregon Health Authority (OHA) are supported entirely, or almost entirely, by public funds, but none of them are traditional HIEs. In all three cases, their role is to coordinate a network of networks approach used in their states. MiHIN does operate and act as the single gateway into the Michigan Department of Health and Human Services (MDHHS), but that is distinct from offering HIE services. All three entities are developing exchange-related and supporting projects which benefit all

HIE initiatives such as statewide MPI, provider directories, and patient attribution services. Thus, they do not fit a category of public utility and none operate a traditional HIE network.

Public/Private Partnership

Except for Oklahoma, each of the other states is best categorized under this category. Nebraska began as purely a Client Model before beginning its integration with the state. The reason for the closer integration is the realization of the mutual benefit of collaboration such as development of the state Prescription Drug Monitoring Program (PDMP) or using NeHII's expertise as a contractor under IAPD activities. Like a number of HIEs, NeHII and the state of Nebraska are building services and electronic access points to the state systems in the shared belief that there are strong benefits to having the state HIE as an efficient option for that access. The private portion of this category consists of revenues derived from HIE subscription or fees for services.

In the public/private partnership model, there is substantial variance between the states.

There is substantial variance between the states.

- In Delaware, DHIN receives 45 percent of its revenues from fees levied on the health insurance industry in that state, but has successfully developed services that generate the majority of its fees from data senders.
- The SDE in Maryland, CRISP, substantially benefits from the CMS waiver which moved Medicare to a unified rate setting approach. This arrangement increases the utility of the data exchanged between stakeholders. User fees from providers and payers account for 25 percent of revenues with grants and state contracts (including D.C. and West Virginia) accounting for 75 percent of revenues.
- In Colorado, two regional HIEs built sustainable businesses based upon a mix of cooperative agreement funds and now subscriber fees. These entities are now being more closely integrated with the state through partnerships and are actively leveraging federal and state funds.
- In Nebraska, the HIE was developed primarily independently of the state, but, similar to Colorado, is being more closely integrated with state agencies and planning, through Public Health connectivity and integrating the PDMP services within the HIE.
- In Maine, HealthInfoNet has gone beyond basic provider use of healthcare data to receiving claims information from Medicaid and using the information for analytics that helps to predict future events of care and doing assessments.
- In Utah, UHIN has utilized federal and state funding to expand services including recent expansion of the HIE for use by specialists in physical therapy and expanding their patient view, and personal health record access to their providers. The state Medicaid agency receives payer information in the same way as commercial payers in the state.

Client Model

Of the states analyzed for comparison, Oklahoma is one of the strongest representations of the Client Model. Nebraska is also an example of a strong client model. Oklahoma elects not to have an SDE. Nebraska's SDE is the Nebraska Information Technology Commission which is a commission under the state's CIO and not a functioning HIE. Therefore, NeHII is not actually the SDE in Nebraska but many in the state refer to it as such. It should also be noted that Maine legislation cites an SDE but does not specifically name the entity. However, Maine has had state involvement since the inception of HealthInfoNet. Oklahoma's statewide network evolved from revenues generated from subscription and service fees from providers and payers and Nebraska's from a single payer first before providers. The HIEs in states that also represent many qualities in the Client Model are Delaware, Maine, and Utah. An HIE with a strong Public/Private Partnership can also have a strong client model aspect when the state is seen as a key customer.

In the interviews for this project, the majority of the respondents identified the Client Model as having the benefit of requiring the HIE to respond to the needs of the customer to remain economically viable. Also, providers or other stakeholders paying for the service would be more proactive in making the HIE accountable and focused on high value use cases. This dynamic was identified as a benefit to the state and the public. The principal criticism against the Client Model is that it is not necessarily focused on larger policy or health goals of the state and there is limited leverage over the HIEs. Similar to Colorado, the state of Oklahoma and regional partners are coordinating efforts with the HIE and have received Accountable Health Communities funding.

A benefit of the client model is requiring the HIE to respond to the needs of the customer.

3. Relationships to the State

As discussed above and as indicated in Table 1 below, there are a number of approaches taken by the states and HIEs in establishing governance models as well as in the relationships between the state government and HIEs within a state. This suggests that there is more than one way to conduct health information exchange successfully in a region.

Within the states assessed, state agencies are either a partner or key customer. A key driver is the availability of federal funds through IAPDs and SIM Grants, but an equally important focus is the desire by all stakeholders to better coordinate HIE activities to meet the needs of the state. Some stronger HIEs have also leveraged the state as a powerful partner who can encourage, and even mandate, participation and use of HIE. Some states have used state legislation to require participation in the state HIE due to an overwhelming belief that it is important to centralize the collection and exchange of health

A key driver is the availability of federal funds through IAPDs and SIM Grants, but an equally important focus is the desire by all stakeholders to better coordinate HIE activities to meet the needs of the state.

information. Others have built closed electronic access points to state systems such as Medicaid and Public Health registries which, in effect, require participation to exchange data electronically with that system without legislatively mandating it. A summary of different models is summarized below.

1. States with **historically independent service revenue** models, Nebraska and Colorado, **have moved to more closely integrate HIEs with state agencies**.
   - While originally independent of the state, the Nebraska HIE (NeHII) now operates the statewide PDMP and is seeking closer relationships with the state.
   - The two private HIEs in Colorado (CORHIO and QHN) are being integrated with statewide services and increased strategic planning is occurring between the state and the HIEs.
   - The Colorado's SDE designation was moved from CORHIO to Colorado's Office of eHealth Innovation and the eHealth Commission, which is a state entity, to better coordinate activities.

2. States with a true **network of networks governance** approach, Colorado, Michigan, and Oregon, are operated by a "de-facto state agency" in MiHIN or a true state agency, in Colorado OeHI and the OHA.
   - All three states have encouraged the development of data sharing organizations including public and private HIEs.
   - Colorado is the most recent of the three states to begin creating statewide network of networks shared services having just changed its SDE to the state organization in October 2015. The first targeted shared services in Colorado are MPI and Provider Directory.
   - Michigan has 114 data sharing organizations with agreements with MiHIN including 11 HIEs (not all based in Michigan), multiple large IDNs, and three academic medical centers. Data sharing organizations range from regional HIEs like Great Lakes Health Connect to the University of Michigan Health Network to commercial health plans such as Blue Cross Complete to federal agencies and to commercial businesses such as pharmacies.
   - MiHIN has developed a "Use Case Factory" to prioritize and standardize the characteristics of exchange occurring between these entities and maximize shared services within the state.
   - MiHIN is the only gateway into the Michigan Department of Health & Human Services (MDHHS) which ensures access for all organizations. MiHIN describes itself as "joined at the hip" with MDHHS.
   - Oregon's network of networks for HIE consists of one large regional HIE, two nascent regional HIEs, two large IDNs, and one academic medical center. The OHA provides statewide diagnostic services. The state of Oregon alternately takes the role as a lead partner on some initiatives (provider directory) or general partner (ADT Alert System), but federal and state match funding is optimized through either role. Services developed by the states of Colorado, Oregon, and Michigan such as a provider directory support all stakeholders involved in exchange.

3. States that have taken a more **middle ground of public/private partnerships** combine a substantial integration with the state and a business model that relies upon revenues from providers and/or payers for services. The states fitting this approach include Maryland, Delaware, Maine, and Utah.

- State agencies can have the dual role of partner/client depending on the type of activities. For example, the Medicaid Agency's policy staff would work with the HIE as a partner on policies that encourage provider participation and, at the same time, the agency's care coordination staff may have access to member's health data through the HIE as a client.
- The HIEs must be accountable to paying customers resulting in focused use cases that may also benefit the state and the public.
- State involvement in the governance allows for a public benefit perspective on the activities of the HIE.
- States such as Maine have included their HIE in their SIM planning activities and rollout. This is an example of state partnership to leverage the HIE.

4. States with only a **business relationship** with the HIE, for example, where the state is another business client with the HIE, could still have federal funding made available to the HIE through a contractual relationship between the state and the HIE.

In sum, the states analyzed have a variety of approaches to the way in which HIEs interact with state agencies. What they have in common is that they have established processes for effective communication, processes, and affiliation.

The states analyzed have a variety of approaches to the way in which HIEs interact with state agencies. What they have in common is that they have established processes for effective communication, processes, and affiliation.

4. Governance Models

Table 1 Governance Models

HIE/State	State Designated Entity (SDE)	Governance Model	Governance Origin or differences	Governance Body	Primary Role for this entity	State Involvement
CO State Level + 2 private HIEs	X - New commission as SDE	Public entity having public/private partnership	Transitioned from non-profit SDE to state entity	• Board appointed by governor	Coordinator	• Commission provides advice on priorities
CHORIO & QHN (information provided by the state, were not interviewed)	No	Both not for profit	Not provided	• Both private boards with variety of stakeholders	Service providers	• Commission provides advice on priorities • Active in operational committees • Both on the state SDE board
Delaware DHIN	X Single HIE and SDE	Not for profit	Has not changed	• 19 member, statute based, governor appointed board	Service Provider	• Has a strong relationship with the state • HIE provides reporting to the state, increasing the analytics for the state
Maine Health Info Net	X Single HIE and SDE	Not for profit	Has not changed	• 19 member, three state • Commissioner of HHS, director of Maine CDC, one at large governor appointed	Service Provider	• Has a strong relationship with the state • HIE provides reporting to the state, increasing the analytics for the state

HIE/State	State Designated Entity (SDE)	Governance Model	Governance Origin or differences	Governance Body	Primary Role for this entity	State Involvement
				• Remainder stakeholders: hospitals, physicians, consumers, government, business, and payers • No one group has a majority		
Maryland CRISP	X SDE 8 HIEs in state in MD	Not for profit, but active in new business ventures	Consistent, Allows CRISP into new ventures	• State independent Regulatory agency, • Board of directors, • SME committees	Multiple including supporting CMS Medicare waiver	• IAPD sponsor of many new services
Michigan MiHIN	X SDE and Network of Networks	Quasi-state agency	Consistent	• State appointed Governance Bd., • Board of directors • SME committees	Master data sharing infrastructure gateway to DHSS	• IAPD sponsor of many new services
Nebraska NeHII	X Single HIE and SDE	Not for profit 501(c)3	Has stayed the same	• Mixed board indicated in bylaws	Service provider	• Started without state involvement

HIE/State	State Designated Entity (SDE)	Governance Model	Governance Origin or differences	Governance Body	Primary Role for this entity	State Involvement
						• State involvement growing and currently good relationship with the state • Working to add additional state connectivity, participation, and services for the state
Oklahoma My Health Access	No SDE	Non-Profit 501(c)3	Board of directors of customers/ stakeholders	• Oversight board	Service provider	
Oregon	No	State level systems, however no SDE or statewide HIE	Changed following benefits exchange issues	• Oversight board appointed by the state • Use case advisory committees	Coordinator, Partner	• State Agency
Utah UHIN	X Single SDE	Not for Profit 501(c)3	Not changed	• 26 member board • Hospitals, health systems, UHA, physicians, UMA, UMGMA, payers, consumers, state on administrative side, and DPH	Service Provider	• Has a strong relationship with the state • HIE provides services to the state as a payer and state pays a fee as any other payer does

HIE/State	State Designated Entity (SDE)	Governance Model	Governance Origin or differences	Governance Body	Primary Role for this entity	State Involvement
Vermont VHIE	X Single SDE	Not for profit	Not changed	• Statute designated, all but two government representatives, picked and approved by VITL Board	Service Provider	• Strong reliance on state funding approved through state contract • Not a strong relationship • Per VITL, state not an actual customer as a user of services

5. HIE Services and Funding

Table 2 below provides a summary of the services, funding, and comparable operating measures across states interviewed. The categories of services are divided between Meaningful Use based services and others. Most HIEs have provided Meaningful Use based services for providers to be eligible for incentive payments. Therefore, they are largely standard across all HIEs. The additional services category is where differentiation occurs. Funding sources and the aggregate amount of funding are listed where they are publicly available. Comparable measures include a ratio measure of number of employees per $1 million in annual revenue and the cost per capita for the HIE based upon the operating budget and the population in the state.

Table 2 – State HIE Services and Funding

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
Office of eHealth Innovation	• Light statewide enabling services currently in development • Most exchange handled by two HIEs with full state coverage	• None	• MPI and provider directory proposed	MPI and PD funded by Medicaid	Not Available (NA)	NA	Only two state employees thus far	NA 5.5M state population	High
CORHIO and QHN (not interviewed but gathered)	• Extensive statewide services between the two and extensive HIE coverage	• CCD lookup and exchange at private HIE level	• Direct secure messaging • Longitudinal record (clinical data repository) • Alerts/notifications • Data analytics • HISP solutions	All current activities self-funded by HIEs	NA	Yes	NA	NA	Low
Delaware DHIN	• Extensive statewide services	• ELR • Syndromic • Immunizations	• Clinic results delivery • Community health record	All current activities self-funded	$7.5 M cost; $9 M revenue	Yes	26 2.9 employees/ $1M revenue	$7.88 952K state population	Low

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
	• Extensive HIE coverage	• Newborn screening • CCD exchange	• Single sign-on • Care summary creation, and download • Medical history • PACS image sharing • PH reporting • Event (ADT) notification • Direct secure messaging • Care summary exchange • Consulting services • Specimen location for clinical research • Common provider scorecard • Analytics/report-ing services						

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
Maine Health Info Net	• Statewide services	• ELR • Syndromic	• Central data repository • Query • Event notifications • Predictive modeling	Combination of fees, state contract and grants	Not publish-ed or shared	Yes	Not published or shared	NA 1.3 M state population	None
Maryland CRISP	• Maryland, • Washington DC • West Virginia	• MU Resource Center and support	• Alerts (ENS) • Query portal • PDMP • DSM • CQM-aligned Pop Health reporting • Single sign-On • Reporting service • Texting solution • Image exchange	75% state and federal funding 25% other	$33.8 M	Yes	100 FTE (25 on project contracts) 3.0 employees/ $1M revenue	$3.97 6.0M MD state population 681K DC population 1.8 M WV state population	Low
Michigan MiHIN **Master data-sharing infrastructure**	•Network of networks •Gateway to the state, 13 HIEs, 12 payers, CMS, 5 pharmacies, •Consumer portals	•Immuniza-tions •Labs	• Interface to MDHSS • Master sign-on to HIEs and HISPs • Provider directory • Patient attribution	NA	NA	Yes	NA	NA 9.9M state population	Low

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
			• Consent management • Alerts • "Use case factory"						
Nebraska NeHII	•Extensive statewide services and extensive HIE coverage	• ELR • Immun-izations	• Direct secure messaging • Longitudinal record (CDR) • Query portal view • Query XCR, XDS.b • PDMP	Private funding and fees	$3.9 M	Yes	12 3.07 employees/$ 1M revenue	$2.05 1.9M state population	Low
Oklahoma My Health Access **Trusted 3rd Party Model**	• No SDE • Non-profit HIE	• Electronic eligibility and attesta-tion • Electronic clinical laboratory : ordering and results delivery	• Patient-centric record • Alerts • Active panel monitoring • Quality measures, CPC+ reporting • QCDR registry • X-community longitudinal gap	67% fees/ 33% Grants Both providers and payers	$4 M	Yes	10 2.5 employees/ $1M revenue	$1.02 3.9M state population	None

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
		• Public health reporting • E-prescri-bing • Clinical summary exchange • Quality reporting	analysis and quality reporting • Voluntary APCD						
Oregon Network of Networks Model **No SDE** **Private/ Public Partnerships for Services**	• State acts as coordinator/ facilitator • Types of HIEs: ▪ State supported ▪ 2 regional HIEs ▪ Vendor ▪ National networks ▪ Federal network ▪ Organiza-tional networks	• Immuni-zations	• Direct • Alerts • Pre-manage • Provider directory • Common credentialing • Flat file directory • PDMP • HIT commons (leveraging public private partnerships)	State Agency	NA	Yes	NA	NA 4.1M state population	High

HIE/State	Services Approach	MU Interfaces	Additional Services	Funding	Annual Budget	Sustainable – Y or N and Year expected or obtained	Employee Count And Employee # /$1M Revenue	Per Capita Cost HIE	Use of APD Monies
Utah	•Extensive statewide services and extensive HIE coverage	•All public health	• Direct • Alerts/notifica-tions • CDR • Analytics • Medicaid medication history (Other large line of business is operating a claims clearinghouse)	Not published but comes from mix of fees/private funding and minimal state monies	Not publish-ed or shared	Yes	43 for two lines of business (possibly 23-25 for the HIE)	NA 3.1M state population	Low
Vermont VHIE	•Statewide services	• Immuniza-tions	• VITL Access • Direct • Alerts • Portal • SMS messaging • Data warehouse	95% state and federal funding	$6.594 M 2018 budget	No	28 4.2 employees/ $1M revenue	$10.40 625K state population	High

6. Summary of Lessons Learned from other States

The nine states interviewed were selected due to their varying economic and governance models. Each state has its own unique characteristics and what may work in one state, does not necessarily apply to all states' HIEs. However, the evaluation team was able to document specific lessons learned through the interviews which may be directly applicable in Vermont. The following list contains the lessons learned from these nine HIEs.

- An economic model which includes a public/private partnership component supports an HIE that is more responsive to the needs of stakeholders and the marketplace.
- A governance model which includes a broad mix of accountability to public, private, and consumer stakeholders who clearly articulate a state-specific strategy and establish measurable and actionable program objectives is more successful in meeting the needs of the state.
- A use case approach focuses on high utility data exchange that can be optimized for interoperability, scalability, and rules for information sharing.
- Health information exchange has evolved as a network of networks which should be leveraged to provide efficient and non-redundant services. Large academic medical centers or integrated delivery networks can act as key hubs in this network.
- High degree of integration with state agencies (including Medicaid) is a critical success factor.
- Charging fees for participation and especially use of the information available in the HIE yields higher engaged users of that information. This can be very difficult to migrate to if not started in the beginning and should expect many years to complete.
- HIEs must maintain very organized finances to report accurately on all revenue, expenses, and the activities of either to all constituents.

IV. VERMONT AT THE CROSSROADS

A. Structure and Governance of Health Information Technology and Health Information Exchange in Vermont

This section discusses the structure and governance of HIT/HIE in Vermont with special attention paid to VHIE structure, governance, finances, and technology/usage.

As covered in Section III, successful HIEs have met their core service obligations which means they have:

- Significant numbers of patients with their data accessible in the HIE;
- They matched the patients with the patient's records;
- Providers and consumers find that the HIE is easy to use; and
- The data are of high quality (the records are complete, accurate, etc.)

After accomplishing these elements, successful HIEs focus on adding value through use cases such as alert systems to assist them in being sustainable.

This section will demonstrate that the VHIE, operated by VITL, has not yet met these core service obligations and a fragmented structure for governance of HIT/HIE exists in Vermont today.

- Only 19.5 percent of Vermonters have been asked to consent to having their healthcare data accessible via the VHIE, and less than 19% affirmed, which means that a user has only a one in five chance that a specific patient's records can be viewed in the VHIE.
- The VHIE reports that it has many more patients records in the VHIE with a Vermont address than the number of Vermonters, which means that there are likely duplicate patients and records in the VHIE; and
- The VHIE use can be cumbersome (for example, accessing the VHIE may require a user to sign on to a different system) which is a common complaint of providers.

1. Vermont's Consent Management Policy and Process

Table 3 - Lives in the VHIE and Consent Given[16]

VITL	Records in the MPI	Vermont population	Number of Vermont patients solicited to provide consent	% of total solicted	Number of Vermont patients who gave consent (opted in)	% of total giving consent
2017	2,700,000	626,042	122,431	20%	117,432	19%
2016		626,042				
2015	1,500,000	626,042				
2014		625,741				
2013	800,000	625,741				
2012	543,500	625,741				
2011	300,000	625,741				

A key purpose of an HIE is to provide users with a complete source of healthcare data than can be used to make informed healthcare decisions and improve outcomes. Healthcare providers who range from individual clinicians to practices to hospitals and systems need to be able to rely on the VHIE to provide a complete picture of their patients' healthcare. This is equally true of participants in Vermont's state-led Blueprint for Health (Blueprint) program designed to "integrate a system of healthcare for patients, improving the health of the overall population, and improving control over healthcare costs by promoting health maintenance, prevention, and care coordination and management."[17] Other users greatly benefit from data extracts from the VHIE to develop population health strategies and services. To achieve these benefits, the VHIE must have a significant number of patients who have consented to having their data viewable in the exchange.

Of the 626,042 Vermonters, only 117,432 have consented to have their healthcare data accessible in the VHIE. Only 122,431 Vermonters have been asked with 117,432 saying yes and 4,999 saying no. This means that only 19.5 percent of Vermonters have even been asked to consent to have their data accessible in the VHIE.

HIEs that operate under an opt-out mechanism (patients' physical health data[18] may be accessed in the HIE unless the patient specifically opts out), have many more patient records accessible to providers than HIEs that operate under an opt-in mechanism (patients' physical health data may be in the HIE but is not

[16] Vermont 2017 MU Program IAPD.
[17] Vermont Act 128 of 2010, amending 18 V.S.A. Chapter 13.
[18] Patient's behavioral health information is further protected by law and is not viewable in HIEs unless the patient has specifically consented to allow their behavioral health information to be viewed, and under certain circumstances only.

accessible unless a patient specifically states that their records can be shared/exchanged). HIEs that are opt-out typically have 2 - 4 percent of their population opting-out or 96 - 98 percent opted-in.

Vermont operates under an opt-in model. Of the 626,042 Vermonters, only 117,432, or less than 19%, have consented to have their healthcare data accessible in the VHIE.[19] In addition to the inherent challenges of the opt-in model, there are several specific reasons for this very low percentage. First, patients must be asked if they want to have their healthcare data accessible in the VHIE. Only 122,431 Vermonters have been asked with 117,432 saying yes and 4,999 saying no. This means that only 19.5 percent of Vermonters have even been asked to consent to have their data accessible in the VHIE. When patients are asked, they over whelming provide consent.

One of the primary reasons for the low number of patients who are asked to provide consent is the cumbersome process that is used. Currently a provider must have a patient sign a consent form which is a separate form than the consent form the patient signs agreeing to be treated by that provider. The provider must log out of their internal EHR system and log in to a second system that notifies the VHIE that the patient has consented. The provider must enter demographic information about the patient in that second system.[20] Then, the consent form must be signed and retained by the provider.

Vermont hospitals, and most of Vermont providers, belong to a network of hospitals (hypothetically called Network 1) which includes healthcare data from all the EHRs, their own internal consent forms, and their own Master Patient Index used by the hospitals and providers. This means that providers within Network 1 have their patients' healthcare records for all the services performed within Network 1. Only records for services performed outside Network 1 are not in Network 1's system. Providers do not have an incentive to ask their patients for consent to share their data in the VHIE because most of their patients likely get their care within the network. There is little reason to take on the administrative burden of getting consent or for using the VHIE with its low number of patients who have provided consent.

2. Fragmented Structure and Governance of HIT/HIE in Vermont

Understanding the history of HIT/HIE structure and governance over the past 10 years, and the current structure and governance of HIT and the VHIE provides a useful context for the HIT/HIE challenges in Vermont.

As HIT was evolving, Vermont recognized the importance of having a statewide coordinated HIT Plan for the state. In 2006, Vermont enacted a law that created the framework for the Vermont Health Information Technology Plan (VHIT Plan).[21] Under 18 V.S.A. § 9351, the Secretary of the Agency of Administration was named as being responsible for the overall development and coordination of a statewide health information technology plan. The statute required the Secretary to:

[19] VITL statistics as of September 30, 2017.
[20] The VHIE recently began a pilot project with a UVM hospital that does not require providers to sign into a separate system to indicate that a patient has consented to have their health data viewable in the VHIE.
[21] Act 70 of 2007

> "update the plan annually to reflect emerging technologies, the state's changing needs, and such other areas as the secretary or designee deems appropriate [after soliciting recommendations from VITL and other entities] … to update the health information technology plan pursuant to this section, including applicable standards, protocols, and pilot programs… ."[22]

Additionally, the law required the Secretary to update the HIT Plan "comprehensively every five years to provide a strategic vision for clinical health information technology."[23]

The HIT Plan foresaw the development of a network where patients' healthcare records would be housed and viewed by providers to improve patient care—a Statewide Health Information Exchange. In 2007, Act 70, the Legislature directed that VITL "be designated in the Health Information Technology Plan pursuant to [18 V.S.A. §9351] to operate the exclusive statewide health information exchange network for the State."[24]

In 2010, two major federal programs began: the Medicare and Medicaid EHR Incentive Payment Program,[25] and the ONC State HIE Cooperative Agreement Program[26], a program that provided funding for states to build and implement HIEs. These two programs have provided significant funding for HIT/HIE efforts in Vermont.

Around the same time, the Blueprint state-led initiative was charged with implementing sustainable healthcare delivery reform in Vermont. The law codifying Blueprint defines it as a "program for integrating a system of healthcare for patients, improving the health of the overall population, and improving control over healthcare costs by promoting health maintenance, prevention, and care coordination and management."[27]

In 2011, the Green Mountain Care Board (GMCB) was established to "reduce the rate of healthcare cost growth in Vermont while ensuring that the State of Vermont maintains a high quality, accessible healthcare system."[28] The Board's regulatory authority includes payment and delivery system reform oversight, provider rate-setting, health information technology plan approval, workforce plan approval, hospital and ACO budget approval, insurer rate approval, certificate of need issuance, and oversight of

[22] 18 V.S.A. § 9351.
[23] 18 V.S.A. § 9351(a).
[24] Act 70 of 2007. 18 V.S.A. §9352(c).
[25] There are two Federal Meaningful Use Payment Programs: 1. Medicaid program run by the Medicaid Agency under CMS in the Department of Health and Human Services; and 2. Medicare program run by the Medicare Agency under CMS in the Department of Health and Human Services.
[26] The Office of the National Coordinator for HIT is a separate agency under the Department of Health and Human Services.
[27] Vermont Act 128 of 2010, amending 18 V.S.A. Chapter 13.
[28] Act 48 of 2011. § 9372. Purpose. It is the intent of the general assembly to create an independent board to promote the general good of the state by: (1) improving the health of the population; (2) reducing the per-capita rate of growth in expenditures for health services in Vermont across all payers while ensuring that access to care and quality of care are not compromised; (3) enhancing the patient and health care professional experience of care; (4) recruiting and retaining high-quality health care professionals; and (5) achieving administrative simplification in health care financing and delivery.

the state's all-payer claims database. The law also transferred the authority for approving the annual HIT Plan to the GMCB. In 2015, the GMCB was given oversight of the budget and core activities of VITL. [29]

Recently, CMS approved Vermont's updated Global Commitment to Health Waiver which uses an All-Payer Accountable Care Organization (ACO) Model as an alternative payment model. The most significant payers throughout the entire state – Medicare, Medicaid, and commercial healthcare payers – voluntarily participate in the Model.[30] The Model offers incentives for ACOs to provide healthcare value and quality, with a focus on health outcomes, under the same payment structure for the majority of providers throughout the state. The ACO Model began on January 1, 2017, and is scheduled to conclude on December 31, 2022.[31]

In sum, over the past 10 years, Vermont has added entirely new programs including the Statewide Health Information Exchange (VHIE) managed by VITL, the Medicaid EHR Incentive Payment Program (Meaningful Use), the Global Commitment to Health Waiver, Vermont All-Payer ACO Model, the Green Mountain Care Board, and Blueprint, each of which required governance structures.

The current governance and structure of HIT/HIE in Vermont is depicted in Figure 5 below:

[29] Act 54 requires the GMCB to "[a]nnually review the budget and all activities of VITL and approve the budget, consistent with available funds, and the core activities associated with public funding." See 2015 Vt. Acts & Resolves No. 54 (Act 54), § 7 (adding 18 V.S.A. § 9375(b)(2)(C)). Each year, the Secretary of Administration (or its designee the Department of Vermont Health Access (DVHA)) funds the activities by "enter[ing] into procurement grant agreements with VITL" after the Board "approves VITL's core activities and budget."

[30] The GMCB was given the authority to administer the Vermont All-Payer Accountable Care Organization Model.

[31] https://innovation.cms.gov/initiatives/vermont-all-payer-aco-model/

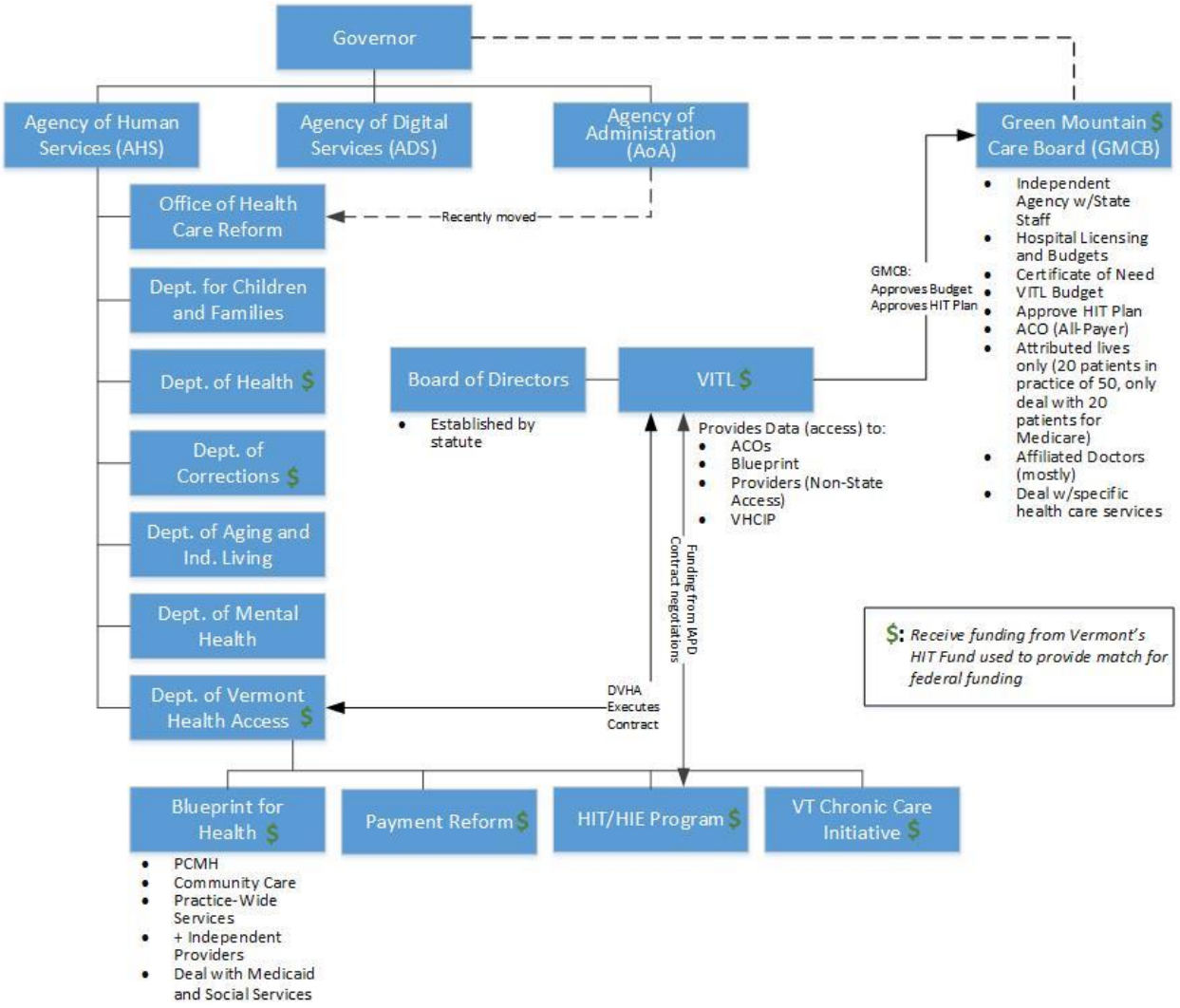


Figure 5 – Current governance and structure of HIT/HIE in Vermont

The current structure and governance of HIT/HIE is likely the result of what typically happens at the federal and state government levels when new programs, which do not quite fit into an existing entity, are established. The existing structure is modified, and new agencies are created with the advent of changing priorities, technology, and initiatives, especially in the healthcare and HIT arenas.

