Health Information Technology Approaches in QUERI Implementation Research:

Case Study Evaluation

VA Information Resource Center
Quality Enhancement Research Initiative Consultation

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EXECUTIVE SUMMARY

Background and Objectives

Since the inception of the Health Services Research and Development (HSR&D) Service Quality Enhancement Research Initiative (QUERI) program, the VA Information Resource Center (VIReC) has provided consultation relating to technical assistance, scientific reviews, educational programs, and dissemination activities regarding use of data, data resources and clinical informatics in research. In 2008, QUERI leadership asked VIReC to perform a follow-up evaluation to an earlier study to explore issues specifically related to health information technology (HIT) in QUERI-supported implementation research. We used a case study approach and sought to address the following aims:

1) Describe current HIT strategies in use
2) Identify barriers related to the use of HIT
3) Identify facilitators related to the use of HIT
4) Identify emerging requirements for HIT

Design, Methods, and Analysis

The evaluation selected cases from among funded QUERI implementation research projects that: 1) were actively deploying HIT as a key component of an intervention (QUERI implementation research stage 4, 5/6), and 2) were open and active in FY 2009. The project team rated the projects to qualify a purposeful sample of implementation science projects involving HIT for inclusion. The team developed an interview guide and conducted field interviews with key informants affiliated with selected cases. VIReC contracted with the Survey Research Laboratory of the University of Illinois for qualitative analysis of the field interview transcriptions. The project team reviewed the qualitative analysis and considered contextual factors in the VA to develop a set of implications of these findings. Recommendations were made based on this set of implications.

Findings and Implications

Case Selection

We purposefully selected 9 projects from among the 88 involving HIT in the areas of: clinical decision support system (2 studies), CPRS-based clinical reminder, CPRS-based collaborative care management, Web-based collaborative care management, interactive kiosk, clinical documentation, home telemedicine, and tablet computers with audio capabilities for interactive self interviews. We also actively sought an implementation project using MyHealth*e*Vet; however, no projects were active at the time of this evaluation.

Major Findings

Three principal pathways, all critical to the implementation process emerged from our analysis: Information Technology (IT) Pathway; Operations Pathway; and Research Pathway. Each pathway provides an organizing structure for our findings and implications.

IT Pathway

- The transition from decentralized to centralized IT resource allocation frustrated researchers
- Standards and resources for loading research trial HIT onto local facility servers were unclear and problematic
- There were examples of both successful national deployment and unsuccessful national deployment of research HIT
- Researchers faced considerable obstacles in connecting research HIT to CPRS/VistA systems
- Researchers experienced obstacles in the purchase of new devices
- Placing new end user devices into the operational setting introduced new challenges of physical security for the devices and providing support for their use

Operations Pathway

- Building networks of collaboration was a major task for HIT researchers
- End user participation was a critical factor in HIT successes
- Research that serves the stated priorities of the organization is more likely to be successful

Research Pathway

- Researchers found obtaining continuous funding for their programs of research to be problematic
- Researchers found that regulations and IRB scope varied across VA sites and this variation made planning for research timelines very challenging
- QUERI Center funding support was a critical factor in HIT implementation research successes

Major Implications of the Findings

IT Pathway

- Researchers followed three basic strategies for attaining compliance with VA OI&T (Office of Information and Technology) software standards: 1) work with national VHA Office of Health Information (OHI), 2) work with local VA OI&T, or 3) augment existing CPRS/VistA software
- Most researchers relied on collegial relationships with local OI&T contacts for IT solutions that touch the CPRS/VistA system in any way
- Projects progressed more quickly when they minimized burdens on OI&T staff
- Projects had mixed success in achieving data exchange with CPRS/VistA
- HIT research programs need to plan past the development of the HIT and include their vision for how the HIT and related infrastructure will be maintained when the research projects are complete

Operations Pathway

- Organizational pull from the VHA organization is exceedingly important in advancing HIT from implementation science research to national deployment
- End user participation is a critical factor in HIT success, thus various forms of usability testing are needed at several stages in development, from early stages through national deployment

Research Pathway

- There is presently no path for acquiring VA OI&T resources to support implementation research involving HIT
- The current HIT research funding structure is a barrier to initiating and sustaining the resources required

Recommendations

Based on the study findings, we recommend the following actions to address challenges associated with implementation research involving HIT.

Recommendation 1: Obtain access for researchers to an appropriate IT architecture for development and deployment of implementation science-based HIT.

Problem Summary: Increased opportunities for researchers to influence the VA's IT architecture can make a significant difference in the likelihood of national deployment for implementation research-based HIT. We identified three methods of inserting new functionality into the VA HIT architecture that displayed potential for research: 1) utilization of functionality already present in CPRS/VistA such as Clinical Reminders or Health Factors, 2) use of thin clients operating from a national server platform, 3) operation of HIT trials on local servers.

Recommended Actions:

1) Better identify and understand the barriers to researchers performing implementation science research utilizing CPRS/VistA applications.
    a. Actions for ORD/ HSR&D/QUERI Directors
        i. Work with researchers to understand the barriers they face in developing new CPRS/VISTA applications and modifications
        ii. Work with OI&T to clarify for them the needs of research and clinical care that might enable modifications to CPRS/VISTA for improving quality of care
        iii. Advocate for national deployment of specific field based CPRS/VistA developments based on changes in the evidence base or VHA policy
2) Provide a server platform for HIT researchers to use for national deployment of a thin client.
    a. Actions for HSR&D/QUERI Director:
        i. Open discussion with OI&T to clarify processes for developing class III software for a server infrastructure for HIT development and deployment.
        ii. Advocate for CPRS/VistA data extract services for research HIT
        iii. Open a conversation with VHA Office of Informatics and Analytics (OIA) and VA OI&T regarding the need for insertion of specific new data elements in the electronic health record

3) Support the cooperation between OI&T and Research for the use of facility servers for local HIT trials.
    a. Actions for QUERI Director:

i. Communicate the pathway for moving HIT from test to institutionalization clearly to researchers
ii. Clarify with OI&T the responsibility/ authorization of facility OI&T staff for providing support for Research HIT trials
iii. Clarify with OI&T and then communicate to researchers clear parameters for what can be expected from local OI&T staff for software installation and maintenance for local trials
iv. Clarify with OI&T and provide to researchers clear standards for field developed HIT that will be allowed to be implemented on VA servers

b. Actions for VIReC:

i. Maintain liaison relationships with OI&T, OHI, OIA, VA Informatics and Computing Infrastructure (VINCI) POCs, and Consortium for Health Informatics Research (CHIR) to identify sources of information regarding preferred architecture for national deployment of research developed HIT
ii. Disseminate information to QUERI HIT researchers regarding official sources of information regarding preferred HIT architecture

Recommendation 2: Improve the process for garnering support for moving data and information systems from proof of concept to national implementation.

Problem Summary: The case studies indicated that some QUERI implementation researchers were able to take advantage of serendipitous opportunities to contribute to the VHA operations agenda. Ideally, the recognition of opportunities to contribute to the VHA strategic and operations agenda should be less based on chance occurrence and more grounded in the thoughtful linking of the QUERI research agenda with the VHA operations agenda. Efforts focused on developing connections and disseminating information so that researchers are aware of ongoing initiatives and can align their efforts with those of the system will likely yield the most value in the short term.

Recommended Actions:

1) Maintain and enhance connections between QUERI and initiatives from Offices of the Secretary and Under Secretary for Health as they evolve.

a. Actions for HSR&D/QUERI Director:

i. Explore with network leadership specific points of contact to assist researchers with collaboration with high priority HIT developments
ii. Identify opportunities for QUERI HIT implementation researchers on the VHA agenda, e.g., as was recently done for Patient Aligned Care Teams
iii. Engage ad hoc work groups to keep informed of the barriers and obstacles researchers face and to develop solutions to deploy HIT locally and nationally

b. Actions for VIReC:

i. Maintain liaison relationships with OI&T and VHA points of contact, especially OHI, OIA, VINCI and CHIR, to remain informed about all planned and active VHA informatics development initiatives

ii. Disseminate information about active and planned VHA informatics development to QUERI HIT researchers and to HSR&D/QUERI leadership

iii. Assist HSR&D/QUERI leadership with convening discussions and work groups

Recommendation 3: Foster the continuity of HIT programs of research.

Problem Summary: QUERI implementation research poses special continuity challenges because it is a program of research that requires upfront investment and sustained resources over time. The entire research prioritization, review and funding process should take into account the special needs of research that includes HIT. The effort focused on natural language processing culminating in the CHIR may provide an example of a successful yet highly focused process and ultimate program of research.

Recommended Actions:

1) Consider HIT project funding requests within the context of a program of HIT research efforts and support.

a. Actions for QUERI Director/QUERI researchers:

i. For peer review process, engage scientific reviewers who have expertise in informatics and HIT implementation and evaluation

ii. Researchers should include in their funding proposals:
- Their vision for maintenance of research-initiated HIT
- Plan for a follow-up assessment post implementation
- Evaluation of physical security and technical support
- Evidence of collaboration with end users

iii. Consider expanding an existing resource center or establishing a new resource center that would provide an infrastructure to support knowledge and practical expertise development skills in informatics and HIT. This resource should be specifically focused on a narrow range of high priority HIT areas. Collaboration with VIReC, a Resource Center with customer support and dissemination specialists focused on use of data, could be an efficient mechanism and support researchers

2) Research service should explore ways to leverage OI&T and Clinical Program resources to support research HIT.

a. Actions for HSR&D/QUERI Director:

i. Identify funding for continuity of HIT development, evaluation, and implementation projects that hold great promise through better understanding of IT funding determinations in OI&T

ii. Collaborate with OHI, OIA, OI&T, and VHA Network Office to identify high priorities requiring sustainable funding source(s) and obtain research funding for these efforts

b. Actions for VIReC:

i. Maintain relationships with OHI, OIA and data committees and provide regular reports to QUERI and research field about new IT initiatives and priorities

ii. Assist QUERI/HSR&D with identifying initiatives that may offer the best opportunities for QUERI researchers to leverage their efforts

c. Actions for researchers:

i. Seek collaboration with OI&T and clinical partners

ii. Ensure sufficient and appropriate informatics expertise on the project

iii. Leverage opportunities in clinical programs to focus informatics development efforts

Recommendation 4: Seek national collaboration for implementation science-based HIT.

Problem Summary: The IT reorganization from a VHA decentralized model to a VA federated model complicates the ability of individual researchers or QUERI Centers or even program offices such as QUERI and HSR&D Service to establish collaborations with OI&T. ORD/HSR&D/QUERI need to be more involved in decision making about allocation of OI&T resources to ensure research HIT contributes in useful and productive ways to improve health care. In addition to the recommendations in the prior sections, we perceive the need to enhance national liaison relationships with OI&T and other program offices.

Recommended Actions:

1) Build a national collaboration for facilitating the development and deployment of research HIT.

a. Actions for ORD/HSR&D/QUERI Director:

i. Promote and establish a research program in informatics and HIT

ii. Consider collaboration with biomedical informatics resources supported through other national programs, such as the National Institutes of Health, National Center for Research Resources, Clinical and Translational Research Award Programs, many of which also have VA affiliations and are charged with developing a range of research informatics efforts; and the National Library of Medicine

b. Actions for VIReC:

i. Coordinate an invitational meeting among VA and VHA representatives which most likely would include the Office of Patient Care Services (PCS), OIA, OHI, OI&T, and the HSR&D CHIR/VINCI projects. This meeting would focus on a discussion of the findings and recommendations in this report and have the dual objectives of: 1) reaching consensus on action items for improving the development and deployment of research field-developed HIT and informatics, and 2) creating an ongoing collaboration to address

emerging issues related to research field-developed HIT and informatics

ii. Provide leadership and continuity for the ongoing collaboration

iii. Include communications from OI&T, OIA, OHI, VINCI, CHIR and other key informatics leaders in regular updates to QUERI researchers

2) Broadly disseminate information concerning HIT in implementation research.

a. Actions for VIReC:

i. Continue discussion and dissemination activities across a broad range of venues to ensure information exchange among many stakeholders

ii. Coordinate a special journal supplement on the development and use of HIT in QUERI implementation research. This supplement would highlight QUERI implementation research which utilizes HIT tools and solutions to conduct and evaluate quality improvement efforts

Limitations of This Evaluation

This study focused on the facilitators and barriers to performing QUERI implementation research involving HIT and does not document the impacts of QUERI HIT on either patient outcomes or VHA operations. An explicit objective of this evaluation was to focus on the perspectives of the key stakeholders directly involved in the research projects. Although the interviews raised many questions about OI&T support, it was not the intention of the study to also examine the OI&T perspective beyond those directly involved in carrying out the research. While we included the informatics scientist/developer as a key informant in each of our case interviews, these individuals were not OI&T staff. Similarly, we did not include PCS staff beyond those clinicians directly involved in the research projects. In addition, we did not include among the case studies a MyHealth***e***Vet project because we could not identify MyHealth***e***Vet implementation research projects at the time of this evaluation.

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This report presents the findings and conclusions of the authors; it does not necessarily represent the Department of Veterans Affairs or Health Services Research & Development Service.

1. Background and Objectives

Since the inception of the Health Services Research and Development (HSR&D) Service Quality Enhancement Research Initiative (QUERI) program, the VA Information Resource Center (VIReC) has provided consultation relating to technical assistance, scientific reviews, educational programs, and dissemination activities regarding use of data, data resources and clinical informatics in research.

In a 2005-6 evaluation, VIReC identified data and information strategies used in implementation research by QUERI investigators (Hynes, 2007; Hynes, 2010). VIReC documented QUERI's heavy dependencies on the development and deployment of databases and systems development projects and the increasing prevalence of clinical informatics. Specific recommendations included: improving the national-level integration of QUERI with VA operations; identifying funding sources to sustain the development of data and information systems; and, requiring QUERI Centers to include long term data and informatics strategies as a component of their annual strategic plans (Hynes, 2007, p 49). In 2008, QUERI leadership asked VIReC to perform a follow-up evaluation to explore in greater depth challenges and opportunities related to health information technology (HIT) in QUERI-supported implementation research. We used a case study approach and sought to address the following aims specific to QUERI implementation research:

1) Describe current HIT strategies in use
2) Identify barriers related to the use of HIT
3) Identify facilitators related to the use of HIT
4) Identify emerging requirements for HIT

Using this approach we provide recommendations to address current and emerging needs regarding HIT related to QUERI implementation research.

