

**FROM NUMBERS TO KNOWLEDGE**



**“ADDING CLINICAL DATA TO STATEWIDE  
ADMINISTRATIVE DATA”**

**FINAL REPORT**

**VIRGINIA HEALTH INFORMATION**

**September 30<sup>th</sup>, 2009**

# Executive Summary

## 1. Team members and consultants

The team members and consultants were:

Michael Lundberg (Virginia Health Information, Executive Director),  
Chris Delcher (Virginia Health Information, Analyst),  
Deborah Waite (Virginia Health Information, Operations Manager),  
Ramesh Shukla, PhD (Virginia Commonwealth University, subcontractor),  
Michael Pine PhD (Michael Pine and Associates, Inc. subcontractor),  
Sallie Cook MD (Virginia Health Quality Center, clinical pathologist,  
subcontractor)

Virginia Health Information (VHI) also worked closely with state pilot partners and the Agency for Healthcare Research and Quality (AHRQ) consultants over the course of the project.

## 2. Project summary

VHI was able to successfully recruit 27 Virginia hospitals into the pilot program. This resulted in the collection of nearly 400,000 present on admission (POA) enhanced patient records with accompanying lab values representing almost half of all Virginia discharges. During the project, VHI provided data quality feedback via custom reporting to show the distribution of POA values, provided customized reports that identified potentially hospital acquired conditions using the POA indicators, and provided AHRQ quality indicator reports showing the impact to rates pre and post use of the POA indicator. During the course of the project, POA reporting was mandated in Virginia. Towards the end of the project, VHI began engaging the health insurance, physician, and consumer communities on the use of this information for quality initiatives. Feedback from these stakeholders is expected in November 2009.

## 3. Number of hospitals participating in the pilot

There were 27 participating hospitals. Even those hospitals that could not participate because of technical issues expressed interest in the project.

## 4. Materials/tools developed for hospitals

We developed a host of materials including business associate agreements, presentations, promotional newsletters, LOINC mapping templates and record layouts for hospital use, a project website, and customized data quality and analytical reports.

## **5. Data elements collected**

In addition to the POA indicators on all discharges, we collected approximately 30 laboratory values (see page 5-8, Attachment 1). The lab values were based on recommendations from Michael Pine and Associates, Inc. because of their experience with risk-adjusting cardiac care outcomes. We also collected several “linking” variables to help with joining back to administrative data sets.

## **6. How data elements are standardized**

The POA indicators were standardized by the Centers for Medicare and Medicaid Services (CMS). For the lab values, we used the Logical Observation Identifiers Names and Codes (LOINC) standard (<http://loinc.org>). Additional data elements were standardized according to VHI’s long-standing data submission layout.

## **7. Data transmission methods**

VHI established a secure FTE site. Occasionally, hospitals sent lab records via password protected CD because file sizes exceeded the limits of the web transfer.

## **8. Stakeholders engaged in the process**

There were several stakeholder groups engaged in the process including the Board of Virginia Health Information, the Virginia Hospital and Healthcare Association, the Virginia Health Quality Center, and 30 participating hospitals. Towards the end of the project, VHI recruited new stakeholders from the health insurance, physician, and consumer communities to examine the utility of project results. These results are scheduled for presentation in November 2009.

## **9. Major challenges and their resolutions**

Initially, VHI expected the HL7 format to be a major challenge. Indeed, after examining the technical details, VHI decided to move forward with a different transmission format. VHI faced few obstacles, beyond standard administrative delays, in getting business associate agreements signed. As the data began to flow, there were challenges encountered when file formats were not followed to the letter. While troublesome, these problems were readily solved. Additionally, one of the major challenges that VHI faced was in designing custom reports that would be useful to hospitals. VHI typically followed a process of internal development with our subcontractors and then release to hospitals. Hospital feedback was limited so it was a challenge to

ascertain whether or not these reports were useful to them. VHI is planning to have to a final project meeting to request more explicit feedback on these materials.

#### **10. Project websites**

VHI developed [www.vhi.org/hybriddata.asp](http://www.vhi.org/hybriddata.asp) for this project. VHI also actively participated in the project WIKI. VHI has also included a Master Timeline in Attachment 8.