For the VHIE, a challenge to this governance structure is that once the GMCB approves an activity proposed by VITL for the VHIE, it is primarily DVHA that determines the level of funding available from federal grants and programs and administers the grant agreements and contracts between VITL and the state. DVHA, as the state's Medicaid agency, is also responsible for administering the federal HIT programs, grants, and reporting. Even more layers to the governance structure have been added, because contracts must be reviewed by the Agency of Administration and since HIT involves the state's Information Technology systems, the contracts are also reviewed by the newly formed Agency of Digital Services (ADS).

This structure is further hampered because there is no formal coordination across these entities other than generic procurement rules and administrative oversight rules established under Vermont law.

3. The Governance and Structure of the VHIE

The Vermont law establishing the VHIE and naming VITL as its operator provided that the VITL Board of Directors would have between nine and 14 members comprised of the following categories:

A Member of the General Assembly and a Governor-appointed Member; and a representative of each of the following: business community, healthcare consumer, hospital, physician, clinician, insurer, two individuals familiar with HIT, two at-large Members, and the CEO of VITL (as a non-voting member). The law stated that non-government members would be nominated by an existing Board Member and voted on by the full Board.[32]

There is some flexibility in the law in terms of the actual person who is nominated to the Board, yet historically, the business, hospitals, and at-large members are generally presidents, CEOs, or CIOs of larger entities. When asked about the composition of the VITL Board, many interviewees agreed that while it may have been important to have high level executives on the Board in the past, now that the VHIE has been in operation for some years, the VHIE Board should include more actual users (or potential users) of the VHIE, such as people who are directly providing patient care or care management, or performing data analytics and public health.

Many interviewees agreed that while it may have been important to have high level executives on the Board in the past, now that the VHIE has been in operation for some years, the VHIE Board should include more actual users (or potential users) of the VHIE, such as people who are directly providing patient care or care management, or performing data analytics and public health.

In addition to the Board of Directors, VITL's bylaws identify six committees appointed by the Board that are comprised of Board Members and the community at large, however, according to their website only four of the following are active:

- Executive Board Committee – acts with the full authority for the Board of Directors when the Board of Directors is not meeting. The Committee's actions are presented in writing at each subsequent board meeting.
- Finance Board Committee – monitors and addresses fiscal issues, advises management on fiscal matters and informs the full Board of Directors on the financial status of the organization.
- Governance Board Committee and Board Nominating Committee – reviews VITL's bylaws, organizational structure, and recommend changes. This Committee also nominates candidates for membership on the Board of Directors.
- Provider Advisory Committee – discusses the activities of VITL, specifically as they impact providing healthcare services in the State of Vermont.

[32] 18 V.S.A. §9352.

- Consumer Advisory Committee – discusses the activities of VITL, specifically as they impact healthcare services in the State of Vermont
- Technology Committee – discusses the technology used or available to VITL and oversees data security for VITL. [33]

The four active committees are: Executive/Governance, Finance, Technology, and Provider Advisory committee.[34] The Executive/Governance committee has two vacancies out of its five Members. Also, a Consumer Advisory Committee does not exist. Both of these committees would seem to be critical for VHIE operations and most successful HIEs have strong consumer participation. At the very least, the VITL should address why it apparently is not complying with its current bylaws.

Incomplete VHIE Annual Reports

VITL is required to file an annual report by January 15th with the Secretary of Administration; Commissioner of the Agency of Digital Services (formerly the Department of Information and Innovation); the Commissioner of Financial Regulation; the Commissioner of Vermont Health Access; the Secretary of Human Services; the Commissioner of Health; the Commissioner of Mental Health; the Commissioner of Disabilities, Aging, and Independent Living; the Senate Committee on Health and Welfare; and the House Committee on Health Care.[35] The annual report is required to include an assessment of progress in implementing health information technology in Vermont and recommendations for additional funding and required changes to legislation.[36] VITL's 2015 and 2016 reports provided an update of those year's activity but did not include an assessment of progress in implementing health information technology nor recommendations for additional funding and legislation[37] (Specific recommendations on this issue are included in Section V).

During the evaluation process, VITL was asked to provide its Strategic Business Plan for the VHIE. VITL management stated that it does not have a Strategic Business Plan because VITL is dependent on the General Assembly to pass a budget which includes funding for the VHIE. Due to a lack of a sustainability model, VITL is dependent on funding it receives from the state legislature. As a result, and due to the timing of when the budget is passed, each year VITL has less than one week to finalize their activities for the upcoming fiscal year.[38]

[33] VITL ByLaws.
[34] https://www.vitl.net/about/corporate-structure/board-directors
[35] 18 V.S.A. §9352
[36] 18 V.S.A. §9352 also requires VITL to publish minutes of VITL meetings and any other relevant information on its public website.
[37] VITL 2015 and 2016 annual report
[38] Interview with VITL Management

The VHIE has No Strategic Plan

Successful HIEs have long-term strategic business strategies, regardless of the mix of funding sources.[39] Under the MU Program, states submit a five-year roadmap that delineates short-, mid-, and long-term HIT projects. Individual activities of VHIE were included in the state's five-year plan and implementation plans that run for two years. Individual activities for the VHIE were in the four-year ONC HIE grant plan. Individual activities that VHIE was a part of were included in Vermont's four-year SIM grant application and operational plans. Yet, the VHIE has not been operated under a Strategic Business Plan that ties back up to the state's federal grants and HIT initiatives. VITL's claim that it could not develop a plan until the budget was passed in June is not a convincing argument. Specific recommendations on this finding are included in Section V.

Successful HIEs have long-term strategic business strategies regardless of the mix of funding sources. VITL's claim that it could not develop a plan until the budget was passed in June is not a convincing argument.

Summary of Governance and Structure of HIT/HIE in Vermont

It is fair to say that the current governance model of the VHIE and the current structure and governance of VITL are not meeting the needs of providers and users today and also need to be updated to reflect healthcare reform and other emerging initiatives.

Many interviewees stated that they had positive interactions with some of the VITL staff saying the staff are dedicated and genuinely want to provide good service to the users of the VHIE. A challenge pointed out by the interviewees is that the quality of data, coupled with the low number of patients who have consented to having their data viewed, has made the work of the staff more challenging. The interviewees believe that more Vermonters need to be asked to consent to have their healthcare data viewable in the VHIE and want improved quality healthcare data and services. Finally, most interviewees indicated that VITL should concentrate its efforts on operations as the contractor for the VHIE. Given the breadth of HIT and HIE in Vermont, bigger policy decisions would be best handled by some type of governance committee comprised of public and private stakeholders and policy makers.[40] Additionally, there should be a data governance structure to determine appropriate use of not only healthcare data in the VHIE, but other state and public/private systems such as Department of Labor, Corrections, Family Services, social agencies, and the like. The Governance Committee model is discussed in further detail in Section V.

4. Discussion of the Vermont Health Information Technology Plan

As mentioned above, the VHIT Plan was first published in 2007 with subsequent updates approved through 2010. The MU Program which also began in 2010, requires states' Medicaid agencies to submit five-year State Medicaid Health IT Plans, which have a similar framework as the Vermont HIT Plan, but are

[39] Most successful HIEs post their Strategic Business Plans on their websites

[40] The interviewees' responses on whether the "governance committee" should be the GMCB were mixed. The majority responded by saying that the GMCB was established for regulatory purposes and the HIT Plan and HIE are about data, so governance may be better suited elsewhere.

primarily focused on Medicaid HIT activities. The MU Program also requires Medicaid agencies to submit annual implementation updates to CMS for review and approval of activities and funding for Medicaid HIT efforts. After the HIE ONC grant program ended in 2014, the MU Program began funding (at reduced levels) HIE activities that can be tied back to Medicaid MU Program requirements. The Medicaid MU Program is scheduled to end in September 2021. Additional administrative activities may continue into 2022 for some states.

The state focused on meeting the Medicaid MU Program requirements and the HIE grant program. The MU Program, under federal law, must be under the purview of the State's Medicaid agency, in this case, DVHA. In 2011, the GMCB was established and given the responsibility for approving Vermont's HIT Plan, yet almost all the funding for HIT activities in Vermont was under the Medicaid MU Program and the HIE grant under DVHA. CMS and ONC do not require that states have a statewide HIT Plan; but CMS requires that the Medicaid agency have a State Medicaid HIT Plan for its MU Program in order to officially operate the program and request other federal funds. Vermont met the CMS requirement, but did not meet the requirements under Vermont's HIT Plan law.

A draft VHIT Plan was submitted to the GMCB in early 2016 for review and approval. After much deliberation, the draft was not approved. Based on a review of documents and responses to interview questions, it appears that several factors contributed to the draft VHIT Plan not being approved:

- It was submitted near the end of an administration that would be leaving in less than a year and there was a belief that the VHIT Plan should wait until the new administration came onboard.

- Some of the HIT activities were being performed under the state's State Innovation Model (SIM) grant which was nearing the end of its grant period.[41] There was a view that the SIM evaluation should be submitted and reviewed before a new HIT Plan was approved.

- At the time, Vermont was faced with challenges on other major projects, such as Vermont Health Connect, the ACA State-Based Marketplace, and the driver's license project, and it was not the right time to deal with the VHIT Plan.

- There did not appear to be one (or several) individuals given the authority to lead the initiative and make general decisions.

- Interviewees noted that the HIT Plan could have benefited from presenting a "business plan" for HIT and HIE efforts and breaking down the Plan into manageable pieces.

[41] The SIM grant program, housed in CMS, awards grants to states to study and implement new models for healthcare services. In 2013, Vermont was awarded $45 million under the SIM program over a four-year period to accomplish three major project aims: improve care; improve population health; and reduce healthcare costs. (State Innovation Model Operational Plan, July 31, 2013).

Not having an approved statewide HIT Plan has presented challenges to the HIT/HIE efforts in Vermont, including the performance of the VHIE. Despite the 2016 HIT Plan not being approved, almost all the interviewees indicated that the state needs to have an HIT Plan and that it needs to be comprehensive, yet manageable. Interviewees also stated there needs to be a stakeholder process where all voices are heard. Specific recommendations for an HIT Plan process are included in Section V.

Not having an approved statewide HIT Plan has presented challenges to the HIT/HIE efforts in Vermont, including the performance of the VHIE. Despite the 2016 HIT Plan not being approved, almost all the interviewees indicated that the state needs to have an HIT Plan and that it needs to be comprehensive, yet manageable. Interviewees also stated there needs to be a stakeholder process where all voices are heard.

5. Vermont HIT Fund

32 V.S.A. §10301(a) establishes a Vermont Health IT Fund (the "Fund") in the state Treasury "as a special fund to be a source of funding for Medical Health Care Information Technology programs and initiatives such as those outlined in the Vermont Health Information Technology Plan administered by the Secretary of Administration or designee." A source of funding for the Fund is the healthcare claims tax. The Fund is to be used for loans and grants to healthcare providers pursuant to 32 V.S.A. §10302 and for the development of programs and initiatives sponsored by VITL and state entities designed to promote and improve healthcare information technology, including financial support for VITL to build and operate the health information exchange network.[42]

As required by Section 15 of Act 73 of 2017, a review of past payments from the Fund has been performed utilizing financial information provided by the DVHA Business Office and VITL. The following tables provide a history of major Fund expenditures from State Fiscal Year (SFY)14 through current projections to SFY19. Transfers of administrative responsibility for the Fund make comparison for years prior to SFY14 difficult without significant manual compilation. A brief description provided by the HIE/HIT Program for each major initiative during the review period follows in Table 4.

Table 4 – HIT Fund Expenditures by State Fiscal Year

	SFY14		SFY15		SFY16	
Initiative	**HIT Fund**	**Total (State & Fed)**	**HIT Fund**	**Total (State & Fed)**	**HIT Fund**	**Total (State & Fed)**
Covisint (Discontinued)	$ 998,276	$ 2,291,268	$ 644,286	$ 1,480,777	$ 119,245	$ 265,166
VITL-DVHA Grant (SFY14-17)	$ 2,453,276	$ 5,091,709	$ 2,185,507	$ 4,917,313	$ 1,147,816	$ 2,552,399
VITL-DVHA Contract (SFY14-17)	$ -	$ -	$ 218,605	$ 453,266	$ 195,901	$ 1,264,452

[42] 32 V.S.A. §10301(a)(2).

	SFY14		SFY15		SFY16	
VITL-DVHA Core Contract	$ -	$ -	$ -	$ -	$ -	$ -
VITL-DVHA Services Contract	$ -	$ -	$ -	$ -	$ -	$ -
BP Healthcare Data Analytics (DDI)	$ -	$ -	$ -	$ -	$ -	$ -
BP Healthcare Data Analytics (O&M)	$ 143,559	$ 330,077	$ 147,138	$ 338,171	$ 510,123	$ 1,134,360
VT Clinical Registry & BP Data Quality (DDI)	$ -	$ -	$ -	$ -	$ -	$ -
VT Clinical Registry & BP Data Quality (O&M)	$ -	$ -	$ 322,444	$ 741,081	$ 224,851	$ 500,000
HSE Project Management Support	$ 64,754	$ 267,730	$ 45,349	$ 453,491	$ 49,119	$ 754,880
BiState	$ 43,406	$ 100,600	$ 30,446	$ 69,975	$ 53,690	$ 119,390
EHRIP Program	$ 3,937	$ 39,369	$ -	$ -	$ 46,751	$ 467,515
Cathedral Square	$ 72,352	$ 167,072	$ -	$ -	$ 76,056	$ 169,125
Stone Environmental	$ 40,070	$ 91,930	$ 19,460	$ 44,725	$ 10,978	$ 24,413
HSE Initiatives	$ -	$ -	$ 18,520	$ 3,053,250	$ 7,727	$ 623,750
VDH Agreements	$ -	$ -	$ -	$ -	$ -	$ -
Cumberland (VDH)	$ -	$ -	$ -	$ -	$ -	$ -
Mosaica Partners	$ -	$ -	$ 7,103	$ 71,033	$ 17,419	$ 533,197
HIT Evaluation	$ -	$ -	$ -	$ -	$ -	$ -
OneCare VT	$ -	$ -	$ -	$ -	$ -	$ -
eCQM Repository	$ -	$ -	$ -	$ -	$ -	$ -
Other Grants & Contracts (HSA, etc.)	$ 63,971	$ 146,037	$ (525,600)	$ (298,962)	$ (89,345)	$ (58,766)
Staffing/Overhead	$ 80,620	$ 732,285	$ 70,243	$ 800,757	$ 56,625	$ 566,230
One Time HIT Fund Transfer	$ -	$ -	$ -	$ -	$ -	$ -
Total	**$ 3,964,221**	**$ 9,258,077**	**$ 3,183,501**	**$ 12,124,876**	**$ 2,426,955**	**$ 8,916,108**[43]

[43] Source: DVHA Business Office.

Table 5 – HIT Fund Historical Report

Table - HIT Fund Historical Report- DVHA	SFY17		SFY18		SFY19	
Initiative	HIT Fund	Total (State & Fed)	HIT Fund	Total (State & Fed)	HIT Fund	Total (State & Fed)
Covisint (Discontinued)	$ 31,342	$ 66,500	$ -	$ -	$ -	$ -
VITL-DVHA Grant (SFY14-17)	$ 2,245,068	$ 4,763,410	$ -	$ -	$ -	$ -
VITL-DVHA Contract (SFY14-17)	$ 266,949	$ 712,814	$ -	$ -	$ -	$ -
VITL-DVHA Core Contract	$ -	$ -	$ 1,867,531	$ 3,973,471	$ 2,328,300	$ 3,900,000
VITL-DVHA Services Contract	$ -	$ -	$ 448,816	$ 1,471,529	$ 488,000	$ 1,600,000
BP Healthcare Data Analytics (DDI)	$ -	$ -	$ 36,600	$ 120,000	$ 36,600	$ 120,000
BP Healthcare Data Analytics (O&M)	$ 240,245	$ 509,732	$ 305,485	$ 668,750	$ 411,120	$ 900,000
VT Clinical Registry & BP Data Quality (DDI)	$ -	$ -	$ 305,000	$ 1,000,000	$ 305,000	$ 1,000,000
VT Clinical Registry & BP Data Quality (O&M)	$ 427,634	$ 764,314	$ 742,300	$ 1,625,000	$ 970,700	$ 2,125,000
HSE Project Management Support	$ 81,206	$ 771,218	$ 140,000	$ 1,400,000	$ 140,000	$ 1,400,000
BiState	$ 26,798	$ 56,857	$ 131,600	$ 280,000	$ 167,160	$ 280,000
EHRIP Program	$ -	$ -	$ 160,000	$ 1,600,000	$ 160,000	$ 1,600,000
Cathedral Square	$ 96,620	$ 205,000	$ 93,644	$ 205,000	$ 93,644	$ 205,000
Stone Environmental	$ 14,039	$ 29,788	$ 55,000	$ 150,000	$ 20,145	$ 44,100
HSE Initiatives	$ -	$ -	$ -	$ -	$ -	$ -
VDH Agreements	$ -	$ -	$ 38,250	$ 382,500	$ 26,250	$ 262,500
Cumberland (VDH)	$ 8,610	$ 86,095	$ 26,838	$ 268,380	$ 26,838	$ 268,380
Mosaica Partners	$ -	$ -	$ -	$ -	$ -	$ -
HIT Evaluation	$ -	$ -	$ 52,500	$ 525,000	$ -	$ -
OneCare VT	$ 37,500	$ 375,000	$ 104,300	$ 1,043,000	$ 263,000	$ 2,630,000

Table - HIT Fund Historical Report- DVHA	SFY17		SFY18		SFY19	
eCQM Repository	$ -	$ -	$ 42,500	$ 115,000	$ 42,500	$ 115,000
Other Grants & Contracts (HSA, etc.)	$ 28,998	$ 61,525	$ -	$ -	$ -	$ -
Staffing/Overhead	$ 201,027	$ 1,333,961	$ -	$ -	$ -	$ -
One Time HIT Fund Transfer	$ -	$ -	$ 2,500,000	$ 2,500,000	$ 2,000,000	$ 2,000,000
Total	**$ 3,706,036**	**$ 9,736,214**	**$ 7,050,364**	**$ 17,327,630**	**$ 7,479,257**	**$ 18,449,980** [44]

Covisint

Refers to the vendor for the Vermont Blueprint for Health's document management system. The license was ultimately purchased by the state in perpetuity and became known as the Vermont Clinical Registry.

VITL- DVHA Grant (SFY14 - SFY17)

Refers to a state grant established between VITL and DVHA to support the VITL operational and design, development and implementation (DDI) budgets.

VITL- DVHA Contract (SFY14 -SFY17)

Is the contract established between VITL and DVHA beginning in SFY14 to support VITL's DDI activities, supported by HITECH enhanced funding.

VITL- DVHA Core Contract

Established in SFY18, this agreement allows VITL to maintain secure operations of the VHIE and continue to develop electronic connections to electronic health record systems.

VITL- DVHA Services Contract

Established in SFY18, this agreement primarily supports the VITL services that are federally allowable for HITECH funding.

BP Healthcare Data Analytics (DDI)

On behalf of the Blueprint for Health program, this contract with Onpoint Analytics, is aimed at the development of new healthcare data analytic systems, datasets, and analytic products involving linked claims data from the state's All Payer Claims Dataset (VHCURES), clinical records from EHR systems, survey

[44] Source: DVHA Business Office.

data, human services administrative data, and (planned) wage data. The initiative's purpose is measurement of healthcare service utilization, quality, and outcomes.

BP Healthcare Data Analytics (O&M)

Itemizes maintenance and operations for the BP Healthcare Data Analytics project with Onpoint Analytics.

VT Clinical Registry & BP Data Quality (DDI)

Under the contract with Capitol Health Associates, the Blueprint for Health program will expand and improve the capabilities of the Clinical Registry by implementing data quality initiatives related to clinical registry inputs, upgrading encryption and security provisions, upgrading translation and integration coding for converting HIE messages and flat files to structured clinical data, enhancing data management for 42 CFR Part 2 compliant data, developing new interfaces and onboarding new healthcare organizations to the registry, upgrading the self-management web portal module, enhancing identity management in coordination with the state's MPI systems, integrating new forms of clinical data (e.g., pharmaceutical data, hospital data, care-management system data), and developing new, standardized data elements in the registry for healthcare measurement.

VT Clinical Registry & BP Data Quality (Operations & Maintenance)

Itemizes maintenance and operations for the VT Clinical Registry and Blueprint Data Quality initiative and ongoing provider data quality workflow activities with Capitol Health Associates.

HSE Project Management Support

A contract with Speridian Strategic Solutions Group to provide additional support to program staff to meet needs of Vermonters. Staff roles include Business Analysts, Project Managers, and a Program Manager.

BiState

A contract with BiState Primary Care to provide support for Federally Qualified Health Centers (FQHC) across initiatives and populations using integrated claims and clinical data, data analytics platforms, and other appropriate data sources to drive quality improvement.

EHRIP Program

The federal HITECH Act supports the EHR Incentive Payment (EHRIP) Program, which states can choose to participate in by establishing a state-specific Medicaid incentive program for the adoption and Meaningful Use of this technology. Eligible hospitals and professionals who satisfy the criteria for attestation receive incentive payments. The incentive payments themselves are 100% federally funded. The noted costs cover Medical Assistance Provider Incentive Repository (MAPIR) - the system that Vermont and other states use to manage the EHRIP program.

Cathedral Square

Contract agreement which supports the IT infrastructure for the Vermont Support and Services at Home (SASH) program.

Stone Environmental

Contractual support for the system used by providers to validate that they have met all enrollment criteria required to act as a designated Blueprint for Health provider.

HSE Initiatives

Summary category for past and planned activities of the Vermont Agency of Human Services to develop cross-functional platform capabilities.

VDH Agreements

Various efforts including development of the birth/death registry, hiring a forecaster and procuring a consultant to assist in maximizing public health reporting opportunities, particularly those associated with HITECH.

Cumberland (Vermont Department of Health)

Multiple contracts fulfilled by Cumberland Consulting group for DDI efforts required when onboarding new immunization interfaces as well as mitigating Immunization message errors due to batch historical upload in the registry at the Vermont Health Department.

Mosaica Partners

Agreement to develop the 2016 update of the Vermont Health Information Technology Plan (VHITP).

HIT Evaluation

Evaluation by HealthTech Solutions of the operations and infrastructure that comprise Vermont's Health Information Exchange to develop a strategic, tactical roadmap for the future of HIE/HIT in the state.

eCQM Repository

Planned projects to assist Vermont in discovery and planning for an electronic Clinical Quality Measures (eCQM) repository solution that supports multiple performance initiatives that require measures analysis.

Other Grants & Contracts

General category to capture additional contract and grant expenditures with various parties. Includes reimbursements to the Fund from unallowable costs.

Staffing/Overhead

Includes DVHA oversight staff charged with administration of the Fund.

One Time HIT Fund Transfer

Includes legislatively directed Fund transfers for SFY18 - SFY19.

The current evaluation asked stakeholders to consider whether the HIT Fund should continue, and if the continued level of support was appropriate. The vast majority of interviewees expressed support for continuing the Fund. There are few viable alternatives for funding. Under the Meaningful Use program, the matching state funds must come from the state. Vermont is actually a leader in this field because it designated a specific fund with the intent to use it for HIT/HIE purposes. At this point, if the HIT Fund had to compete with other programs for general funds it could be seen as being counter to the strong support of the HIT Fund.

Oversight of the HIT Fund needs to be strengthened. Section V which makes recommendations for a new governance structure for HIT/HIE efforts in Vermont, also includes recommendations for HIT Fund oversight. It is believed that this new governance structure along with an invigorated HIT Plan will enhance priority setting and the type of projects and initiatives that receive HIT Fund dollars.

6. DVHA Administration of the HIT Fund and VITL

As noted above, 32 V.S.A. § 10301, establishes the Fund and further designates responsibilities for fund oversight by the Secretary of Administration and Green Mountain Care Board. Programmatic and financial oversight of contract and grant agreements with VITL have been further designated to DVHA by the Agency of Administration (AoA). As the administrative programmatic entity, DVHA is responsible for both federal and state, sub-recipient, and contract monitoring. Federal grant awards requirements are established by Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance); Office of Management and Budget (OMB) directives; and Notice of Award (NoA) guidance from federally awarding agencies. State grant award and contract requirements are established by AoA Bulletin No.5 *Policy for Grant Issuance and Monitoring* and Bulletin No 3.5 *Procurement and Contracting Procedures* respectively.

In 2016, the Vermont State Auditor released Report No. 16-06, *Vermont Information Technology Leaders Inc.: The State has begun to address oversight deficiencies, but has limited measures in place to evaluate performance*. That report assessed state oversight of VITL's performance in state fiscal years 2015 and 2016 and produced several observations and recommendations. Both DVHA and AoA had mechanisms in place to provide programmatic and financial oversight of VITL, but the mechanisms had deficiencies (as noted in Objective 1a).[45] Additionally, it was found that performance measures contained within VITL's agreements from the review period were generally limited to those that assessed quantity, not quality or

[45] Report of the Vermont State Auditor, *Report No. 16-06*. September 30, 2016 pgs. 10-16.

impact (as noted in Objective 1b).[46] The conclusion of that report noted, "Without quantifiable performance measures, the state's ability to judge VITL's efforts and gauge success is significantly inhibited."[47]

As indicated in the HIT Fund Historical Report above, beginning in SFY18 the sub-recipient relationship with VITL has changed to a contractual one as it pertains to assistance from the HIT Fund. As noted in federal Uniform Guidance and AoA Bulletin 5, the substance of the agreement is more important than the form of the arrangement. As such, performance monitoring of grants or contracts is required by both federal and state policy. To support the internal control environment surrounding the state administration of the HIT Fund, many governance, performance and financial recommendations have been made to address compensating controls for grant and contract administration.

B. Analysis of VITL Financial Statements State Fiscal Year (SFY) 2014 – SFY2016

As the primary recipient of funds from the Vermont HIT Fund,[48] a review of the VITL Financial Statements and Supplementary Information was conducted for SFY14 through SFY16, the most recently available financials for the past three fiscal years. The results of that analysis, interviews with VITL leadership, and supporting documentation are presented in the following sections.

1. Revenues

VITL Support and Revenue	SFY 16	SFY 15	SFY 14
Federal and state grants	$ 5,632,267	$ 6,993,040	$ 6,521,243
Program service fees	$ 1,478,391	$ 363,453	$ 70,616
Conference Revenue	$ 62,668	$ 59,970	$ 31,710
Interest Income	$ 885	$ 1,145	$ 571
Total	**$ 7,174,211**	**$ 7,417,608**	**$ 6,624,140**[49] [50]

VITL derives most of its funding from state and federal grants. Grant support constituted 98.4 percent of revenue in SFY14, 94.3 percent in SFY15, and 78.5 percent in SFY16. The percentage of funding through which a non-profit entity derives from external sources is a test of financial solvency. Solvency is the ability to cover existing liabilities with current assets, if an entity takes on too much debt it will struggle to remain in operation. Over the period reviewed, the reliance on state and federal grants declined most significantly in SFY16. However, any entity which draws more than 75 percent of its revenues from state and federal sources remains heavily dependent on those funds to continue.

As shown in Figure 6 below, the Vermont HIT Fund constitutes a significant portion of the overall state and federal assistance to VITL. The Fund comprised 37 percent of the total in SFY14, 32 percent in SFY15,

[46] Report of the Vermont State Auditor, *Report No. 16-06*. September 30, 2016 pgs. 16-21.
[47] Report of the Vermont State Auditor, *Report No. 16-06*. September 30, 2016 pg. 24.
[48] Source: HIT Fund Historical Report- DVHA Business Office.
[49] Source: VITL Financial Statements and Supplementary Information.
[50] Note: Revenues were overstated in the SFY 2015 report, adjusted SFY16 totals for SFY 15 are presented above.

and 19 percent in SFY16. Thus, from an operational perspective the Fund remains a critical component of VITL's continued operations. On a positive note, program service fees increased from 5 percent in SFY15 to 21 percent in SFY16 of total revenues showing a significant decrease in the reliance on state and federal support.

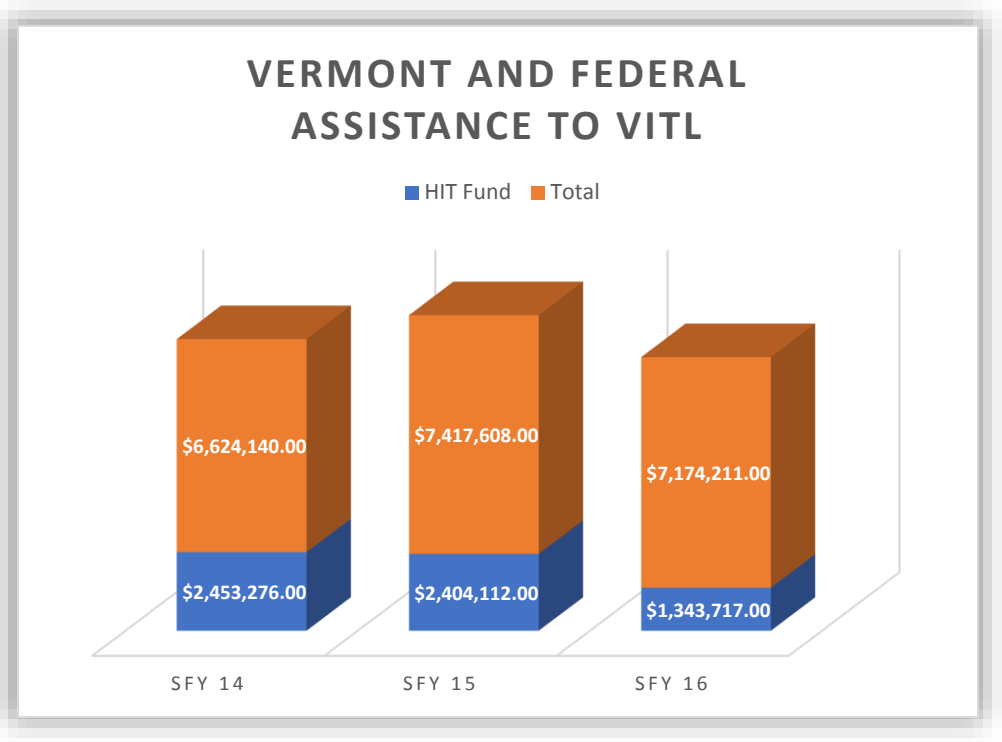


Figure 6 – VT and Federal Assistance to VITL

Another helpful metric when considering revenues is the operating reserve. The operating reserve is useful for determining whether a non-profit organization's typical operating revenues cover expenses as a test of financial solvency. Operating reserves increase the ability of a non-profit to tolerate risk from unanticipated budget events or temporary losses in revenue. Operating reserves measure the amount of liquid to fixed assets, if a non-profit lacks liquidity it may not have the resources necessary to deliver its programs and services. Also, without an operational reserve, an organization may present cash flow issues which lead to short term versus strategic planning. An analysis of unrestricted revenues and assets was conducted to determine the operating reserve for VITL during the review period. VITL showed a healthy operating reserve for the period reviewed: 23.6 percent in SFY14, 18.9 percent in SFY15 and 27 percent in SFY16.

Operating reserves increase the ability of a non-profit to tolerate risk from unanticipated budget events or temporary losses in revenue. VITL showed a healthy operating reserve for the period reviewed: 23.6 percent in SFY14, 18.9 percent in SFY15 and 27 percent in SFY16.