1.1 Background on HIT Development Resources

During the period of time in which the research projects evolved, the environment of HIT support and development has undergone multiple reorganizations. It isn't the purpose of this report to review the history of these reorganizations, however, we did consider the role and support of key offices that affected research-developed HIT during the most recent years of the case studies, and provide some context about these specific offices here.

Two of the directorates within the VHA Office of Health Information (OHI) are designed to provide HIT support to the field: (1) the Enterprise Systems Management Office (ESM) and (2) the Chief Health Informatics Office (CHIO). Both offices coordinate their efforts with the VA Office of Information and Technology (OI&T). ESM works with OI&T's Product Development organization. (http://vaww.oed.oit.va.gov/field_development) to provide a step-by-step guide for HIT developers to follow, which can lead software from Class 3 (local software produced outside the Product Development organization) to Class 1 (sanctioned for national deployment). The goal is to inform HIT developers about producing software that complies with

VA standards, uses approved tools, meets architectural requirements, is documented appropriately, and is otherwise qualified for national deployment. This process could be useful to QUERI because it could involve OI&T's Product Development organization in all of the steps of HIT development including the early stages. Unfortunately the current budget constraints have severely limited new field development and have proven to be a barrier to information technology innovation and deployment. Requests for field development follow a New Service Request process and are ultimately recommended for approval by the Information data management Committee (IDMC). Projects with a New Service Request filed and approved are left to flounder due to lack of OI&T funding and hence no OI&T development staff. This situation occurs when the HIT does not fall under one of five VA priorities: sustainment of existing systems, transformational initiatives, critical patient safety, core, organizational initiatives, or discretionary mission work (Lloyd, VeHU 2010).

- Two initiatives falling under the VHA OHI CHIO directorate have potential significance to QUERI researchers: the Innovation Sandbox and Grassroots (formerly Greenfield) Incubation Program. The Sandbox is a virtual space for HIT developers and researchers to collaborate, innovate, and develop requirements and products. For the Grassroots Incubation Program, field innovators apply for participation and are rated by their peers prior to a senior management review for funding. If selected, innovations receive funding to develop a functional prototype. (Seventy-one Grassroots projects have been awarded to date.) The Grassroots projects have been making use of resources set up in the Innovation Sandbox such as virtual space in which VHA software can be developed, evaluated and unit tested before being made generally available.

Under the VHA reorganization announced in November 2010, a new Office of Informatics and Analytics (OIA) has been set up under the leadership of Gail Graham, Acting Chief Officer, OIA. This office is separate from VHA's OHI, but will include under its purview the CHIO office. Also included under OIA are the Office of Medical Informatics and the Office of Nursing Informatics. While OIA is still in development and key offices within it may experience reorganization, VHA informatics innovation efforts going forward are expected to be coordinated through this office. As this recent reorganization evolves, QUERI research efforts should take note of strategic directions and opportunities that may facilitate or hinder their research.

2. Design and Methods

2.1 Selection of Cases for In-Depth Study

We selected cases from among funded QUERI implementation research projects that:

1) were actively using or deploying a HIT as a key component of an intervention (QUERI implementation research stage 4, 5/6), and 2) were open and active in FY 2009. We also took care to consider a broad range of the HIT types and to include representation across multiple QUERI Programs. We used information from QUERI Program Annual Reports and corroborated reports about the focus of the interventions and the HIT types with the study principal investigators and staff. The project team (DH, TW, EW, MB) rated the projects to qualify a purposeful sample of implementation science projects involving HIT for in-depth case

evaluation. Specific HIT types and QUERI projects that comprised the sampling frame are listed in the appendix (Appendix A).

2.2 Development of Interview Guide for Key Informant Interviews

We developed and field tested an interview guide to be used in the key informant (KI) interviews. Development of the guide included consultation with the Survey Research Laboratory at the University of Illinois at Chicago. We sought to obtain in depth information from key personnel involved in the development of the research aims and goals, operational aspects of the implementation of the HIT and in the development and deployment and evaluation of the HIT. We identified that we needed three project roles to fill the KI roles: Principal Investigator, Implementation Science Coordinator and Informatics Scientist/Developer for each case study. We developed the interview guide with these perspectives in mind. The final interview guide comprised 46 questions, organized into five sections (see Appendix E: Interview Guide)

- HIT Descriptions – Identification of HIT and research context
- HIT Resources – Identification of resources needed because of the use or development of the HIT
- HIT Objectives and Accomplishments – Identification of purpose of the HIT, whether goals were accomplished and obstacles that were overcome
- OI&T Process – Identification of VA process used to request permission to connect study HIT with CPRS
- Lessons Learned – Key Informant's subjective assessment of HIT in QUERI research

In addition, interviewers made extensive use of probes when they felt that further information was necessary to provide a clearer picture of the implementation process. Although the interviewers used a standardized instrument, two KIs preferred to talk about the project and then let the interviewers ask follow-up questions for any further information they needed.

2.3 Key Informant Interviews

We identified KIs for each case study for each role with the assistance of QUERI Center staff. Once the identified key informants agreed on participation, we arranged face to face interviews via a series of emails and telephone communication.

Two VIReC staff attended each KI interview (pairs included TW, EW, RP, or JH). They informed the KI that the Hines IRB had reviewed the study and considered it exempt. We recorded all interviews and had transcripts made by a hospital contractor. VIReC project staff who conducted the interviews performed a transcript quality review prior to sending the transcripts for analysis by comparing each transcript with the audio recording. Project staff (LM & EW) removed all names prior to coding for analysis and replaced each with a random code assigned to each individual. Transcripts were sent to an outside contractor for qualitative analysis.

3. Analysis

As a case study design all analyses were qualitative. Two analysts divided the projects, with one analyzing five sets of transcripts and the other analyzing four. The two analysts analyzed the transcription data and coded their interpretations using Atlas TI software. Two approaches were used: the first pass used the structure of the Interview Guide questions and the second coding pass ignored the Interview Guide structure and identified themes that emerged from the data. The second thematic coding provided a general portrait of HIT implementation, highlighting the objectives, resources, facilitators, obstacles, and strategies used by the implementation teams.

4. Findings

4.1 Case Selection

The Annual Reports for the nine QUERI Centers listed 345 projects. We identified descriptions in 88 of the abstracts for these projects that could loosely be interpreted as "HIT" (see Appendix A: HIT Case Study Candidate Projects). VIReC classified a project as "HIT" if it included any reference to electronic devices used to collect or communicate digital information related to clinical care, with the exception of standard voice telephone.

We identified 14 HIT types when we tagged each of the 88 projects with an emergent classification: Clinical Decision Support Systems (CDSS) (n = 4); Clinical Reminder (n = 13; CPRS Template (n = 15); HIT Treatment (n = 2); Interactive Voice Response (IVR) (n = 5); Kiosk (n = 3); MyHealtheVet (MHV) (n = 5); Multi-Media (n = 3); Personal Digital Assistant (PDA) (n = 2); Telehealth/Consultation (n = 4); Telehealth/Home (n = 9); Tracking Systems and Databases (n = 7); VistA Interface (n = 4); and Web-Based (n = 12) (see Appendix A). We rejected projects in six of the HIT type categories for the following reasons:

- HIT Treatment: Computers used as a therapy considered outside of the study scope
- IVR: Traditional technology considered outside of the study scope
- MHV: No suitable implementation studies available
- Multi-Media: Training videos considered outside of the study scope
- VistA Interface: Technical innovation without affecting patient care process considered outside of the study scope
- Web-Based: Traditional Web site considered outside of study scope

Based on the application of the selection criteria, the project level case study analysis focused on nine projects in the eight remaining HIT type categories (See Appendix B: HIT Case Study Marker Projects. Project labels used below and study titles are given in this appendix.).

- Two studies utilized a clinical decision support system that displays as a pop-up window in CPRS. (**ATHENA-HTN and OT**)
- One study involved collaborative care management using telephones for assessment and CPRS for a care/intervention. (**TIDES**)

- Another study used an interactive kiosk for documenting patient symptoms and concerns. (**PAS**)
- One study developed a clinical software application for documenting care. (**CART-CL**)
- One study involved collaborative care management using a telephone assessment and web-based program. (**Net-DSS**)
- One telemedicine study used a video phone and in-home messaging. (**TV**)
- One study utilized an interactive audio computer assistant for self interviews. (**ACASI**)
- The last study utilized a CPRS-based clinical reminder. (**AUDIT-C**)

We did not include a case study of MyHealtheVet (MHV) because we could not identify a current instance of the use of MHV in a QUERI implementation study. Additionally, we used an SCI QUERI program as a pilot to develop the interview tool, however the data for this case study was not included in the analysis since the project was not active.

4.2 Overview of Project Advancement and Implementation Pathways

Analysis of the case study transcripts revealed how researchers used a combination of approaches for the advancement of HIT in QUERI implementation research. Researchers used the metaphor of "pathway" to express their need to find and follow the correct project-exogenous steps to comply with VA requirements to facilitate progress and remove barriers to advancing their program of research to the next stage. For example,

> "So, I told you earlier how we had an organizational structure where the chief medical officer worked with VISN IT people to identify a IT point of contact at each medical center, and then the IT point of contact helped direct **paths** to the right person at that med center."
>
> "There's not a really good process for getting information technology people to think about what are the pros and cons of different approaches and then to get on a **path** that will really most efficiently make this happen."
>
> "There's a supposedly, or is, a theoretical **pathway** towards this software actually becoming live in the VistA".
>
> "Nobody really understands how the system works and the system is changing. In the old days, what made this successful was that we had four centralized groups that sort of bridged all of those needs, the clinical needs, the technology needs and the development needs, now it's just in one group. I guess the disadvantage of that is that we didn't get as many ideas and the advantage of it was that you had people who have multiple skills and could facilitate input from the providers and there were lots of **pathways** for the provider to get them and that's not true anymore."

We identified three principal VA pathways, all critical to the implementation process: Information Technology (IT) Pathway; Operations Pathway; and Research Pathway. The IT Pathway refers to complying with the VA Office of Information and Technology (OI&T) policies and building collaborations. The Operations Pathway refers to complying with VHA policies and building necessary collaborations with HIT end users, clinicians, network

administrators, and facility administrators. The Research Pathway refers to obtaining research resources and approvals. In sum, QUERI researchers "do" stage advancement while simultaneously navigating the IT, Operations and Research pathways.

4.3 IT Pathway

The QUERI HIT programs of research utilized a variety of approaches for navigating the IT pathway with researchers having varying degrees of success. As implementation research projects, investigators encountered both (1) HIT development issues such as addressing user-centered design and usability testing, as well as (2) HIT dissemination issues such as addressing IT policy and organizational factors in the VA. The six prominent themes related to the IT Pathway that emerged from the key informant interviews bridged both phases of program development.

VA's Changing IT Environment

An **ATHENA HTN** KI cited OI&T reorganization and new security measures as a challenge. The reorganization of IT in the VA resulted in many changes in data security, and open positions in OI&T management led to some confusion about who had authority to grant access to which systems and what changes were allowed. This reorganization caused many delays in their project. Another KI on this project suggested that HIT developers need to work with clinicians and content experts to be successful.

The **ATHENA OT** team found it challenging to install and maintain the program on all the machines of end users. Because they were working to satisfy security and OT&T rules, and these rules were not well specified or known in advance, they had to make repeated adjustments in their program to incorporate changes in security rules and OI&T rules. What worked at one point in time might not be viable six months later.

CART-CL also reported difficulties. When the mandate for national distribution came out, the CART-CL staff faced IT challenges. While CART-CL can be installed remotely, the team needed local access to VistA at each of the 77 clinics using CART-CL. The VA was undergoing many changes in data security at the time and these changes would often result in the CART-CL team being cut off from the clinics. They had to get re-established each time that happened. The CART-CL project also faced difficulties when the VA reorganized and IT development was moved to OI&T. OI&T allowed some of the CART-CL staff to become information technology specialists under their organization. One CART-CL KI expressed that without that flexibility, CART-CL might not have succeeded.

Working with OI&T was also a challenge for the **PAS** team. OI&T was skeptical about the program and wanted to make sure it was secure and that patients would not be able to access the VA system from the kiosks. Another issue raised by one of the PAS KIs was the problem of VA human resources regulations making it nearly impossible to hire staff. The KIs recognized that the OI&T staff are separate from clinical and research operations and they are not a part of the VHA. Without those staff on their team, it was hard for clinicians and researchers to accomplish the IT portions of their applications. In order to get the help they needed, they had to work from the top down at different sites to find out who the appropriate OI&T staff member was, get permission to use that individual' time, and convince that individual that the project was legitimate and worthwhile.

In the **TIDES** project, one of the major obstacles was trying to develop the IT in "the largest healthcare system in the US." The process may have been easier without the VA OI&T reorganization, but the KI who mentioned it didn't really see a way to avoid it. One KI noted that the lack of connection between "bottom up" development and "top-down" spread has been a challenge. Prior to the reorganization, CPRS was created with a "bottom up" approach and had been extremely successful. In the KI's view the reorganization limits "bottom up" development.

Loading Field Developed Software on a Local Facility Server

CART-CL found it necessary to go through the Certification and Accreditation (C&A) process before some of the labs would implement the software. The C&A process took over two years to complete. While the C&A process was time consuming and expensive, one of the CART-CL KIs also thought it was a key facilitator. As a result of obtaining C&A approval, sites that had been hesitant to use CART-CL were willing to install it.