## **Project Overview**

#### **11. State for which you are reporting.**

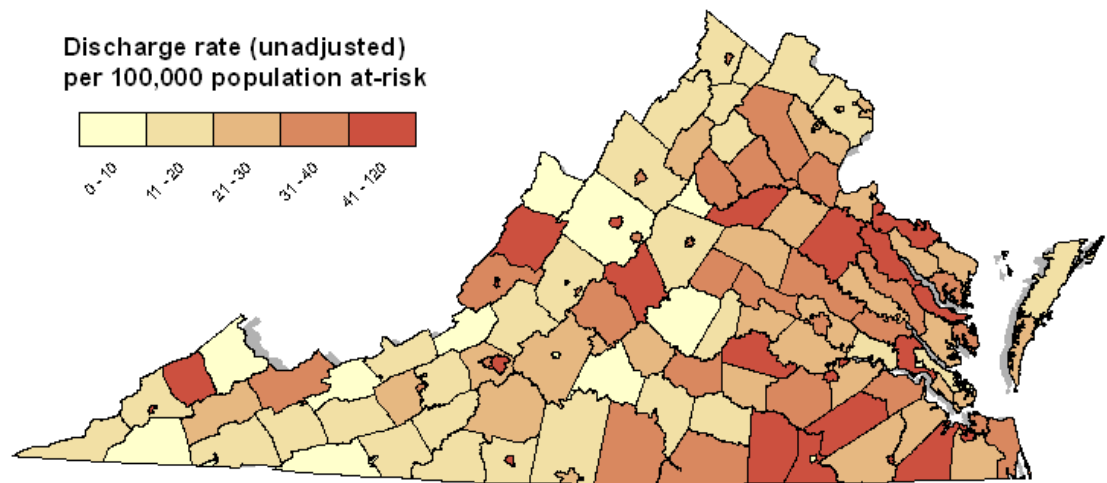
Virginia.

#### **12. Description of the purpose and intention of your project. How does it relate to your organization's current activities and how might the data be used? How has it evolved since the beginning of the project?**

Virginia Health Information (VHI) sought this contract to add present on admission and clinical data to Virginia's established administrative data system. In the "Technical Proposal", VHI proposed three major objectives, all of which were met without major deviation, for the project.

1. "In order to improve the health data VHI collects, VHI will collaborate with health care stakeholders to establish the feasibility of and link clinical data and a present on admission indicator for diagnoses to VHI's administrative statewide inpatient hospital database. VHI has used AHRQ Quality Indicators software for quality improvement and public health surveillance. Outcomes do vary by geographic region (see map) and by hospital."

2007 Selected Infections Due to Medical Care (Area-wide PSI 23). (Updated for the final report)



“Improving VHI’s ability to discern infections or better adjust mortality rates by adding POA indicators or clinical data will improve the value of these data to consumers, providers and researchers. Through previous work with Virginia trauma registry data, outpatient surgery data, EMS and vital records information, VHI has utilized existing patient identifiers needed to link additional information to the administrative files. In addition, VHI has extensive experience with the technical problems that can arise in data linkage and approaches and techniques needed to overcome those challenges to acquire and produce enhanced files for analysis and reporting. VHI’s relations with hospitals and their association is a positive one where collaboration and open communication are the norm. Through a process of inclusion and problem solving, VHI will develop information and data sets that could, if supported legislatively by stakeholders, lead to broader statewide collection and be customized for a variety of purposes including public reporting of quality information on mortality, readmissions and other outcomes to help foster consumer choice and quality improvement. The enhanced data would also be expected to benefit researchers and public health scientists already using VHI administrative data and others in the future.”

Through the course of the project, VHI incorporated the POA indicator into the AHRQ quality indicator software and provided before-after POA scenarios for participating hospitals.

2. “VHI recognizes there is variation in state data systems, present on admission data collection and hospital clinical data systems such as laboratory, vital signs and other key clinical values. VHI expects there could be a need to address concerns about data confidentiality, data

extraction issues, changing lab formats and incompatibility of data formats. Hospitals may change key personnel involved in the exchange and be re-recruited. Thankfully, there are also many common approaches to data collection and integration. VHI intends to develop a reproducible approach for linkage and use of data for quality improvement and reporting by identifying how hospital data streams vary (by system and vendor) and developing a plan to uniformly integrate these data into a statewide data set. By documenting and sharing these challenges and solutions through a series of information sharing and dissemination activities, VHI will help foster these abilities in other states.”