2. Expenses

A review of balance sheets or functional expenses for VITL was performed for the period of SFY14 - SFY16. It should be noted that the format and presentation of the financial statements from VITL varies from year to year which makes comparison between program years challenging. The Statement of Functional Expenses for SFY15 provides a useful comparison column for SFY14, which was used for the below analysis since expense categories within the SFY14 report differed from other years. Summary information was used in corroboration with the audited financial statements for the period of review.

A review of VITL's Program Expense Ratios from SFY14 - SFY16 aids in the evaluation of the effectiveness of VITL at providing core programmatic services. Analysis showed a general decline in program expenses from a high of 86.5 percent in SFY14, to 83.5 percent in SFY15 and 72.7 percent in SFY16. The program expense ratio is used to show how much of a non-profit's total expenses are for providing services and programs, a common benchmark is 70 percent or greater. VITL's ratios show a decreasing amount being used for services and, while these are still within a generally acceptable range, both the directionality over time and the fact that 2016's ratios are close to 70 percent should warrant monitoring going forward.

VITL's ratios show a decreasing amount being used for services and, while these are still within a generally acceptable range, both the directionality over time and the fact that 2016's ratios are close to 70 percent should warrant monitoring going forward.

Personnel costs constituted the most significant proportion of overall costs for each year. Personnel costs amounted to 53 percent in SFY14, 54 percent in SFY15, and 57 percent in SFY16. Of note, General and Administrative Personnel constituted 9 percent in SFY14, 5 percent in SFY15 and rose to 17 percent in SFY16.

Based upon interviews and reviewed source documentation from VITL, contractor services (e.g., Medicity, PatientPing) comprise a significant percentage of overall program services which are annually reported. VITL financial statements do not explicitly address contract expenses including hosting, development, and implementation by contractor. Although there is a high degree of variability among states, it is worth noting that Nebraska includes line items for the Cost of Goods Sold which include contractor amounts in their annual reporting. VITL is encouraged to pursue more detailed annual financial reporting to ensure public accountability and transparency.

3. Financial Management

VITL prepares annual financial statements and undergoes an annual financial audit in accordance with generally accepted accounting principles (known also as GAAP), generally accepted government auditing standards (known also as GAGAS, or "The Yellow Book"), and Uniform Guidance. Per standards, the annual audit includes obtaining audit evidence about both amounts and disclosures in the annual financial statements (the auditor's opinion is expressed based on those statements; no opinion is offered on the effectiveness of internal control).

As defined by accounting standards, and VITL's independent auditor,

> "A material weakness in internal control over compliance is a deficiency, or combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A significant deficiency in internal control over compliance is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance."

Based on the review of SFY14 - SFY16 financial statements and supplementary materials, the following observations were made by the auditor:

	Material Weakness	Significant Deficiency	Other Findings
SFY14	1	1	2
SFY15		2	
SFY16		6	

One Material Weakness was noted during the review period and pertained to revenue recognition. The SFY15 audit noted that the condition had been mitigated before the SFY15 audit was performed. SFY14 additionally included one significant deficiency pertaining to account reconciliations.

SFY15 included two significant deficiencies:

- Inadequate accounting policies and procedures for payroll
- Questioned costs within a federal grant program

SFY16 included six significant deficiencies:

- Inadequate accounting policies and procedures for payroll
- Charging unallowable costs to federal awards
- Federal procurement procedures not being applied to the purchase of goods and services
- Remaining three deficiencies questioned costs

The SFY16 audit also noted that VITL needed to amend the financial statements for SFY15 required restatement to correct federal and state grant revenues.

Significant deficiencies although less severe than material weaknesses, are still important enough to warrant additional attention by those charged with governance. The recurrence of significant deficiencies reflects upon the control environment for effective compliance with state and federal programs. VITL's management represents that a number of corrective actions have been implemented throughout the review period, as stated in their compliance reports and supplementary materials.

Both the state of Vermont and the VITL Board have a fiduciary duty to ensure the control environment for both state and federal programs. To support the internal control environment recommendations for

governance, performance and financial administration have been made to address grant and contract administration. Of note, an operational/performance audit should be conducted to establish the effectiveness of the internal control environment at VITL. Such a review would be in addition to the annual financial statement audit and review of Uniform Guidance compliance and would assist to provide reasonable assurance that both state and federal program objectives are being accomplished.

C. Ownership and Control of VHIE Data and Assets

The September 30, 2016 "VITL Report of the Vermont State Auditor" raised several questions about ownership of assets and patient data in the VHIE. Did the state own VHIE assets and work product based in part, on the significant federal and state funding provided to VITL to operate the VHIE? Was there sufficient articulation in the grant agreements between the state and VITL that the state could claim ownership in the various assets and ownership of the data in the VHIE?

The Act mandating this evaluation included a requirement to address the issue of property and ownership of the VHIE, including identifying all specific tangible and intangible assets that comprise or support the VHIE. It specifically required the evaluation to consider VITL's current and previous agreements with the state and the significant public funding that was used to create this property.

There is a distinction between ownership and control. The ownership question includes who owns the VHIE assets and identification of the assets. The ownership issue leads to the question of control. Regardless of ownership, who controls the use of the healthcare data in the VHIE? Is it the patient, the provider, or VITL (by having provider agreements that specify how the data can be used and who has access to it)? Or is it the state that controls the data based on the notion that the VHIE has been primarily funded through public funding and the VHIE is a public good?[51]

The legal nuances surrounding the term ownership may be best stated in graphic form showing three levels of ownership or control as in Figure 7 below.

[51] One could argue that the funding VHIE received from the state was not general fund taxpayer money. The HIT Fund is funded by a fee on claims paid by payers to the state who then use the HIT Fund, in part, to pay the portion of the costs of the VHIE to get federal funds (state match).

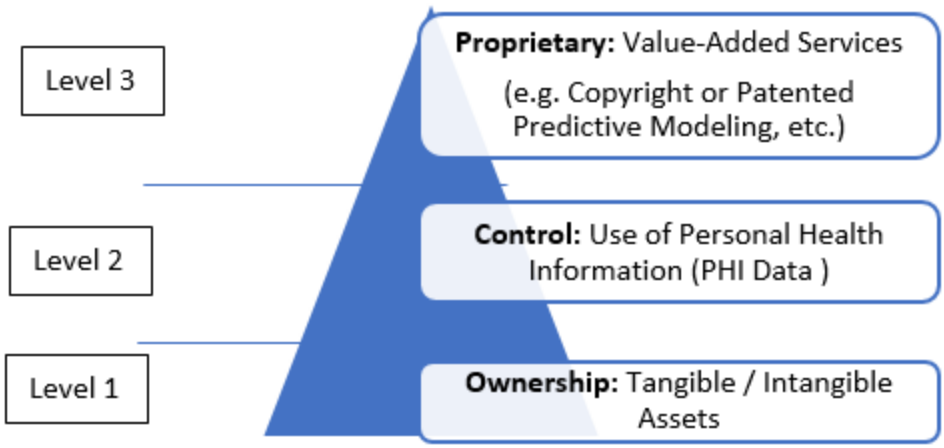


Figure 7 – Levels of Ownership

1. Ownership of VHIE Assets

The ownership question involves two types of assets: Tangible assets which are physical, such as buildings, equipment, and computer servers; and intangible assets which are non-physical assets, such as intellectual property which includes software, patents, trademarks, copyrights, or business methodologies. Intangible assets also include brand recognition and customer lists.

As background, the VHIE has parallel architectures (discussed in detail in Subsection G):

1. VITL has purchased licenses from a vendor (Medicity) that allows providers to sign in via a portal to *view* healthcare data in the VHIE. As long as a provider has access to the Internet, the provider can view data (if the patient has provided consent).

2. Over the past several years, VITL has built a Health Data Management (HDM) infrastructure which is a data warehouse consisting of a subset of the clinical data collected through Medicity. Providers connect to the HDM through interfaces established by VITL. In theory, data in the HDM can be manipulated to work in different ways. For example, if the state wanted to view just immunization data, or a hospital wanted to better understand its diabetic population, the HDM could provide these value-added services.[52] The phrase "in theory" is used because to provide the value-added services, the VHIE must first meet its core services (i.e., high level of patients with

[52] The 2016 State Auditor Report.

their data accessible and matching the patients with their data). The VHIE has not yet met its core services obligations.

In looking at the ownership question, the first part is who owns the tangible VHIE assets, VITL or the state? The agreements between the state and VITL (regardless of whether they were under the HIT grant or the new contractual relationship between the state and VITL under the July 1, 2017 contract) have terms that state that all "work product" belongs exclusively to the state which has the sole and exclusive ownership rights.[53] Work product is defined as tangible or intangible ideas, inventions, improvements, databases, computer programs.[54] In an interview with VITL management, VITL did not dispute that provision.

In looking at the ownership question, the first part is who owns the tangible VHIE assets, VITL or the state? The agreements between the state and VITL (regardless of whether they were under the HIT grant or the new contractual relationship between the state and VITL under the July 1, 2017 contract) have terms that state that all "work product" belongs exclusively to the state which has the sole and exclusive ownership rights.

VITL's annual financial reports for SFY14 - SFY16 (and interviews with VITL management and staff) indicate that depreciation expense is only recorded for General and Administrative assets. No other depreciation for tangible assets is claimed by VITL. Therefore, the question of whether VITL or the state of Vermont owns the tangible assets of the VHIE is almost a moot point, as basically, there are no tangible assets to "own." However, a performance audit would either confirm that or find programmatic assets that arguably would belong to the state. Recommendations for a performance audit are included in Section V.

In terms of intangible assets, none are claimed and intellectual property is not recorded for SFY14 - SFY16 in VITL's financial statements. Further, an October 3, 2014, report[55] to the legislature from the Attorney General's Office (AGO) stated: "VITL informed the AGO that they rely on Medicity, Inc. - an Aetna affiliate - for the intellectual property needed to support the exchange network."[56] The Master Licensing Agreement between VITL and Medicity clearly states that services provided to the VHIE are via license agreements which VITL has no ownership interest in. Although the Agreement allows the parties to enter into a joint venture to develop software at some point in the future, VITL management informed the AGO that "no joint venture is contemplated."[57]

[53] See for example, State of Vermont, Contract for Personal Services, Department of Vermont Health Access and Vermont Information Technology Leaders, Inc., #33798, Attachment D, Other Terms and Conditions, page 28.
[54] Ibid.
[55] Attorney General's Office William Griffin, Chief Assistant Attorney General, Memo: Re: Act No. 144, Section 21- Health Information and Intellectual Property. The Report was required under Section 21 of Act No. 144, which directed the Attorney General's Office (AGO) to consult with Vermont Information Technology Leaders, Inc. (VITL) and report to the General Assembly on "the need for intellectual property protection with respect to Vermont's Health Information Exchange and other health information technology initiatives." Page 1.
[56] Ibid, page 2.
[57] Ibid, page 2.

The AGO report indicated that the Attorney General's Office made some inquiries with the state to help determine whether the State of Vermont itself might own marketable interests in health information technology. At the time, the response was that state agencies typically use, but do not create, computer software. The AGO was informed "that the occasional piece of software that a state agency might develop would be designed to meet the unique needs of that agency and so would not generally be marketable to others." The AGO report concluded "[t]he AGO has not identified any health information intellectual property assets that are owned by VITL or by the State of Vermont."[58]

After the 2014 AGO report was issued, VITL built the HDM infrastructure. The 2016 State Auditor's Report discusses the issue of who owns this data warehouse. It criticized the state for not "defin[ing] the HDM functional and performance requirements. … [and] without such requirements, the State is not in a position to know whether the clinical data warehouse is functioning as it intends."[59] The July 1, 2017 contract with VITL includes a term which requires VITL to report on service level agreements and standards for the HDM.[60] Thus, the state has followed up on that recommendation.

The Auditor's Report indicated that VITL generally agreed that the state owned various elements of the clinical data warehouse, but said that the state "may" own the algorithms VITL developed to parse clinical data in a patient's complete healthcare record.[61] Given the "work product" term in the July 1, 2017 contract between the state and VITL which was signed by VITL management, and the fact that VITL does not depreciate any intangible assets, the issue of who owns intangible assets (if any) favors the state's position that it would own intangible assets. The question may be, since the 2014 AGO report, have there been any quantifiable intellectual property assets associated with the HDM? The state may want to further examine that question.

In summary, a review of financial records and interviews with VITL management conclude that there are not any significant VHIE tangible assets or intangible assets that have been identified, other than the possibility that the HDM may have algorithms that would constitute intellectual property, which the state may wish to further examine. The IT system that directs exchange of clinical data is a service purchased from a third-party, Medicity.

2. Ownership and Control of Patients' Healthcare Data in the VHIE

The primary federal law governing private healthcare data, the Health Insurance Portability and Accountability Act of 1996 (HIPAA), led to Privacy Rules that govern the "disclosure" (i.e., sharing) of a patient's private healthcare information (known as Protected Health Information, or PHI).[62] The rules

[58] Ibid, page 3.
[59] Page 12 of the Audit Report.
[60] Section 8. Budget Table, Term 3.1.1.2.
[61] Page 12 of the Audit Report.
[62] Sections 261-264

limit the information that can be disclosed without patient consent to what is "minimally necessary" to provide "treatment, payment, and healthcare operations."[63]

The HIPAA law establishes the "floor" for privacy. States may enact laws that further restrict the sharing of PHI. Vermont has chosen to further restrict the sharing of patient information under a patient privilege statute that prohibits physicians, chiropractors, dentists, nurses, and mental health providers from disclosing PHI without the patient's consent unless required by law.[64] A similar law covering hospitals states that patient identification and records shall be kept confidential absent the patient's written consent or a court order.[65] Finally, the law governing the VHIT Plan stated that "[t]he privacy standards and protocols developed in the statewide health information technology plan shall be no less stringent than applicable federal and state rules and regulations."[66] Thus, Vermont is considered to be an opt-in state where a patient's physical health data may be in the HIE but are not accessible unless the patient specifically consents to allowing providers to view his/her records in the VHIE. [67]

In accordance with these directives, VITL adopted VHIE policies such as patient consent form to opt-in to the VHIE thus allowing access to PHI; provider agreements which govern the use of patient healthcare data between organizations; and the conditions under which the VHIE can share patient healthcare data with other entities (secondary use).

Policies adopted by a Board of Directors, such as the VITL Board, are important in that they establish consistent guidelines that have been approved by the Board. VITL's policies may also be modified by the Board of Directors by simply voting to change the policy.

Currently, VITL's policy on secondary use states: "[P]rotected Health Information ("PHI") shall not be made available on the Exchange [VHIE] for any purposes other than the treatment of the subject individual, payment related to that treatment, or necessary healthcare operations of the Healthcare Provider who accesses PHI for treatment purposes... (except for Quality Review)."[68] The use of the term "Health Care Provider" is important because the term is understood to mean a clinician or hospital or other entity that *provides* healthcare services to a patient.

[63] 45 C.F.R. § 164.502(a)(1).
[64] 12 V.S.A. § 1612
[65] 18 V.S.A. §7103.
[66] Federal regulations include the "Standards for Privacy of Individually Identifiable Health Information" established under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) under 45 C.F.R., Parts 160 and 164 *et seq,* and Subtitle D of Title XIII of Division A of the American Recovery and Reinvestment Act of 2009, Public Law 111-5, sections 13400 *et seq*.
[67] Under federal law 42 CFR Part 2 behavioral health data has additional restrictions on accessing that type of data in an HIE.
[68] Pages 1,2.

National reports reveal that five percent of Medicaid patients account for more than 50 percent of Medicaid expenditures.[69] Healthcare reform efforts include interventions such as curbing the inappropriate use of emergency rooms through care managers who work with patients that use a lot of healthcare services. Recognizing that care management tools may improve health outcomes while keeping costs as low as possible, DVHA employs care managers under its Vermont Chronic Care Initiative (VCCI) to assist Members. It took DVHA, as the Medicaid agency, more than two years to get VITL to accept that DVHA's care managers are providing healthcare services and can legitimately get access to a patient's records in the VHIE. [70]

It took DVHA, as the Medicaid agency, more than two years to get VITL to accept that DVHA's care managers are providing healthcare services and can legitimately get access to a patient's records in the VHIE.

Healthcare data are becoming increasingly more valuable. Individual patient information can be aggregated to analyze population health characteristics and perform predictive modeling. Additionally, as hospitals and ACOs assume more risk (and potential rewards), data become critical in the development of business plans especially in a competitive healthcare market. An argument could be made that some larger provider groups, hospitals, or ACOs may not want to have their patients' healthcare data available to other providers or payers that may be considered competitors. This was referred to in Section III(A) as "information blocking."

An argument could be made that some larger provider groups, hospitals, or ACOs may not want to have their patients' healthcare data available to other providers or payers that may be considered competitors. This was referred to in Section III(A) as "information blocking."

Interviewees were asked their opinion on who owns the individual patient healthcare data in the VHIE. Many interviewees stated that patients own or *should* own the data because it is their personal healthcare data. Fewer interviewees indicated that the data was owned by the provider because the patient had given consent to receiving services from the provider, which includes consent for treatment, payment, and operations.

A review of Vermont court cases and Attorney General opinions did not reveal that a legal determination has been made on who owns the personal health data in the VHIE. Additionally, Vermont law does not directly address this issue.[71] The statute establishing the HIT

[69] The Agency for Health Research and Quality, Statistical Bulletin #354, 2012.

[70] See, for example, the June 1, 2016 letter from Howard Pallotta, General Counsel, DVHA to John Evans, re: VCCI request for VITLAccess which reiterates that the Medicaid Provider Agreements allow DVHA to have access to health care data and also states that since VCCI care managers can visit a provider's office to get the records, it only makes sense that they can access those records in the VHIE.

[71] Vermont Legal Aid, Protected Health Information: What Vermonters Should Know, June 2014:"Historically, entities that produce the paper records (e.g., hospitals, practices, and providers) have been considered the owners of the file itself, while the patients are considered the owners of the information contained within the record." citing Laurinda B. Harman, PhD, RHIA, et al. State of the Art and Science, Electronic Health Records: Privacy, Confidentiality, and Security, Virtual Mentor, American Medical Association Journal of Ethics. Sept. 2012, Vol. 14, No. 9: 712-719. "However, in the new age of electronic medical records, where there is no longer a tangible file holding the information, ownership is an unsettled issue. Hall states, "In the

Plan states that the HIT Plan must "address the issues related to data ownership, governance, and confidentiality and security of patient information"[72] thus providing a legislative desire to address ownership and control. The 2010 HIT Plan does not address the ownership and control topics.

The issue of who owns the data must be considered in conjunction with who controls the use of the data and as important, who gets the value of the aggregated data of protected health information in the VHIE? These are important topics that the state must consider as it moves forward with its HIT/HIE related initiatives. Specific recommendations on ownership and control are included in Section V.

D. Amount and Use of Funds received under Medicaid HIT IAPDs

1. Funding under the IAPDs

Vermont's HIT/HIE IAPD funding requests to CMS for federal fiscal years (FFY) 2011 - 2018 (October 1, 2011 through September 30, 2018) were analyzed by the evaluation team. The IAPD is a document submitted to CMS on an annual or as-needed basis to obtain funding for administrative tasks related to running a state's EHR Incentive Program. States also request funding in the HIT/HIE IAPD for EHR incentive payments which are paid to providers who can prove they meet Meaningful Use requirements, and for projects which will further health information exchange throughout the state. States are required to report on funds spent from prior IAPDs in addition to reporting on benchmarks, completion dates, and progress made on the previously approved projects.

Vermont's HIT/HIE IAPDs contained requests for many VITL projects. In all, over $19.5 million[73] has been requested for HIE specific projects for these years with $16,927,774 in federal funds and $2,583,102 from state matching funds. Most project funding for HIT and HIE activities is 90 percent federal and 10 percent state match. However, some of the project costs were allocated to other programs because CMS and the federal Office of Management and Budget mandate that Medicaid only pays their "fair share" of the costs. CMS-funded projects in the HIT/HIE IAPDs must flow through the state's Medicaid agency meaning that the state Medicaid agency is responsible for overseeing that the funds are spent appropriately and that the projects meet their goals and benchmarks set. The state Medicaid agency can hire outside vendors for these projects, but CMS must approve each of the vendor contracts.

Table 6 below notes the funding requested for HIE projects throughout the years. Please note however that funds requested in the IAPDs were not necessarily spent.

emerging era of electronic health informatics, few other medicolegal questions are more critical, more contested, or more poorly understood… [The Affordable Care Act] fails, though, to resolve who owns this massive increase in electronic information." citing Mark A. Hall, JD & Kevin A. Schulman, MD, Ownership of Medical Information, JAMA, March 25, 2009, Vol. 301, No. 12, 1282.

[72] 18 V.S.A § 9352(b)8.

[73] VT SMHP IAPD Version 2.0 Final, VT HSE IAPDU_112013_v2.0 draft, VT HSE HITECH APD_v1.5, VT HIT IAPD 2015 v2.3, VT HITECH IAPD v2.9.2_FINAL_26MAY2017, VT HITECH IAPD v3.0

Table 6 – HIE IAPD Requested Amounts

Year	HIE Projects Requested Amount
2018	$2,180,000[74]
2017	$2,482,500[75]
2016	$2,389,433[76]
2015	$2,033,448[77]
2014	$5,832,268[78]
2011-2013	$4,593,228[79]
Total	**$19,510,877**

Appendix J contains information obtained from the IAPD analysis such as statistics on usage and transactions reported over the years in addition to a list of all HIE projects requested.

2. IAPD Analysis Summary

Although the IAPDs clearly showed an increase in transactions, interfaces, and number of users each year, it is difficult to ascertain outcomes and value received because statistics related to actual usage of the VHIE was not reported. It can be assumed that as the number of interfaces and transactions increased each year, the VHIE usage also increased, but specific details related to the number of times data was accessed in the VHIE was not reported within the IAPDs. It was also difficult to determine if progress was made on many of the individual projects that were requested in the IAPDs because individual project progress was not reported within the IAPDs. What the evaluation team did learn is that VITL requested funding for some of the same projects year after year, and while it makes sense for some of the projects to continue each year (such as interfaces and onboarding), other projects most likely should have been a one-time funded project. For example, VITL requested funding for a project to properly protect and align sensitive behavioral health data with other healthcare data, consistent with 42 CFR Part 2 for three years, yet the VHIE still does not accept these data. 42 CFR Part 2 are federal regulations that protect the confidentiality of addiction treatment records of any person who has sought treatment for or been diagnosed with addiction at a federally assisted program.

Specific recommendations on these issues are included in Section V.

[74] VT HITECH IAPD v3.0
[75] VT HITECH IAPD v2.9.2_FINAL_26MAY2017
[76] VT HIT IAPD 2015 v2.3
[77] VT HSE HITECH APD_v1.5
[78] VT HSE IAPDU_112013_v2.0 draft
[79] VT SMHP IAPD Version 2.0 Final

E. Estimates for Market Share and Traffic for the Private HIE Networks in Vermont

The market share for health information exchange can be measured in different ways. The most direct way is the lives covered or included within an information exchange system. Using that measure, VITL has 19 percent of the population in Vermont as measured by opt-in individuals. The most prominent form of health information exchange is between the University of Vermont Medical Center, OneCare, and Dartmouth Hitchcock Medical. This private network encompasses an estimated 40 percent of the citizens of Vermont and the Epic Care Everywhere solution is its backbone.[80] This network operates under the control of Business Associate Agreements with a patient opt-in based upon clinical and business use of patient data by the trading partners. There is evidence of other private network exchange activity within regions of the state such as in Rutland, but it does not appear to represent substantial traffic.

An alternative way of measuring market share is the potential for exchange based upon interfaces in place with providers and other stakeholders. Based upon estimates provided by VITL, they have interfaces in place to support exchange between 97 percent of the Primary Care Practices and 100 percent of the Hospitals.[81] An alternative measure provided by VITL is that when connectivity is indexed to healthcare expenditures, 72 percent of the data has the potential to be captured.[82] This represents an infrastructure and potential but is subject to the constraints of patient opt-in and provider usage.

In addition, exchange in Vermont is complicated by the variety of EHRs and other clinical systems in place.

F. VITL Impact Assessment Review

In undertaking this assessment, a report was provided to the research team, entitled *VITL Impact Assessment, June 2017 Final Report*, authored by Samuel W. McDowell, Ph.D., Executive Director, Research and Value Analysis. Dr. McDowell's professional profile also indicates a position of Vice President of Operations at Vermont Information Technology Leaders. The *Impact Assessment* study is designed to respond to the questions:

1. What is the value of a Health Information Exchange?
2. Why is Health Information Exchange important in Vermont and what are the expected outcomes?
3. How is the state benefitting from its investments in HIE?

There is a well-established peer-reviewed research literature of more than 100 published articles examining and measuring the public benefit of health information exchange and interoperability.[83] In undertaking the *Impact Assessment* study, a novel methodological approach was used which corresponds to no other study in the established body of literature. The method is a "Maturity Model" which is designed to measure a client's maturity "in a particular practice, domain or discipline... A maturity model

[80] This estimate is based upon interviews conducted of various stakeholders for the purpose of this study.
[81] Based upon data presented by VITL August 22, 2017 in a private meeting with HTS principals.
[82] Ibid. Slide 52.
[83] Blevin, F. et al. *Analyzing the Public Benefit Attributable to Interoperable Health Information Exchange. Draft Final Report.* A report conducted under task order number HHSP23337017T with the HHS's Office of Assistant Secretary for Planning and Evaluation. Under Review, September, 22, 2017.

can help organizations assess operations consistently, and allow for strategies that can lead to improved operations and quality."[84]

The assumption of applying the "VITL Clinical Maturity Model" to a healthcare organization is that as a provider implements technology and uses technology, its overall maturity increases and comparisons to other health systems are assumed to remain constant. "There is no measurement of quality of care or operational effectiveness."[85] There is also an assumption that the VITL relationship is a causal factor not a correlate or artifact.

Thus, unlike the existing literature, there is no attempt to measure the HIE impact on process measures or outcome measures, but rather assumes a causation between a "measure of maturity" and a dependent variable of practice expenditure per patient for claims data available for 116 patient centered medical home (PCMH) practices. There is an assumed causation between predictor variables designed to measure VITL services to a provider with no control variable for technology or operations of the facility. The unit of analysis is the patient, and the control variables used in the analysis for "risk adjustment" (e.g., patient characteristics, diagnosis, insurance type) with no rationale for their inclusion.

The predictor variables consist of "technical maturity measures" which are researcher defined, and not based upon existing literature or vetted protocols. The user defined variables consist of: interfaces with VITL, use of VITL Access, number of consultative interactions with VITL and completion of a VITL security risk assessment. Binary scores of zero (0) and one (1) were assigned to seven variables and a score of zero to two for one other variable based upon the hours of interaction with the VITL eHealth specialists. Thus, the operationalization of a concept such as "Community Coordination Maturity" was measured by whether or "not a practice has subscribed and installed VITL access."[86] The binary variables measure a technical relationship not necessarily a process or activities. A Clinical Technology Maturity Score is developed for each practice by summing the eight variables.

A regression analysis is performed against a dependent variable of average practice expenditure per patient with the maturity model as a predictor variable and the population controlled by the "risk adjustment variables." Based upon the regression model, that each unit of "technical maturity" (e.g. the sum of the eight variables) accounted by a $59.00 reduction in annual patient costs. The specific research questions were not addressed.

There are many issues with this study which are summarized below:

1. The research was not undertaken by an independent 3rd party.
2. The methodological approach has no basis in the established literature of health information exchange or in studies measuring the impact of health information technology on healthcare organizations.
3. There is an assumption of causation in the presence of an HIE. As has been established by Vest and other researchers, healthcare processes and healthcare organizations are complex with

[84] McDowell, S. *VITL Impact Assessment, June 2017, Final Report*. Unpublished. P.7.
[85] Ibid.
[86] Ibid. p.11.

many moving parts.[87] For example, payment reform is taking place, consolidations, technology decisions, and staff changes sometimes simultaneously. It is not possible to associate cause and effect with the presence or absence of health information exchange unless a multitude of process and organizational variables are controlled. The maturity model assumes all providers are moving in lock-step and comparisons can be made across organizations which further confound the assumption of causation in this approach.

4. Assuming that a "measure of maturity" as defined by a technology is driving improved outcomes is not verified by the existing literature. The brief literature review provided in the Impact Assessment acknowledges the complexity of HIE research. The research described highlights results with positive results. The vast majority of studies show little or no benefit for health information exchange at this point in time. Thus, the literature review was misleading.
5. The predictor variable consisting of the sum of binary variables primarily indicating the presence or absence of a VITL service or activity does not consider collinearity between the variable components and assumes that they are measuring unique factors which can be additive and maintain their predictive power.
6. The explanation that each "unit" can account for an equal and additive effect seems spurious. At a minimum, the variables should be run in a stepwise regression with each as a binary variable in order to account for variance and for control. No correlation matrices or R-values were provided in the report.
7. As indicated in the user surveys, the presence of an interface does not represent use. There is very limited use of VITL Access as currently configured. Its power of prediction also seems spurious.
8. The assumption that variables that indicate a provider's interaction with VITL are the appropriate measurement of that providers technological maturity progress stretches both the validity and reliability of the results.

As such, it is our assessment that the reliability and validity of the results from the *VITL Impact Assessment June, 2017 Final Report* require verification from other studies which use established methodologies and are built upon the existing literature. Further these studies should be subject to peer-review.

G. Use of the VHIE

1. How the VHIE Works

This section describes at a high level the operation of the VHIE, particularly the internal workings between the Medicity and HDM architectures. There is more information on this topic in Appendix I including end-to-end flow diagrams for all message types.

[87] [87] Vest, J. et al. "The Potential for Community-Based Health Information Exchange Systems to Reduce Hospital Readmissions." Journal of the American Medical Informatics Association 22 (2): 435-42. 2015

As discussed in Section IV above, a key purpose of an HIE is to provide users with a complete source of healthcare data that can be used to make informed healthcare decisions and improve outcomes. Healthcare providers need to be able to rely on the VHIE to provide a complete picture of their patients' healthcare. This is equally true of participants in Vermont's state-led Blueprint for Health program designed to "integrate a system of healthcare for patients, improving the health of the overall population, and improving control over healthcare costs by promoting health maintenance, prevention, and care coordination and management."[88] Other users greatly benefit from data extracts from the VHIE to develop population health strategies and services. To achieve these benefits, the VHIE must have a significant number of patients who have consented to having their data viewable in the exchange, have accurate, quality data available to providers, have an efficient and accurate process to match patients, support providers sending public health data for Meaningful Use, and have a simple, straightforward way for providers to access a consolidated view of patients' data.

Vermont's HIE operates by receiving patient clinical data from providers' EHRs and parsing the data into a clinical data repository (CDR) operated by Medicity, a VITL contractor, for consumption by providers either through a web based portal called VITLAccess or by an on-demand Continuity of Care Document (CCD).

VITL also provides other services such as reporting to the state's immunization registry and data extracts to OneCare Vermont. VITL uses parallel infrastructures to operate the VHIE – one provided by a vendor called Medicity, and the other constructed by VITL, which they call the Health Data Management (HDM) infrastructure.

Medicity Functionality

One of the primary use cases for the VHIE is to offer providers a record that contains the entirety of an individual patient's clinical information from all providers treating the patient in a single, unified context. To do this, data from patient records is collected from EHRs by the Medicity system through interfaces, and the data is then parsed into the CDR. The CDR unifies the data submitted by multiple providers (different EHRs) in one place.

Functionality is available within Medicity to parse clinical documents into the CDR, but it requires an upgrade to the Medicity license.