Researchers repeatedly seemed befuddled in trying to identify the pathway for loading their field developed software onto a VA server. One of the major challenges to the **TIDES** team was the "lack of a link between bottom up development and top down spread."

Deploying HIT Nationwide

Researchers found it very difficult to achieve national rollout for their HIT solutions. One of the goals of **AUDIT-C** was to develop a standardized national reminder. Although they set one up, certain features of it can be edited at the site level, since CPRS, starting out as a decentralized program, is not yet standardized across all the sites. There is no way to determine if features have been edited without doing a patient chart review.

CART-CL needed to contact individual labs and experienced difficulties finding the correct person to talk to or to get that person to respond to email messages or phone calls. The CART-CL installation process itself was simple. Once CART-CL staff reached the right person, it only took 10-15 minutes to install the program. Getting the correct person to approve the installation was the major challenge. In spite of the mandate to distribute nationally, the CART-CL team also ran into obstacles at individual sites because there isn't a mechanism for national level access to all sites. CART-CL staff would get security access to each site, but before they could complete the implementation of the software the access would expire and they would have to reapply. If CART-CL had been issued global access to all of the labs, it would have simplified the implementation process.

In addition, each time something in VistA changes, they have to change the CART-CL application. Because each site has different codes in VistA, these changes to CART-CL can be different at each site. CART-CL had a small team with a big scope—implementation to over 70 labs. While the actual technology was not a challenge, the wide-scale implementation was because all of the labs operated differently and had different sets of rules. In addition, no one had done a project of similar scope before, so the CART-CL staff didn't have anyone to turn to for guidance. Streamlining would help with this challenge. The use of more internet applications and providing developers with a national access code would result in fewer customized applications and easier implementation across multiple sites.

NetDSS was not able to successfully disseminate outside the original VISN. The reason the KIs gave was OI&T rules regarding Class III software. From the KIs perspective, it would

be ideal to develop HIT on a local level and then be able to work collaboratively with other interested sites to standardize the HIT.

Connecting with CPRS

Researchers had great difficulty in extracting data from CPRS/VistA to use in their applications and even greater difficulty in loading data collected in their research application into CPRS/VistA. **ACASI** could not connect to CPRS because they did not have the time or funding to do so during the development phase of the project.

ATHENA is designed to make specific recommendations for a patient; it is more than just a clinical reminder, because it considers many clinical factors including the present prescriptions, the status of pain in the patient, related co morbidities, lab results, etc,. Thus, it is more comprehensive than a clinical reminder. It pulls data from the electronic medical record (EMR) and writes a note back to CPRS. The team had to work within constraints imposed by working with the EMR, so they were limited in how they could create their program and in what software they were allowed to use.

The PI of **PAS** said they would like their system to be connected to VistA/CPRS, but that it is impossible within the current structure of the VA. The vast majority of IT work in the VA is contracted to external vendors. It is no longer in the capacity of the VA to introduce software that works with VistA. Because the vendors are not part of the VA, they don't understand the needs of the VA researchers and clinicians. In addition, there is no incentive for them to deliver software that meets the needs of VA staff.

NetDSS was not able to connect to CPRS with the reason given as OI&T rules regarding Class III software. **TIDES** succeeded in part because of their use of CPRS. The TIDES team initially developed a program that worked outside of CPRS, but at end-user suggestion, they decided they needed to program something using only the tools that were already part of CPRS. This limited their options and the flexibility of their system. It prevented them from achieving one of their objectives. One of the TIDES KIs said they were forced to use CPRS. This was ultimately a facilitator because it set the direction for the development and kept them focused.

Incorporating New Technology in the VA

Researchers faced a multitude of timing challenges in incorporating new technology. The case management component of **PAS** was not a success. The programming took too long, so it wasn't available at the same time as the kiosk. A major challenge for the PAS team was logistical—equipment and programming. These types of problems are not avoidable; they occur in any project that uses technology. Because they were not able to develop a patient registry system with CPRS, the developers of **TIDES** used Microsoft SharePoint for that purpose. However, they have not been able to use it to its full capacity because of data security problems.

In the **TV** project, the use of the video phone was a failure. It worked inconsistently and patients who dropped their landline service could not use it. The user's telephone had to be analog and any digital components in the household would create interference. In addition, the system was complicated and the certified nurse assistants in the homes could not troubleshoot any problems. This was also a limitation for the providers because the VA hospital switched from analog to digital phones. The investigators attempted to work with the company to fix the problem, but the company went bankrupt. Thus, they implemented a substitute for this component of the project.

Purchasing IT equipment was an obstacle for the TV project. Because they used research dollars to buy equipment, they had to adhere to research regulations, which are incongruent with the operations side of the VA. Some of the telehealth equipment is considered OI&T equipment, while other components are defined as prosthetics. Thus, approval for purchasing has to go through several layers of bureaucracy and has to be approved by people with different interpretations of the regulations. The KIs suggested solution to this problem is to have inter-department integration, so there is a more streamlined process for purchasing and approval.

Deploying New Technology in the VA

Researchers needed to respond to unanticipated events deploying new technology. One of the challenges for the **PAS** team was simply working with technology. The program didn't always work the way it was supposed to and the program experienced problems with the internet connectivity. They had more difficulties in some of the sites than others. None of these problems were avoidable, nor were they insurmountable; they were just the standard challenges involved in working with technology.

The **TV** team faced several challenges because of the technology they were using. One of the facilitators for the Health Buddy system was training. They had onsite staff training, a manual of procedures, and around the clock availability of an engineer to answer any questions they had about the system.

4.4 Operations Pathway

Since its inception, QUERI was designed organizationally and functionally to move programs of research along the Operations pathway. Three distinct themes emerged from analysis of the interview data that relate to the Operations pathway.

Building Collaborations

Researchers needed to build collaborations with clinical offices and facilities. In the **ATHENA OT** project, one of the biggest challenges was pulling together all the participants in the project and creating a unified view of the project objectives. The stakeholders represented different backgrounds and needs; the language they used often had different meanings. As a result, it took several iterations to develop a unified project goal.

In the **CART-CL** project, the infrastructure and people problems were bigger barriers than the technology. At the beginning of the project, they didn't even know how many cardiology labs the VA had. In the **TV** project, one of the KIs suggested that neither OI&T nor the Office of Telehealth seems to be interested in clinical research. For HIT implementation to be more successful, these offices need to support research.

Enlisting the Support of End Users

Researchers used various strategies to enlist the support of end users. **AUDIT-C** became part of a performance measure. However, one of the KIs believes that the providers' use and satisfaction of the reminder is only because it is part of VA performance measures; providers are not really interested in conducting brief alcohol counseling at the time of care. This lack of interest is partly a result of the timing of the dissemination of the reminder. The development team wanted to educate the providers about the benefits of brief alcohol counseling before rolling out the reminder. However, the timing of the roll-out was not in their control and they were unable to complete their education segment.

Providers are resistant to the idea that they should have to address alcohol misuse as part of their role. End users' lack of understanding of the need for intervention was a challenge in the implementation of AUDIT-C. Providers tend to see alcohol misuse as a dichotomy—either the patient is an alcoholic or is not. The investigators had hoped to educate the providers about the fact that alcohol misuse is a continuum and sometimes the recommended course of action is to limit alcohol consumption while at other times it is to abstain completely. The AUDIT-C staff attempted to use the clinical reminder as a venue for educating providers, but found that the more text they put up to educate the providers, the less likely providers were to use the reminder. This reluctance is likely because of workload; providers may have 10-20 clinical reminders to go through with a single patient. The KI did not have a suggestion for how to minimize this challenge, but the team plans to do an analysis of how providers use clinical reminders to see if they can better understand the providers' perspectives.

The **ATHENA OT** staff found that a barrier to using their program is that providers don't have enough time to go through all the recommended, or even nominally required, care practices because most patients have multiple problems that need to be addressed in the short visit so the provider has to prioritize what to discuss. The procedures they needed to go through, such as watching a patient provide a urine sample, were too complex to carry out in an appointment. The ATHENA OT team suggested that this obstacle could be overcome by making pain management more of a team approach in which providers are not expected to attend to every detail of the recommendations, but expect other staff to do so. This way, providers are not responsible for covering every aspect of a patient's condition or treatment.

CART-CL was easy to use. In addition, it was better than the process that most of the cath labs were already using. As a result, most end users were willing to use it. Although the national mandate helped, one KI for CART-CL said the mandate would not have been effective if the tool was not easy for the clinics to use and an improvement over what most of them already had. On the other hand, the CART-CL staff encountered problems in some cases where the existing system was more sophisticated than CART-CL and the clinicians did not want to switch. In addition, CART-CL had to go through the certification and accreditation process, which was time consuming, and some of the sites would not install it until it was certified. In some cases CART-CL staff had to get support from VACO to get labs to use the program.

One of the CART-CL KIs stressed the importance of outreach to the sites that would be using their system. The team worked with the sites individually, showing them the program and asking for feedback. The CART-CL staff incorporated this feedback into their design to make sure their program worked well for the users. Another reason for success the KIs stressed was that CART-CL was developed by clinicians, which increased the likelihood clinicians would use it. In addition, the database architecture was flexible and could incorporate changes users wanted easily.

One of the reasons for the success of **PAS** was that the patients liked the kiosks; they were easy to use, private, and empowered the patients to participate in their own care. PAS staff had veterans test their system and provide feedback, to make sure it was ultimately tailored to the patients' needs, recognizing the importance of keeping the consumer in mind when developing HIT. On the other hand, the nurses did not want to use it because they already had a system in place. The PI of PAS visited the sites that would use it to not only generate enthusiasm but to get input into its development. Opinion leaders at the roll-out sites were enthusiastic about the kiosk functionality, tested it, and encouraged other providers to use it. However, while the PAS project

met its objectives, the team members are not sure how well doctors are utilizing the reports the system produces. These reports may be overlooked for a number of reasons. The patients may not bring them in, they may not discuss them with the providers, or the providers may put them on the desk and never refer to them. In any of these circumstances, the obstacle is simply user willingness.

NetDSS benefitted from input from all of its primary users, in particular the depression care managers. The NetDSS team was responsive to care managers' requests for various program functions, which resulted in a user-friendly product. However, involving end users in the development was a bit of a challenge. The NetDSS team went through several iterations of the project to be sure it functioned the way the end users wanted, and this iterative process was time consuming. But the team created a much more user friendly product than what they started with. They considered themselves lucky to have the same PI and many of the same developers throughout this iterative process. In summary, as one of the KIs said, including the care managers in the development process was critical. Without their feedback, "it would have been dead in the water."

When asked why the Health Buddy messaging device was a success in **TV** project, the PI said, "I think it's very basic. It's easy to use." The device plugs into a wall and the users just answers the questions by pressing a yes or no button.

Contributing to VHA Initiatives

Researchers experienced greater success with implementation where there was clear convergence with another VHA initiative. One KI cited the alcohol performance measure as a primary reason that **AUDIT-C** was successful. For the **CART-CL** team, the national directive was both a challenge and a facilitator. It was a facilitator because it forced the end-users to implement the program. Once the mandate was issued that all cath labs use CART-CL, the timeline became an issue. The team worked better as just a small team, but in order to meet the timeline specified by the mandate, they needed to consider involving more people in the implementation. This, however, would have undermined the success of the project because the components of the project could not be easily distributed to a large number of people.

One of the KIs for **TIDES** mentioned serendipity. They were working on their HIT for collaborative care just before the Primary Care/Mental Health Integration Initiative was launched, so they were in a position to receive funding from this initiative to develop Re-TIDES.

Changing VHA Operations Environment

VHA operations are often very dynamic and in turn may require HIT solutions that can be easily adapted to this environment. The **ATHENA OT** team was working in an IT environment that was not very well specified; they had to change the method of data extraction from CPRS due to changes in OI&T privacy rules, and security rules. This also caused a need to make repeated adjustments in the program to incorporate changes in OI&T policy rules and procedures. What worked at one point and time might not be viable six months later.

CART-CL is not a system that can be installed and then left alone. It needs continuous adjustments to meet changing needs, regulations, or technology. The CART-CL team mentioned that each cath lab is accountable to the Joint Commission and has to meet their requirements. Not only may those requirements be implemented differently at different sites, but they also change over time. This situation can't really be avoided; it is just a reality of the environment.

Placing New Expectations on VHA Operations

The introduction of new HIT solutions into clinical care can place new expectations in the VHA operations organization in addition to placing an expectation on end users to adapt their workflow to incorporate the HIT. For example, one of the challenges for the **PAS** team was simply assuring that the equipment were secure, as some machines were stolen.

4.5 Research Pathway

The research pathway appears to have been complicated by the reorganization of VA information technology into the two offices of the Office of Health Information (VHA) and the Office of Information and Technology (VA). Subsequent to the reorganization, the VA significantly altered the procedures for obtaining IT resources for research. Researchers were adapting their strategies to navigate the research pathway in this changing environment.

Maintaining a Program of Research

Researchers consistently stressed the importance of having a sustained program of research to conduct HIT implementation research. **ATHENA OT** was successful because the ATHENA-CDS system was already implemented through ATHENA-HTN and they did not have to start from scratch. ATHENA OT had a smart, persistent, multi-disciplinary team and interested clinical programs like Primary Care and the Pain Management Clinic. However, in the ATHENA OT project the team had trouble getting the time they needed from clinical experts.

One of the KIs who worked on **AUDIT-C** said knowledge of the VistA/CPRS system and connections with key people in the field were important to their project. Another KI on the project also mentioned relationships with others in the field. A major reason for the success of the alcohol follow-up clinical reminder was having these connections on the team. They had a good understanding of how CPRS worked, had national contacts including the National Clinical Reminder Committee. Thus, they had not only expertise, but a broad set of contacts developed over a period of time.

CART-CL cited the ability to retain a small team (2-3 people) who operated outside the typical main OI&T process as a key facilitator for the CART project. Their willingness to collaborate with the CART-CL investigators and cath lab clinicians resulted in CART CL's successful implementation. It was important to retain this team because they understood the needs of the project and worked well with the clinicians. In particular, a "brilliant IT person" in Denver was mentioned as a key factor for the CART project success.