In the early stages of the project, VHI developed a technical survey (see Attachment 2) to assess the technical capabilities of participating hospitals. The results of this survey played a significant role in the design of the data elements. Data submission was never quite uniform despite the fairly strict technical specifications so there was a significant time investment in formatting and compatibility.

3. “Meeting contract objectives is the start point and not the end point of this contract. VHI seeks this contract to set the stage for ongoing integration and use of these additional clinical data in the future. This goal will be met through a process of collaboration, demonstration of proof of concept which may lead to legislative action with the support of its stakeholders.” VHI did, in fact, successfully implement legislation to mandate the collection of POA beginning July 1, 2009. We believe that this project helped demonstrate the value and relative ease of POA reporting for hospitals.

Virginia’s team members and consultants were:

Michael Lundberg (VHI, Executive Director),  
Chris Delcher (VHI, Analyst),  
Deborah Waite (VHI, Operations Manager),  
Ramesh Shukla, PhD (Virginia Commonwealth University, subcontractor),  
Michael Pine PhD (Michael Pine and Associates, Inc. subcontractor),  
Sallie Cook MD (Virginia Health Quality Center, clinical pathologist,  
subcontractor).

### **13. Key stakeholders and their roles**

During the start-up phase, the Virginia Hospital and Healthcare Association [www.vhha.com](http://www.vhha.com), representing 44 member health systems and hospitals, representing 106 community, psychiatric, rehabilitation, and specialty hospitals throughout Virginia played an important role in assisting with hospital recruitment.

**14. Consultants and their major contributions. Include your reasons for adding consultants to your team.**

VHI has many years of experience in collecting, analyzing and publishing health care information. As a small staff of 8, VHI benefits greatly from those with expertise outside of VHI's core capabilities. For this contract, VHI engaged the help of both local and national experts. Dr. Sallie Cook, a pathologist was very helpful in designing tools for the proper mapping of in-hospital lab tests to a standard called LOINC. She was also instrumental in helping to develop screens and edits for submitted laboratory values. Dr. Ramesh Shukla, an expert in operations research and health outcomes measurement was involved in helping design systems to measure the accuracy of submitted POA information and assessing the improvements in outcomes measurement when laboratory and POA information were added. Dr. Michael Pine is experienced in analysis of health data for outcomes measurement. His experience with lab and POA data was valuable in assessing the extent to which adding laboratory and POA information to administrative data will improve our ability to measure health outcomes.

## **Project Planning**

**What issues did you consider and materials did you prepare prior to contacting hospitals for participation?**

VHI requested that VHHA send the following announcement to member hospitals via their electronic newsletter.

“VHI Awarded Contract to Link Clinical Data with Hospital Discharge Data”  
Virginia Health Information (VHI) has been awarded a two-year contract to work with hospitals to develop a method to improve Virginia's patient level data system's ability to predict and evaluate mortality and other outcomes of care. The contract effective date is September 30, 2007, and is provided by the Federal Agency for Health Care Research and Quality (AHRQ.) The contract has a total possible award amount of \$327,704. VHI will work with participants to identify the data elements to be collected and develop enhanced quality reports for hospital internal use. VHHA and VHI view this effort as a potential method to enhance the patient level data system for measurement and improvement of the quality of care. Hospitals participating in the pilot can influence the development process, including information collected, and benefit from enhanced quality information for internal use and an early opportunity to use this information to improve care. For more information on participating in this effort, contact Michael Lundberg, Executive Director of VHI, at michael@vhi.org or (804) 644-7026.”

*Initial Recruitment Announcement sent to Hospitals via the VHHA electronic newsletter.*

Some of the initial issues with recruitment were whether or not the CEOs should

be contacted directly and in what format (because letters tend to “get lost on desks”), the development of a follow-up schedule with strategies to handle non-responsive hospitals, and whom to contact first inside of multi-hospital systems.