The patient-centric record is displayed to users either via the VITLAccess portal or through an electronic record called an on-demand CCD provided through Medicity's Integrating the Health Enterprise (IHE) Gateway. Parsing all data into the CDR creates a complete record that's available through both of these access points. The on-demand CCD is the mechanism for making patient data available to providers within their own EHR system. VITLAccess is a portal that can either be linked from an EHR system, or requires a separate login to a system outside of the EHR.

[88] Vermont Act 128 of 2010, amending 18 V.S.A. Chapter 13.

An EHR encapsulates a clinical interaction and when specific interactions are shared with the VHIE they are called "messages." Parsing is the process of identifying specific data points within that message so they can be sorted, exchanged and searched for. For example, if a patient is admitted to the hospital, an Admission, Discharge, Transfer (ADT) message is sent to the VHIE with this information; the VHIE then needs to find the data elements within the message which identify the specific clinical information of interest, such as the time and place it occurred, and to populate it into the patient's unified patient record.

A problem that exists in VHIE is that although a patient's clinical data is sent by providers and stored in the CDR, not all of this data is made available for consumption in a parsed format. For example, if a provider sends a CCD on a patient to the VHIE, even though that data is stored in the CDR, the information from the CCD is not included in the patient-centric longitudinal record because it is not stored in a parsed format. The better solution would be to parse this data into the CDR so that providers can more conveniently access the data in a single, unified context. Medicity has this functionality available, but VITL would have to upgrade their Medicity license to implement this functionality.

Medicity provides the VITLAccess provider portal which allows for query-based exchange. Query-based exchange is used by providers to search and discover accessible clinical sources on a patient. This type of exchange is often used when delivering unplanned care and is a way for providers to "pull" data from the HIE. Another way for providers to consume data from VHIE is to subscribe to message feeds where Medicity forwards messages about specific patients the provider has registered. These messages include all message types handled by the system such as when a patient is admitted, discharged or transferred out of the hospital.

Medicity also receives messages from providers' EHR systems for reporting to the state's immunization registry. These messages are passed from Medicity to VITL's HDM which forwards them onto the immunization registry.

Additionally, Medicity provides a consent module to track patient consent in the VHIE which is described in greater detail below.

HDM Functionality

VITL's HDM receives data primarily from Medicity using a popular interface engine called Rhapsody. VITL uses the HDM to store and share information for specific purposes such as feeding the Blueprint for Health Registry, transmitting data to OneCare Vermont to support care and analytics tools, sharing immunization data with the state's immunization registry, and supplying admission, transfer and discharge information to PatientPing an alerts system for providers.

Figure 8 below presents a high-level view of the input and output data between the various participants in the HIE network. VITL manages the non-infrastructure aspects such as help desk, management of the system's functions, data quality and management, connecting the provider to the VHIE (onboarding), contracting, and outreach.

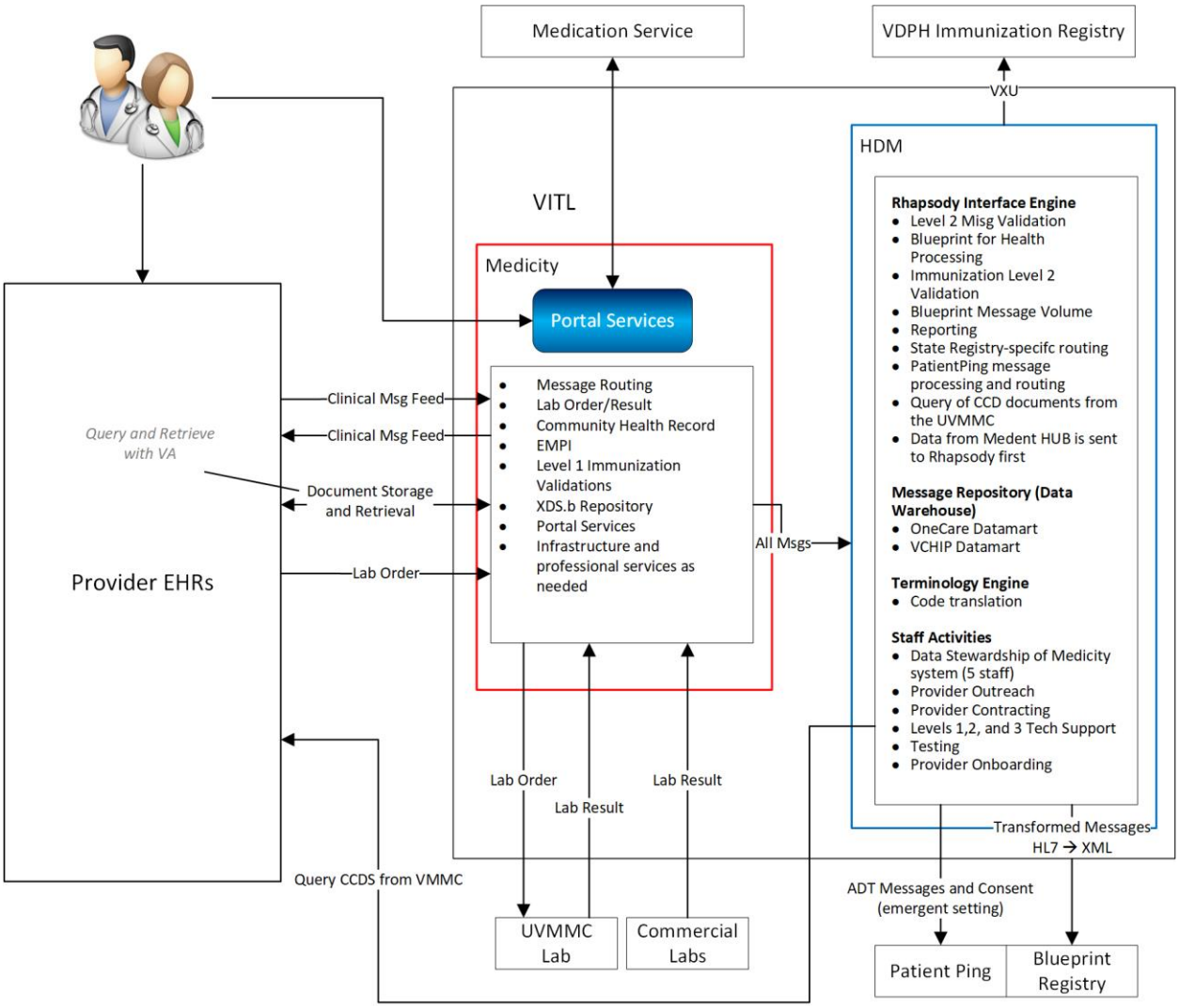


Figure 8 - VHIE Overview

2. Parallel Architectures

As noted and depicted in Figure 8 above, the VHIE has parallel architectures – Medicity and the HDM. An HIE does not need parallel architectures to function, this is an overly complicated infrastructure.

On one side is the Medicity product suite which provides connectivity in a standardized way, but according to VITL, there are times when this is not compatible with existing EHR systems, hospital systems, or the state's immunization registry. For example, some EHRs require acknowledgements for submitted messages that VITL claims Medicity cannot provide. For those interfaces, VITL uses their Rhapsody

interface engine that is part of HDM. For example, according to VITL, the Medicity system cannot validate immunizations to the level required by Vermont's immunization registry. According the VITL, they implemented the HDM because the Medicity infrastructure does not support all of Vermont's needs such as event notification services and Public Health Information Network Messaging System (PHINMS).[89]

VITL has implemented a parallel architecture called the Health Data Management (HDM) infrastructure because the Medicity infrastructure does not support all of Vermont's needs.

Medicity validates immunization messages according to CDC's nationally published standard. Therefore, VITL uses Rhapsody to perform this second level of validation to the state level. It is important to note that in our interview with Medicity, they stated that they can support all required functionality.

HDM comprises a message processing engine to receive, transform, and transmit clinical messages, a data warehouse, and a special system called a vocabulary manager to translate between disparate code sets. All data collected by Medicity are forwarded to the HDM which, in addition to validating and routing, also stores it in the VITL Data Warehouse. The only major component missing is a Master Patient Index to match patient data across providers. VITL is currently exploring the feasibility of implementing a product within HDM (Open EMPI) to perform this function.

3. Medicity

The Medicity product can receive data through Health Level Seven (HL7) messaging, or by receiving clinical documents via the IHE Gateway using the XDS.b profile. HL7 is a clinical messaging standard that has existed since the 1980s. It is not secure on its own, and special steps must be taken to secure the channel with a virtual private network (VPN) for secure messaging. Medicity supports VPN functionality, but it is a network approach to security whereas modern technologies such as Transport Layer Security (TLS) and Secure Sockets Layer (SSL) are more convenient and faster to implement.

The IHE XDS.b profile is a collection of standards assembled for storing documents in a document management system. A full explanation of the XDS.b profile is beyond the scope of this document, but the reader can find more information in the ITI Technical Framework at the following link: http://ihe.net/uploadedFiles/Documents/ITI/IHE_ITI_TF_Vol1.pdf

Providers can submit clinical documents using web services and have them stored in the CDR. However, the installed version of the Medicity software does not parse these documents into their component parts. Therefore, these documents can only be shared in whole, and cannot be included in the on-demand CCD. This limited view is a major barrier to adoption of this service. Medicity has a version of software that can parse these documents, but the VHIE does not use that version.

Very few providers are sharing clinical documents using the XDS.b functionality within the Medicity system. This functionality is used for data submission only. The only consumers of data submitted this way are VITLAccess portal users and Blueprint for Health, through their Clinical Registry. There is one user,

[89] VITL Power Point Presentation 8/22/2017

University of Vermont Medical Center (UVMMC), that is in the process of onboarding to the IHE Gateway service. There is also an interface with the Veteran's Administration that is utilizing this functionality.

As mentioned previously, Medicity also provides a portal, VITLAccess, for users to log on and interact with patient data. The usage among providers is low because providers do not want to use two different systems to manage a patient's care. Providers prefer to see all of their patient's information directly in their EHR systems. This is why adoption of the XDS.b, especially for queries, is so important. If providers are not using the portal or the XDS.b query, the system is just collecting data for analysis.

Medicity can receive messages and route them. For example, it can receive an immunization message and forward it to the state's immunization registry. However, the system is only being used to support national standards and cannot support a state like Vermont that has an immunization system with local constraints. This requires VITL to use another interface engine (Rhapsody) to do more specific validations. This complicates matters significantly and has stymied development of bi-directional interoperability with the immunization registry. Also, it is difficult to imagine how the immunization registry could be made available as a federated data source with an interactive response time using VITL's current architecture. It is important to the clinical community to be able to query for the full shot record, and to include immunization data from the registry in the on-demand CCD.

Medicity has also implemented a Master Patient Index (MPI), which serves to match patients from different sources and keep track of where the patient's data is in the CDR. This is a critical piece of technology for the proper function of the HIE. VITL reports that they have customized the matching algorithm in the MPI to fit their needs.[90] The evaluation team was not able to confirm the effectiveness of the management of this technology. However, there are far more "unique" patients in the HIE than there are people in Vermont. The assumption is that this is the result of duplicates, most likely due to MPI difficulties.

4. Messages Sent and Received

Through Medicity, VITL receives about six million messages every month from all sources. Mostly these are ADT messages that carry information about a patient's visit including diagnosis information. Although the messages could be viewed by all appropriate users through the VITLAccess portal, they are only forwarded to the Blueprint, and PatientPing. Blueprint uses these messages to maintain a patient listing. PatientPing is a service to which providers can subscribe that sends messages to alert providers when a patient visits an emergency room or other type of events occur. PatientPing is a third-party subscription service, not managed by VITL. Providers contract directly with PatientPing, and must provide their own patient roster for attribution.

There are two ways to manage consent. Users can either use the VITLAccess portal or they can establish an interface with VITL and use ADT messages to inform the HIE. The University of Vermont Medical Center is currently the only provider using the automated interface. The evaluation found that one of the primary reasons for the low number of patients who are asked to provide consent is the cumbersome process that

[90] HTS VT Assessment Questionnaire from VITL 8/21/17

is used through the VITLAccess portal. Currently a provider must have a patient sign a consent form which is a separate form than the consent form the patient signs agreeing to be treated by that provider. To log the consent, the provider needs to log out of their internal EHR system and log in to a second system that notifies the VHIE that the patient has consented. Then, they must enter demographic information about the patient in that second system.[91] The consent form must be signed and retained by the provider. For these reasons, it is critical to the success of the VHIE that consent be gathered and recorded in a timely manner, and a greater focus should be placed on achieving this via an automated interface instead of a separate user login through the VITLAccess portal.

There are a number of other messages received and processed or routed by VHIE. Table 7 below provides a brief overview of the data exchanged. For each message type, there are a set of inbound and outbound statistics giving the message count and the number of participants involved.

Table 7 – Annual Message Counts[92]

Message Type	Inbound to VHIE		Outbound from VHIE	
	Message Count	Participant Count	Message Count	Participant Count
Encounter	50,005,790	65	45,892,580	2
Lab	8,568,749	18	1,206,678	49
Transcription	3,963,235	14	242,397	26
Continuity of Care Document	3,048,539	34	534,311	1
Radiology	834,634	14	117,537	28
Immunization	680,582	64	680,582	1
Microbiology	587,613	9	30,740	22
Pathology	302,529	7	2,358	7
Medical Document	134,302	5	64,323	1
Blood Bank	133,407	8	1,779	15
Telehealth	10,783	2	0	0

In addition, providers can submit immunization records to the Vermont Department of Health's immunization registry, which makes it easier for them to meet Meaningful Use. They can also order labs through the system and receive the results back into their EHRs. Providers can subscribe to messages and receive them in their systems as well. Figures 9 and 10 below are two graphs depicting the overall inbound and outbound message traffic.

[91] The VHIE recently began a pilot project with a UVM hospital that does not require providers to sign into a separate system to indicate that a patient has consented to have their health data viewable in the VHIE.
[92] All message traffic analysis is based on the VITL-provided spreadsheet "VITL Interface Counts."

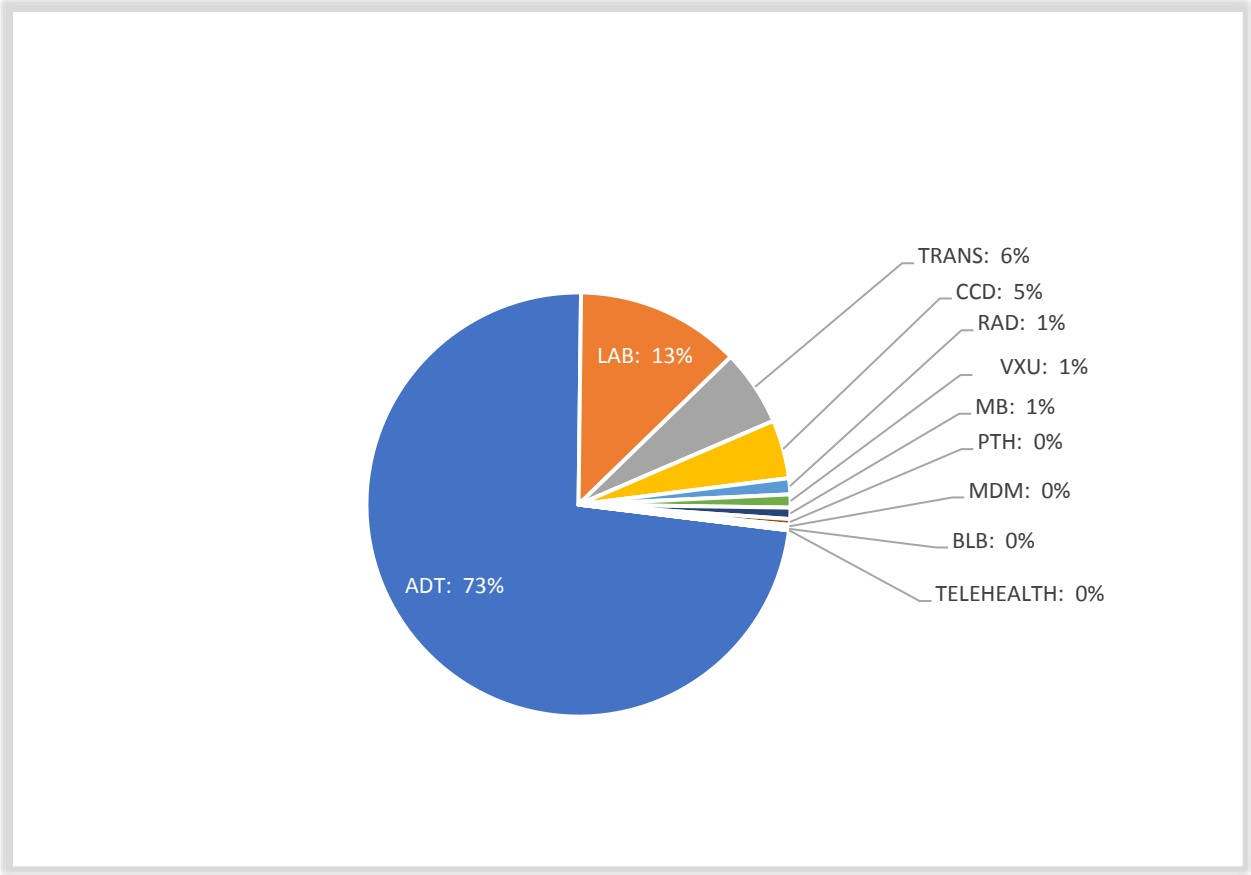


Figure 9 – Inbound VHIE Transactions

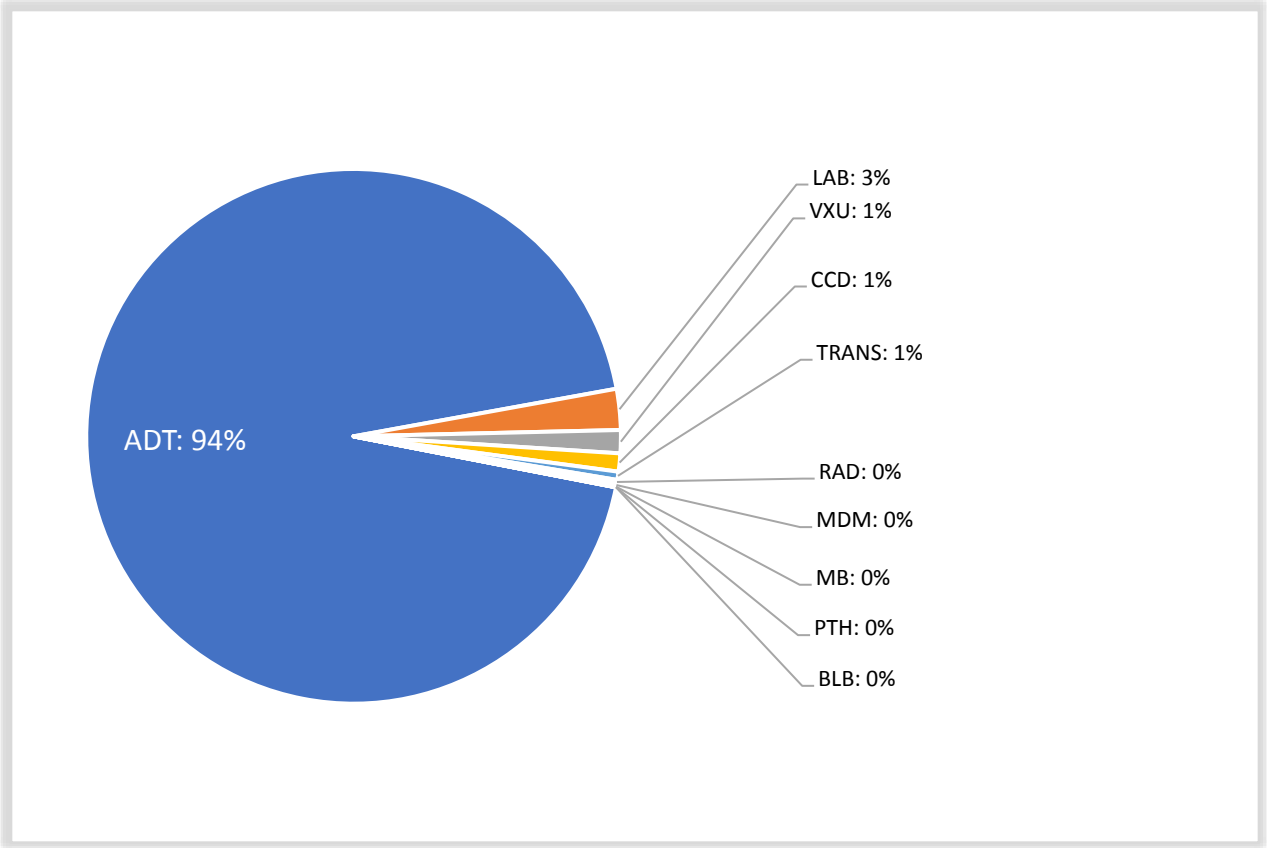


Figure 10 – Outbound VHIE Transactions

VITL sends out about 4.5 million messages per month. Most of these are ADT messages being forwarded to PatientPing and Blueprint. Overall, the number of messages sent is increasing, but the messages are sent unsolicited, or automatically, so it is not possible to determine if anyone is using the data. Our analysis reveals that the only unsolicited points of consumption are the VITLAccess Portal, and the on-demand CCDs.

Please note that usage statistics for the VITLAccess Portal were unavailable at the time of this report. Please see Appendix I for additional services and messages offered by VITL through the VHIE.

H. Summary and Analysis of the State of Vermont Architecture and Security Assessment

Architecture Assessment

The Agency of Digital Services (ADS) completed an Architectural Assessment (AA) for VITL's information architecture to identify the current state information technology and to determine if it met the business

objectives and state standards included in VITL's contract.[93] As part of the AA, DVHA reviewed VITL's business and IT processes related to non-functional and cloud security requirements in 16 specific categories— artifacts, business continuity, compliance, data accessibility, data definitions, data governance, data management, data migration, data quality, data sharing, entity relationship diagrams, auditing and audit requirements, data inventory and flows, non-production data, data ownership and stewardship, and secure disposal of data.

It should be noted that the AA is incomplete at this time and is a work in progress. [94]

ADS Recommendations

Based on the ADS review, the following recommendations were made for VITL:

- Establish a repository for artifacts associated with the VHIE and HDM.
- Create a detailed disaster recovery plan for both the VHIE and HDM to include documentation relating to all subcontractor's disaster recovery plans.
- Develop a model for data governance.
- Include data transformation under the current scope within the HIT Ecosystem.

Security Assessment

A security assessment was completed by NuHarbor Security to evaluate the systems that transmit, process, and store State of Vermont Personally Identifiable Information (PII) and SoV PHI with VITL to operate and manage the VHIE.[95] The assessment included discussions with VITL staff, documentation provided by VITL, and a copy of the most recent independent control assessment of VITL performed by an independent third party.

VITL's independent third party (CynergisTek) conducted a FIPS-200 controls assessment.[96] The assessment reviewed 93 of the top-level NIST 800-53 security controls. VITL was determined to be compliant in 73 of these controls and non-compliant in the remaining 20 controls.[97] Two control families were rated as not applicable.

[93] Agency of Digital Services, Architecture Assessment Report, September 12, 2017

[94] The Agency of Digital Services recently received comments from VITL on the Architecture Assessment and is in the process of reviewing the comments. As a result, VITL's comments have not been considered in this evaluation.

[95] VITL Security Assessment Report, August 2, 2017. The Agency of Digital Services recently received comments from VITL on the Security Assessment and is in the process of reviewing the comments. As a result, VITL's comments have not been considered in this evaluation.

[96] VITL Security Assessment Report, August 2, 2017

[97] The VITL Security Assessment Report identified 20 non-compliant findings. However, when adding the total non-compliant findings the result is 19 non-compliant findings.

Table 8 – 2016 Findings by NIST Control Family

NIST Control	Findings
Access Control (AC)	0
Security Awareness and Training (AT)	0
Audit and Accountability (AU)	5
Security Assessment and Authorization (CA)	1
Configuration Management (CM)	1
Contingency Planning (CP)	1
Identification and Authentication (IA)	0
Incident Response (IR)	1
System Maintenance (MA)	1
Media Protection (MP)	3
Physical and Environmental (PE)	N/A
Security Planning (PL)	N/A
Personnel Security (PS)	0
Risk Assessment (RA)	1
System Services and Acquisitions (SA)	1
Systems and Communications Protection (SC)	1
System and Information Integrity (SI)	3
Total Number	20[98]

The 20 non-compliant control findings were not severe enough to warrant a shutdown of the system.

For comparison purposes, the 2013 and 2015 assessment finding numbers are also provided in Table 9 below.[99]

Table 9 – Assessment Findings

Year	Number of Findings
2013	34
2015	29
2016	20

In general, the assessment performed by CynergisTek appeared to adequately consider the full scope of the SoV data within the VITL systems. Both the VHIE and the Data Warehouse environments were considered.

NuHarbor Recommendations

Based on the security assessment, NuHarbor made the following recommendations:

[98] Table from VITL Security Assessment Report
[99] VITL Security Assessment Report, August 2, 2017

- Regular security risk assessments should be performed for VITL's third parties that transmit, process, or store SoV data. These include; Medicity, ViaWest, PatientPing, HealthCatalyst, TechVault, Rackspace, Blueprint for Health, OneCare Vermont.
- The SoV Chief Information Security Officer (CISO) should request and review the upcoming VITL 2017 controls assessment. Findings should be risk rated and prioritized.
- Expand the review of the Security Assessment control family area to explicitly call out controls related to third party security risk. Consider inclusion of appropriate security planning controls.

I. IT Infrastructure Evaluation Summary

Documented below is a summary of the issues identified from HealthTech Solutions' VHIE IT Architecture Evaluation.

- The VHIE infrastructure is overly complicated.
  - Parallel architectures exist meaning that the VHIE consists of both the Medicity product suite and the HDM which is supported by the Rhapsody interface engine.
- The VHIE does not have a singular, consolidated view of all information.
  - VITLAccess requires a separate login for providers and does not contain a patient's entire clinical record in a convenient form.
  - The query based exchange (on-demand CCD consumption) is minimal and it does not contain all of the clinical information for a patient.
- It is challenging to exchange public health data through the VHIE.
  - Providers can submit immunization data to the state's immunization registry, but they cannot query and receive immunization data from the VHIE.
  - The immunization registry data is not present in VITLAccess or in the on-demand CCD.
  - Providers cannot submit disease surveillance data through the VHIE.
  - Providers cannot submit clinical quality information through the VHIE.
- There exists a lack of quality datasets.
  - When receiving data from providers, a lack of rigor exists in the data validation and cleanup processes resulting in poor quality data.
  - The MPI has duplicates and there are not enough resources and support from VITL to effectively clean up the MPI duplicates.
- Consent management is not automated.
  - The potential for automation exists, but only one provider is currently using it. Patient consent is required for data to be shared by the VHIE. The cumbersome collection and reporting processes are limiting the amount of patient consent collected.

Based on the identified issues, the following are the technical recommendations to improve the VHIE.

- Simplify the architecture. The state of Vermont should work with an HIE vendor that can meet all of Vermont's needs – data exchange and data warehousing – in a single unified architecture.
- Upgrade Medicity to be capable of including clinical document data in the on-demand CCD.
- Promote the automated consent management service.

- Add additional resources and work with Medicity to improve the resolution of patient record duplicates and other issues in the MPI.
- Commit more resources, effort, and structure around the original receipt of data into the VHIE.
    - Create and promote better technical specifications and documentation so that clean data is received in the VHIE.
- Create a quality program which focuses on input, matching, and presentation of data. This involves improved internal data management processes, such as analyzing data issues and addressing them at the source before they are stored in the HIE.
- Add bi-directional support for the Immunization Registry and expand the number of supported public health use cases to include such things as syndromic surveillance, reportable disease, and specialized registries.
- The state of Vermont should complete the Architecture Assessment for VITL's technology architecture.
- Through Plan of Action & Milestone (POA&M) Management, centralize findings and defects and then track the remediation effort into dates, milestones, and cost.
- Require VITL to submit a corrective action plan to address the 20 NIST control findings. The corrective action should include a description of how the finding will be corrected with a detailed implementation plan and timeline completed through POAM management.
- Ensure that a third-party security assessment is conducted each year. It appears that a security assessment was not completed for 2014.
- Identify gaps in current and planned remediation efforts related to deficiencies that were identified in 2015, 2016, and 2017. Implement processes and technology that provide a formal approval and review process and capture performance management and cost metrics. Provide VITL managers, executives, and information assurance stakeholders with a consolidated view of outstanding issues.
- Implement governance for risk acceptance requiring proper review, approval, and documentation to ensure the proper compensating control has been implemented.
- Develop a prioritized, risk-based approach to security through implementation of a cybersecurity framework (CSF)

J. Summary of Interview Findings

For this evaluation, a total of 89 stakeholders were engaged in 60 individual interviews, eight focus groups/group interviews, and one technical expert panel. Interviewees consisted of stakeholders across the entire state. Percentages of interview responses are in the table below.

Table 10 – Interview Responses

Percentages of answers to questions asked in interviews				
Q #	**Question**	**Yes**	**No**	**Undecided**
1	Is the VHIE meeting the needs of your organization?	19%	47%	35%
2	Is the VHIE meeting the needs of Vermont?	19%	51%	30%

Percentages of answers to questions asked in interviews				
3	Is it critical to have the VHIE in existence in the state of Vermont?	91%	2%	7%
4	Is it critical to have VITL manage the VHIE moving forward?	21%	53%	26%
5	Do you think the organizational structure of VITL allows them to successfully maintain and operate the VHIE?	21%	42%	37%
6	What about the relationship to the state? Has the state provided guidance and planning?	9%	56%	35%
7	Should there be a continuation of the HIT fund?	58%	2%	40%[100]

Of the 43 structured interviews conducted:

- Eight responded that the VHIE meets the needs of the organization with 20 responding that the VHIE does not meet their needs. The remaining 15 responses were undecided.
- Eight responded that the VHIE meets the needs of the state of Vermont with 22 responding that the VHIE does not meet the needs of the state. The remaining 13 responses were undecided.
- 39 responded that it is critical to have the VHIE in existence in the state of Vermont with one responding that it is not critical to have the VHIE in existence. The remaining three responses were undecided.
- Nine responded that it is critical to have the VITL manage the VHIE moving forward with 23 responding that it is not critical to have the VITL manage the VHIE. The remaining 11 responses were undecided.
- Nine responded that the organizational structure of VITL allows successful maintenance and operation of the VHIE with 18 responding that the organizational structure does not allow successful maintenance and operation. The remaining 16 responses were undecided.
- Four responded that the state has provided guidance and planning with 24 responding that the state has not provided guidance and planning. The remaining 15 responses were undecided.
- 25 responded that there should be a continuation of the HIT fund with one responding that there should not be a continuation of the HIT fund. The remaining 17 responses were undecided. Of those in the undecided category, the majority (76 percent) indicated they were withholding a final opinion until changes occurred to governance, accountability, strategic planning, and the overall vision.

[100] n=43.

V. RECOMMENDATIONS

Health Information Technology and the exchange of healthcare data touch every Vermonter's life. Patients, providers, hospitals, the VHIE, state government, and those working on healthcare reform all rely on HIT/HIE. Federal and state imperatives require the exchange of health information and they also assume that the HIE systems function appropriately. Additionally, there was consensus amongst many interviewees and stakeholders that HIT/HIE is critical to Vermont's healthcare reform efforts and therefore must continue to improve. To that end, the following recommendations are offered.