The **PAS** team's environment was conducive to its success. As stated above, they had stable staffing, space, access to the data core, programmers, developers and an affiliation with a UCLA Center. As a result, they were able to retain a stable team of people with the expertise necessary to successfully implement their HIT. In sum, the success of the PAS objectives was due to good project leadership, careful planning, and the expertise of the staff. One of the KIs in PAS project said the staff was a key to their success. They went to the sites, set up the kiosks, and made sure the patients knew how to use them.

The **NetDSS** team could not use a local VA OI&T person to do their programming. They could not hire an IT person using research dollars. They had to use a programmer from the university who knew nothing about the VA. Being allowed to use local VA OI&T staff would obviously avert this type of challenge.

In the **TIDES** project, one of the major challenges was the lack of clinical application coordinators, programmers, and time. There was also a disconnect between clinical informatics and clinicians, where the informatics staff weren't very helpful to the clinicians. The KIs didn't have a suggestion for avoiding this type of obstacle. It is just part of working in a bureaucracy like the VA. One of the Re-TIDES KIs stated that the biggest challenge for them was to find the time for their clinical applications coordinator to develop and create the protocol. One of the KIs attributed their success to the persistence of the project staff.

One of the **TV** KIs also mentioned persistence as a reason for their success, emphasizing the diligence of the project team. There were so many barriers along the way that they could have easily given up, but they were dedicated to helping improve the health care of veterans, so they continued working on the HIT. The research staff, physical therapist, and certified nurse assistant, who all interact with the patient, communicated well with each other and were competent at using the equipment.

Utilizing QUERI Support

Researchers cited QUERI support as instrumental in their ability to make progress. The HIV/Hepatitis C QUERI provided critical support to the **ACASI** team. The backing of IHD QUERI and operational support were key facilitators for the **CART-CL** project. This support took the form of both money and leadership and led to a national directive. In addition, many cardiologists, not just clinical champions, were enthusiastic about the project. For **TIDES**, support came from people in QUERI who know that IT development is crucial for implementing best practices in a variety of illnesses.

Utilizing Evidence

Researchers grounded their HIT applications in research evidence. The pilot project for **ACASI** was a key facilitator to their success because it allowed them to make sure the technology worked and to see whether patients could complete the survey in a reasonable amount of time before their visits.

The effectiveness of brief interventions in treating alcohol misuse/abuse is well documented. Because of this and the fact that alcohol misuse is so prevalent among veterans, the VA instituted performance measures regarding the treatment of alcohol misuse, which was critical to the **AUDIT-C** project.

PAS was successful in part because of the evidence base they had about how to use the system. For the PAS project, the project was a success in that patients were willing to use the kiosks, the clinics saw the value of them, and many patients had improved wellness outcomes as a result of using the system. Key people understood the value of kiosk-based systems in mental health care.

The primary objective of **NetDSS** was to create a user-friendly, web-based, decision support system for nurse care management of depression that improved fidelity to the nursing manager's protocol. One of the reasons for the success of NetDSS was that they were using something they already knew worked; they just needed to find a way to give users access to it.

Funding HIT Implementation Research

Projects experienced staffing and equipment funding challenges related to HIT implementation research. Funding hospital-based OI&T staff with research funds was a

challenge for the **ACASI** staff. Without that support, the barriers this team experienced would have been nearly insurmountable. ACASI had NIH funds available to provide flexibility. ACASI developed an arrangement whereby they funded the purchase of tablet computers with NIH funds and then donated the computers to the VA for property tagging and use.

Several programs of research went outside of HSR&D funding to accomplish HIT research. National Library of Medicine funding was a key facilitator for **ATHENA HTN** as it provided a strong motivator for their university affiliate to work on implementation. HRS&D funding was also critical. Funding for staffing provided different challenges. The **ATHENA OT** team had difficulty keeping their core staff continuously funded. One VA employee had to quit his VA job to become an outside contractor so he could continue to work on the project. Career development funding and QUERI funding were significant facilitators in funding HIT development for **AUDIT-C**.

CART-CL researchers found year-to-year funding challenging. During the course of development and implementation, CART-CL had to apply for funding each year. Had they not received it, the program may not have succeeded. Now that there is a national mandate, eliminating funding for the project would be a patient safety issue. The CART-CL team relied on contractors for part of their project and they cited the VA's varying use of contractors as a challenge. They experienced some delays in development because the payments to the contractors were delayed, sometimes as much as 4 months.

The timing of IT funding was also a challenge for the **PAS** team. They would receive notice that they had to order all their equipment or software by a specific date, but would not yet have determined exactly what they needed for their projects. Their way around this problem was to have several IT grants active at once so they had more flexibility regarding when they could order equipment. For **PAS**, OI&T has competing demands and is in a "constant state of crisis."

Researchers were not short of suggestions for fixing HIT funding challenges. They suggest the VA be more flexible in their staffing and devote some IT money to research and project development. The VA could address this problem of funding programming staff by restructuring funding and staffing. This could come about by a better collaboration between research and OI&T, with both OI&T and the Office of Research and Development figuring out how to adapt the administrative structure to be more flexible in working in a rapidly changing healthcare system. In brief, funding for HIT needs to be more aligned with the research structure and goals. It would also be advantageous to have OI&T staff who are funded to support research.

Acquiring Expertise from Outside the VA

Researchers experienced difficulty in acquiring expertise when it was not available within the VA. The **ACASI** team included both VA and non-VA personnel. It was difficult for the non-VA personnel to get access to VA computer systems and to get clearance to some areas of the VA. Their adherence care manager was working with patients, but didn't have access to their records until she had access to CPRS. The ACASI staff did not see a way to avoid this; it was just time-consuming to get the correct appointments and clearances.

In the **AUDIT-C** study, VA regulations created major obstacles. Their biostatistician worked at another location but could not take data off site. He had to travel to the Seattle site to work on the project. Each time he did that, he had to set up a new account to access data. All of the clinicians who worked on the study, even if working in just a research capacity, had to be

credentialed as clinicians. The KI who mentioned these obstacles thinks they will put an end to collaborative research between VA researchers and those outside the VA, effectively isolating the VA from the larger research community. One researcher thinks that to overcome these challenges, VHA Office of Research & Development should consider reviewing their regulations to make sure there is some rationale behind them. Many of the regulations appear to be rules just for the sake of having rules.

Navigating the IRB

IRB approvals received several mentions. **ACASI** had some challenges getting IRB approval. The board was concerned about where patient data would be stored. The developers changed the system so that data would be uploaded directly to a server without being stored on an individual computer. The KI suggests the only way to avoid this type of obstacle is to have more experience with HIT implementation.

One researcher observed that research projects have to go through IRB approval, even if they do not include data. IRB demands were a challenge for the **PAS** team. Because of data security concerns, they had to go through multiple rounds of IRB approval. These were not insurmountable, but just another set of details to attend to.

5. Synthesis and Discussion

We purposefully selected nine projects from among the projects in the FY2008 QUERI annual reports that involved an aspect of HIT and were active in FY2009. These nine projects represented a cross section of significant HIT types in use or development in QUERI implementation research. In the previous section, we reported on common themes that emerged from analysis of the field interviews. In this section, we explore implications of the themes.

5.1 IT Pathway

The study findings indicate that QUERI implementation researchers faced the burden of shifting OI&T expectations for their use and development of HIT. Although all of the research studies furthered their respective implementation research program, we examine the strategies researchers used to confront the shifting OI&T expectations to synthesize information to use in developing recommendations for improving the impacts of future QUERI implementation research involving HIT:

- Attaining compliance with OI&T standards for field developed software
- Collaboration with OI&T for HIT development and deployment
- Minimizing OI&T burden to facilitate national deployment
- Data extraction and loading

Attaining compliance with OI&T standards for field developed software

We found that researchers involved in the case study projects gave considerable thought and effort to producing field developed software that would be compliant with OI&T standards.

The researchers followed one of three basic strategies: 1) work with national VHA Office of Health Information (OHI), 2) work with local VA OI&T, 3) reconfigure previously developed software.

One pathway to the development of OI&T compliant software involved researchers working with representatives of the VHA OHI to develop specifications for software development. The VHA OHI requests that anyone within the VHA seeking nationally compliant software development complete a New Service Request (NSR). The VHA OHI reviewed the specifications and prioritized the software programming either into existing projects or forwarded them to VA OI&T as VHA priorities. Ultimately funding decisions for these priorities were made by the IDMC and NLB. There was mixed success with this approach. One project succeeded in submitting a NSR and having a nationally approved program developed to extract data from CPRS/VistA for use in their program. Another project submitted a NSR that VHA OHI attempted to combine with other requests that included seemingly similar functionality. After an initial flurry of discussion, this request became stagnant with inaction. The word-of-mouth perception by researchers that the VHA OHI's NSR process may lead to analysis of the request but that it will fall into inaction became a barrier to having researchers commit to this path. Researchers attempted to follow two alternative paths based on their perception that the NSR pathway does not lead to field software development within the cycle time of a typical research project.

A second pathway used by researchers in their quest to develop compliant software was to work with local VA OI&T representatives. Researchers thought they would be in compliance with national standards by gaining acceptance of local VA OI&T staff enabling them to deploy their software first at the local facility and then in ever expanding domains, i.e., VISN and national. The results were mixed for the four case study projects that used this approach. Three of these projects relied on end user devices controlled by software that ran on servers at local facilities. The researchers were able to sufficiently meet OI&T requirements to be permitted to load the software on local VA servers for the purpose of conducting research. However, the researchers did not have the ability to pass data between their applications and CPRS/VistA. They also were not permitted to operate their software beyond the research cycle or to deploy the software for non-research operations.

One project worked with local OI&T to greater success. However, instead of focusing solely on the end user device as the three previously mentioned projects had, the successful project moved upstream to the middleware server between CPRS/VistA and the end user. This strategically different approach allowed the project to minimally impact OI&T. The main difference in the architectural approach from the perspective of OI&T is the scope of the software required to be in compliance with OI&T standards. When researchers install software on a VA server, OI&T staff need to assure that the software does not introduce privacy or security threats; that it does not impact the service levels provided by other programs operating on the software; and that the maintenance of the software does not adversely impact OI&T staff who are already stretched in the performance of their duties. This software maintenance and system administration can be burdensome. The three approaches that failed to be deployed were installed on servers maintained by OI&T and required OI&T to assure the workings of the software and the system administration. The approach that achieved national deployment was installed on a server dedicated to the project and only required OI&T to assure secure connectivity, but did not require the burdensome maintenance and system administration tasks. .

The researchers completed the Certification and Accreditation(C&A) process to assure OI&T about privacy and security concerns. Server load and program maintenance were not a problem for OI&T because the program operated on a dedicated server maintained by the research project team.

The final alternative that researchers exhibited to comply with OI&T standards were to abandon the development of field software and to instead re-configure existing VA software. Two projects used this approach. One project settled on the Health Factor feature of CPRS/VistA as the preferred solution at the outset of their project. They configured the functionality they required using existing CPRS/VistA features. The second project had identified initially field developed software running as an application on a VA server as the preferred approach to provide the required computer functionality to implement the evidence-based practices. However, the project team abandoned the development of field software and instead re-configured functionality within CPRS/VistA because of concerns about their ability to achieve national deployment of a field developed software solution.

Collaboration with OI&T

All of the case study researchers sought to collaborate with their local facility OI&T representatives in the Information Resources Management Service (IRMS). These collaborations for the most part involved building of collegial relationships to accomplish their HIT needs, including permission to use VA servers, programming assistance and routine updating for programs running on the VA servers. One researcher who had moved from a facility in one VISN to another facility highlighted the effort required to build a collegial relationship. He indicated that he wished that his program could extract data from CPRS/VistA and load data back into CPRS/VistA. He said that he could have accomplished this at his previous facility but that he had not yet developed a relationship with the local IRMS chief. He responded that it would take three years when asked how long it would take to build the relationship needed to assist his research.

One project used a more formal approach for building collaboration with OI&T. This project completed the formal C&A process. From the perspective of HIT use for implementation research, the C&A process accomplished the same objective as building many local informal relationships. The goal of both approaches is to gain permission or resources from local OI&T staff. Completion of the formal C&A process allowed researchers to communicate that they were trustworthy of permission and support, the same as building trust informally over an extended period of working together or from vouching by a third party.

OI&T burden

There is no doubt that several of the implementation projects placed an extra burden on local OI&T. Four of the case study HIT projects required OI&T to load and maintain software on a local server. These four HIT projects plus one other also required OI&T to load and maintain software on end user workstations, including CPRS/VistA workstations, and tablet computers. None of these HIT's achieved national deployment.

The two projects that reconfigured existing CPRS/VistA features did not require "extra" maintenance by OI&T and were able to be deployed. As discussed previously, one project installed their program remotely through the VA network and did not require local OI&T effort. This HIT achieved national deployment.

Exchanging data with VISTA/CPRS

Three of the HIT cases achieved exchanging data with CPRS/VistA using specialized programs. Three other projects did not require specialized data exchange because the research team reconfigured CPRS/VistA (2 projects) or telehealth (1 project) to approximate the desired functionality. However, three researchers desired data exchange with CPRS/VistA but were not able to obtain the permissions or programming to achieve it due to the requirement to invest resources and obtain permissions.

5.2 Operations Pathway

As identified earlier, the development and use of HIT required researchers to navigate the pathway of VHA operations. This section discusses main implications of the VA operational organization for QUERI HIT research:

- Organizational "pull"
- Operational burden
- End user participation

Organizational "pull"

All of the HIT projects exhibited both a research "push" and an organizational "pull." The organizational pull came in the two forms of pull from the clinical services associated with the QUERI and national pull from VHA operations in the form of mandates. Six of the case studies were closely affiliated with their associated clinical service but had no further mandate. These projects all exhibited success with their research program but had not achieved national deployment. The "pull" solely from the clinical service had not been enough impetus to gain national deployment for these HIT projects.