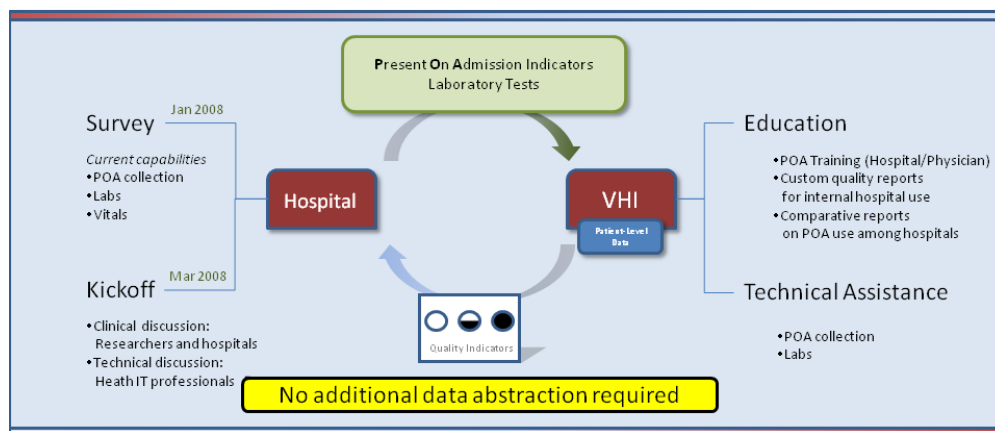
VHI developed several key materials to help ensure hospital participation:

The full recruitment package (see Attachment 3) contained three elements:

- 1) A cover letter from VHI’s Executive Director explaining the importance of the project
- 2) A graphic overview of the project (see below) and
- 3) A clear description of the roles and responsibilities of all parties involved. This letter was sent to three contacts: the hospital administrator, the quality assurance coordinator, and the patient level data contact.

It is worth describing a couple of key points about these recruitment materials. On the graphic itself, VHI consulted with its internal nursing staff and we determined that the most compelling feature of the project was that “**No additional data abstraction [would be] required.**” Given the work burden of the quality contacts, our nurses thought that knowing this up-front would increase the likelihood of participation.

## Virginia Health Information *Adding Clinical Data to Administrative Data* An Overview

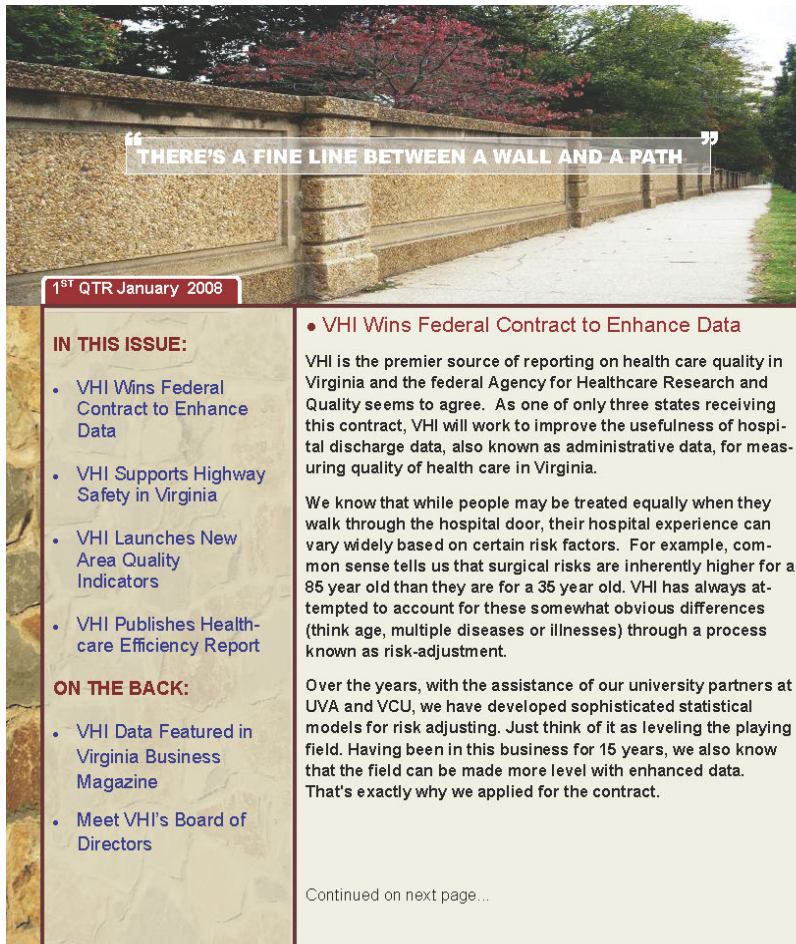


Partners:    



When the opportunity arose, VHI's Executive Director hand-delivered these recruitment materials.