A. Recommendations for Overall Structure and Effective Governance of HIT/HIE Efforts in VT

1. HIT/HIE Governance Committee

Establish an effective across-the-board governance model led by a Governance Committee (such as the State of Michigan model[101]) which is charged with developing broad HIT/HIE policies and Vermont's HIT/HIE strategic direction; drafting and approving Vermont's HIT Plan; ensuring that the various components and HIT/HIE systems and efforts tie back up to the state's strategic HIT Plan; and prioritizing and coordinating activities that align with and support healthcare transformation efforts in Vermont. The Governance Committee needs to create trust and ensure that entities that are involved with HIT/HIE activities are accountable for their roles and responsibilities, and that a primary goal of these activities is to improve secure access to healthcare data that is of high quality which can be used to improve health outcomes while keeping costs down.

An effective model would be an HIT/HIE Governance Committee comprised of 12-14 members, consisting of public (e.g., DVHA, GMCB, AoA, Digital Services, Health Care Reform, Office of the Healthcare Advocate, Department of Health, Legislature), private (hospitals, providers, payers, medical associations), and consumers/patients.

- To ensure the Committee has adequate administrative support, the Committee should be administratively attached to a state entity. DVHA is a logical choice as it is the state's Medicaid agency that oversees the Meaningful Use Program and other Medicaid programs that provide significant HIT/HIE funding. Current state functions such as contract oversight would remain with the relevant state entity.

- The Committee would be assisted by permanent and temporary subgroups, such as finance, technology, and clinical, formed to work on specific activities.

- A Data Governance Subcommittee comprised of Committee members and subject matter experts would draft a data governance policy for Vermont for the full Governance Committee to review, seek input, and approve.

[101] See Section B for a description of the Michigan model.

- A Legal and Policy Subcommittee comprised of Committee members, subject matter experts, and lawyers would address and draft an ownership and control of healthcare data policy, and recommendations under Vermont's opt-in consent law for improving the amount of patient data accessible in the VHIE, for the full Governance Committee to review, seek input, approve, and if legislation is required, submit draft legislation for the Vermont Assembly to consider.

2. HIT Plan

The Committee would be responsible for the development, oversight, and approval of a new HIT Plan (and annual updates). The new HIT Plan must be performance-based and traceable to state strategic direction with a commitment by the state to follow and meet the HIT Plan goals and objectives. An HIT Plan subcommittee consisting of several Committee members and the chairs of the subcommittees would be responsible for overseeing the annual updates.

The HIT Plan, among other topics, should:

- Establish ground rules for the HIT Plan process that actively engages stakeholders giving opportunities to provide input during the HIT Plan process and on draft HIT Plans.

- Complete an inventory of existing and projected sources of funds to help guide priorities. For example, the federal Meaningful Use Payment Program for healthcare providers is available through September 30, 2021. Consider activities that meet requirements for this program because for every $1 the state spends, it receives $9 in Federal funds. A 90/10 match rate.

- Continue the HIT Fund at its current level and continue the current source. The HIT Plan should establish a more formal process of setting funding and prioritizing projects based on efficient and effective use of public and private resources. Annual updates to the HIT Plan should review the level and source of funding to ensure needs are being met without overly burdening those who provide fees used to source the Fund.

- Clearly define the relationships among the major HIT/HIE initiatives in Vermont such as the CMS Waiver, Accountable Care Organization Model, Blueprint and identify roles and responsibilities for future activities under the HIT Plan.

- Define accountability standards and ensure HIT/HIE programs operate in a transparent manner.

- More clearly define the role of the VHIE and identify priorities for the VITL Board of Directors whose focus needs to be on overseeing the operations of the VHIE including meeting core services (see recommendations below for VHIE Governance and Performance).

- Given the federal program which required states to designate an HIE has ended, evaluate the need for VITL to continue to be statutorily designated as the state's HIE.

- Include mechanisms that require ongoing review, evaluation, and continuous improvement of HIT/HIE initiatives.

- Include education and outreach plans for HIT/HIE initiatives including the VHIE.

B. Recommendations for VHIE Governance and Performance

1. To provide high-value services such as alerts to providers when their patients go to the emergency room or are discharged from a hospital, the VHIE must ensure that it meets core services obligations. The VHIE should focus on improving core services before it seeks to implement high-value services. The following activities should be done on parallel tracks:

    - Work collaboratively with the state and other stakeholders to develop and implement mechanisms to increase the number of Vermonters who consent to have their data viewable in the VHIE.
    - For the patients who have already provided consent, expend resources to match the patients with their records.
    - Implement easier ways to access and use the data in the VHIE that do not burden providers and facilitate healthcare reform measures.
    - Improve the quality of the data in the VHIE by making sure that records are accurate and complete.

2. As the primary source of VHIE funding, the state should direct that state funds (including the remaining funding under the July 1, 2017 - June 30, 2018 contract with DVHA) be used to improve core services and tie contractual payments to specific deliverables and timelines. For example, by a certain date, determine an attainable increase in the percentage of Vermonters who have consented to having their data viewed in the VHIE.

3. Continue/increase recent push to hold VITL accountable for contractual obligations and tie all payments to defined deliverables. For the July 1, 2018 - June 30, 2019 contract, continue to involve state agency counsel at the beginning of negotiations; add more delivery-based conditions for meeting core services with financial and legal consequences for not meeting deliverables; meet reporting and corrective action recommendations contained in this Evaluation Report, and consider incentives if VITL exceeds performance or completes activities under budget.

4. For the HIT Meaningful Use Program funding, require VHIE to report on the current status of each project including the amount of funds spent. For projects not completed by the projected due date, require VHIE to explain why and provide an expected date of completion.

5. The role of the VITL Board should be to oversee the operations of the VHIE and make sure that VITL follows and meets its roles and responsibilities under the HIT Plan. To that end, the state should transform the VITL Board Membership to include users or potential users of VHIE with

technical expertise and emphasize the role of the VITL Board is to have a focus on operations, meeting core services, and use priority use cases identified during the HIT Plan development to drive technical decision making.

6. Fill the state's VITL Board slot with an individual who has technical, business, policy, and/or government experience; credibility and trust of public and private leaders; and who can put in the effort needed.

7. Require VITL to submit its annual report through the Governance Committee and include an assessment of progress in implementing HIT in Vermont and recommendations for additional funding and legislation as required under Vermont law.

8. Based on VHIE activities identified in the new HIT Plan, develop a VHIE strategic plan that defines the services that should be provided, a sustainability plan, technological approaches to services such as the use of modular systems, and based on responses to interview questions, the VHIE either providing an integrated view within VITL Access or dropping the focus on it.

9. In 2018, the state should conduct a performance/operational audit of VITL to determine effectiveness of internal financial controls, management policies, and practices. The audit plan should include compliance objectives relating to provisions of law, regulation, and contracts and grant agreements. In its next contract with VITL, the state should require VITL to correct all findings and take necessary actions to follow and meet the recommendations, as a condition for payment.

10. Require VITL to submit a corrective action plan to address the findings on VHIE's security controls, including a description of how findings will be corrected with a detailed implementation plan and timeline.

11. Require VITL to conduct an annual security assessment of the VHIE to evaluate if the security controls in place adequately cover the transmission, processing, and storage of the State of Vermont's data within the VHIE systems.

12. Require VITL to review all policies on an annual basis, and publicly post all policies, Board meeting agendas, minutes, and handouts on its website, and ensure that the most current version of policies are posted.

13. VITL White Papers and other self-assessments should be developed by an independent 3rd party and/or peer reviewed and should be built on existing literature using established methodologies before public dissemination.

C. Financial Recommendations for the VHIE

Financial recommendations are inseparable from governance and performance. The recommendations to address governance through the creation of a new board which will develop the HIT Plan and oversee disbursements and projects paid for by the HIT Fund and federal monies will form a cohesive set of compensating controls which will address accountability, transparency, and oversight of the VHIE. The following financial recommendations supplement the governance recommendations:

1. Evaluate whether the contract relationship with VITL ensures that Federal Uniform Guidance §200.330 and Vermont's Agency of Administration Bulletin 5 are complied with in terms of both the form and substance of sub-recipient agreements and, if necessary, implement changes to ensure compliance.

2. Adopt financial reporting and transparency best practices from HIEs in other states, including publicly available detailed financial statements. Require VITL to itemize income sources by specific grant type, contract, and program service; itemize expenses including contract services. An example of a sound public annual report is the Nebraska Health Information Initiative.

3. The review of the SFY14 - SFY16 period revealed a number of recurring or similar audit findings pertaining to the effectiveness of internal controls. The VITL board should establish an Audit Committee consisting of only members who are not employed by VITL or VITL's chosen audit firm. The Committee should use the National Council of Nonprofits and American Institute of CPAs (AICPA) Audit Committee Toolkits included as Appendix N as a framework for the Audit Committee.

4. The state should require the VITL Board to pursue more detailed annual financial reporting to ensure public accountability and transparency.

VI. CONCLUSION

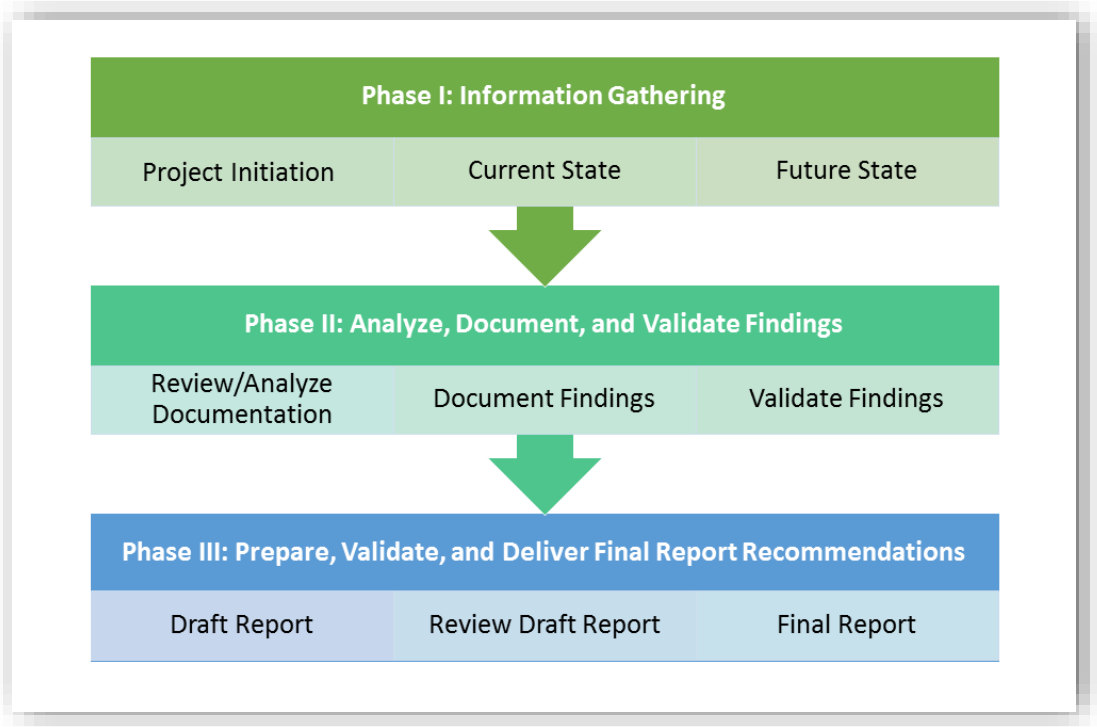
The state of Vermont, and indeed the nation, has witnessed an explosion of health information technology in the past 10 years that continues to evolve. The one thing that Vermont cannot do, is to do nothing. The governance and structure of Vermont's HIT/HIE initiatives no longer meet the ever-growing need to integrate systems and services that come with healthcare reform and the ability to improve the quality of healthcare delivery. Vermont is truly at a crossroad and has the opportunity to once again be a national leader in health IT. The first step must be an HIT Plan process that is owned by the state and which delivers a comprehensive yet manageable HIT Plan that not only guides the future, but one which Vermont remains committed to and diligently follows through on.

APPENDICES

- Appendix A. Three-Prong Approach to Evaluation
- Appendix B. Stakeholder Engagement and Interviews Process
- Appendix C. HIE Evaluation Interview Questions
- Appendix D. Document Catalog
- Appendix E. Time Management Plan
- Appendix F. Project Communication Plan
- Appendix G. Project Management Plan
- Appendix H. Risk Management Plan
- Appendix I. VITL Services
- Appendix J. Vermont IAPD Analysis
- Appendix K. Detailed Feed Interface Measures
- Appendix L. Vermont HIE Evaluation Elements
- Appendix M. Frequently Used Terms and Acronyms
- Appendix N. AICPA Audit Committee Toolkit
- Appendix O. Review of VITL Policies and By-Laws

Appendix A. Three-Pronged Approach to Evaluation

The Project Team, working in conjunction with the Executive Steering Committee agreed upon the following three-pronged approach for the evaluation:



A. Phase I - Information Gathering

The Act identified specific areas to address in the evaluation which centered around how the State's HIT Plan (VHIT) is used; use of the past payments from the Fund and whether to continue the Fund; financial and accounting issues of the VHIE; management and governance of the VHIE and VITL; and recommendations for the future of HIT/HIE in Vermont.

The state, with input from individuals and groups who have been involved in Vermont's HIT/HIE efforts, identified 86 stakeholders to be interviewed to help inform the evaluation. The Project Team used three different methodological approaches to gather information:

1) Structured interviews, conducted in a one-on-one encounter either in person, via telephone, or video conference
2) Focus groups based upon organization, committees, or similar characteristics conducted either in person or through virtual meetings
3.) A technical expert panel (TEP) was used to address information technology planning conducted through virtual meetings. A full list of the evaluation questions is included in Appendix B.

1. Gather and Review Current and Historical Documents, Processes, and Policies

During Phase I and Phase II, multiple research methodologies were used to conduct a comprehensive review and assessment of the state's Health IT Fund, HIT Plan, and VITL organization, and project artifacts, such as health reform initiatives, legislation, statutes, annual reports, and parallel projects including the State Innovation Model (SIM) grant, Blueprint, Accountable Care Organization (ACO) models, and other relevant initiatives.

A catalog of documents is included in Appendix D.

2. Gather Information on other States' Health Information Exchanges and Best Practices

The Legislation required the evaluation and comparison of the VHIE with other states' HIEs, specifically Maine and Michigan. After discussions with DVHA and other stakeholders, including VITL, the following states were also chosen for comparison: Colorado, Delaware, Maryland, Nebraska, Oklahoma, Oregon, and Utah. Each states' HIE governance, operations, revenues, and technology are discussed in detail in Section VI and compared with the VHIE, followed by recommendations for improvement of the VHIE.

B. Phase II – Analyze, Validate, and Document Findings

During this phase, the Project Team analyzed the results of the work conducted during Phase I followed by development of draft findings for the report.

The interviews consisted of quantitative and qualitative questions developed from the nine Evaluation Elements. The validation of qualitative responses was handled differently from the purely objective responses to the quantitative questions. For example, one question asked the interviewee if he/she thought the HIT fund should be continued. In that respect, the importance or the "validity" of the response was not what may be generally thought of as "statistically valid," but rather knowing the number of interviewees who responded with similar answers and reasons why. A major advantage of the comprehensive approach of this study is the large number of stakeholder (sample size) and the range of stakeholders included in this analysis.

The documents, reports, and historical artifacts were grouped by category (governance, financial, organization, operations) to get a complete picture of the landscape of Vermont's healthcare systems and efforts related to health information technology and exchange. The information and data were then analyzed to provide the foundation for the findings and recommendations.

C. Phase III – Prepare, Validate, and Deliver the Final Report and Recommendations

1. Final evaluation report to DVHA

HTS provided summarized results and emerging findings from the ongoing analysis in three interim draft reports. The draft documents were submitted to the Executive Steering Committee for review and comment which were then captured for use in preparation of the final Evaluation Report and Legislative Presentation.

Draft Evaluation Report submission dates:

- August 4, 2017
- September 15, 2017
- October 27, 2017
- November 1, 2017

Appendix B. Stakeholder Engagement and Interviews Process

Purpose

The purpose of the Stakeholder Engagement plan is to ensure stakeholders are properly identified and actively and effectively participate in the project. This tool is designed to help gain support for the project; anticipate and resolve resistance, conflicts, and competing objectives among the project's stakeholders; and arrive at sound decisions and recommendations.

Stakeholder Register and Analysis

The State of Vermont (SOV) has identified key stakeholders whose input is of value to the project:

- Legislators and staff
- Agency of Human Services (AHS) Health Reform Leadership
- Accountable Care Organizations (ACO)
- Department of Vermont Health Access (DVHA) Financial/ Business Office
- HIE/HIT Staff
- Vermont Information Technology Leaders (VITL)
- Medicity
- Agency of Digital Services
- AHS and Attorney General Office (AGO) Legal
- Hospital/FQHC - IT Leads
- Blueprint for Health
- Green Mountain Care Board
- Medical Associations
- Persons involved in HIT Planning
- Provider Representatives
- Vermont Department of Health
- Payers
- Agency of Administration (AoA)
- Office of the National Coordinator for Health IT (ONC)
- Other interested parties

The above listed stakeholders have been grouped into the following seven distinct groups to facilitate data collection:

1. Legislators
2. HIT Oversight and Planning
3. End Users
4. Legal/Finance
5. IT
6. IT/HIT Planning

7. Administrative and Policy Planning

Given the number of stakeholders, the short timeframe for this Project, and for efficiency purposes, stakeholders were grouped based on their expertise, respective title, and profession. Input and direction from the HIT Executive Committee is welcome in determining the groupings.

The stakeholder groups are documented in Table 11 on the Stakeholder Analysis Register so the project team may assess the impact each stakeholder group has on the project and the impact the project has on each of the stakeholder groups. The Interview Group Category is also documented in the Stakeholder Analysis Register below. In addition; issues, opportunities, and risks will be kept up-to-date throughout the engagement for each of the stakeholder groups.

Table 11: Stakeholder Analysis Register

Stakeholder Group Name	# in group	Description & Role	Impact on Project (H, M, L)	Impacted by Project (H, M, L)	Interview Group Category	Issues, Opportunities & Risks
Legislators and staff	9	State Legislators	M	M	Legislators	
AHS Health Reform Leadership	5	Health Care Reform Leadership and Oversight	H	H	HIT Oversight and Planning	
ACOs	3	VT ACO Leadership	M	M	End Users	
DVHA Financial/ Business Office	6	Financial and Grants Management and Oversight	M	M	Legal/ Finance	
HIE/HIT Staff	3	HIE/HIT SOV Staff	M	H	IT	
VITL	3	VITL Leadership	H	H	IT	
Agency of Digital Services	6	SOV IT Agency	L	L	IT	
AHS/AGO Legal	7	SOV Attorneys	H	M	Legal/ Finance	
Hospital/FQHC IT Leads	3	IT Leadership for Hospitals and FQHCs, ACOs	M	M	End Users	
Blueprint for Health	4	State-led initiative that	H	H	HIT Oversight and Planning	

Stakeholder Group Name	# in group	Description & Role	Impact on Project (H, M, L)	Impacted by Project (H, M, L)	Interview Group Category	Issues, Opportunities & Risks
		helps healthcare providers meet the medical and social needs of people in their communities.				
Green Mountain Care Board	4	Oversight of healthcare regulation, innovation, and evaluation.	H	H	HIT Oversight and Planning	
Medical Associations	2	Medical Society and VT Association of Hospitals and Health Systems Leadership	M	M	End Users	
Persons involved in HIT Planning	7	Person currently or previously involved with HIT Planning in VT	L	L	IT/HIT Planning	
Provider Reps	7	VT Provider Reps using VHIE	M	M	End Users	
VDH	2	Vermont Department of Health Leadership	M	M	Administrative and Policy Planning	
Payers	5	VT Payers Leadership	M	M	End Users	
AoA	1	Agency of Administration – Funding	M	M	Administrative and Policy Planning	
ONC	4	ONC staff and consultants	L	L	Administrative and Policy Planning	

Stakeholder Group Name	# in group	Description & Role	Impact on Project (H, M, L)	Impacted by Project (H, M, L)	Interview Group Category	Issues, Opportunities & Risks
		with national HIT perspective				
Other	3	Former VT HIT Leadership	L	L	Administrative and Policy Planning	

Please note: Impact is measured by High (H), Medium (M) or Low (L).

Stakeholder Management

Stakeholder Management is the process of developing appropriate management strategies to effectively engage stakeholders throughout the lifecycle of the project based on the analysis of their needs, interests and potential impact on the project's success. The key benefit of this process is that it provides a clear, actionable plan to interact with project stakeholders to support the project's interests.

Using the groups identified on the Stakeholder Analysis Register, the HealthTech Solutions (HTS) Project Manager will engage stakeholders throughout the lifecycle of the project recognizing that the level of stakeholder engagement required may change as the project progresses.

Manage Stakeholder Engagement

Stakeholder Engagement Management is the process of communicating and working with stakeholders to meet their needs and expectations, and to address issues as they occur. The key benefit of this process is to increase support and minimize resistance from stakeholders, significantly increasing the chances to achieve project success.

To effectively manage stakeholder engagement throughout the project's lifecycle, the project will follow a clearly defined Communication Plan (below) to ensure that all project communications to key stakeholders occur in a proactive and timely manner. Using the Communication Plan ensures that all stakeholders are well-informed which helps to increase stakeholder cooperation and support, minimize stakeholder resistance, and mitigate risks throughout the project lifecycle. Timely and accurate communication to key stakeholders fosters project success by having a clear understanding of project goals, objectives, benefits, and risks.

In addition to the stakeholder management activities listed above, the project team will actively listen and solicit input and feedback from the stakeholders and stakeholder groups through meetings and interview sessions. This provides the ability to ensure that all communication and engagement efforts are being received and fully understood and to adjust if necessary.

Interviews and Focus Groups

HTS will use three different methodological approaches to gather information from stakeholders. The first is structured interviews, to be conducted in a one-on-one encounter either in person, via telephone, or video conference. The second approach consists of focus groups based upon organization, committees, or affinity characteristics. The focus groups can be conducted either in person or through virtual meetings. The third approach is a technical expert panel (TEP). The TEP will be used to address the information technology planning and will be conducted through virtual meetings.

Given the broad scope of content within this project, specific structured interview instruments will be tailored to the expertise of the individual interviewee. This structure supports efficiency in both data gathering and the time commitment of the stakeholders. Focus group and TEP protocols will likewise be targeted to the expertise of the panelists. HTS has extensive experience in conducting this research and developing appropriate instruments and protocols. The data and information gathered will support the full evaluation of the research questions identified, make recommendations, and produce the final deliverable report for the state.

Input and direction from the Committee is welcome in determining the most appropriate data gathering method and the domain questions to be asked for each stakeholder group. Based on our industry knowledge of HIEs, Table 12 below describes the proposed research method associated with each stakeholder group, as well as which of the five principal elements (content domains) will be addressed within each stakeholder group. The preferred data gathering method will be modified from input provided by the HIT Evaluation Executive Committee (Committee).

Table 12: Research Method and Associated Content Domain by Stakeholder Group

Stakeholder Group	Preferred Data-Gathering Method	Principal Elements (Content Domain*)
Legislators and Staff	Focus Group	1,2,3,4
AHS Health Reform Leadership	Structured Interview	3,4,5
ACOs	Focus Group and Structured Interviews	1,5
DVHA Financial/Business Office	As-Is Interview	1
HIE/HIT Staff	Technical Expert Panel	2,3,5
VITL Infrastructure	Technical Expert Panel	2,5
VITL Board of Directors	Focus Group and Structured Interviews	1,2,3,4,5
Agency of Digital Services	Technical Expert Panel	1,5
AHS/AGO Legal	As-Is Interview	1
Hospital/FQHC IT Leads	Focus Group and Technical Expert Panel	1,3,5
Blueprint for Health	Structured Interview	1,2,3,4,5
Green Mountain Care Board	Structured Interview	1,2,3,4,5
Medical Associations	Focus Group and Structured Interviews	3,5,

Stakeholder Group	Preferred Data-Gathering Method	Principal Elements (Content Domain*)
Persons involved in HIT planning	Technical Expert Panel	1,2,3,4,5
Provider Reps	Focus Group	3,5
VDH	Structured Interview	2,3
Payers	Focus Group and Structured Interviews	3,5
AoA	Structured Interview	3,5
ONC	Structured Interview	1,3,5
Other Persons	Structured Interview	1,3,5

*Content Domain Key

1. Current Landscape
2. VITL, VHIE Performance
3. Governance
4. Funding
5. Information Technology (To-Be)

Phase I

The HTS Project Manager will work with DVHA to identify the key stakeholders included as subjects/experts in the research and data gathering phase of this project. As described in the Overview section above, there are two timeframes: the first is the "As-Is," which addresses the legal and statutory issues as well as historical performance questions; and the second is the "To-Be," which addresses governance, funding, and HIT planning. Interviews/meetings will be scheduled, with the relevant information and documents collected, including "As-Is" and "To-Be" financial processes, organizations, and discussions. It is important to note that as of July 1, 2017, the relationship between the state and VITL changed from a primarily grant-based relationship to a contract-based relationship. The "As-Is" analysis will be a "Was-Is" (period ending June 30, 2017) and a consideration of the "As-Is" (period beginning July 1, 2017).

Phase I Key Activities:

- Kick-off Meeting
- Draft and Delivery of Final Evaluation Methodology Plan
- Conduct Interviews
- Identify and Review Historical Artifacts, Research Reports, and Evaluations Studies of HIT/HIE Models and Best-Practices

Evaluation Methodology Details

In approaching the information gathering and analysis phase of the project, substantial field research will be required. HTS proposed a field research team be on-site in Vermont for two separate weeks consisting of four full work days to conduct the in-person interviews and in-person focus groups. Optimal weeks

would be in late July or early August, and the first two weeks of September. A summary of timetable and logistics for each field research approach is summarized below and depicted in Table 13:

- Structured Interviews – Appendix B provides a draft of the structured interview instrument consisting of the aggregate research questions identified by the HIT Evaluation Executive Committee, questions developed by HTS, and suggested potential questions. Structured interviews will be conducted in-person or via telephone and will last approximately one hour. However, some interviews for key individuals may need to be scheduled for more than one hour.
- Focus Groups – Appendix B provides a draft of the focus group protocol. Focus Groups will last approximately two hours and can be conducted live or virtually.
- Technical Expert Panel – There will be two TEP groups. Both will be conducted virtually using TEP protocol. The duration of each TEP will be approximately two hours.

Table 13: Logistics for On-Site Field Research Activities

Date (Week)	Interviews per Day/Week (Ideal)	Focus Groups per Day/Week (Ideal)	Hours per Day/Week (collecting data)	Issues
Last week of July or first week of August	4	1/4	6/24	Vacations, Scheduling, Travel Time, Some Interviews > 1 Hour
August 21 - 24	4	1/4	6/24	Vacations, Scheduling, Travel Time, Some Interviews > 1 Hour
Second week of September	4	1/4	6/24	Travel Time, Some Interviews > 1 Hour
Total (4 days/wk)	4/32	1/8	6/48	Ambitious, unlikely to be achieved but indicates potential availabilities

Table 13 provides an ideal scenario for on-site research activities to support the structured interviews and focus groups. This would provide a potential of 32 in-person interviews, and eight in-person focus groups. This is unlikely to be achieved owing to logistics and availability of the research subjects. However, it does suggest that a substantial number of interviews could be accomplished in person, and that all the focus groups could potentially be conducted in-person.

In addition to conducting interviews with stakeholders, the week of August 21st through August 24th will include in-depth interviews with the VITL executive team. The purpose of the discussions with VITL is to get their historical context of HIE in Vermont and gather information and discuss how they plan, manage, and perform their operations.

Prioritizing Research Interviews/Organizing Focus Groups

The HIT Evaluation Executive Committee (Committee) has identified 84 individuals to potentially be information resources and included in the primary research. Table 13 above took a first cut at allocating groups of these individuals to a type of methodology (e.g., interviews, focus groups, TEP). Some may be subjects for both interviews and focus groups/TEPs.

The next step is for the Committee to provide input to HTS on the prioritization of the individuals relative to their potential contribution of the information gathering phase and whether they should be prioritized as an in-person interview. The advantages to in-person interviews are typically greater engagement and buy-in by the subjects. In addition to the in-person interviews, input by the Committee on the organization and make-up of focus groups would be extremely useful. The main purpose of the focus groups will be to provide suggestions on how to change or create services (e.g., use cases) that meet the needs of the stakeholders going forward as well as future funding approaches.

Research Questions

Research questions have been suggested by the Committee. As appropriate, they have been incorporated into the interview instrument (Appendix B), focus group protocol (Appendix B), and are being incorporated into the TEP protocol.

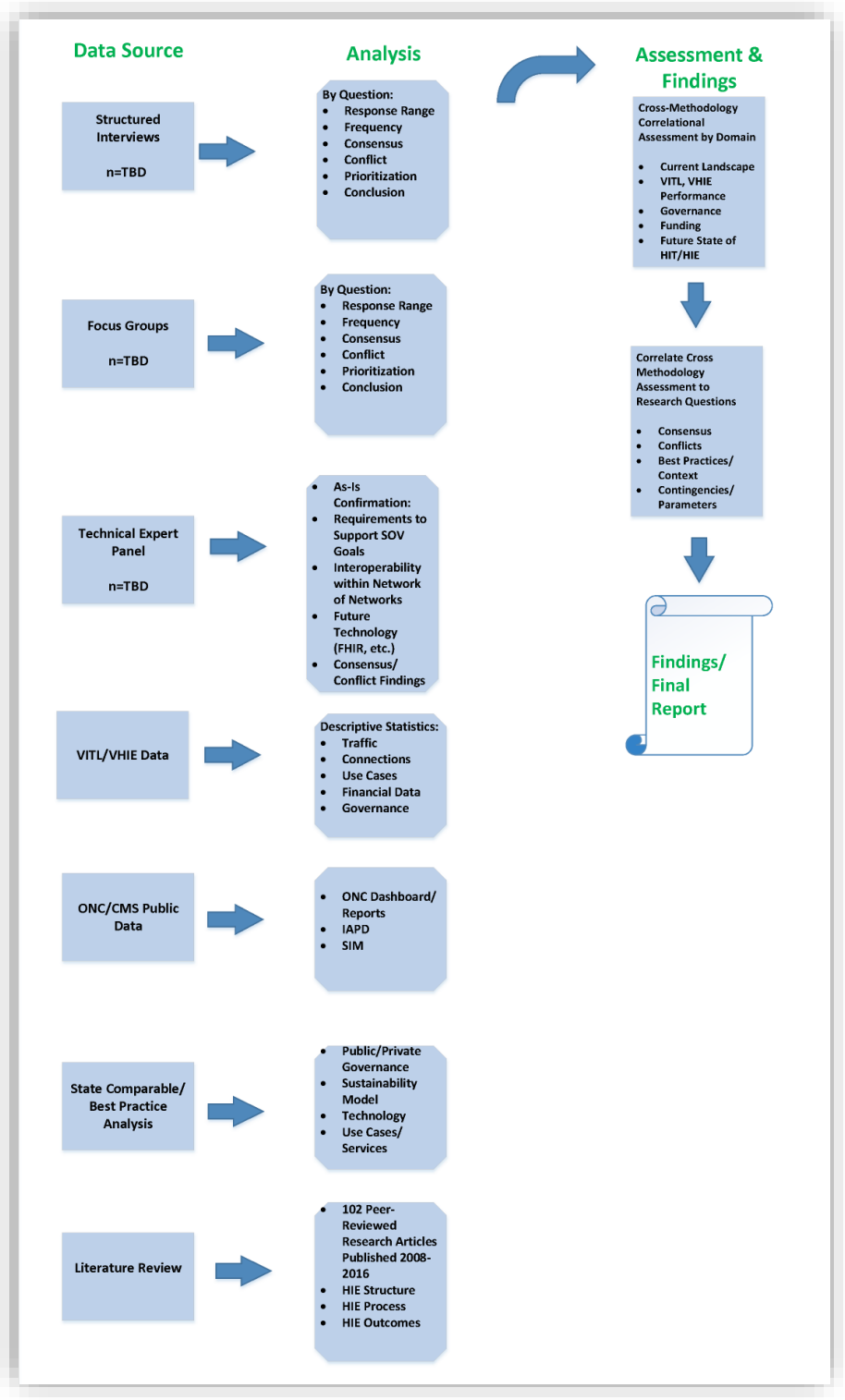
In addition to the research questions identified by the Committee, HTS is suggesting adding questions in three areas:

- Understanding the market structure and characteristics of interoperable exchange and data re-use between trading partners in Vermont, in particular the roles of Integrated Delivery Network systems and vendor networks, such as Epic CareEverywhere. This includes the use of hybrid solutions such as vendor portals and peer-to-peer networks.
- The role for value-based models, including MACRA, in shaping HIT interoperability in Vermont.
- The opportunities associated with new technology solutions, such as Application Programming Interfaces (API) and specific standards such as Fast Healthcare Interoperability Resources (FHIR) and more specifically SMART on FHIR.