Two case studies were each associated with a VHA mandate that extended beyond the clinical service to the national VHA organization. These two projects had achieved national deployment. However, there were two models among these HIT programs of research. One of the project teams defined the HIT as a means to collect data to further their research. They began their project with the careful definition of the data elements that they needed to include in the HIT. In contrast, another one of the three projects that gained success by being associated with a national mandate responded to the organizational pull without a clear objective to collect residual data for their research. In this second case, the data that resulted from national deployment was largely not usable to further their program of research.

Operational burden

Similar to the unintended burden that research-initiated HIT projects can place on the OI&T organization for computer operation and maintenance, research HIT in some cases places an operational burden on VHA operations. Six of the projects displayed no evidence of placing additional burden on VHA operations. However, the remaining three projects introduced specialized equipment that required maintenance and were potential targets of theft. Placing these HIT projects into national deployment would require special purchases, placement, maintenance and physical security measures.

End user participation

All of the HIT programs built collaborations with end users in one form or another. In one case of national end-user collaboration, the HIT team involved selected users in the HIT design, but made the direction, functionality and architecture decisions within the team. It was

after the team had moved the HIT to an advanced state that they approached the total community of end users to build a collaboration. The remaining projects all involved end-users in the HIT design but were less focused on building national involvement in the specifics of the HIT. For example, one project tested their design with a group of end users and redesigned the functionality as a result of the feedback.

5.3 Research Pathway

An obvious and taken for granted point is that investigators' research drives the need to adapt HIT to new functions, features or configurations to advance programs of research towards national deployment and operational use. There are several implications of HIT studies that affect not only the individual project but also QUERI/HSR&D/OR&D:

- Continuity challenges special to HIT programs of research
- IRB Review
- Acquiring OI&T Personnel Resources

Continuity challenges special to HIT programs of research

HIT funding continuity challenges arise because the "traditional" HSR&D research project funding model is not a good match with implementation research that involves programs (as opposed to projects) of HIT research. Eight of the nine case studies relied on HIT associated with prior research projects. These HIT programs faced the problem of keeping their HIT together across multiple project funding applications and time periods. The practical matters of keeping a HIT program together included retaining access to the HIT software tool, retaining access to the expertise required to maintain the HIT tool, and keeping the IT and VHA operations collaborative networks required intact. Implementation research involving HIT requires upfront investment and a critical mass of resources that must be sustained over time. The case studies exhibited multiple approaches for sustaining their informatics assets.

Four of the projects relied solely on QUERI/HSR&D funds. Of these four projects, three were able to continue their program of research over multiple project applications cycles and the fourth had not yet reached a refunding decision. Three of the five remaining projects used a blend of research funding sources that included National Library of Medicine, National Institute of Health, or Robert Wood Johnson in addition to QUERI/HSR&D funds. The two remaining projects avoided the research funding cycle by obtaining funding from VA operations for their programs of research. The use of operations funds introduced special problems for one of these two projects because of the yearly uncertainty that funding would be available and also the VA policy problem of allocating operations funds for IT.

In addition to the use of funding strategies to provide continuity, four of the projects utilized HIT developed by vendors outside of the VA. This approach placed the responsibility of maintaining HIT assets on the HIT vendor/contractor. The prevalence of this strategy for HIT implementation research introduces the fundamental issue of "make or buy" into the strategic direction for QUERI implementation research involving HIT.

IRB Review

The case studies indicated that although IRB requirements could sometimes be challenging because of concerns about security and privacy, these requirements were eventually met and/or resolved in all cases. IRB security and privacy concerns were most difficult to address in two of the projects that placed new devices into the hands of patients in public

settings. The new ORD policy for data repositories also received mention, with one project successfully completing the approval process for establishment of a data repository.

Acquiring OI&T personnel (2210) resources

HIT researchers face a major obstacle in obtaining "2210" staff for their projects. "2210" staff are OI&T technical workers with the skills and permission to perform work designated as IT. By VA policy, researchers cannot use research or operational funds to acquire the services of 2210 workers. Researchers used several approaches to comply with the VA policy. One project in essence outsourced the programming work to an outside vendor. The vendor performed the programming customization and supported the HIT tool. Another project retained an employee with dual status in operations and as a 2210 OI&T technical staff. The researcher said that his/her program of HIT research would have been severely hampered, or not possible, without the availability of the dual status staff member for the project. Yet another project outsourced the HIT programming work to an affiliated University. This approach was similar to the outside vendor approach but instead of licensing a product customized for the HIT research project, the project received a University-produced HIT tool to employ in their research. A fourth project was able to convert their technical staff who had previously been employed in Research (non-OI&T) to OI&T (2210) status. The converted staff had remained dedicated to the HIT program since the conversion but there was no assurance that they would not be reassigned to other priority work in the future. In summary, the VA policy of providing the VA OI&T organization with a monopoly on the supply of 2210 technical workers remains a major barrier to conducting VA-based HIT implementation research. Although HIT researchers displayed a range of approaches for getting 2210 work accomplished, the fact that no one pattern emerged indicates that acquiring 2210 staff for research projects is a problem that is not readily solvable at the level of the individual PI.

6. Recommendations

QUERI implementation researcher involving HIT in their programs had difficulty identifying pathways to national deployment. However, two exemplars emerged from analysis of the case studies: 1) abandoning development of new HIT tools and re-configuring instead existing CPRS/VistA features, and 2) developing new HIT tools on an architecture that places minimal burden on OI&T resources. Our recommendations build on these exemplars.

Recommendation 1:

Obtain access for researchers to an appropriate IT architecture for development and deployment of implementation science-based HIT.

VIReC recommended in our 2005-2006 study to "improve the processes and support for moving data and information systems from proof of concept to national implementation" (Hynes, 2007, p 42). We based our recommendations on the information we obtained from QUERI Center investigators who had varying levels of knowledge about specific QUERI projects focused on developing, implementing and deploying HIT.

Increased opportunities for researchers to influence the VA's IT architecture can make a significant difference in the likelihood of national deployment for implementation research-based HIT. We identified three methods of inserting new functionality into the VA HIT architecture that displayed potential for research: 1) utilization of functionality already present in CPRS/VistA such as Clinical Reminders or Health Factors, 2) use of thin clients operating from a national server platform, 3) operation of HIT trials on local servers.

Recommended Actions:

1) Better identify and understand the barriers to researchers performing implementation science research utilizing CPRS/VistA applications.

   Description: Refers to the adaption of existing CPRS/VistA functionality for a new purpose. For example, the development of a new clinical reminder or health factor.

   a. Actions for ORD/ HSR&D/QUERI Director:

      i. Work with researchers to understand the barriers they face in developing new CPRS/VISTA applications and modifications

      ii. Work with OI&T to clarify the needs of research and clinical care that might enable modifications to CPRS/VISTA for improving quality of care

      iii. Advocate for national deployment of specific field-based CPRS/VistA developments based on changes in the evidence base or VHA policy

2) Provide a server platform for HIT researchers to use for national deployment via thin clients.

   Description: Refers to the establishment of an application on a national server that can be pushed out remotely to regional or local servers.

   a. Actions for HSR&D/QUERI Director:

i. Open discussion with OI&T to clarify processes for developing class III software for a server infrastructure for HIT development and deployment

ii. Advocate for CPRS/VistA data extract services for research HIT

iii. Open a conversation with VHA OHI and VA OI&T regarding the need for insertion of specific new data elements in the electronic health record

3) Support the cooperation between OI&T and Research for the use of facility servers for local HIT trials.

Description: Refers to the use of new HIT on a local server or client station with the understanding that eventual national deployment would require migration to either a reconfiguration of CPRS/VistA or a national server platform.

a. Actions for QUERI Director:

i. Communicate the pathway for moving HIT from test to institutionalization clearly to researchers

ii. Clarify with OI&T the responsibility/authorization of facility OI&T staff for providing support for research HIT trials

iii. Clarify with OI&T and then communicate to researchers clear parameters for what can be expected from local OI&T staff for software installation and maintenance for local trials

iv. Clarify with OI&T and provide to researchers clear standards for field developed HIT that will be allowed to be implemented on VA servers

c. Actions for VIReC:

i. Maintain liaison relationships with OI&T, OHI, the VHA Office of Informatics and Analytics (OIA), VA Informatics and Computing Infrastructure (VINCI), and Consortium for Health Informatics Research (CHIR) to identify sources of information regarding preferred architecture for national deployment of research developed HIT

ii. Disseminate information to QUERI HIT researchers regarding official sources of information regarding preferred HIT architecture

Recommendation 2:

Improve the process for garnering support for moving HIT from proof of concept to national implementation.

VIReC recommended in our 2005-2006 study to "improve the processes and support for moving data and information systems from proof of concept to national implementation" (Hynes, 2007, p 42). The recommendations in the 2005-2006 analysis focused on building improved relationships between Research and VHA Operations to assure that implementation science-based HIT was addressing operational priorities with the assumption that this focus would improve the rate of HIT national deployment. Based on the HIT cases in this evaluation, the

previous recommendation to focus on HIT programs of research that benefit VHA Operations priorities remains highly relevant.

The case studies indicated that some QUERI implementation researchers were able to take advantage of serendipitous opportunities to contribute to the VHA operations agenda. Ideally, the recognition of opportunities to contribute to the VHA strategic and operations agenda should be less based on chance occurrence and more grounded in the thoughtful linking of the QUERI research agenda with the VHA operations agenda. Efforts focused on developing connections and disseminating information so that researchers are aware of ongoing initiatives and can align their efforts with those of the system will likely yield the most value in the short term.

Recommended Actions:

- Maintain and enhance connections between QUERI and initiatives from the Office of the Secretary and Under Secretary for Health offices as they evolve.

  Description: The VA T21 Major Transformation l Initiatives are new since the previous VIReC 2005-2006 evaluation and provide clear priorities for HIT investment. QUERI HIT researchers should be linked into these transformational initiatives and other strategic initiatives as they evolve

  a. Actions for HSR&D/QUERI Director:

     i. Explore with network leadership specific points of contact to assist researchers with collaboration with high priority HIT developments

     ii. Identify opportunities for QUERI HIT implementation researchers on the VHA agenda, e.g., as was recently done for Patient Aligned Care Teams

     iii. Engage ad hoc work groups to keep informed of the barriers and obstacles researchers face and to develop solutions to deploy HIT locally and nationally

  b. Actions for VIReC:

     i. Maintain liaison relationships with OI&T and VHA points of contact, especially OHI, OIA, VINCI and CHIR, to remain informed about all planned and active VHA informatics development initiatives

     ii. Disseminate information about active and planned VHA informatics development to QUERI HIT researchers and to HSR&D/QUERI leadership

     iii. Assist HSR&D/QUERI leadership with convening discussions and work groups

Recommendation 3:

Foster the continuity of HIT programs of research.

QUERI implementation research poses special continuity challenges because it is a program of research that requires upfront investment and sustained resources over time. The entire resource prioritization, review and funding process should take into account the special needs of research that includes HIT. The effort focused on natural language processing

culminating in the Consortium for Health Informatics Research (CHIR) may provide an example of a successful yet highly focused process and ultimate program of research.

Recommended Actions:

1) Consider HIT project funding requests within the context of a program of HIT research efforts and support.

   Description: HIT research occurs within a program of research rather than within an individual project although the QUERI project funding mechanism forces researchers to fit the project model. When giving consideration for funding, implementation science funding applications involving HIT should indicate aspects related to their program of research (i.e., long-term goals) in addition to the considerations of the specific project (i.e., short-term goals).

   a. Actions for QUERI Director/QUERI researchers:

      i. For peer review process, engage scientific reviewers who have expertise in informatics and HIT implementation and evaluation

      ii. Researchers should include in their funding proposals:

         - Their vision for maintenance of research initiated HIT
         - Plan for a follow-up assessment post implementation
         - Evaluation of physical security and technical support
         - Evidence of collaboration with end users

      iii. Consider expanding an existing resource center or establishing a new resource center that would provide an infrastructure to support knowledge and practical expertise development skills in informatics and HIT. This resource should be specifically focused on a narrow range of high priority HIT areas. Collaboration with VIReC, a Resource Center with customer support and dissemination specialists focused on use of data could be an efficient mechanism and support researchers

2) Research service should explore ways to leverage OI&T and Clinical Program resources to support research HIT.

   Description: Researchers faced a multitude of problems in obtaining funding for 2210 staff and IT equipment. Local Research Service does not have decision making authority for IT requests (personnel, hardware, or software support). Budget request are submitted by the PI to the ACOS-R, and then submitted to HSR&D. After the FY10 appropriation was approved and funds made available from CO, ORD instructed R&D offices to spread funds over all research projects. In FY09, funding was allocated by project versus the entire service. This cycle interrupts the next phases of a project for further development and evaluation and implementation; presents challenges with staffing continuity (appointments are discontinued without funding; experiences with HR processes generally result in delay filling positions). Researchers end up needing to leverage operations funds and extramural research funds to obtain equivalent 2210 services and equipment.

   a. Actions for HSR&D/QUERI Director:

i. Identify funding for continuity of HIT development, evaluation, and implementation projects that hold great promise through better understanding of IT funding determinations in OI&T

ii. Collaborate with OHI, OI&T, and VHA Network Office to identify high priorities requiring sustainable funding source(s) and obtain research funding for these efforts

iii. Continue to encourage researchers to leverage new OI&T and other VA Service Directed Projects as a method to provide consistent funding for ongoing HIT development and evaluation

b. Actions for VIReC:

i. Maintain relationships with OHI, OIA and data committees and provide regular reports to QUERI and research field about new IT initiatives and priorities

ii. Assist QUERI/HSR&D with identifying initiatives that may offer the best opportunities for QUERI researchers to leverage their efforts

c. Actions for researchers:

i. Seek collaboration with OI&T and clinical partners

ii. Ensure sufficient and appropriate informatics expertise on the project

iii. Leverage opportunities in clinical programs to focus informatics development efforts

Recommendation 4:

Seek national collaboration for implementation science-based HIT.