As discussed, the research questions developed can be considered a pool of questions which can be drawn upon depending on the subject matter expertise and role of the individual being interviewed or the nature of the focus group subjects. One approach is to attempt to capture the greatest amount of information and avoid assumption errors about the expertise of the subject, by including a larger breadth of questions in all the interviews. If a subject indicates no or limited knowledge, that question/area can be passed over. The opportunity cost risk is the limited amount of time available for the interview and ensuring that

appropriate information is gathered from the subject. A pre-test of the interview instrument will provide insight into this issue. HTS welcomes guidance from the Committee on this question. Please see the

process flow diagram below depicting the interview process.



Appendix C. HIE Evaluation Interview Questions

HIE BACKGROUND

What is your current role at [name of organization]?

I. LANDSCAPE (AS-IS)

1. How would you describe the **current status** of the use of health information technology and the exchange of health information in your state?

Specifically, what is good about being able to use HIT and exchanging health information in its current state?

What are the major issues and barriers to the effective use of HIT and information exchange?

2. There are **several different paths or solutions** to health information exchange. What types of exchange are being used in your state? What is your relationship to stakeholders such as IDN networks, vendor networks, ACOs. Would you describe the willingness of stakeholders to exchange data?

3. Do you have:

Patient portal?
Provider portal?
EMPI?
Master Provider Index?
Do you have a single-sign in?

II. HIE SPECIFIC

4. Please describe the following as of the most recent data available:

Entity	In HIE	No. of Users	No. of Records in HIE
No. Hospitals In State			N/A
No. Providers			N/A
Population of State	No. Lives in HIE:	N/A	

5. What you do believe are your core functions?

6. What particular **services of health information exchange** are you providing?

MU (standard services)
Additional services

7. Does the HIE house a Central Data Record for each patient (or AKA Virtual Health Record) or just exchange the data without storing it?

8. Do you operate a Data warehouse? Data marts (how many and for whom?)

III. HIT USERS AND USAGE

9. Which of the following entities have some access to patient-specific clinical data in the HIE (in accord with federal and state privacy laws)?

	Unrestricted Access	Restricted (briefly describe)
Healthcare providers (Hospitals, PCPs, Labs, FQHCs, Specialists, etc.)		
State Medicaid agency		
Mental Health Agencies		
Substance Abuse Agencies		
Pharmacies		
DME providers		
Long-term Care facilities		
Other State Agencies (Public Health		
Insurance Companies		
Employer based self-insurers		
Others		

10. Which of the following entities do you consider to be a client/customer?

Entity	Yes
Healthcare providers (Hospitals, PCPs, Labs, FQHCs, Specialists, etc.)	
State Medicaid agency	
Mental Health Agencies	
Substance Abuse Agencies	
Pharmacies	
DME providers	
Long-term Care facilities	
Other State Agencies (Public Health	
Insurance Companies	
Employer based self-insurers	
Others	

11. How do you identify “low users” and what tools do you use to increase usage?

IV. FUTURE

12. Are there particular use cases or applications of health information exchange that you are **planning to provide**?

13. What kinds of **payment and delivery system reform** activities are occurring in your state?
    How are those activities currently affecting health information technology and electronic health information exchange activities?
    What are some ways that those activities may affect HIT and health information exchange in your state in the future?

14. What exchange of data (if any) do you have with the state's APCD and plans for the future?

15. Do you plan to include and exchange Part 2 data in the HIE?

V. OWNERSHIP, CONTROL, AND GOVERNANCE

16. Does your state have a State Designated Entity and if so, is your organization the **SDE** in your state? If not, who is?

17. What is the **governance structure** for your organization?

18. Has that stayed the same since origin or has the governance changed over time? If so, how and has it made things better?

19. What is your **relationship to the state**? Do you, or have you, received funding from IAPDs? SIM?

20. What is the use of **APD monies**? Do you receive HITECH and MMIS funds? **SIM monies**?

21. Do you see the **integration of your organization with the state** increasing, decreasing, staying the same? In what ways?

22. How do you plan to successfully maintain and operate the **HIE going forward**?

23. Different **states have different models** of HIEs. From your perspective, what is the best model public entity, a private business, or a public-private partnership?

24. Some states' HIEs consist of a **"network of networks" approach** where other entities own or control parts of the exchange network. How well do you think this will work?

VI. BUSINESS STRATEGIES AND PLANNING

Questions	Responses
Do you have a mid/long term strategic plan?	
What is the timeframe for your strategic plan?	
How often do you do periodic updates?	
How do you track and tie back actual performance to the strategic plan?	

25. Would you provide a copy of your latest strategic plan?

26. Do you conduct periodic user surveys? Can you provide us with a copy of your last provider survey?

VII. PLANNING AND IMPLEMENTATION (TECHNOLOGY)

27. What **overarching technical framework** is needed to support the needs of your stakeholders?
    What role will there be for FHIR? Query-Based Exchange? Blockchain?
    What use cases need to be supported to achieve health reform goals?

28. The development of HIEs, both the noun and the verb, is complex, particularly given that it was a relatively new concept in terms of implementing HIE statewide. How long did it take your HIE to get to the maturity level it is at today?

VIII. FUNDING AND FINANCING

29. How are you funded?
    Provider fees
    Payer fees
    State contributions
    Federal grants

30. Do you think the advent of **value-based payment models will shift the costs and benefits** that underlie funding and financing?

31. If state funds are used for HIE investments how should they be used?
    How should that public investment be shaped? (General fund, HIT fund, other)
    If other, please explain the source for the funds.

32. Are the HIE financials available publicly or would you be able to share them?

33. What is your annual budget? What percentage is used on personnel/salaries versus technology costs?

34. How critical is it for an HIE to have key personnel who have longevity with the HIE?

35. What is the number of FTE employees supporting the organization including both internal and contracted?

36. Recognizing that HIE staff and contractors "roll-on and roll-off" depending on the projects, do you have a core number of managers/key personnel that have had continuous employment with HIE for:

    0-2 years
    2-4 years
    More than 4 years

IX. WRAP UP

37. Is there anything else that we have not covered that you think is important for us to know?

Appendix D. Document Catalog

Catalog of public documents reviewed and analyzed for this evaluation and report.

Category	Document
CMS Documents	All Payer ACO Model waiver
	CMS Report_April_2017_HITECH
	CMS Report_February_2017_HITECH
	CMS Report_March_2017_HITECH
	CMS Report_May_2017_HITECH
	FW State Innovation Models Bulletin August 17, 2017 (email)
	HITECH_IAPDU_TABLES_v2.9.2_26May2017Final
	VERMONTSMHP14Nov2016
	VT HIT IAPD 2016 v2.5 FINAL (2)
	VT HITECH IAPD v2.9.2_FINAL_26May2017
HDI Meeting Materials	HDI Meeting Minutes/Materials 10-28-16
	HDI Meeting Minutes/Materials 11-18-16
	HDI Meeting Minutes/Materials 12-14-16
	HDI Meeting Minutes/Materials 7-20-16
	HDI Meeting Minutes/Materials 9-21-16
	VHIE Connectivity Criteria Stakeholder Engagement Plan 07132017
HIT Funding	2016_01_28_HIT_memo
	2016_2_10_HAC_VITL Responses
	HIT Fund Historical Summary Tables
	HIT_Fund_Financial_Analysis_Updated_092017
	House Health Care Testimony 1-10-2017 Draft
	Reply to House Appropriations 2.18.16
	SenFinance_Memo_HITFund_4.14.17
	Vermont HIT Fund - FY14 - FINAL
	Vermont HIT Fund - FY15 - FINAL
	Vermont HIT Fund - FY16
	Vermont HIT Fund - JFC 09-06-13 Report - final
	Vermont HIT Fund Legislative Report_SFY17_ForFinalReview
	Vermont_HIT_Fund_Legislative_Report_SFY17
	HIT Talking Points-3-16-2017
HIT Planning	2016-02-04 VT House Committee on Health Care FINAL
	Attachment_Vermont Health Care Innovation Plan_September2012
	Vermont SIM and HIT Overview May 2017_v0.1
	Vermont SIM Operational Plan FINAL for distribution 8.2.13
	VHITP 4.8.16_web

Category	Document
	VT HSE APD v2.0 Final Draft
	VT HSE APD v2.0 Project Budgets
Independent Reviews	For HITHIE (email from SIM Evaluator)
	Independent Review of the VHIE
	SAO_VITL Final Report
Legal Ownership/Statutory Issues	18 VSA 9351 HIT Plan
	18 VSA 9352 VITL
	18 VSA 9375 GCMB
	32 VSA 10301 HIT Fund
	ACT048
	ACT054 As Enacted
	ACT073 As Enacted
	Addendum 3.5_Act54_Sec 32A_v5
	AOA-Bulletin_3_5
	VITL 28155-Final-Signed--SoV Contract for Personal Services with VITL 1/1/2015
	VITL 31204-Final-Signed--SoV Contract with VITL 1/1/2016
	VITL 31204-SIM-Amend-1-Final-Signed--SoV Contract with VITL Amendment 8/15/2016
	VITL 32349-Final-Signed--SoV Contract for Personal Services with VITL 7/1/2016
	VITL 33798 Signed Contract--SoV Contract for Personal Services with VITL 7/1/2017
	VITL_Joint Fiscal Office Ownership Justification Memo
	VITL Bylaws 111715
	VITL Final Executed Contract—SoV Grant Agreement Amendment with VITL 7/1/2016
	VITL Final Signed VITL APD Contract 33799—SoV Contract with VITL 7/1/2017
	VITLAccess-Consent-Form-2014-v2
	VITL-SIM-31204-final-signed--SoV Contract for Personal Services with VITL 1/1/2016
	Whitaker v. VITL.Docket No. 781-12-15 Wncv.Decision Following Production
	Whitaker v. VITL.Docket No. 781-12-15 Wncv.Decision on Cross-Motions for Summary Judgement
	Whitaker v. VITL.Docket No. 781-12-15 Wncv.Docket Sheet.07.11.17
	Whitaker v. VITL.Docket No. 781-12-15 Wncv.Entry Order.09.18.17
Technical Review Current	Architectural Assessment of VITL
	Architectural Assessment Overview Presentation
	Architecture and Security Touch Base with HTS Meeting Agenda 072017_Minutes

Category	Document
	Architecture Assessment
	Att 4 Impact Assessment Early Findings
	Blueprint_InterfaceStatus_Master Onboarding Sheet 6-9-17 v3
	Blueprint2016AnnualReport12.29.16
	CHA 29244-Capitol-Health-Associates-Contract-29244-for-Vendor-signed
	CHA-29244-Amendment-1-signed-final
	CHA-29244-Amendment-2-signed-final
	Change_Order_of_Contract_34073-3_For_VITL_Security_Gap_Assessment
	Clinical and Claims Step-Down Graphic CY2015 12-22-2016
	Data Flows and Overview 14Sept2017RLT
	Data Utility Report with Appendices-1228
	Data Warehousing Report-122816
	Documentation Request Response Details 20170720 v2 (from VITL for Arch/Sec Assmt)
	HIE_HIT Arch_Sec Assessment Check-In Meeting Agenda 072017_Minutes
	Immunization Registry Traffic report end of Q2 2017 (email)
	Infra Needs GMCB
	RequestToContract_VITL_SecurityAssessment
	State HDMI Overview 2017-07-04 (from VITL)
	Vermont Data Dictionary Revision 712013 for distribution
	Vermont Health Data Inventory Report - December 2015
	VITL Architecture Assessment Workbook
	VITL Baseline Infrastructure Conversation 3March2017
	VITL Infrastructure Plan_06-10-2016
	VITL Phases (002)
	VITL Services IT_ABC_Form
	Architecture and Security Assessment Deliverables Log
Technical Review Future	Architecture and Security Touch Base with HTS Meeting Agenda 072017_Minutes
	Architecture Assessment and Security Assessment Project Scopes
	Document Request List 20170718
	HIE_HIT Arch_Sec Assessment Check-In Meeting Agenda 072017_Minutes
	HIE_HIT Arch_Sec Assessment Check-In Meeting Agenda 07262017_Minutes
	HIE_HIT Arch_Sec Assessment Kickoff Meeting Agenda 071017
	HIE_HIT Architecture_Security Assessment Kickoff Meeting 071017_Minutes
	Security and Architecture Meeting Notes_7_14_2017
	State HDMI Overview 2017-07-04 (from VITL)

Category	Document
	VITL Architecture and Security Assessment Project Plan
	VITL Architecture and Security Assessment_rebaselined
VHCIP Status Reports--HDI Focus	VHCIP Status Reports for April 2017 - HDI Focus Area
	VHCIP Status Reports for December 2016 - HDI Focus Area
	VHCIP Status Reports for February 2017 - HDI Focus Area
	VHCIP Status Reports for February 2017 - HDI Focus Area_0
	VHCIP Status Reports for January 2017 - HDI Focus Area
	VHCIP Status Reports for March 2017 - HDI Focus Area
	VHCIP Status Reports for November 2016 - HDI Focus Area
	VHCIP Status Reports for October 2016 - HDI Focus Area
	VHCIP Status Reports for September 2016 - HDI Focus Area
VITL Connectivity Reports	Connectivity_Health Care Organization Connectivity Report 2017-06-30 FINAL
	Connectivity_VHIE Connectivity Criteria Stakeholder Engagement Plan 071320172017-06-30 FINAL
	Health Care Organization Connectivity Report 2016-02-19
	Health Care Organization Connectivity Report 2016-06-30 VITL Original
	Health Care Organization Connectivity Report 2016-12-31 FINAL
	Health Care Organization Connectivity Report 2017-06-30 FINAL
	HIE Connectivity Criteria Proposal 102816
	HIE Connectivity Target Proposal 121416
	HIE Connectivity Target Proposal 122016
VITL Operations	032117-VITL-Board-Minutes
	2016_5_6 VITL Letter
	2016_6_1 VITL Letter
	Connectivity_Health Care Organization Connectivity Report 2017-06-30 FINAL
	Connectivity_VHIE Connectivity Criteria Stakeholder Engagement Plan 07132017
	CORE_Deliverable_3.2.1.3_ConsentAuditOverview
	Downtime Notification Procedure 07312017 - FINAL
	FINAL FY15 VITL Unallowable Distribution
	FINAL FY15 VITL Unallowable Distribution_FY15 with Carries side-by-side
	FY14 VT Info Technology Leaders
	FY15 A-133 Vermont Information Technology Leaders
	FY15-FY18 Agreements to Strategies
	FY16 Disallowed Costs
	FY17 3rd QTR DVHA_VITL Grant Meeting 8May2017
	HIE Data Mgmt Overview

Category	Document
	Infra Needs - GMCB June 2-17 v2
	Interface Dashboard - July
	Memo re VITL indirect and unallowables to AHS and DVHA 1.10.17
	SFY18 Agreement Kick Off (002)
	State HDMI Overview 2017-07-14 (From VITL)
	VITL Connecting Visions to Goals to Outcomes to Funding Final
	VITL F16 Single Audit
	VITL Fy17 June Monthly Q4 Quarterly Annual Progress Report FINAL
	VITL FY2018 Budget Review_GMCB Budget Presentation_03-30-2017 Final
	VITL impact assessment status 6-30-17 final
	VITL indirect Cost Rate Agreement 12Dec2016
	VITL Infrastructure Needs - 2016, v2
	VITL Memo.FINAL.1.7.15
	VITL Overview HAC 01-21-2016
	VITL Q2 FY17 Update to GMCB 2017 2 9 FINAL
	VITL Q2 Grant Review Meeting 01312017
	VITL SIM 31204 Signed Contract
	VITL SIM 31204 Signed Routing Docs Package
	VITL_VT Provider Survey_June 2016_Final Report
	VITL_VT Provider Survey_June 2016_Final Report
	VITLAccess-consent-Form-2014-v2
	VITL--Overview for House Health Care Committee-1-27-2017
	VITLsEMT Dashboard - September 28
VITL Policies	FIN-01-Procurement Policy-APPROVED
	FIN-02 Compensation and Benefits Policy - APPROVED
	FIN-03 Employee Expense Reimbursement Policy - APPROVED
	FIN-04 Cell Phone Usage and Cost Allowance Policy - APPROVED
	FIN-05 Cash Management & Interest Policy - APPROVED
	FIN-06 Bad Debt and Bonding Cost Policy - APPROVED
	FIN-07 Capitalization & Depreciation Policy - APPROVED
	FIN-08 Cost Policy Statement - APPROVED
	FIN-09 Risk Management Policy - APPROVED
	FIN-10 Revenue Recognition Policy - APPROVED
	FIN-11 Conflict of Interest Policy - APPROVED
	FIN-12 Clinician Stipends - APPROVED
	SEC006-01-Disaster Recovery Policy-NOT APPROVED
	SEC007-01-Mobile Device Security Policy-APPROVED
	Policy on Secondary Use of PHI on VHIE-APPROVED
	Corporate By-Laws-APPROVED
	Policy on Patient Consent for Provider Access to Protected Health Information on VHIE or through the Blueprint-APPROVED
	SEC006-02-Disaster Recovery Procedure-NOT APPROVED

Category	Document
	OPS-CABDNP-001-VITL Downtime Notification Procedure-APPROVED
	SECPROC03-VITL Access Audit Procedures-APPROVED
	Policy on Participating Health Care Provider Policies and Procedures for the VHIE-APPROVED
	SEC010-Security Policy Instructions (no approval date)
	SEC011-Glossary of Terms (no approval date)
	VITL 2015 Annual Report
	VITL 2016 Annual Report
	VITL Board Meeting Minutes - 1/21/14
	VITL Board Meeting Minutes - 3/20/14
	VITL Board Meeting Minutes - 5/20/14
	VITL Board Meeting Minutes - 7/15/14
	VITL Board Meeting Minutes - 9/9/14
	VITL Board Meeting Minutes - 11/12/14
	VITL Board Meeting Minutes - 12/16/14
	VITL Board Meeting Minutes - 1/20/15
	VITL Board Meeting Minutes - 3/17/15
	VITL Board Meeting Minutes - 5/19/15
	VITL Board Meeting Minutes - 7/21/15
	VITL Board Meeting Minutes - 9/30/15
	VITL Board Meeting Minutes - 11/17/15
	VITL Board Meeting Minutes - 1/12/16
	VITL Board Meeting Minutes - 3/8/16
	VITL Board Meeting Minutes - 3/22/16
	VITL Board Meeting Minutes - 5/23/16
	VITL Board Meeting Minutes - 7/12/16
	VITL Board Meeting Minutes - 9/27/16
	VITL Board Meeting Minutes - 12/20/16
	VITL Board Meeting Minutes - 1/31/17
	VITL Board Meeting Minutes - 3/21/17
	VITL Board Meeting Minutes - 5/30/17
	VITL Security Assessment Report
	VITL Review of SoV ADS Architecture Assessment

Appendix E. Time Management Plan

The Project Plan created for the project serves as the roadmap for how the project will be executed. The Plan, in conjunction with the weekly status updates and bi-weekly status presentation meetings, will help to provide the project team and stakeholders with an understanding of the project's progress at any given time. The HTS Project Manager will monitor the project schedule and manage changes after the baseline schedule has been approved, including identifying, analyzing, documenting, prioritizing, approving or rejecting, and publishing all schedule-related changes.

Schedule Management Approach

The project schedule uses Microsoft Project. Activity definition will identify the specific work packages which must be performed to complete each deliverable. Activity duration estimates and resource estimating activities will be utilized to ensure that the project schedule meets defined contractual deadlines. The preliminary schedule has been attached for review and comments. Once the state Program Director has reviewed and approved the schedule, it will then be baselined.

The project team is responsible for participating in work package definition, sequencing, and duration and resource estimating. The project team will also review and validate the proposed schedule and perform assigned activities once the schedule is approved.

Schedule Control and Reporting

The project schedule will be reviewed and updated on a bi-weekly basis and will be used in preparing for the Bi-Weekly Presentation Meeting.

In addition, the HTS Project Manager is responsible for submitting the Weekly Progress Report to the state Program Director which will include a dashboard describing progress and status in executing the plan, identified risks, challenges, and issues, and proposed schedule for the following week. The Bi-Weekly Presentation Meeting will focus on analysis of identified assessment elements, progress towards plan execution, current recommendations and findings with the plan and overall evaluation, challenges, issues, or risks with the plan and overall evaluation.

Schedule Changes

If any member of the project team determines that a change to the deliverable schedule is necessary, the HTS Project Manager will review and evaluate the change request. Adjustments necessary to mitigate the effect of the deliverable schedule change on project deadlines will be determined and made by the HTS Project Manager. The HTS Project Manager is responsible for adjusting the schedule to reflect any approved schedule changes and communicating all changes and impacts to the project team, state Program Director, and stakeholders.

Appendix F. Project Communication Plan

Project Team Directory & Project Roles

The Project Communication Plan outlines the communication plan for the Project. The tasks for this project involve an extensive review of artifacts, analysis and assessment, and structured interviews/focus groups/TEP sessions with stakeholders to identify key recommendations regarding the state sponsored Health IT Fund, the Vermont Health Information Technology Plan, and the VITL organization. As a result of these activities, HTS will produce three interim reports and a final report that may be presented to the state legislature.

The following project team and stakeholder roster identifies the project team members and stakeholders along with contact and role information for each. It will be the responsibility of the HTS Project Manager to update team members if the contact information of any individuals changes over the duration of the contract period. This information shall be provided via an official email communication. Additionally, if new key individuals are added to the team, the HTS Project Manager shall send the key individual's information via email to all team members when the information becomes available.

Table 14 - Project Team and Stakeholder Lead Roster

Name	Organization	Email	Role
Thomas Kester	DVHA	Thomas.Kester@vermont.gov	Legal Stakeholder Lead
Mary Kate Mohlman	AHS-CO	MaryKate.Mohlman@vermont.gov	Governance Stakeholder Group Lead
Darin Prail	ADS/DVHA	darin.prail@vermont.gov	HIT Planning Stakeholder Group Lead
Casey Cleary	ADS	Casey.Cleary@vermont.gov	IT/Technical Review Current Stakeholder Group Lead
Emily Richards	DVHA	Emily.Richards@vermont.gov	IT/Technical Review Future Stakeholder Group Lead/VITL Stakeholder Group Lead/Executive Committee Stakeholder Group Lead/ State Program Director
Richard Terricciano	DVHA	Richard.Terriccciano@vermont.gov	Program History and Current IT SME
Michael Costa	DVHA	Michael.Costa@vermont.gov	HIT Funding Stakeholder Group Lead
April Smith	HTS	april@thinkhts.com	Project Manager
Kathy Frye	HTS	kathy@thinkhts.com	Contract Manager
Dawn Gallagher	HTS	dawn.gallagher@thinkhts.com	Project Team Member-Legal/Lead Writer
Kim Norby	HTS	kim.norby@thinkhts.com	Project Team Member-Governance SME
Gary Ozanich	HTS	gary.ozanich@thinkhts.com	Project Team Member-Sustainability SME
Greg Haskamp	HTS	greg@thinkhts.com	Project Team Member-Financial Analyst
Jason Webster	HTS	jason@thinkhts.com	Project Team Member-Technical

Name	Organization	Email	Role
			Architect/Assessment Lead
Carrie Banahan	HTS	Carrie.banahan@thinkhts.com	Project Team Member-Policy Analyst
Brenda Gokey	HTS	Brenda.gokey@thinkhts.com	Project Team Member-Business Analyst
Chris Huckabee	HTS	Chris@thinkhts.com	Project Team Member-Business Analyst
Pam Kaur	HTS	pam.kaur@thinkhts.com	Project Team Member-Business Analyst
Christy Vowels	HTS	christy.vowels@thinkhts.com	Project Team Member-Business Analyst

Stakeholder & Project Staff Communications

The HTS Project Manager will be responsible for distributing key project materials, establishing meetings, updating the project management plan and providing updates on project milestones to responsible stakeholders.
Primary communication for the HTS team will be with the DVHA project team. Any communication between HTS and other DVHA staff or stakeholders will be submitted to the DVHA project team for review and approval prior to being sent.

The primary method of stakeholder communication throughout the duration of the project will be email communications, both formal and informal. Weekly Progress Reports will be delivered to the state Program Director in an agreed-upon format and agreed-upon method of delivery. Bi-weekly Presentation Meetings will be held between HTS and the state. A written agenda and written summary of the agenda and agenda items will be delivered to the state for approval no later than two business days prior to each Bi-weekly Presentation Meeting.

The suggested Communication Matrix in Table 15 below provides a guide for communicating routine project documents.

Table 15: Communication Matrix

Communication Type	Description	Frequency	Format	Participants/ Distribution	Deliverable	Owner
Project Plan	Project Plan Timeline	As Amended	Email or Conference Call Review	Project Manager(s),	Project Plan Timeline	Project Manager

Communication Type	Description	Frequency	Format	Participants/ Distribution	Deliverable	Owner
				Project Staff, Stakeholders		
Weekly Progress Report	Dashboard including: • progress and status in executing plan • Identified risks, challenges, and issues • Proposed work schedule for following week	Weekly (Monday)	Email	Project Manager(s), Project Staff	Weekly Progress Report	Project Manager
Bi-Weekly Status Presentation Meeting	Bi-weekly Status Presentation Meeting	Bi-weekly (Deliverables two days prior to scheduled meeting)	Email	Project Managers, Project Staff	Bi-Weekly Status Presentation Meeting and Agenda Summary	Project Manager
Ad hoc	Email or Report as Request	As Requested	TBD through consultation	Project Manager(s), Project Staff, Stakeholders	TBD	Project Manager

Appendix G. Project Management Plan

Project Objectives

The ultimate objective of this project will be to develop a report and presentation that DVHA may present to the legislature. If appropriate, DVHA may ask members of the HTS project team to participate in this presentation. To successfully achieve this objective, the following activities must be conducted throughout the project:

- Produce a project plan outlining all evaluation activities that will take place and result in a final report
- Work with the state to identify stakeholders who must be engaged in the evaluation process
- Provide a recommended approach for gathering stakeholder feedback and execute the agreed-upon approach

- Develop a draft schedule to apprise the state of progress made in the evaluation
- Provide the state with three interim reports on progress made on the evaluation

Project Management Approach

A project plan has been created and will be maintained using Microsoft Project. A copy of this project plan can be found in Attachment B. This plan details all the activities that will take place to allow for the result in the final deliverable report along with corresponding duration and schedule information for those activities. This plan will help to ensure that all necessary activities occur within the proper timeline to allow for the timely completion of the final deliverable.

Stakeholder Identification and Engagement

Stakeholder Identification and Engagement will be done in accordance with the Stakeholder Identification and Engagement Plan. Any risks or issues related to stakeholder engagement will be reported in the Weekly Progress Update and Bi-weekly Presentation Meeting and will be mitigated in accordance to the Risk Management Plan.

Stakeholder Feedback

Communication with stakeholders and stakeholder feedback will be solicited/conducted in accordance with the Project Communication Plan.

Evaluation Monitoring and Control

Monitoring of project progress against the project schedule will be conducted on a weekly basis by the HTS Project Manager. A report of the progress will be provided to the state via the Weekly Progress Report. A sample of the Weekly Progress Report may be found in Attachment C. The Weekly Progress Report will include:

- A dashboard describing progress and status in executing the project plan with delineation for each of the assessment elements defined in the Analysis Method section of this plan
- Identified risks, challenges, and issues which will be monitored in accordance to the project Risk Management Strategy
- Proposed work schedule for the following week

Appendix H. Risk Management Plan

Project Risk Mitigation Approach

Potential risks are identified based on the understanding of each of the project objectives. The HTS team will identify potential risks for each of the contract objectives. Each team member has experience with the objectives and will use “lessons learned” in the identification of the risks. Since it is difficult to determine the exact type or number of risks that could present themselves in a project and additional risks may become known as the project progresses, identification of risks is an iterative process. Risks will be identified not just at the beginning of the project, but throughout it as each objective progresses through the lifecycle. The frequency of risk identification will change based on the current objectives being

worked on at the time. Members of the project may find that some risks which were identified at the start of the project evolve into different ones as the project progresses.

There are characteristics of each risk to be evaluated: the probability it will occur, the impact, the timing, and how often it may occur. After each risk is identified, it is analyzed for those characteristics which subsequently determine the greatest negative impact as the project moves forward. Risks that pose larger impacts will need to be monitored more closely, while ones with lesser impacts are not as threatening to the project and require less attention. Once risks are identified, a response plan is developed for each of the proposed risks. Each plan will describe different options and actions that can be put into place by members of the team to reduce or eliminate threats to the development of each project objective. Risks are monitored throughout the progression of the project, and the response plan is put into action when, and if, a risk presents itself.

Risk Assessment

Each time a risk is identified, the first step is to assess the probability or likelihood of the risk occurring. The anticipated risks in this project typically will not have calculable percentages and therefore must be discerned subjectively. The follow table shows an example of probability levels and values:

Table 16 – Risk Levels and Values

Probability	Description
Low	2 - 10% Chance
Medium	11 - 25% Chance
High	26 - 99% Chance

The second step in risk assessment is to identify the possible impact on the project if the specific risk occurs. It is important that everyone assessing risks has a common definition and understanding of "impact." The following risk impact categories explain how to assess the impact of a risk.

Table 17 – Risk Categories

Impact	Description
Minor	Minor impact to the project. The consequences would threaten the efficiency or effectiveness of some aspects of the project.
Medium	Average impact to the project whereby the scope would be subject to significant review and possible amendment.
Major	Major impact to the project requiring intervention and possible halt; Management intervention is likely required.

The third step to the risk assessment process is to record both the risk impact and probability on the Risk Register; this is called the Impact Probability or Risk Chance. The cross reference between the Probability and Assessed Impact determines the Risk Chance. The Risk Register will be maintained by the HTS Project Manager. Risks will be reviewed and discussed during project planning and provided in the Weekly Progress Report and presented in the Bi-weekly Presentation Meeting.

Table 18 – Risk Management Responsibility

Risk Management Activity	Risk Management Task Description	Ownership (Participants)
Initial Risk Identification	The HTS project team will work with the state Program Director to define initial risks for the Project	State Program Director, HTS Project Manager, HTS Project Team Members
Ongoing Risk Identification	Project members from all stakeholder groups will identify new risks. New risks will be added to the risk register and discussed with the project team and state Executive Committee during Bi-weekly Presentation Meetings and provided to the state Program Director in the Weekly Progress Reports.	HTS Project Manager, Project Team Members
Risk Mitigation	At Bi-weekly Presentation meeting, all risks will be discussed, and the mitigation strategy of each of those risks will be evaluated for success or failure.	HTS Project Manager, state Program Director
Risk Closure	Risks will be closed when all parties agree they have been addressed adequately and pose no danger to the project.	HTS Project Manager, state Program Director

Appendix I. VITL Services

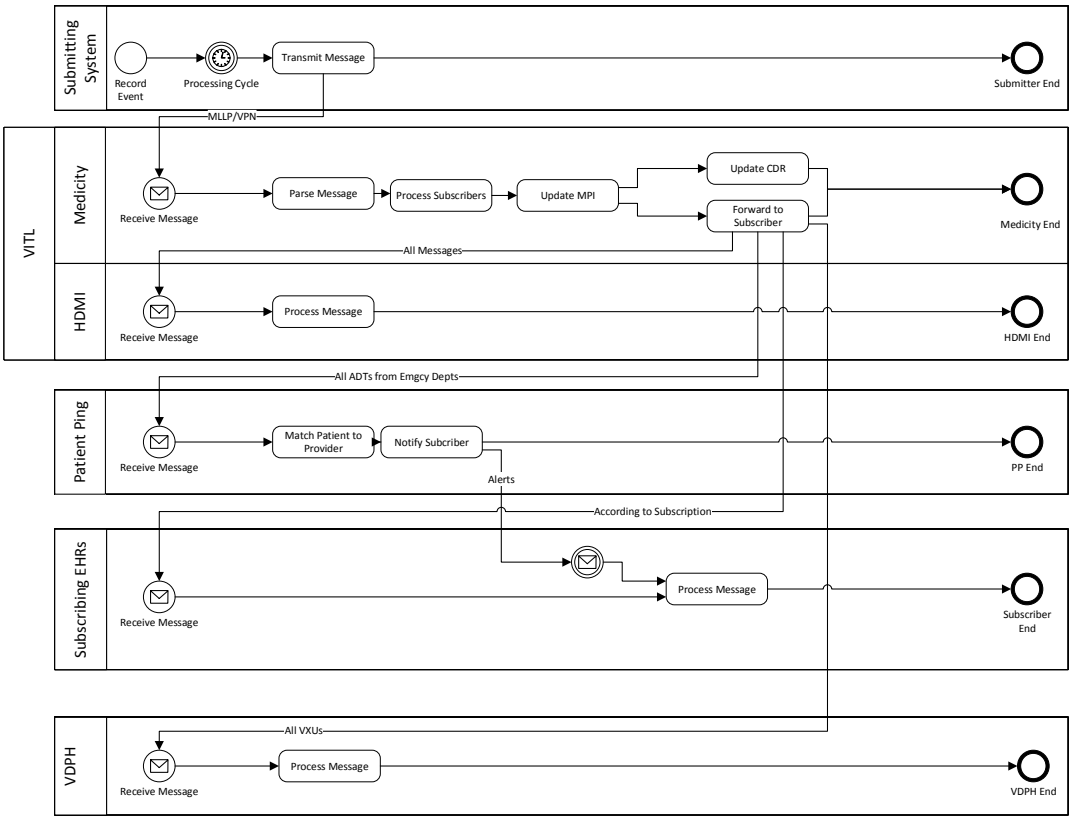
Under its contract with VITL, Medicity provides a suite of services. Documented below are the current services offered.

VITL Medicity Services

HL7 Message Processing

Medicity receives unsolicited HL7 version 2 message feeds provided by EHRs. These messages are generated in source clinical systems as clinical events are recorded. Medicity performs the following activities with these messages:

1. Patient discovery and MPI maintenance
2. Parse and store clinical data into a patient-centric clinical data repository that can be used to generate a patient-centric view of clinical data across providers
3. Validate and Forward messages without modification to subscribers such as the Immunization Registry (VXU only), PatientPing (ADT only), and HDMI (all messages)



Clinical Document Processing

Medicity implements a document management feature using IHEs XDS.b profile, which is a standards profile for a clinical document management system. XDS.b is used for documents such as CCDs and C-CDAs. VHIE is only exchanging CCDs at the time of this writing. There are currently 34 organizations submitting CCDs. Our analysis revealed that only Blueprint is consuming the CCDs. Some submissions are via the XDS.b functionality, but most are embedded in HL7 MDM messages and submitted using legacy messaging systems. Blueprint does not retrieve these documents from XDS. Instead, VITL receives them from Medicity and transforms them into XML formats suitable for Blueprint.

While the XDS profile is designed for static document storage and retrieval, it also provides for an on-demand document type that is dynamically created from other documents and messages received by a given system. The XDS profile does not say what the on-demand document must contain or how it is created, only that it allows for a non-static, dynamic document type. The Medicity Organize product, rebranded as "VITL Access" supports the synthesis of multiple documents such as CCDs and HL7 message traffic into a single, patient-centric record that can be delivered via an XDS query. At the time of this writing, however, there are no endpoints consuming this service.

Clinical Data Repository (CDR)

Clinical Data Repository (CDR) houses data from multiple sources and constructs a patient-centric record to provide a 360-degree view of the patient's health information. It also works in conjunction with a Master Patient Index where data is matched to an individual person to verify the patient's identity and that the data in the repository is correct. What is unclear at the time of this writing is who exactly consumes this data, and if the MPI is reliable. Points of consumption include the portal and the on-demand CCD.

Also, the installed version of the Medicity product does not include data from clinical documents such as CCDs in the on-demand CCD, nor are they part of the consolidated portal view. Instead, they live as documents in a library that must be individually accessed, and only the HL7 message data is included in the longitudinal view.

Portal Services (VITLAccess)

Medicity provides an online portal for use by providers separate from the provider's EHR. Some services are only available through this service such as the patient-centric community health record, and the consent module.

Lab Orders and Results

Medicity provides a service by which providers can order labs, and get the results back. Orders can be placed either within the EHR or in the Portal. Results can also be delivered back via either the portal, or to the EHR. However, according to VITL, problems with the Medicity system being compatible with EHRs has led to the necessity of implementing their own Rhapsody interface engine.

Master Patient Index and Record Locator Service (MPI/RLS)

The MPI matches records from multiple sources, links them together, and supports searches. The submitted records may have different values for certain fields caused by spelling errors, nicknames, and other (largely data entry driven) issues. The MPI must first match these records, and then resolve these different values.

Matching behavior is controlled by a rule base consisting of matching algorithms that compare the typical fields available in a demographics data set such as name, address, gender, date of birth, and identifiers. Matches can be exact, or algorithmic. For example, the first names can match exactly, or can match using a double metaphone matching algorithm that is similar to Soundex except that it has been upgraded to address Soundex's shortcomings. Also, edit distance is also applied to address matches using the Levenshtein Distance method that can compare typographic errors.

The RLS stores the locations for all the data associated with the entities that the MPI is connecting. Provider data is kept in provider specific repositories until it is queried. The MPI and RLS together provide a federated search across these repositories. The MPI resolves the patient's identity and matches it to all other submitted identities. The RLS then tells the system where to find the clinical data, and the system queries these locations.

Consent Management

Consent management is performed via the VITLAccess Portal. There is an automated method for communicating consent with communicating directly from an EHR system, but only one hospital is using this method. Providers must find the patient, and opt them in at the patient's direction. The providers are supposed to ask each patient if they wish to opt in. However, only about 20 percent have had any consent choice recorded in the system. This results in the HIE having a large amount of data on a very wide population, but being unable to make it available to users of the system.

VITL Services augmenting Medicity's Functionality

HDMI

HDMI consists of Rhapsody and a data warehouse. The Rhapsody interface engine handles connectivity for HDMI as well as transformation of message traffic. The data warehouse is used for analysis, and provides reports to participating organizations. The value of this service could be greatly enhanced by providing secure access to interested parties, which include providers, DVHA, and Blueprint.

Provider Contracting

VITL manages the process of contracting providers for participation in the VHIE. They manage the onboarding process and use Medicity as second tier support for technical issues involving the Medicity suite.

Data Stewardship

VITL provides data stewardship services for the Medicity tool. Data stewards are involved in data quality activities of all sorts including testing, correcting, and matching records in the MPI. It is unclear as to the extent or quality of this work, especially as it pertains to the Medicity MPI. VITL seeks to implement a

separate MPI because of limitations they assert lie with the Medicity MPI being too deterministic in its matching behavior. There are too many distinct patients being reported, which calls into question the quality of the Medicity MPI matches. The ideal situation would be to have only one MPI that offers professional data stewards powerful tools for resolving ambiguous matches and selecting the fields for the "best record." Also, it is of paramount importance that the lessons learned by human data stewards get codified into matching/best record rules for the MPI to implement automatically in the future. If the data stewards are not performing this task, and feeding back the information to the rule definers, then little or no progress will be made on this issue.

Community Outreach

Help Desk

VITL operates a help desk to assist providers with technical issues, onboarding, testing, and other issues surrounding use of the system.

Alerts and Notifications

PatientPing is a third-party service that providers can subscribe to and receive notifications of significant clinical encounters such as emergency department visits, hospital admissions and discharges, and other significant events. Providers must sign up for this service, and provide and maintain a patient listing. VITL forwards HL7 admission/discharge/transfer (ADT) messages to PatientPing, which uses them to drive the process.

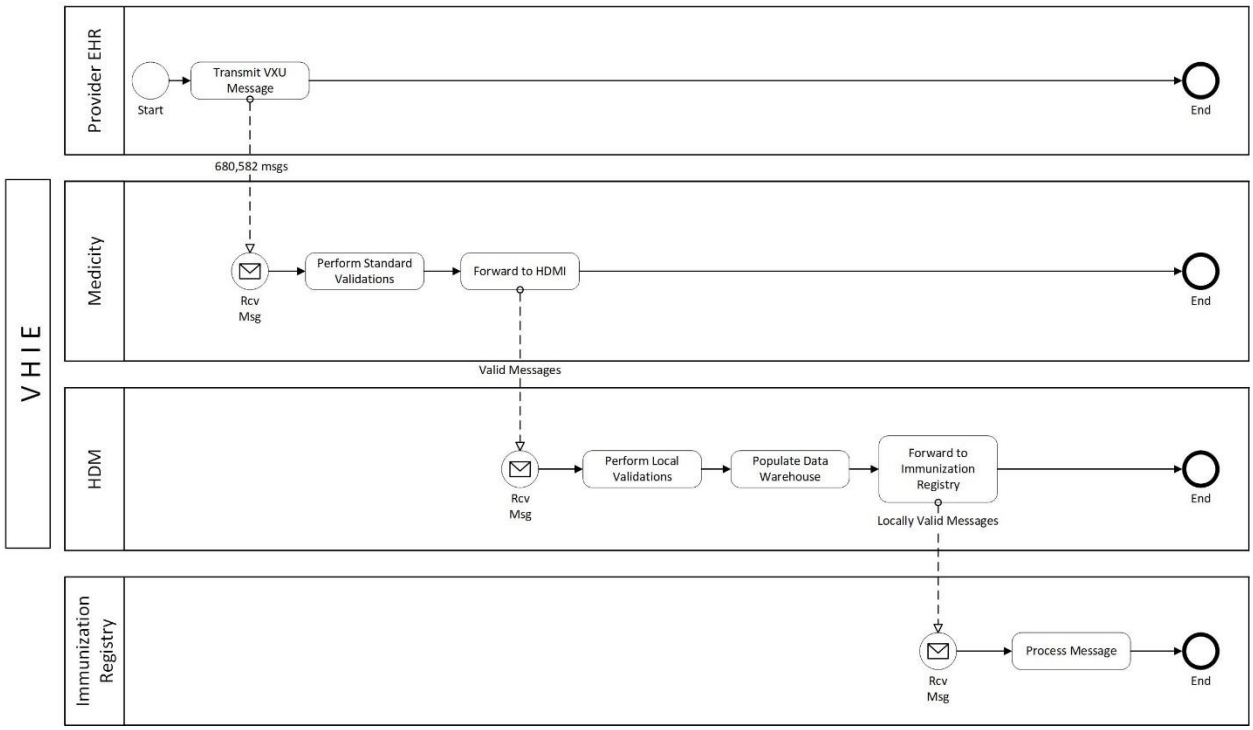
Data Flows

It is important to understand what is happening inside of the VITL architecture for each flow. The following diagrams depict the flow of this data and the architectural components involved in each.

Vaccinations

Vaccinations are given to patients at provider locations and recorded in the provider's EHR system. The EHR system then creates an HL7 VXU message according to CDC and VDPH specifications and sends it to the Medicity system. Medicity validates the CDC specifications and forwards the message to the Rhapsody interface engine within the HDMI. Rhapsody performs further, state-specific, validations and then forwards the message on to the Immunization Registry. Information about the immunization is not retained in the HIE; the message is simply validated and routed to its destination.

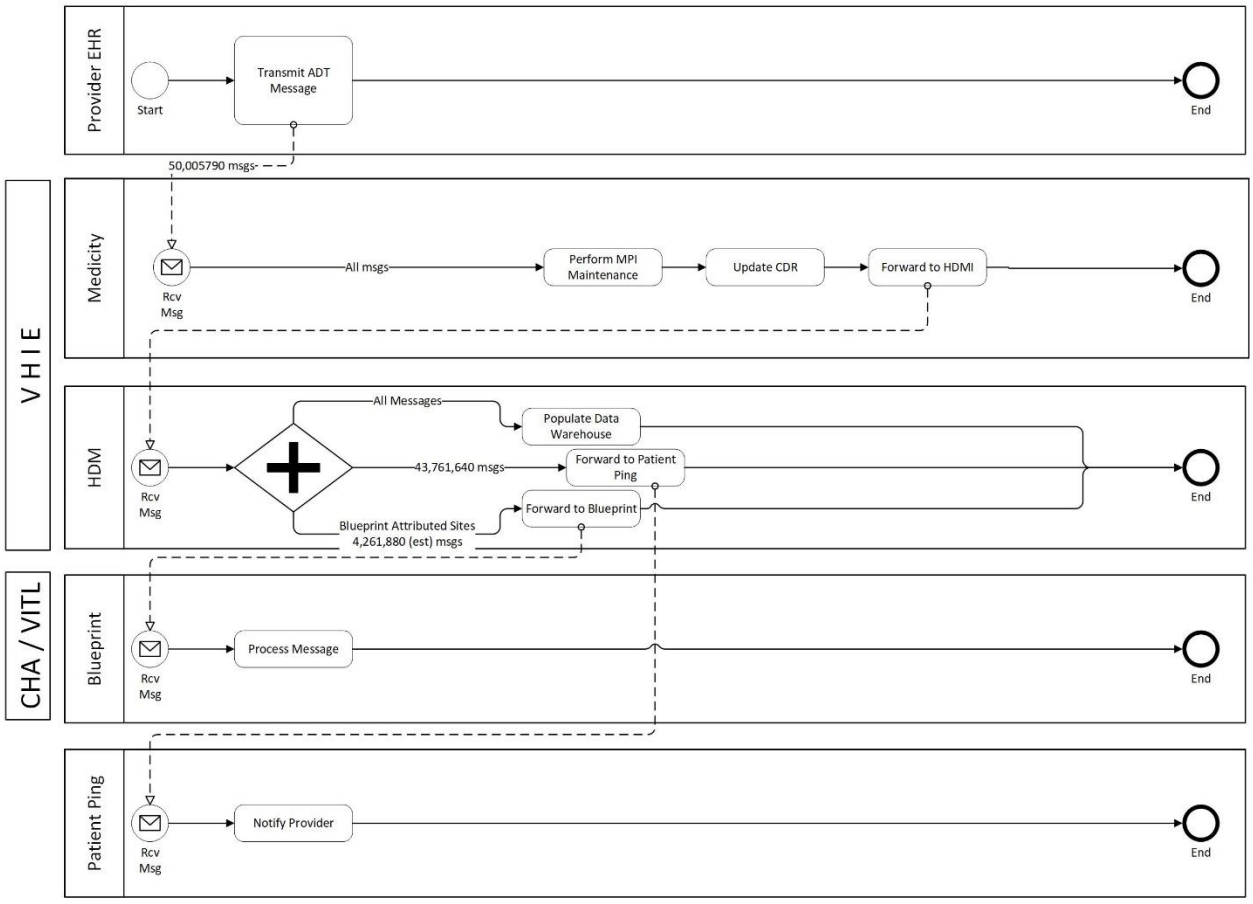
VXU Data Flow



Admissions Discharges and Transfers

Collected by all, but only sent to PatientPing and Blueprint.

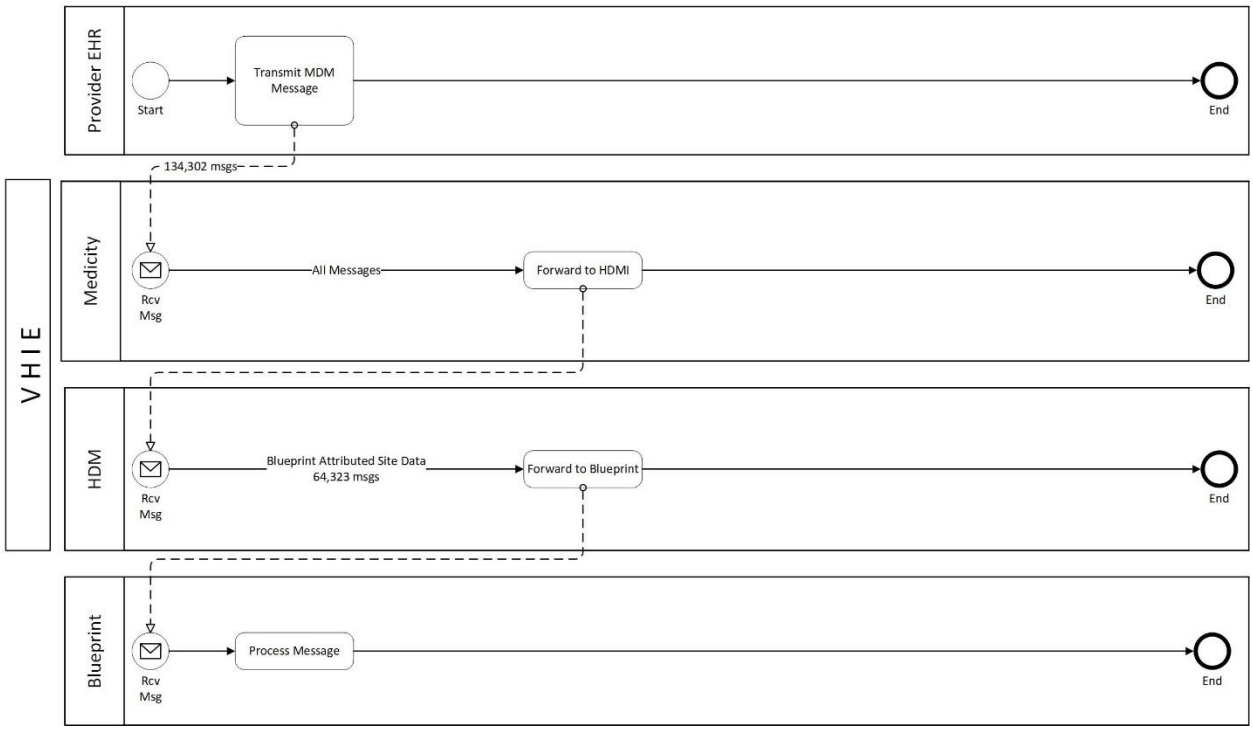
ADT Data Flow



MDM

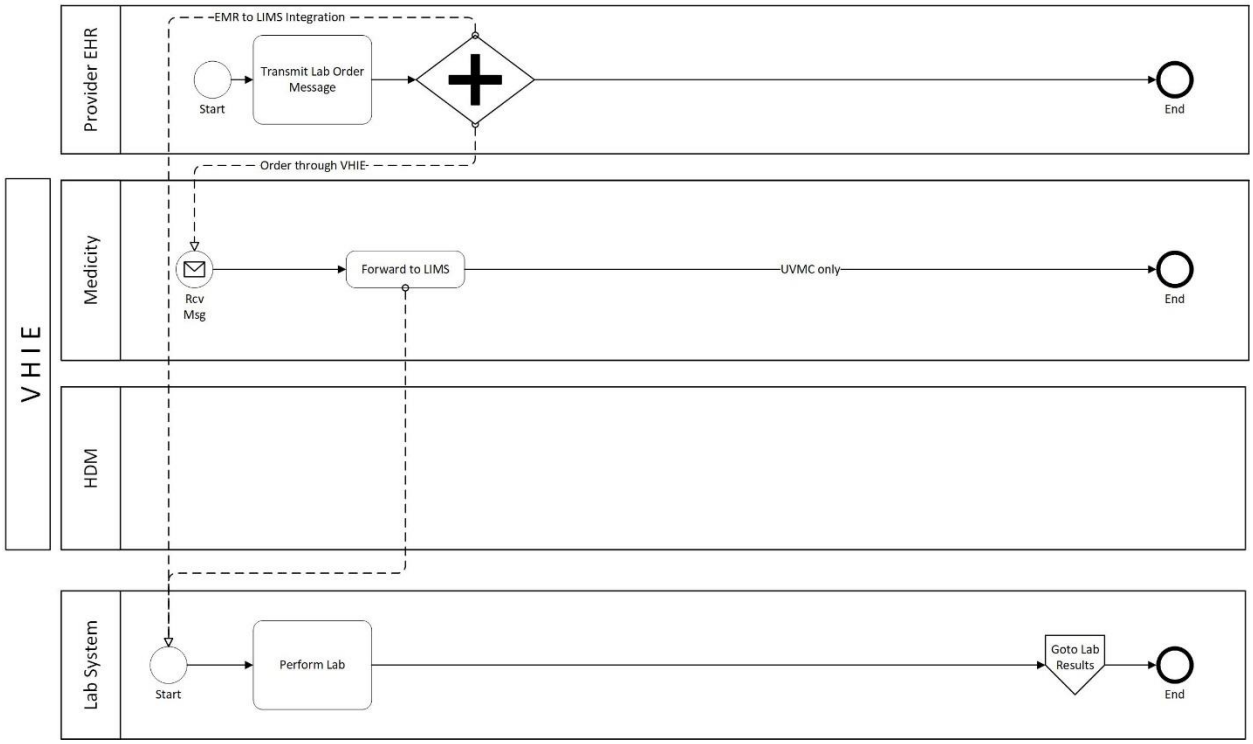
Collected by only five entities; all are sent to Blueprint.

MDM Data Flow



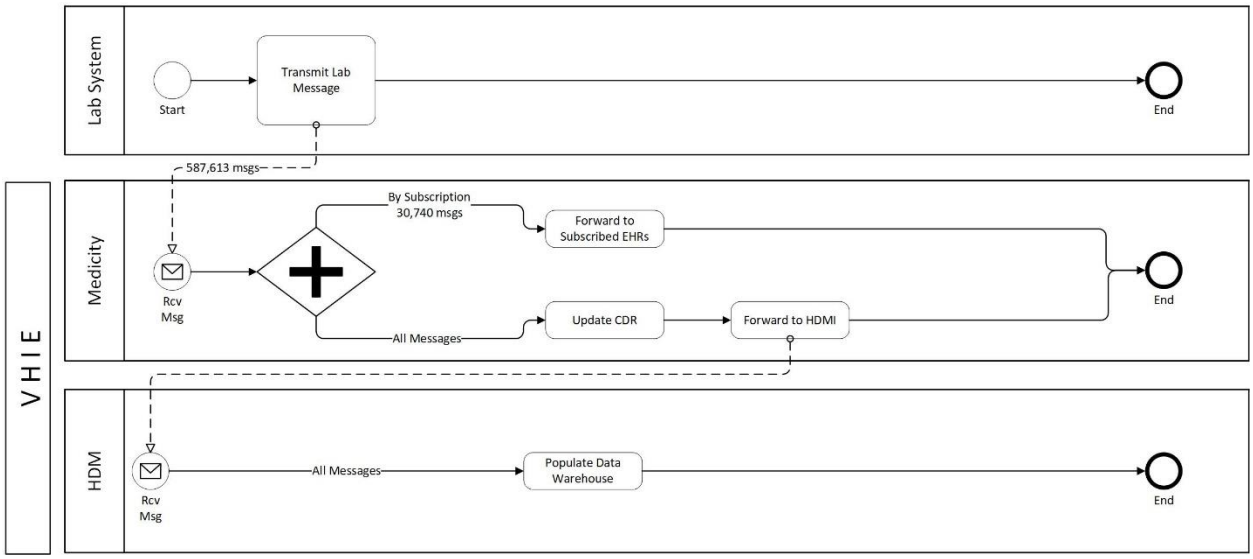
Lab Orders (non-Microbiology)

Lab Orders Data Flow



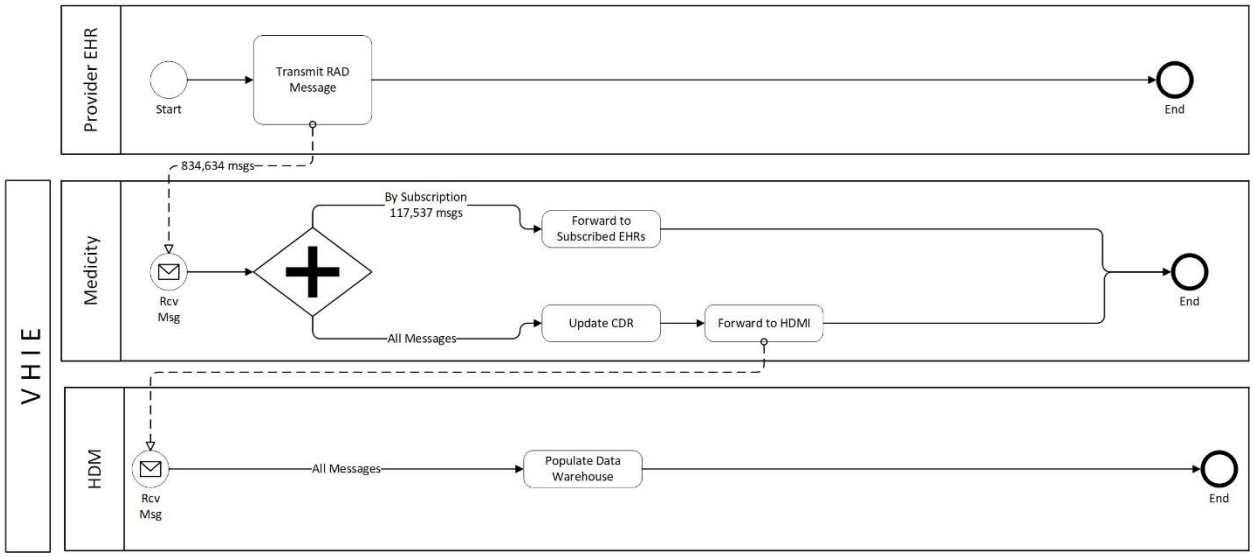
Lab Reports (Microbiology)