The IT reorganization from a VHA decentralized model to a VA federated model complicates the ability of individual researchers or QUERI Centers or even program offices such as QUERI and HSR&D Service to establish collaborations with OI&T. ORD/HSR&D/QUERI need to be more involved in decision making about allocation of OI&T resources to ensure research HIT contributes in useful and productive ways to improve healthcare. In addition to the recommendations in the prior sections, we perceive the need to enhance national liaison relationships with OI&T and other program offices.

Recommended Actions:

1) Build a national collaboration for facilitating the development and deployment of research HIT.

Description: Facilitate the formation of collaborations that assist QUERI researchers in their development and deployment of field developed HIT and informatics.

a. Actions for ORD/HSR&D/QUERI Director:

i. Promote and establish a research program in informatics and HIT

ii. Consider collaboration with biomedical informatics resources supported through other national programs, such as the National Institutes of Health, National Center for Research Resources, Clinical and Translational Research Award Programs

b. Actions for VIReC:

i. Coordinate an invitational national meeting among VA and VHA representatives which most likely would include the Office of Patient Care Services (PCS), OIA, OHI, OI&T, and the HSR&D CHIR/VINCI projects. This meeting would focus on a discussion of the findings and recommendations in this report and have the dual objectives of: 1) reaching consensus on action items for improving the development and deployment of research field-developed HIT and informatics, and 2) creating an ongoing collaboration to address emerging issues related to research field-developed HIT and informatics

ii. Provide leadership and continuity for the ongoing collaboration

iii. Include communications from OI&T, OIA, OHI, VINCI, CHIR and other key informatics leaders in regular updates to QUERI researchers

2) Broadly disseminate information concerning HIT in implementation research.

Description: Results of implementation research involving HIT is underreported in the literature and is largely unknown outside the VA research community. One major QUERI HIT initiative had only one publication in a peer-reviewed journal. Although VIReC has sponsored a monthly cyberseminar series since 2006 focused on sharing progress and lessons learned in developing HIT, this dissemination is not peer-reviewed and is mostly a VA audience. More formal approaches for dissemination of new knowledge through peer-reviewed publication would also get the attention of the non-research informatics community in VA and external to VA. Publication of QUERI HIT implementation research efforts should be encouraged.

a. Actions for VIReC:

i. Continue discussion and dissemination activities across a broad range of venues to ensure information exchange among many stakeholders

ii. Coordinate a special journal supplement on the development and use of HIT in QUERI implementation research. This supplement would highlight QUERI implementation research which utilizes HIT tools and solutions to conduct and evaluate quality improvement efforts

7. Limitations

This study focused on the facilitators and barriers to performing QUERI implementation research involving HIT and does not document the impacts of QUERI HIT on either patient outcomes or VHA operations. Also this evaluation focused on the perspectives of the key stakeholders directly involved in the research projects, which was the explicit objective of the study. Although the cases raised many questions about OI&T support, it was not the intention of the study to also examine the OI&T perspective. While we included the informatics scientist/developer as a key informant in each of our case interviews, there were OI&T staff. We also did not examine the PCS clinical perspective, although some of the key informants interviewed included clinicians who were still involved in clinical practice. In addition, we did not include among the case studies either a MyHealtheVet case or a case representing the Polytrauma or SCI QUERI program because we could not identify research HIT implementation projects at the time of this evaluation

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9. Tables

Appendix A: Table 1. HIT Case Study Candidate Projects

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
CDSS; Tracking Systems and Databases	DM	Information-User-Task Fit and the Utility of the Diabetes Cube	J Lowery, Ann Arbor; S Kirsh, Cleveland	How best to provide Diabetes Cube data at point-of-care	VA RRP $63,851 8/08-3/09
CDSS	STR	Developing of the Self-management to Prevent (STOP) Stroke Tool: A Feasibility Study	J Anderson	STOP is a CDSS that has automated prompts and documentation of secondary stroke perception CPDs in the EMR	VA Pilot $9,050 6/06-6/07
CDSS	STR	Stroke Quality Improvement Decision Support System (SQUIDDS)	T Kent, Houston	Computer based SQUIDDS, that integrates with VistA, CPRS	VA SDP $771,100 10/08-9/11
CDSS*	SUD	Decision Support for the Management of Opioid Therapy in Chronic Pain*	J Trafton, Palo Alto*	ATHENA - Not listed in 2008 Annual Report*	VA SDP* $924,125 7/05-6/08
Clinical Reminder	HIV	Implementation and Evaluation of VISN-Based Program to Improve HIV Screening and Testing	M Goetz, Los Angeles	Computerized clinical reminder for HIV testing	VA SDP $594,000 5/06-4/08
Clinical Reminder	HIV	Multi-VISN Implementation of Program to Improve HIV Screening and Testing	M Goetz, Los Angeles	Computerized reminder for offering HIV test to patients	VA SDP $1,920,700 10/08-9/11

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Clinical Reminder	HIV	Evaluating the Implementation of Rapid Testing for HIV Infection in a VA Emergency Department	M Goetz, Los Angeles	Evaluating the use of intervention: Computerized reminder for offering HIV test to patients	VA RRP $63,000 10/07-4/08
Clinical Reminder; CPRS Template	HIV	Evaluation Effort to Increase Rates of HIV and Hepatitis C Screening and Testing in VA Primary Care Clinics	K Mcinnes, Bedford	Surveying medical directors to assess how organizational factors affect computerized reminders, and present templates in CPRS	VA Core funding
Clinical Reminder	Pt.BRI	Characteristics of the TBI Clinical Reminder Screening Process	S Fitzgerald, Tampa	Examine TBI clinical reminder data that has been collected with VISN 8	VA SHP $85,600 5/08-9/08
Clinical Reminder	PT.BRI	TBI Screening in VISN 23: Response and Practice Patterns	N Sayer, Minneapolis	To characterize patterns of responses to the VA TBI screening clinical reminder	VA LIP $29,465 2/08-4/09
Clinical Reminder	STR	Implementing Evidence in the Detection and Treatment of Post-Stroke Depression	L Williams, Indianapolis	CPRS-based depression screening reminder to increase PSD screening and treatment	VA IIR $669,101 7/03-6/09
Clinical Reminder	SUD	At-risk Drinking Veterans Intervention: Computerized Reminder Effectiveness Trial (ADVICE)	K Bradley, Seattle	Quasi-experimental trial including one group with activated reminder and one group with usual alcohol screening process	RWJ $235,000 7/00-6/05
Clinical Reminder	SUD	Quality Improvement of Brief Alcohol Counseling in the VA	K Bradley, Seattle	More work by Bradley and colleagues on brief alcohol counseling (BAC) data captured in clinical reminder	VA QUERI $72,813 7/07-12/07
Clinical Reminder*	SUD	Evaluating a Computerized Clinical Reminder for F/U of Positive screens of Alcohol Misuse*	K Bradley, Seattle*	Examination of efficacy of reminder by looking at clinical reminder reports and patient-level data generated by CR*	VA LIP* $48,803 4/05-9/05

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Clinical Reminder	SUD-	Clinician's Responses to Positive Screening Results in Primary Care	Sox-Harris	Assessment of use of clinical reminder for brief alcohol counseling	MRP $276,690 10/05-10/08
Clinical Reminder	SUD	Population-Based Strategies to Ameliorate Tobacco Health Disparities	Fu	Use of tobacco use clinical reminder to identify current smokers	VA CDTA $825,058 8/06-7/08
Clinical Reminder	SUD-	Proactive Tobacco Treatment for Diverse Veterans Smokers	Fu	Use of tobacco use clinical reminder to identify current smokers	VA IIR $899,197 2/08-2/11
CPRS Template	DM	Adherence and Intensification of Medications (AIM) Implementation Study	M Heisler, Ann Arbor; E Kerr, Ann Arbor	Intervention by pharmacists using motivational interviewing and computerized adherence modules	VA SDP $829,100 7/06-6/10
CPRS (EHR) Template	DM	Improving Adherence and Intensification of Medications Among Diabetes Patients	M Heisler, Ann Arbor; E Kerr, Ann Arbor	Same study as DM-02, but comparison of VA and non-VA (Kaiser) cohorts	NIH $1,891,946 8/07-7/11
CPRS Template	MH	HIV Translating Initiatives for Depression into Effective Solutions (HI-Tides)	J Pyne, Little Rock	Tides Informatics	VA SDP $918,730 4/06-12/09
CPRS Template*	MH	Expanding and Testing VA Collaborative Care Models for Depression*	L Rubenstein, Sepulveda; E Chaney, Seattle*	Tides Informatics*	VA SDR* $4,414,560 10/04-6/08
CPRS Template	MH	Well-being Among Veterans Enhancement Study	E Chaney, Seattle	Implementation TIDES Informatics across multiple VISNs	VA IIR $749,956 10/01-9/05
CPRS Template	MH	Can Family/Caregiver Involvement Improve TIDES Outcomes	L Dixon, Baltimore	Interview provides who have been using Tides Informatics to see about incorporating family/caregiver involvement	VA RRP $73,700 8/07-6/09

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
CPRS Template	MH	Patient-Centered Medication Adherence Intervention for Schizophrenia	J Pyne, Little Rock	Automate the BFM (barriers, facilitators, motivators) intervention	VA IIR $803,472 7/04-12/09
CPRS Template	MH	Evaluating a Collaborative Model for the Treatment of Schizophrenia	A Young, Los Angeles	PAS ; collaborative care model informatics; MINT	VA IIR $747,800 1/01-9/06
CPRS Template	MH	Creating Health-e-Vet Informatics Applications for Collaborative Care	E Chaney, Seattle; A Young, Los Angeles	CHIAC goals: (1) review; (2) design and develop collaborative care informatics module for depression and schizophrenia; (3) test software	VA SDP $699,700 10/4-4/07
CPRS Template	MH	Reengineering Systems for the Primary Care Treatment of PTSD	P Schnurr, White River Junction; M Friedman, White River Junction	3CM: prepared practice, care management, enhanced mental health support	VA IIR $1,191,300 3/07-2/10
CPRS Template	PT.BRI	Pain Assessment in Polytrauma Rehabilitation Centers	R Kerns, West Haven	To test the perceived value of the use of the CPRS pain template and accompanying health factor reports	VA RRP $75,000 3/08-9/08
CPRS Template	STR	VISN 11 Stroke Initiative	L Williams, Indianapolis; D Bravata, Indianapolis	implementing CPRS acute stroke order sets	CORE QUERI $0 9/07-10/08
CPRS Template	SUD	Inpatient Smoking Cessation: Bringing the Program to the Smoker	S Duffy, Ann Arbor	Computerized template for nurse documentation of smoking cessation services	VA SDP $878,200 10/6-9/09
CPRS Template	SUD	Facility Level Smoking Cessation Intervention in VISN 11	S Duffy, Ann Arbor	Computerized template for nurse documentation of smoking cessation services	VA RRP $75,000 10/07-3/08

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
CPRS Template	SUD	HIV Translating Initiatives for Depression into Effective Solutions (HI-Tides)	J Pyne, Little Rock; G Curran, Little Rock	Tides Informatics	VA SDP $898,605 1/06-12/09
HIT Treatment	MH	Identification of and at-risk interventions for post-deployment psychophysiologic predictors of post-deployment mental health outcomes	J Pyne, Little Rock	Virtual reality stress inoculation intervention	DoD $1,612,258 9/08-9/12
HIT Treatment	PT.BRI	Modification to Insomnia Treatment for OIF/OEF Veterans with TBI	D Epstein	Included in effort to determine what modifications to CBT-I need to be made, wrist actigraphs are used at home by veterans in addition to keeping a sleep diary	VA RRP $48,840 8/07-2/08
IVR	DM	Improving Insulin Therapy with Enhanced Care Management and Peer Support	J Piette, Ann Arbor; M Heisler, Ann Arbor	Interactive voice response (IVR) is a computer-based telephone system that initiates outbound calls and receives inbound calls, allowing patients to communicate with each other without incurring charges or divulging home phone numbers used	VA IIR $566,973 4/06-3/10
IVR	IHD	Improving blood pressure in Colorado	M Ho, Denver	Interactive voice response (IVR) is a computer based telephone system that initiates outbound calls and receives inbound calls, it is used a disease management program	Colorado Dept of Public Health $1,100,000 3/06-6/08

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
IVR	IHD	Improving hypertension outcomes among IHD patients	M Ho, Denver	Interactive voice response (IVR) is a computer based telephone system that initiates outbound calls and receives inbound calls, it is used a disease management program	HSR&D +AHA Scientist 910,000 7/06-6/09
IVR	STR	Home-Based Tele-Health Stroke Care: Validation of Evidence-Based Disease Dialogs	N Chumbler, Indianapolis	In-home messaging device	VA RRP $49,412 5/05-4/06
IVR	SUD	Telephone Screening of Community Veterans	L Najavits, Boston	Conducting automated telephone screening of veterans in the community to identify those with untreated PTSD	VA RRP $75,000 10/08-3/09
Kiosk	HIV	Creation of a Kiosk-Based Module to Facilitate Urgent-Care HIV Screening	B Sun, Los Angeles	Education kiosk module	VA RRP $62,357 10/08-4/09
Kiosk*	MH	Implementing Effective Collaborative Care for Schizophrenia*	A Young, Los Angeles*	Computerized patient self-assessment kiosks*	VA SDP* $2,441,400 1/6-12/09
Kiosk	MH	Implementing Outcome Management Using Patient Self-Assessment	A Young, Los Angeles	Computer-assisted patient self-assessment system (PAS)	VA LIP $50,000 7/04-9/05
MHV	CHF	My HealtheVet Health Status Questionnaire and Care Assessment Tools (HFMHV)	P Heidenreich, Palo Alto	On-line health status measure for patients with HF on MyHealtheVet, and Quality Improvement tool	VA RRP $70,000 7/07-3/09
MHV	CHF	Patient Medication Sheet with Pictures of Medications	P Heidenreich, Palo Alto	Patient education material development and posting on MyHealtheVet website	VA LIP $20,000 3/07-8/09