Microbiology Lab Result Data Flow



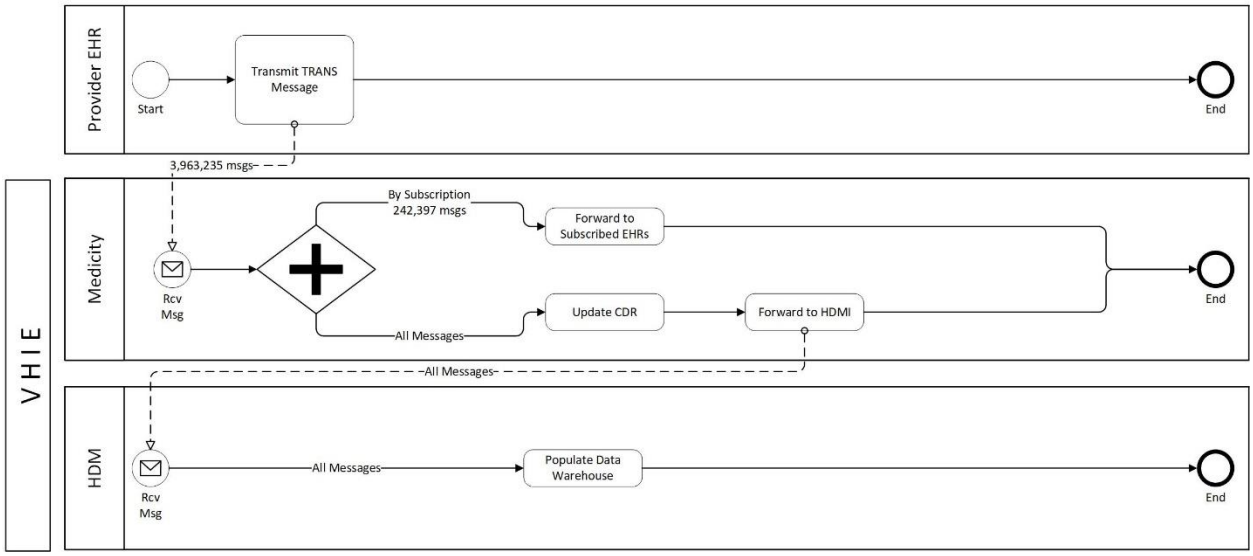
Radiology Reports

Radiology Data Flow



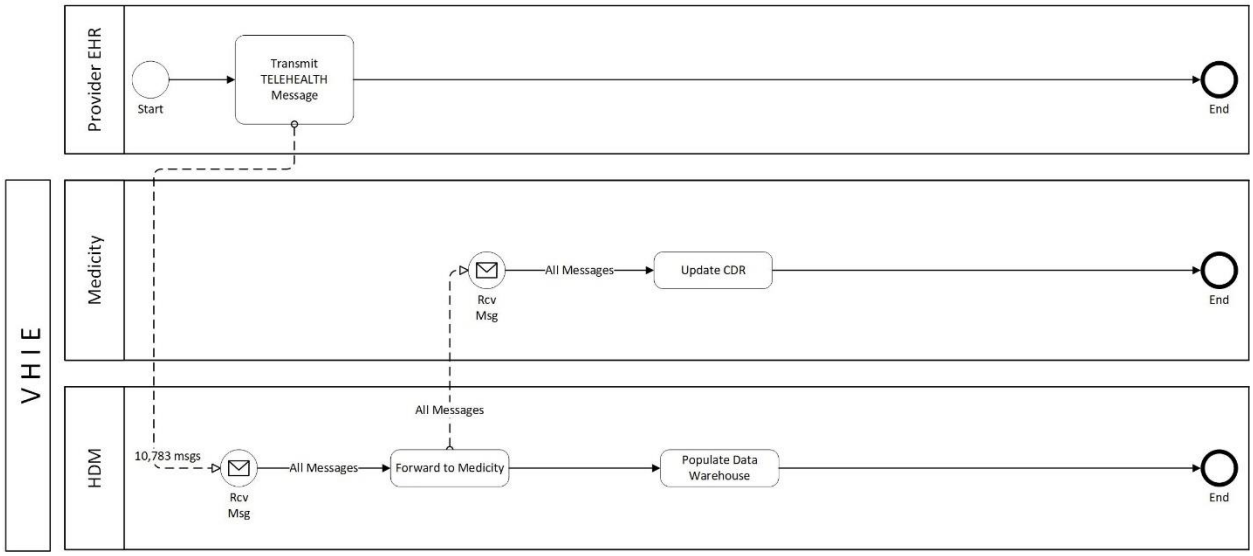
Transcriptions

Transcription Data Flow



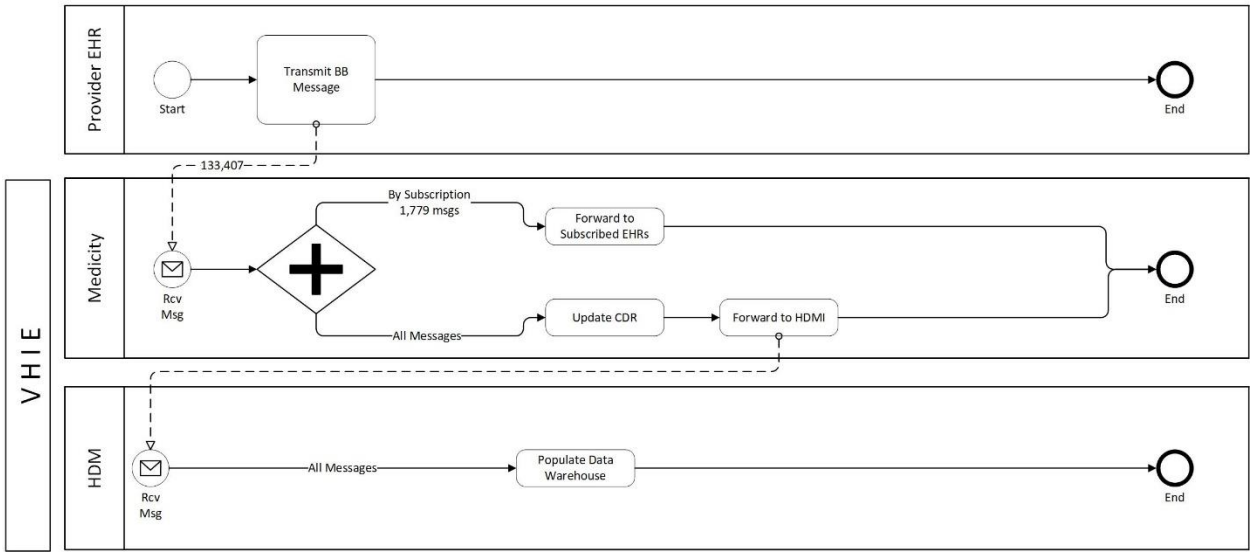
Telehealth

Telehealth Data Flow



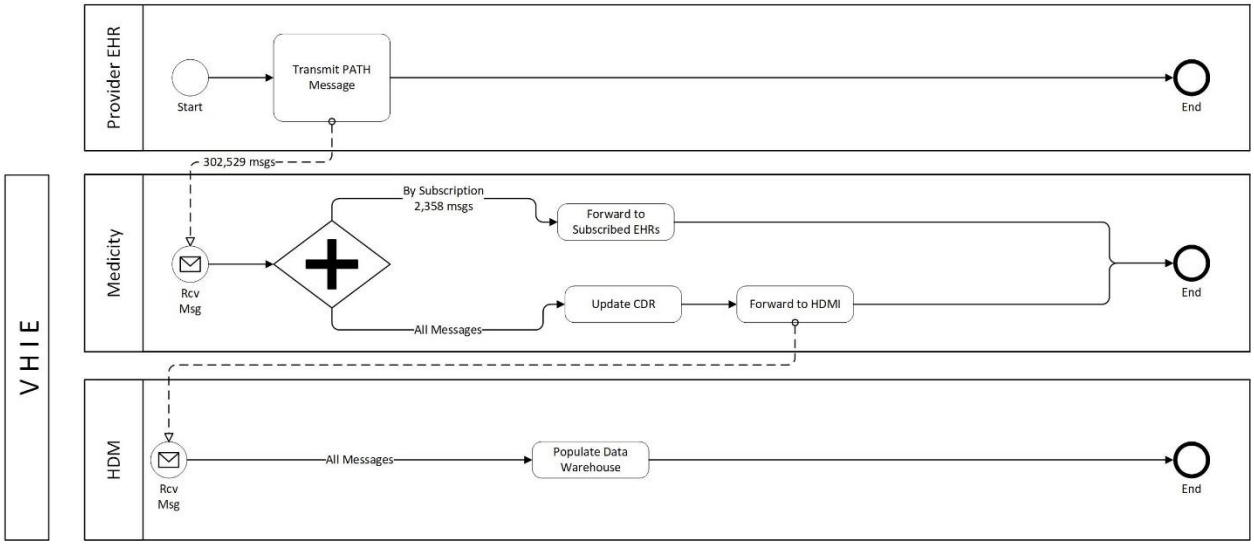
Blood Bank

Blood Bank Data Flow



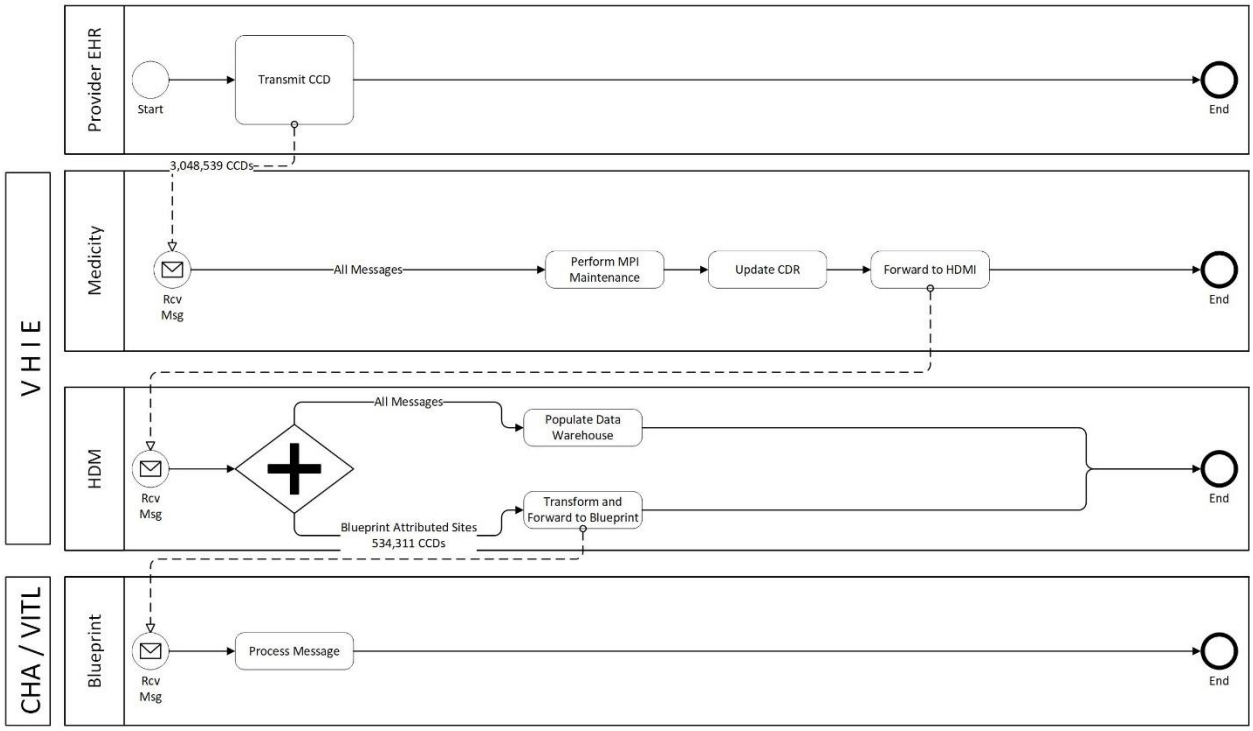
Pathology

Pathology Data Flow



Continuity of Care Document (CCD)

CCD Data Flow



Appendix J. Detailed Vermont IAPD Analysis

Statistics on number of users and types of data accessed was compiled from the IAPDs as shown in the table below. This table depicts a steady increase in interfaces, connections, and transactions documented throughout the years in the IAPDs.

Table 19 – IAPD Statistics Reported

	12/31/2011 [102]	12/31/2012 [103]	12/31/2013 [104]	06/30/2015 [105]	12/31/2016 [106]	8/22/2017 [107]
Interfaces	26	61	131	241	955	
Hospitals		12	13	14	14	
Master Patient Index	300,000	543,500	800,000	1,500,000	2,400,000	2,700,000
Blueprint ambulatory providers		466	601	682		
Immunization Registry transactions		676	15,513	146,121		
VITLDirect Users		66	74	79		
VITLAccess Users				1,932	2,542	2,736

The 2011 - 2014 IAPDs only reported high-level information and benchmarks for the HIE projects. Beginning with the 2015 IAPD, additional details were included for requested projects:

2015 (October 1, 2014 through September 30, 2015)

1. Interfaces
2. VITLAccess eHealth Specialist Provider Assistance
3. Install eCW hub for CCS
4. Data Warehouse
5. Conduct an MPI Assessment
6. Connectivity Criteria

[102] VT HSE IAPDU_112013_v2.0 draft
[103] VT HSE IAPDU_112013_v2.0 draft
[104] VT HSE HITECH APD_v1.5
[105] VT HIT IAPD 2015 v2.3
[106] VT HITECH IAPD v2.9.2_FINAL_26MAY2017
[107] VITL Overview for HealthTech Solutions 08222017

7. Provider Technology Readiness Assessment
8. HIXNY Implementation HL7 version 3 Query Response
9. Security Enhancements
10. Replace MyVITL
11. Assessment of Uber portal
12. Terminology Services
13. VITL Infrastructure Upgrades
14. Substance Abuse (42 CFR Part 2)
15. Patient Portal

Four of the 15 projects for 2015 were included in future IAPDs: Interfaces, Terminology Services, VITL Infrastructure Upgrades, and Substance Abuse (42 CFR Part 2).

2016 (October 1, 2015 through September 30, 2016)

1. Interfaces
2. VITL Access On-Boarding
3. Carry Forward from 2015
4. Data Quality and Analytics
5. Single Sign-On for Hospitals
6. Single Sign-On for Practices
7. VITL Infrastructure Upgrades
8. Vermont Prescription Monitoring System Connection to VHIE
9. Substance Abuse (42 CFR Part 2)
10. Cancer Registry Connection

Many of the projects from 2016 were carried over to the 2017 IAPD including: Interfaces, VITL Infrastructure Upgrades, Single Sign-On Hospitals, Single Sign-On Practices, Data Quality and Analytics, and VITL Access On-Boarding and Substance Abuse (42 CFR Part 2).

2017 (October 1, 2016 through September 30, 2017)

1. Interfaces
2. Terminology Services
3. VITL Access On-Boarding
4. Data Quality and Analytics
5. Single Sign-On for Hospitals
6. Single Sign-On for Practices
7. Data Quality Workflow Support
8. Technical Support
9. VITL Infrastructure Upgrades
10. 42 CFR Part 2
11. Physiologic Data

12. Immunization Automatic Acknowledge
13. VPMS Implementation
14. Consent Policy Review

Terminology Services and VITL Access On-Boarding (reframed as "VITL Access to Use" for the 2018 IAPD) were carried over to 2018.

2018 (October 1, 2017, through September 30, 2018)

For the FFY2018 IAPD, the following projects have been requested.

1. Connectivity to the VHIE
2. Client Services Meaningful Use and Security Risk Assessment
3. VHIE Access and Use
4. FHIR Interface to Vermont Medicaid Chronic Care Initiative
5. Terminology Services
6. Blueprint Data Quality Workflow Support

Please note that the SOV indicated the FFY2018 projects requested were related to core activities only, meaning that new functionality and enhancement projects were not included.

IAPD Analysis Summary

The following table depicts projects included in the IAPDs for the 2015 through 2018 period. While it makes sense for some of the projects such as VITLAccess and Interfaces to span multiple years, other projects such as the 42 CFR Part 2 project requested funding for three straight federal fiscal years and most likely should have been a one-time funded project.

Table 20 – HIE IAPD Projects

Projects	FFY 2015	FFY 2016	FFY 2017	FFY 2018
VITLAccess eHealth Specialist Provider Assistance/VITLAccess On-Boarding/VHIE Access and Use	✓	✓	✓	✓
Terminology Services	✓		✓	✓
Interfaces	✓	✓	✓	
42 CFR Part 2	✓	✓	✓	
VITL Infrastructure Upgrades	✓	✓	✓	
Data Quality and Analytics		✓	✓	
Single Sign-On for Hospitals		✓	✓	

Projects	FFY 2015	FFY 2016	FFY 2017	FFY 2018
Single Sign-On for Practices		✓	✓	
Carry Forward Projects from 2015		✓		
Install eCW hub for CCD	✓			
Data Warehouse	✓			
Conduct an MPI Assessment	✓			
Connectivity Criteria	✓			
Provider Technology Readiness Assessment	✓			
HIXNY Implementation HL7 version 3 Query Response	✓			
Security Enhancements	✓			
Replace MyVITL	✓			
Assessment of Uber Portal	✓			
Patient Portal	✓			
VT Prescription Monitoring System Connection to VHIE		✓		
Cancer Registry Connection		✓		
Data Quality Workflow Support			✓	
Technical Support			✓	
Physiologic Data			✓	
Immunization Automatic Acknowledge			✓	
VPMS Implementation			✓	
Consent Policy Review			✓	
Connectivity to the VHIE				✓
FHIR Interface to VT Medicaid Chronic Care Initiative				✓

Projects	FFY 2015	FFY 2016	FFY 2017	FFY 2018
Client Services Meaningful Use and Security Risk Assessment				✓
Blueprint Data Quality Workflow Support				✓

Appendix K. Detailed Feed Interface Measures

It is important to understand what data is being collected in the HIE to know what will be available for use. Data availability and its uptime is an advanced area to consider ensuring that there is good, accurate information always available for use. The following table provides a brief description of the Data Feed Interfaces and Services listed. The services offered by the HIE to the participants is often initially synonymous with a data feed interface however, as the HIE matures there will be more and more services created that use existing data and therefore have names that are not at all similar to the data feeds they ultimately utilize. Providing information to payers for HEDIS purposes or other reporting provided to payers are examples.

Table 21 – Data Feed and Interfaces Services

Data Feed Interfaces and Services	Description
Event Notification (Often using ADT)	Event Notifications are sent using Admit, Discharge, and Transfer messages to provide basic patient demographics and other data.
Syndromic Surveillance - Public Health Feed	Submits diagnosis and syndromic monitoring data to Syndromic Registry or Biosense 2.0.
Lab Orders	Connected Systems send lab orders to the HIE to be routed to the appropriate lab partner.
Lab Results	Lab results are received by connected labs, stored, and routed to those ordering providers who are connected for this service.
Electronic Laboratory Reporting (ELR) - Public Health Feed	Sends qualifying results from a Lab Results feed to the Public Health Department.
Transcription	Accepts transcribed reports as ORU^R01 HL7 messages.
Radiology	Accepts medical imaging reports as ORU^R01 HL7 messages.
Continuity of Care Document (CCD)	Standardized document that gives a summary of information on a patient. The CCD is either contained within an MDM^T02 HL7 message or a standard XML document.
Immunization Registry Public Health Feed	Sends record of administered immunizations to the Immunization Registry as VXU HL7 messages.
Cancer Registry - Public Health Feed	Send C32 CDA-type document to the Cancer Registry.

Data Feed Interfaces and Services	Description
XDS.b Cross-Enterprise Document Sharing	Provides the HIE XDS.b documents generated by the participant.
XCA Cross-Community Architecture	Provide the HIE participants access to data located in a separate community by way of IHE XCA profile.
Direct Secure Messaging	Allow send and receive of secure messages to and from any other Direct account including all Direct Trusted Agent Accreditation Program accredited accounts.

Appendix L. Vermont HIE Evaluation Elements

The Act identified nine "Evaluation Elements" which were used as a basis for determining Key Inputs and Analysis Methodology/Tools. The table below lists each of the Evaluation elements and the key inputs and tools identified to address each element.

Table 22 – Evaluation Elements

No.	Evaluation Elements Identified in the Legislation	Key Inputs	Analysis Methodology/Tools
1	Review the past development, approval process, and use of the Vermont Health Information Technology Plan	Original VHIT plan and unapproved updated VHIT document, SMHP	Review and add any additional updates
2	Review how past payments from the fund have or have not promoted the advancement of health information technology adoption and utilization in Vermont	Obtain traffic data, statistics from IAPDs, ASPE Interoperability Study, VITL payments mapped to use, # of user agreements	Private HIE research, interviews and focus groups, other state experiences, MU data reported, CEHRTs reported
3	Review property and ownership of the VHIE, including identifying all specific tangible and intangible assets that comprise or support the VHIE (especially regarding VITL's current and previous agreements with the state), and the funding sources used to create this property	Provide a matrix for data needed	Review contract language Review funding history in relationship to procurement of infrastructure, provider owned, non-provider owned data, and configuration
4	Recommend any accounting or financial actions the state should take regarding state-owned tangible and intangible	Results of the analysis performed under No. 3	Recommendation on how the state may account for tangible and intangible assets

No.	Evaluation Elements Identified in the Legislation	Key Inputs	Analysis Methodology/Tools
	assets that comprise or support the VHIE		
5	Review VITL organization, including its maintenance and operation of VHIE, the organization's ability to support current and future healthcare reform goals, defining VITL's core mission, identifying level of staffing necessary to support VITL to carry out its core mission, and examining VITL's use of its staff for activities outside its core mission	VITL stakeholders, stakeholders with historical perspective SOV-Architecture and Security Assessment document analysis Comparison with other HIEs Review and evaluation of VITL technical and operations documentation Review of Medicity functionality: Was-Is/As-Is/To-Be	Core mission analysis from different perspectives
6	Evaluate approaches to health information exchange in other states, including Maine and Michigan, to identify opportunities for reducing duplication in Vermont's HIE infrastructure	Previous state research and analysis	Comparison across comparable Health Information Exchanges
7	Review need for state sponsored Health-IT Fund	Output from multiple evaluation elements	Financial analysis, ROI analysis, identification of competing options
8	Recommend whether to continue the Health-IT Fund with its current revenue source as set forth in 32 V.S.A § 10402	Review current source of funding under contract Document remaining fund and reduced state funding and SIM report Review of the HIT Fund legislative reports and financials	Cash flow, analysis of private HIE in VT. University of VT/EPIC use. What do ACOs use?

No.	Evaluation Elements Identified in the Legislation	Key Inputs	Analysis Methodology/Tools
		Will state funding be sufficient without grant funding? CMS HITECH funding ends 2021. Is MMIS ongoing funding a possibility?	
9	Recommend any changes to the structure of VITL, including whether it should be a public or private entity, and any other proposed modifications to 18 V.S.A § 9352	Document current governance structure. Comparison with other working models.	Will recommendations require modifications to the statute?

Appendix M. Frequently Used Terms and Acronyms

AA – Architectural Assessment

ADS – Agency of Digital Services

ACO – Accountable Care Organization-groups of doctors, hospitals and other healthcare providers who come together voluntarily to give coordinated care for patients

ADT – Admission, Discharge, and Transfer- messages sent regarding patient visit including diagnosis and discharge information

AGO – Attorney General's Office

AICPA – American Institute of CPAs - sets ethical standards for the profession and U.S. auditing standards for private companies, nonprofit organizations, federal, state and local government.

AoA – Agency of Administration in Vermont

APIs – Application programming interfaces- have the ability to support exchange of discrete high-value data elements or templates

All Payer Model – Alternative payment model in which the most significant payers throughout the entire state – Medicare, Medicaid, and commercial healthcare payers – incentivize healthcare value and quality, with a focus on health outcomes, under the same payment structure for the majority of providers throughout the state's care delivery system and transform healthcare for the entire state and its population.

ASPE – Assistant Secretary for Planning and Evaluation under the federal Department of Health and Human Services

Blueprint for Health – State-led, nationally recognized initiative transforming the way primary care and comprehensive health services are delivered and paid for.

CCAG – Common Credentialing Advisory Group – a subcommittee in the state of Oregon overseeing implementation of a statewide common credentialing system

CCD – Continuity of Care Document/Consolidated Clinical Document- Standardized document that gives a summary of information on a patient. The CCD is either contained within an MDM^T02 HL7 message or a standard XML document.

CCDA – Consolidated Clinical Document Architecture

CCO – Coordinated Care Organizations

CDC – Centers for Disease Control & Prevention

CDR – Clinical Data Repository

CEHRTs – Certified EHR Technology- EHR technology that has been certified through meeting standards established by CMS and the ONC

CEO – Chief Executive Officer

CISO – Chief Information Security Officer

CMS – Centers for Medicare & Medicaid Services

CORHIO – Colorado Regional Health Information Organization- prominent HIE in Colorado interviewed during the Vermont Evaluation of HIT Activities

CPA – Certified Public Accountant

CRISP – Chesapeake Regional Information System- SDE in Maryland as well as operates HIEs for West Virginia and Washington DC that was interviewed during the Vermont Evaluation of HIT Activities

DDI – Design, Development and Implementation

DHIN – Delaware Health Information Network- Self-Sustaining HIE in Delaware that was interviewed during the Vermont Evaluation of HIT Activities

DSM – Direct Secure Messaging

DVHA – Department of Vermont Health Access- responsible for the management of Vermont's publicly funded health insurance programs

eCQM – Electronic Clinical Quality Measure

eCW – eClinical Works- EHR technology utilized by some providers within the state of Vermont

ELR – Electronic Lab Reporting- sends qualifying results from a Lab Results feed to the Public Health Department

EHR – Electronic Health Records- the systematized collection of patient and population electronically-stored health information in a digital format. These records can be shared across different healthcare settings.

EMR – Electronic Medical Record- the systematized collection of patient and population electronically-stored health information in a digital format. These records can be shared across different healthcare settings.

ESC – Executive Steering Committee- comprised of individuals representing multiple agencies and organizations to provide guidance in the development of the evaluation approach for the Vermont Evaluation of HIT Activities

ETL – Extract, Transform and Load - a process of how the data are loaded from the source system to the data warehouse.

ERD – Entity Relationship Diagram - shows the relationships of entity sets stored in a database

G&A – General and administrative expenses of a company. Generally accepted accounting principles consider operating expenses to be the day-to-day costs of running a business

GAAP – Generally Accepted Accounting Principles

GAGAS – Generally Accepted Government Auditing Standards

GMCB – Green Mountain Care Board- entity responsible for approving updates to the State of Vermont HIT plan.

FFY – Federal Fiscal Year

FHIR – Fast Healthcare Interoperability Resources- current standard under development that is API based.

FIPS – Federal Information Processing Standard - a U.S. government computer security standard used to approve cryptographic modules.

HCOP – Health IT and Health Information Exchange Community Advisory Council – an advisory council in the state of Oregon.

HDM – Health Data Management - infrastructure put in to place to capture needs beyond those provided by the Medicity infrastructure, comprised of a message processing engine, a data warehouse, and a vocabulary manager

HEDIS – Healthcare Effectiveness Data and Information Set- a tool used by more than 90% of health plans to measure performance on important dimensions of care and service consisting of 81 measures across 5 domains of care

HIE – Health Information Exchange

HIPAA – Health Insurance Portability and Accountability Act – US legislation that provides data privacy and security provisions for safeguarding medical information.

HISP – Health Information Service Provider- securely transports encrypted health information, such as images, reports, and clinical document architecture in a standardized format from on healthcare provider to other facilitating exchange

HIT – Health Information Technology-information technology applied to health and healthcare.

HITECH Act – Health Information Technology for Economic and Clinical Health Act – promoted health information exchange across the US

HIXNY – HixNY is a regional health information organization of physician practices, hospitals, health plans and other organizations in the Greater Capital Region and Northern New York State

HL7 Message – Used to transfer electronic data between disparate healthcare systems.

HTS – HealthTech Solutions- technology and consulting services firm responsible for conducting the Vermont Evaluation of HIT Activities

IAPD – Implementation Advance Planning Document- approval document used to request federal funding for the develop, implementation, maintenance, and operations of a project

IV&V – Independent Verification & Validation- involves verification and validation done by a third-party organization not involved with the development of the product

IDNs – Integrated Delivery Networks- a network of healthcare organizations under a parent holding company

Medicity – Contractor to VITL, operator of the clinical data repository of the VHIE

MDHHS – Michigan Department of Health and Human Services

MHCC – Maryland Health Care Commission- independent regulatory agency with wide-ranging authority over health systems in the state of Maryland.

MiHIN – Michigan Health Information Network- a network of public and private organizations working to promote secure electronic exchange of health information, interviewed during the Vermont Evaluation of HIT Activities

MLLP – Minimal Lower Layer Protocol - defines the leading and trailing delimiters for an HL7 message.

MMIS – Medicaid Management Information System- a mechanized claims processing and information retrieval system for Medicaid that is required by the federal government

MOAC – Michigan Operation Advisory Committee

MPI – Master Patient Index/Master Person Index- index of patients used to match patient data across providers

MU – Meaningful Use- using certified electronic health record technology to improve quality, safety, efficiency and reduce health disparities, engage patients and family, improve care coordination, and population and public health, and maintain privacy and security of patient health information

MyHealth Access Network – Operated by the Greater Tulsa Health Access Network Inc., provides health information exchange and related services across Oklahoma, and was interviewed during the Vermont Evaluation of HIT Activities

NeHII – Nebraska Health Information Initiative- HIE in Nebraska developed independently of the state and sponsored by provider and health insurers interviewed during the Vermont Evaluation of HIT Activities

NIST – National Institute of Standards and Technology

O&M – Operations and Maintenance

OeHI – Office of eHealth Innovation in Colorado

OHA – Oregon Health Authority- entity that oversees the HIE activities in Oregon that relies on a network of network approach with a use case strategy to develop high value services that was interviewed during the Vermont Evaluation of HIT Activities

OHIT – Office of Health Information Technology in Oregon

OMB – Office of Management and Budget - oversees the performance of federal agencies, and administers the federal budget.

ONC – The Office of the National Coordinator for Health Information Technology- the principal federal entity charged with coordination of nationwide efforts to implement and use the most advanced health information technology and the electronic exchange of health information

PatientPing – A third-party subscription service that is used to send alerts to providers when certain events, such as emergency room visits, occur

PD – Provider Directory- a listing of healthcare providers

PDAC – Provider Directory Advisory Committee – a committee in Oregon overseeing implementation of the statewide Provider Directory project.

PDMP – Prescription Drug Monitoring Program- a statewide electronic database which collects designated data on substances dispensed in the state

PHI – Protected Health Information- information about health status, provision of healthcare, or payment for healthcare

QHN – Quality Health Network- Prominent HIE in the state of Colorado interviewed during the Vermont Evaluation of HIT Activities

RFP – Request for Proposal

RLS – Record Locator Service

SDE – State Designated Entity- an entity designated by the state to receive ONC funding to facilitate state HIE efforts

SIM grant – State Innovation Model grant- grant to advance multi-payer healthcare payment and delivery system reform models

SMHP – State Medicaid HIT Plan**-** provides State Medicaid Agencies (SMAs) and CMS with a common understanding of the activities that SMAs will be engaged in relative to HIT.

SMS Messaging – Short Message Service- commonly referred to as text message allowing you to send a message up to 160 characters to another device

SoV – State of Vermont

SFY – State Fiscal Year

TEP – Technical Expert Panel

UHIN – Utah Health Information Network- provides fee based payer and provider services of HIT solutions

VCCI – Vermont Chronic Care Initiative

VHIE – Vermont Health Information Exchange- enables healthcare providers across the state of Vermont and surrounding regions to exchange clinical data

VHITP – Vermont Health Information Technology Plan-

VITL – Vermont Information Technology Leaders- legislatively designated operator of the Vermont Health Information Exchange (VHIE)

VITLDirect – Secure message service offered by VITL

VITLAccess – Portal offered to healthcare providers by VITL to allow access to a patient-centered view of clinical data available through the VHIE

VXU – Vaccination record update transaction used in the immunization registry.

XDS.b – Cross-Enterprise Document Sharing - a collection of standards for exchanging clinical documents via an interoperability profile that facilitates the registration, distribution and access across health enterprises of patient electronic health records. It provides functionality to transmit and query for clinical documents.

Appendix N. AICPA Audit Committee Toolkit

The National Council of Nonprofits and American Institute of CPAs (AICPA) Audit Committee Toolkit notes the importance of a Board's fiduciary duty and governance structures which encourage accountability. The Audit Committee would necessarily have a different composition and mission from VITL's existing Finance Committee - which is best articulated by the AICPA:

Audit Committee	Finance Committee
a) Reviews the organization's financial statements and other official financial information provided to the public	a) Oversees the preparation of the annual budget and financial statements. The finance committee ensures that budgets and interim financial statements are prepared
b) Ensures that reports are received, monitored, and distributed correctly	b) Oversees the administration, collection, and disbursement of the organization's financial resources, in addition to the related policies and procedures
c) Oversees the organization's internal controls, including management's compliance with applicable policies and procedures and risk management (for example, for organizations that are part of a national network, annually reviewing whether the organization meets the re-chartering requirements of its national organization)	c) Advises the Board with respect to making significant financial decisions, such as correcting or restructuring the organization's books and accounting procedures when fiscal problems arise
d) Usually oversees the annual independent audit process, including engaging the independent auditor and receiving all reports and management letters from the auditor	
e) Reviews the annual information returns (IRS Form 990, related schedules, and forms) and recommends it for approval, signature, and submission by the	e) Oversees the preparation and implementation of the governance policies referenced in the Form 990: conflict of interest, document retention,

Audit Committee	Finance Committee
appropriate officer. The audit committee also transmits the returns to the Board for its review before signing and submitting it. The audit committee engages (on the Board's behalf) and interacts with the independent auditor or auditing firm. Many audit firms also prepare the federal and state tax returns for their non-profit audit clients	whistle-blower, review of executive compensation
f) Reviews the organization's procedures for reporting problems. The Audit Committee may exercise primary responsibility to review the whistle-blower policy and process, anti-fraud policies, and policy and procedures related to the discovery of errors or illegal acts, whistle-blower hotline, and other communication methods and determine the process for "special investigations" (whistle-blower allegations, anti-fraud compliance, discovery of errors or illegal acts).	f) Should ensure that joint membership between the Audit Committee and the Finance Committee meets local laws and regulations (if an organization has both committees).
g) The Board may delegate other authority and/or duties to the Audit Committee.	

Appendix O. Review of VITL Policies and By-Laws

The project team reviewed VITL's policies and By-Laws identified in the table below.

Policy Name	Policy Number	VITL Website
Procurement Policy	FIN-01	No
Compensation and Benefits Policy	FIN-02	No
Employee Expense Reimbursement Policy	FIN-03	No
Cell Phone Usage and Cost Allowance Policy	FIN-04	No
Cash Management & Interest Policy	FIN-05	No
Bad Debt and Bonding Cost Policy	FIN-06	No
Capitalization & Depreciation Policy	FIN-07	No
Cost Policy Statement	FIN-08	No
Risk Management Policy	FIN-09	No
Revenue Recognition Policy	FIN-10	No
Conflict of Interest Policy	FIN-11	No
Clinician Stipends	FIN-12	No
Indirect Expenses Policy	FIN-13	No
Information Privacy and Security Management Process	InfoSec1	Yes[108]
Information System User Policy	InfoSec2	Yes[109]
Information System Access Control Policy	InfoSec3	Yes[110]
Information Security Incident Response	InfoSec4	Yes[111]
Disaster Recovery Policy	SEC006-01	Yes[112]
Mobile Device Security Policy	SEC007-01	No
Policy on Secondary Use of PHI on VHIE		Yes
Corporate By-Laws		Yes
Policy on Patient Consent for Provider Access to PHI on VHIE or through the Blueprint		Yes
Disaster Recovery Procedure	SEC006-02	No[113]
VITL Downtime Notification Procedure	OPS-CABDNP-001	No
VITLAccess Audit Procedures	SECPROC03	No
Policy on Participating Health Care Provider Policies and Procedures for the VHIE		Yes
Security Policy Introduction	SEC010	Yes
Glossary of Terms	SEC011	Yes

[108] Current policy (July 24, 2017) provided by VITL is not on the website.
[109] Current policy (July 24, 2017) provided by VITL is not on the website.
[110] Current policy (July 24, 2017) provided by VITL is not on the website.
[111] Current policy (July 24, 2017) provided by VITL is not on the website.
[112] Policy reviewed by CTO but not approved by CEO. VITL provided a copy of policy on October 13, 2017.
[113] Policy reviewed by CTO but not signed by CEO. VITL provided a copy of policy on October 13, 2017.

A request was made by HTS to obtain a copy of VITL's record retention policy, review the list of above polices and advise if there were any polices omitted from the list. VITL advised that the record retention policy was out of date, due for revision, and as a result did not provide a copy. Additionally, VITL did not provide any response to the policy list review request.