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
MHV	CHF	Heart Failure Related Caregiver Information on My HealtheVet	A Sahay, Palo Alto	Caregiver information specific to heart failure will be uploaded to the My HealtheVet website	VA LIP $10,000 2/07-3/09
MHV	DM	Web-Based Patient -Directed Intervention to Improve Medication Adherence among Veterans with Type 2 Diabetes	K Nelson, Seattle; G Reiber, Seattle	Using MHV to deliver "Diabetes Report Cards" for self-management	VA LIP $24,500 3/07-12/10
MHV	SCI	Development of an SCI condition center for MHV	F Weaver, Hines; B Smith, Hines	Area on MyHeatheVet, to include self management guides for depression, pressure ulcers, bowel care, and vaccine video	VA LIP $20,000 7/07-9/08
Multi-media	SCI	Creating a Brief Tobacco Cessation Message Targeted to Persons Who are Spinal Cord Injured or Disabled	F Weaver, Hines; B Spring, Hines	Multimedia smoking cessation video	CRPF $24,960 1/05-12/07
Multi-media	SCI	Development and feasibility of a brief vaccination intervention in SCI&D	F Weaver, Hines	Brief multimedia video to educate and motivate veterans with SCI&D to get yearly influenza vaccination	VA LIP $25,000 7/04-12/04
Multi-media	STR	Adapting Tools to Implement Stroke Risk Management to Veterans	T Damush, Indianapolis	videotapes and training guides for stroke survivors, messaging devised that allow reporting of symptoms for home to health care provider	VA HSR&D $775,000 3/07-9/10
PDA; VistA Interface*	HIV	Supporting HIV Adherence with Patient Audi-CASI Assessment/Instruction Project*	A Gifford, Bedford*	CASI technology, touch screen computer tablet to collect info from patients on medication adherence, this tablet will interface with CPRS for clinician f/u*	NIH* $2,819,941 9/07-10/12
PDA	PT.BRI	Ecological Momentary Assessment in Hearing Research	J Henry, Portland	Patients signaled randomly by PDA to record in the PDA auditory symptoms	NIH $124,830 7/08-6/10

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
PDA	SCI	Pilot test of an improved smoking cessation delivery care system	F Weaver, Hines; B Spring, Hines	Tablet PC with either keyboard or touch screen to respond to a series of questions that assess smoking issues	RRP $22,500 10/08-3/09
Telehealth/ Consultation	DM	Evaluation of VISN 11 Wound Care Teleconsultation Program	J Lowery, Ann Arbor; G Reiber, Seattle	Use of Teleconsultation to provide specialty wound-care expertise to smaller VA facilities	VA LIP + VISN RRP $161,242 4/07-3/09
Telehealth/ Consultation	DM	Diabetes Telemedicine Consultation: A Systems Improvement Intervention	D Aron, Cleveland	PCP consultation with specialty care via teleconferencing	VA IIR $738,000 7/05-3/09
Telehealth/ Consultation; CPRS Template*	MH	Implementing Telemedicine-based Collaborative Care for MDD in Contract CBOCs*	J Fortney, Little Rock*	Adapt collaborative care strategies for large facilities to be deliver via telemedicine to small contract CBOCs*	VA VISN* $1,161,515 10/05-9/08
Telehealth/ Consultation; CPRS Template	MH	Telemedicine Intervention to Improve Depression Care in Rural CBOCs	J Fortney, Little Rock	Adapt collaborative care strategies for large facilities to be deliver via telemedicine to small contract CBOCs	VA IIR $1,316,602 6/02-6/06
Telehealth/ Home	CHF	High Risk HF Identification for Care Coordination (HFCCHT)	P Heidenreich, Palo Alto	Heart failure database, care coordination home telehealth-CCHT	VA LIP $30.000 1/07-1/09
Telehealth/ Home*	CHF	Patient-Centered Disease Management for Heart Failure Trial (PCDMHF)*	J Rumsfeld, Denver; P Heidenreich, Palo Alto*	Health Buddy: Telemonitoring*	VA IIR* $660,000 4/08-3/11
Telehealth/ Home; Web-based	DM	Automated Step-count Feedback and Disease-Specific Tailoring to Promote Physical Activity	C Richardson, Ann Arbor	Connect enhanced pedometers via USB port to secure study Internet site	VA LIP $25,000 3/07-12/07

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Telehealth/ Home, Web-based	DM	Does Step Count Feedback Enhance Counseling for Weight Loss?	C Richardson, Ann Arbor	Connect enhanced pedometers via USB port to secure study Internet site	VA $500,511 1/05-12/07
Telehealth/ Home; CPRS Template	HIV	HIV Translating Initiatives for Depression into Effective Solutions (HI-Tides)	J Pyne, Little Rock	Telephone interviews, record results into CPRS	VA SDP $872,130 4/06-3/09
Telehealth/ Home	IHD	Patient-Centered Disease Management for Heart Failure Trial	J Rumsfeld, Denver	Health Buddy: Telemonitoring	VA IIR $895,800
Telehealth/ Home	PT.BRI	Telerehabilitation for OEF/OIF Returnees with Combat-Related Traumatic Brain Injury	K Siddharthan, Tampa	Home monitoring of low ADL functioning	VA SDR + CDMRP $1,000,000 5/08-5/11
Telehealth/ Home	SCI	Developing a home telehealth program to manage pressure ulcers in SCI/D	M Guihan, Hines	Daily M-F or weekly calls to monitor patients self care via in-home messaging device with disease management protocols	VA RRP $44,244
Telehealth/ Home*	STR	Home-Based Tele-Health Stroke Care: A Randomized Trial for Veterans*	N Chumbler, Indianapolis*	Tele-video and an interactive in-home messaging device is used to facilitate adherence with treatment recommendations*	VA IIR* $790,020 1/07-12/09
Tracking Systems and Databases*	CHF	Evaluating the Implementation of the VA Cardiovascular Assessment Reporting Tracking System for Cath Labs (CART-CL)*	J Rumsfeld, Denver*	CART-CL*	VA RRP* $74,000 8/07-2/09
Tracking Systems and Databases	CHF	VA Heart Failure Database	P Heidenreich, Palo Alto	Utilizing common VistA files across VA to create registry of heart failure patients	VA LIP $40,000 7/05-6/09
Tracking Systems and Databases	DM	Diabetes Shared Medical Appointments: System Redesign and Implementation	S Kirsh, Cleveland	Informatics component: Comparison of Diabetes Cube and local Diabetes Registry	VA RRP $75,000 8/07-2/08

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Tracking Systems and Databases	DM	Stroke Prevention, Incidence and Outcomes in Veterans with Diabetes	T Findley, East Orange	Retrospective analysis of Diabetes Registry	VA IIR $575,450 10/2-3/09
Tracking Systems and Databases	IHD	Cardiovascular Assessment, Reporting and Tracking System (CART)	J Rumsfeld, Denver; S Fihn, Seattle	National VA reporting system, data repository	VA HSR&D $3,858,611 1/03-present
Tracking Systems & Database	IHD	Evaluating the Implementation of the VA Cardiovascular Assessment Reporting Tracking System for Cath Labs (CART-CL)	T Box, Denver; J Rumsfeld, Denver	National VA reporting system, data repository,	HSR&D $75,000 1/07-12/08
Tracking Systems & Database	MH	Management of Metabolic Side Effects of Antipsychotics in Six VISNs	R Owen, Little Rock	Use of VISN 16 Warehouse and Regional Data Warehouse #1	VA SHP $27,389 4/08-9/08
VistA Interface	DM	ASPIRE Pilot	L Damschroder, Ann Arbor; J Lowery, Ann Arbor	In the course of developing a way to input MOVE data into VistA, OI+T approved software was developed for interfacing with VistA	VA QUERI $22,546 4/08-9/08
VistA Interface	PT.BRI	Characterization and Care Coordination of PT Patients	H. Lew, Boston	Coordinate with Defense and Veterans Brain Injury Center to create a web-enabled version of the discharge summary to create a road map for patient and family to navigate complex healthcare systems	RR&D
VistA Interface	PT.BRI	Towards a Continuum of Care Between the Department of Defense and Veterans Affairs Health Care Systems	L Copeland, San Antonio	To establish the feasibility of protocols to transfer PHI from a DoD medical treatment facility to VA	VA SHP $35,600 4/08-9/08

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Web-based	CHF	Heart Failure Network: An Innovative Strategy for Implementation	A Sahay, Palo Alto	Bimonthly web- interview-based meetings, conference calls, formative evaluation underway via telephone	VA LIP $20,000 5/06-9/09
Web-based	CHF	Heart Failure Related Patient Education Materials for Veterans	A Sahay, Palo Alto	Patient education material development and posting on CHF QUERI website	VA LIP $7,500 1/06-9/09
Web-based	IHD	IHD QUERI Emergency Department Quality Improvement Assistance Project	S Fihn, C Helfrich, Seattle	Use of Effective Care Processes website to promote effective care practices for ED related	VA OQP + CORE $141,092 6/06-present
Web-based	MH	Training SUD Counselors CBT for Depression	G Curran, Little Rock	Web-based training manual	VA SDP $970,600 7/08-6/11
Web-based	PT.BRI	Progressive Intervention Program for Tinnitus Management	G Reiber, Seattle	Web-based training for audiologists to improve evaluation of tinnitus	VA RR&D $383,800 10/07-9/09
Web-based	SCI	SCI-Depression: CPG Education	P Ulrich	Web-based measures evaluating annual programs to train SCI primary care team members on the Consortium for Spinal Cord Medicine Clinical Practice Guidelines CSCM CPG	VA LIP
Web-based	SCI	Educational campaign on smoking's effects on SCI/D secondary complications	P Klebine; F Weaver, Hines	Education video and information brochure focusing on high risk factors of smoking, will be disseminated through the web via the spinal cord injury information network	PVA $150,000 8/08-7/10

HIT_Category	QUERI	Project_Title	PI Location	HIT Program	Funding
Web-based	SCI	Antibiotic prescribing for veterans with SCI&D and clinician perceptions	C Evans, Hines	Anonymous web-based survey of clinicians that care for SCI&D patient, to access provider attitudes and behavior	PVA $49,993 2/08-1/09
Web-based	SUD	Tobacco Tactics Website for Veteran Smokers	S Duffy, Ann Arbor	Development and testing of web-based smoking cessation intervention	VA SHP $119,677 4/08-9/08
Web-based	SUD	Web-Based Alcohol Screening and Intervention: Adaptation for OEF/OIF Vets	K Bradley, Seattle	Adaptation of Australian eSBI (web-based screening and brief intervention) to VA population	VA QUERI $121,724 10/08-3/09
Web-based	SUD	Training SUD Counselors CBT for Depression	G Curran, Little Rock	Conversion of CBT manual into web-based training for therapists	VA SDP $970,600 8/08-7/11
Web-based	SUD	VIP: Staff Distance Learning in Substance Use Intervention for Returnees	A Rosen, Bedford; J Ruzek, Palo Alto	On-line catalogue of PTSD-related trainings to better fit care of OEF/OIF returnees	VA RRP $39,000 10/06-9/08

Appendix B: Table 2. HIT Case Study Marker Projects

Program ID	Project Title	QUERI Center Principal Investigator & Location	HIT Program of Research	Type of HIT
ACASI	Supporting HIV Adherence with Patient Audio-CASI (Computer Assisted Self Interviewing) Assessment/Instruction Project http://datalab-1.ics.uci.edu/nih/crisp/2007/getdoc.php?did=49519	HIV/Hepatitis Gifford: Bedford VAMC	Uses CASI Technology, touch screen computer tablet to collect information from patients on medication adherence, this tablet interfaces with CPRS for clinician follow-up.	PDA
ATHENA-HTN	VISN Collaborative for Improving Hypertension Management with ATHENA-HTN http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141693732	CHF & IHD Goldstein: VA Palo Alto Health Care System	Designed in collaboration with experts in guideline-automation at Stanford University, ATHENA-HTN (hypertension) is an innovative clinical decision support system for generating individualized recommendations for primary care clinicians managing patient hypertension.	CDSS
ATHENA-OT	Decision Support for the Management of Opioid Therapy in Chronic Pain http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141695445	IHD & SUD Trafton: VA Palo Alto Health Care System	Updated and Revised the ATHENA-DSS technology to create an automated Decision Support Systems that manages Opioid therapy.	CDSS

Program ID	Project Title	QUERI Center Principal Investigator & Location	HIT Program of Research	Type of HIT
AUDIT-C	Evaluating a Computerized Clinical Reminder for Follow-up of Positive Screens for Alcohol Misuse http://www.queri.research.va.gov/sud/wwd/alcohol/alcohol-projects.cfm	SUD Bradley: VA Puget Sound Health Care System	An Alcohol Counseling Clinical Reminder that identifies patients who screen positive for alcohol misuse. It provides decision support, and facilitates documentation.	Clinical Reminder
CART-CL	Evaluating the Implementation of the VA Cardiovascular Assessment Reporting and Tracking (CART) System for Cath Labs http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141697822	CHF & IHD Rumsfeld: Denver VAMC Fihn: VA Puget Sound Health Care System	Cardiovascular Assessment, Reporting and Tracking (CART) system is a software application for standardized report generation, national data repository, and national quality improvement program for VA Cath labs. The application is integrated within CPRS.	Tracking Systems and Databases
Net-DSS	Implementing Telemedicine-based Collaborative Care for MD in Contract CBOCs http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141694404	MH Fortney: Little Rock VAMC	The Web-based Decision Support System for Care Managers (NetDSS) is a web-based real-time decision support system for depression case management.	Telehealth/ Consultation ; CPRS Template
PAS	Implementing Effective Collaborative Care for Schizophrenia http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141695482	MH Young: VA Greater Los Angeles Healthcare system	Utilizes computerized self assessment kiosks to routinely assess patients, and the Medical Informatics Network Tool (MINT) with CPRS.	Kiosk

Program ID	Project Title	QUERI Center Principal Investigator & Location	HIT Program of Research	Type of HIT
TIDES	Expanding and Testing VA Collaborative Care Models for Depression http://www.hsrd.research.va.gov/research/abstracts.cfm?Project_ID=2141693963	MH Rubenstein: VA Greater Los Angeles Healthcare system	Translating Initiatives for Depression into Effective Solutions (TIDES) is a collaborative care depression management model that utilizes a (Class I) informatics package available nationally. It includes a suite of tools based on VA VistA/CPRS enhancements including automated consult request/progress note documentation, clinical reminder health factor data capture, and patient panel management support.	CPRS Template
TV	Home-based Telehealth Stroke Care: A Randomized Trial for Veterans http://www.trialsjournal.com/content/11/1/74	STR Chumbler: Richard L Roudebush VAMC	Tele-video is used to carry out an in-home assessment of functional mobility	Telehealth/ Home

Appendix C: HIT Resources and Terminology

Disclaimer:

Definitions of frequently used terms throughout the report are provided in this section. Additionally, where appropriate, descriptions of resources available to informatics developers are included with relevant links. It is important to note that these resources, describing requirements and programs, are subject to change and are relevant as of the time of this report's generation.

DEFINITIONS

Certification and Accreditation (C&A): This process is owned by the VA Chief Information Officer (CIO). The VA CIO is responsible for ensuring that a VA wide security/privacy program is effectively implemented, that the certifications and accreditations required across the VA are accomplished in a timely and cost-effective manner, and that there is centralized reporting of all security/privacy-related activities. The objectives of C&A processes are as follows:

- To enable more consistent, comparable, and repeatable assessments of security controls in federal information systems;
- To promote a better understanding of agency-related mission risks resulting from the operation of information systems and the data as described in the privacy impact assessment (PIA); and
- To create more complete, reliable, and trustworthy information for authorizing officials in order to facilitate more informed security accreditation decisions.
- To obtain an authorization to operate (ATO) from the VA Authorizing Official

http://vaww.oed.portal.va.gov/searchcenter/Pages/Results.aspx?k=certification%20and%20accreditation&s=All%20Sites

Field Developed Software: Also known as Class III Software, refers to all VHA software produced outside of the Office of Enterprise Development (OED) organization.
http://vaww.oed.oit.va.gov/field_development/

Grassroots Incubation Program: Provides field innovators with a mechanism to identify opportunities requiring novel solutions, to develop those solutions with full transparency, and to determine the solutions' business value through facilitated, large-scale peer evaluation prior to presentation to senior management.
http://wiki.v08.med.va.gov/groups/InnovationTest/wiki/50a28/Greenfield__SOO.html

Health Factors: Data elements that identify health status and have been specifically constructed to be computable. They can be used by clinical reminder programs to trigger or satisfy the reminder, or importantly, they can be generated as a result of the reminder itself.

Health Information Technology (HIT): VIReC classified a project as "HIT" if it included any reference to electronic devices used to collect or communicate digital information related to clinical care, with the exception of standard voice telephone.

Informatics: Within the VHA informatics practice is the development, evaluation and application of techniques grounded in computer science, information science, systems science, engineering, and organizational behavior in order to solve problems by improving the structure, creation, collection, classification, management, storage, retrieval, preparation, dissemination and transfer of information.
http://vaww4.va.gov/CHIO/WhatsInformatics.asp

Sandbox: The Innovation Sandbox (Sandbox) is a virtual space to collaborate, innovate, and develop ideas, requirements, and products that can become software for the Veterans Information Systems Technology Architecture (VistA).
http://vaww.infoshare.va.gov/sites/chio/EHT/projects/ct/Innovation%20Sandbox%20Library/Innovation%20Sandbox%20CONOPS%20v1.4.pdf

CLASS III to CLASS I RESOURCES

New Field Development Forum

http://vaww.itfo.portal.va.gov/resources/fielddev/default.aspx

> This site is designed as a Knowledge Center for IT Field Development and supports the mission of establishing and maintaining an innovative, robust VA IT Field Development capability that ensures deployment of quality software and promotes responsive customer support. This site also contains links to related initiatives, such as Development Standards, Innovations, Change Management and the C III>CI Program. Additionally, References, Briefings and Frequently Asked Questions may be found on this site.

http://vaww.itfo.portal.va.gov/resources/fielddev/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fresources%2ffielddev%2fShared%20Documents%2fTemplates&FolderCTID=&View=%7b00251CD2%2d5FF0%2d483C%2dABF6%2d4707BDA230A5%7d

> This link has a template for submitting Field Development deployment requests

OED (Office of Enterprise Development) field development process.

http://vaww.oed.oit.va.gov/field_development/process.asp

> This web site is for field developers, defined on this site as non-OED field-based staff who perform software product development. The goal is to inform staff about producing software that complies with VA standards, uses approved tools, meets architectural requirements, is documented appropriately, and is prepared to qualify for national

deployment. Field developers are responsible for applying the guidance documented on this frequently-updated website site.

Approved Tools list

http://vista.med.va.gov/vistaarch/trm/ApprovedToolListSummaryPage.asp

The website provides a list of approved technologies and technical standards that have been assessed and determined to be consistent with VA's technical approach to IT solutions.

Chief Health Informatics Office

http://vaww4.va.gov/CHIO/About.asp

Chief Health Informatics Office (CHIO), is part of the Veterans Health Administration (VHA), Office of Health Information (OHI). CHIO serves as VHA's link to clinical field staff in the areas of high interest health informatics programs, innovation, discovery, and functions as a liaison with industry partners. Offices and services that fall under the CHIO include the Bar Code Resource Office, Emerging Health Technology Office, Health and Medical Informatics Office, Standards and Interoperability Office, and the Veteran/Consumer Health Informatics Office.

Emerging Health Technology Office

http://vaww4.va.gov/CHIO/EmergingHealthTechnologyOffice.asp

Emerging Health Technology Office's efforts include managing design and evaluation of Innovation Sandbox collaboration suite. (The Innovation Sandbox, or simply "Sandbox," is a virtual space to collaborate, innovate, and develop ideas, requirements, and products that may become part of the available information technology tools available to the VHA community)

VHA Innovation Program

http://vaww4.va.gov/CHIO/Innovation.asp

http://wiki.v08.med.va.gov/groups/InnovationTest/

The VHA Innovation Program is a new program being developed in the Office of Information (OI) that will allow mission critical healthcare innovations reliant on information technology to emerge from the field (all VA medical care facilities outside of Headquarters). The program will allow innovations to evolve based on collaborative constructive review by communities of interest, and be piloted in a safe harbor for innovation.

Appendix D: Acronym List

Acronym	Definition
ATHENA HTN	Assessment and Treatment of Hypertension: Evidenced Based Automation Decision Support System
C & A	Certification and Accreditation
CART-CL	Cardiovascular Assessment Reporting and Tracking system for Cardiac Catheterization Labs
CDSS	Clinical Decision Support System – an informatics aid in support of clinical patient care
CHF	Chronic Heart Failure
CPRS	Computerized Patient Record System
DM	Diabetes Mellitus
DoD	Department of Defense
HIT	Health Information Technology
HIV	HIV/AIDS
HSR&D	Veterans Affairs Health Services Research and Development Service
IHD	Ischemic Heart Disease
IRB	Institutional Review Board
IRC	Implementation Research Coordinator
IRM	Information Resource Management
MH	Mental Health
NSR	New Service Request
OEF/OIF	Operation Enduring Freedom/Operation Iraqi Freedom
OHI	Office of Health Information
OI&T	Office of Health Information and Technology
OQP	Office of Quality and Performance
OQP/EPRP	Office of Quality and Performance/External Peer Review Process
OQP/SHEP	Office of Quality and Performance/Survey of Healthcare Experiences of Patients
ORD	VHA Office of Research and Development
PCS	Patient Care Services
PT-BRI	Polytrauma/Blast-Related Injury
RC	Research Coordinator
QUERI	Quality Enhancement Research Initiative
SCI	Spinal Cord Injury
STR	Stroke
SUD	Substance Use Disorders
TIDES	Translating Initiatives for Depression into Effective Solutions
VA	Veterans Affairs
VHA	Veterans Health Administration
VIReC	VA Information Resource Center
VISN	Veterans Integrated Service Network
VistA	Veterans Health Information Systems & Technology Architecture

Appendix E: Interview Guide

Interview Guide and Worksheet - Case Study of HIT Use in QUERI Research
VA Information Resource Center

Name of VIReC Staff Member using Worksheet: _____

Start Time: _____

Introduction:
Thank you for agreeing to participate in this evaluation of Health Information Technology (HIT) use in QUERI implementation research. This evaluation focuses on how a range of health information technology is being used within implementation research. We selected projects that represent a broad range of HIT and that appear to be utilizing the HIT during an intervention phase (i.e. QUERI Implementation Phase 3-4-5). We are interested in long standing efforts as well as new efforts that are just getting started. The information for the case studies will be based primarily on interviews with Principal Investigators, Implementation Scientists, and Informatics Specialists. Your unique perspective on the *(name of project)* is needed for this effort. Our questions fall into the five categories of HIT Descriptions, HIT Resources, HIT Objectives, OI&T Processes, and Lessons Learned. Based on review by the Hines Institutional Review Board, this evaluation was deemed exempt. Respondent names will not be collected during the interviews; responses will be recorded by role. The final report and any publications resulting from this evaluation will focus on themes in the topic areas of our interview, but there may also be some information reported that may be unique to the project or the specific HIT used in your project.

We will be recording our interview to assist in our analysis. Please let us know if there are any points during our interview when you would like to stop the recording.

Do you have any questions before we begin?

Are you ready to begin the recording? [*Start recorder, state the date and time*]

We would first like to go around and introduce ourselves by role for the recording. We would like you to say your role on the project. I'll start. [*Interview team members should say their role in the interview before looking to the participant, i.e., "Interviewer 1", "Interviewer 2"*.]

Section A: HIT Descriptions

- **HIT Descriptions**: We would first like to know a few facts about the HIT used or developed in this project:
- What HIT is being used or developed in this project?

1a) For the rest of the Interview can we refer to the HIT as "_____?" [*Insert name specified in question 1*.]

[*For* (HIT), *insert name agreed upon in question 1a.]*

- What is the intervention being studied?
- How is the (HIT) a part of this intervention?
- How is this (HIT) intended to be used?
- Who are the intended users of the (HIT)?
- When and how do they interact with it? [*Probe for specific instance*.]
- What substitute or alternatives for this (HIT) did you consider in your study design?
- What characteristics led you to select this (HIT) over the alternative approaches?
- Is the use or development of (HIT) in this project related to an earlier QUERI or HSRD funded project, or has it led to the development of a later project? [*If "no", skip to Question 14*.]
- If yes, what was the related project's name?
- What did this project gain from this earlier project? [*Probe for specific instance*.]
- How did the later project build on the current project?
- Central Office is interested in learning about the progression of HIT use in projects building upon each other. What challenges and facilitators did you encounter because this project is related to another QUERI or HSR&D project?
- Is this (HIT) connected to CPRS? [*If "no", skip to Question 16*.]
- (If yes) please describe how it is connected?
- (If no) please describe why it is not connected?

    16a) Would you like it to be connected to CPRS? [*If "yes" then ask question 16b*.]

    16b) How would you like it to be connected?

- Was any of the HIT in this project previously developed? [*If "no", skip to Section B*.]
- (*If yes*) What is the previously developed HIT?
- How did you acquire access to it for this project?

Section B: HIT Resources

- **HIT Resources:** We would like to ask about any special resources you needed because of the use or development of HIT.

What staff were included on the project specifically because of the HIT? We'd like to identify those staff members by job title, organization or department to which they report, and percent full-time effort. For each, please also tell us what they contributed that was unique to their expertise. [Probe for roles, if hesitation in question 22 ask "if replicating this project what % FTE would you budget for each role"]

Project Staff Identification			
20a. Job Title	20b. Organization/Department	22. %FTE	21. Expertise/Unique Contribution

- How was the HIT portion of the project funded? [Probe for specifics and ask if there was any other funding]

- Were there any other unanticipated resources used or needed because of the HIT? By "resources", we mean staff, equipment, funding or anything else. [Probe for examples]

Section C: HIT Objectives

- **HIT Objectives:** Next, we would like to ask about issues related to the HIT objectives.
- What objectives did you have for the (HIT)?
- How did you evaluate the HIT?
- Which of the HIT objective(s) were successful?
- What are the primary reasons for the success of those objectives? [*Probe for examples.]*
- What were the challenges to achieving those objectives? [*Probe for examples.*]
- What HIT objective(s) was the project not able to accomplish?
- What were the primary challenges that prevented their accomplishment? [*Probe for examples*.]

Section D: OI&T Processes

- Did you submit a New Service Request? [*If "no" skip to question 39.*]
- When did you submit the New Service request?
- Who were your sponsors?
- What was the outcome of the submission?
- Did you use an alternative approach other than the VA's New Service Request process? [*If "no" skip to question 42*.]
- If yes, what was your approach? [*Probe for "who" did "what"*.]
- What was the outcome of your approach?

Section E: Lessons Learned

- Where did you go for information about how to develop (HIT) for use in the VA? [*Probe for specific instance*.]
- What were the most significant facilitators to the development, implementation or use of (HIT)? [*Probe for specific instance*.]
- What were the most serious challenges to the development, use, and or implementation of the (HIT)? [*Probe for top 3 challenges*.]
- Ideally, how could these challenges have been avoided or removed?
- What else should we know about the use or development of this (HIT)? [*If appropriate, probe for specific instances*.]

Conclusion: Thank you for your participation, a summary report sharing insights across HIT projects will be completed and submitted to Dr. Atkins this summer.

[*Record the end time*.]
End Time_____