A couple of weeks after the packages were mailed; VHI began to follow-up with data quality contacts by phone. Usually after that discussion, an email was sent with additional follow-up items (see Attachment 4). This follow-up email contained two key components: a link to the "science behind the project" at [http://ahrq.hhs.gov/fund/ReviewofClinicalAdmDataElements\\_4\\_2\\_07Final.pdf](http://ahrq.hhs.gov/fund/ReviewofClinicalAdmDataElements_4_2_07Final.pdf) and a link to an electronic newsletter description of the AHRQ project. A screenshot of the print version of that story is below:



**VIRGINIA HEALTH INFORMATION**  
1108 E. MAIN STREET, SUITE 1201 • RICHMOND, VA 23219  
TOLL FREE 1-877-VHI-INFO OR 804-643-5573 • EMAIL: [INFO@VHI.ORG](mailto:INFO@VHI.ORG)  
ON THE WEB: [VHI.ORG](http://VHI.ORG)

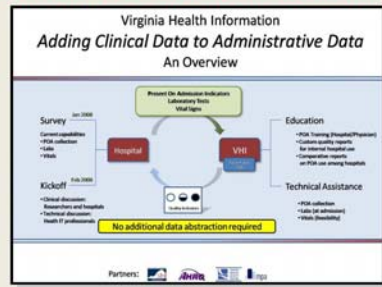


**112**  
The risk-adjusted rate (per 100,000 population) of discharges for adult asthma in Virginia, 2006

**1,532**  
The number of invasive cardiology procedures performed by CJW Medical Center, 2006

**961**  
The number of people who died in traffic crashes in Virginia, 2006

• VHI Wins Federal Contract to Enhance Data con't



A graphic overview of the "Adding Clinical Data to Administrative Data" process.

The idea is simple. Instead of using costly approaches such as medical chart review to discover the clinical differences between people, VHI will be able to mimic this manual process by adding clinical data to administrative data. The goal is to improve our statistical adjustments to include these not-so-obvious differences that people have as they walk through the hospital door. In the end, VHI wants to increase the value of these data to consumers, providers and researchers alike.

If you would like to read more about the science behind this work, visit [http://ahrq.hhs.gov/fund/ReviewofClinicalAdmDataElements\\_4\\_2\\_07Final.pdf](http://ahrq.hhs.gov/fund/ReviewofClinicalAdmDataElements_4_2_07Final.pdf)

• VHI Supports Highway Safety in Virginia

You may not know it from looking at [www.vacodes.org](http://www.vacodes.org) but VHI is the developer behind Virginia's **Crash Outcome Data Evaluation System** also known as **CODES**. We designed **CODES**, in partnership with Virginia DMV/Governor's Highway Safety Office and the National Highway Traffic Safety Administration (NHTSA) to reduce deaths, non-fatal injuries and health care costs resulting from motor vehicle crashes in Virginia.

We have combined our expertise with hospital discharge data and web-based reporting to help planners gain instant access to the hospital charges and outcomes from crashes on Virginia's roads. Our instant access reports provide charge information for a variety of crash-related factors such as driver age and vehicle type over multiple years. The interactive website and downloadable fact sheets can be accessed at [www.vacodes.org](http://www.vacodes.org).

[www.vacodes.org](http://www.vacodes.org)

One of the purposes of including a link to this newsletter was to encourage participation by giving the hospitals the sense that many people around the state would read about the project and to give them refined materials to share with internal key players and link to on their own websites if desired.

After the kickoff meeting, VHI developed two additional web-based materials that the hospitals could use to "market" and follow the project. The first was another electronic newsletter which included a story called "VHI Hosts AHRQ Kickoff Meeting" with a map of all participating hospitals. (This graphic template was used periodically throughout the project, approximately 10 times, to provide project updates in a format that would be visually appealing.) A larger version of the graphic shows a list of participating hospitals, their locations in Virginia, color-coded by the status of their contract, and a pie-chart showing the percentage of hospital discharges also color coded by contract status.

Business  
Representatives  
Stephen J. Enright, MBA,  
[SJE Partners, LLC](#)

Todd R. House, [Micron Technology](#)

M. Addison Jones, [The Supply Room Companies](#)

S Hope Johnson,  
[Bowden](#)

Bruce Nave, [Sun Trust Bank](#)

Consumer  
Representatives

W. Bryan Block

Dolores G. Clement,  
DrPH

James L. Kammert

Health Insurance  
Representatives  
Gail Thompson, [Kaiser Permanente](#)

Rome H. Walker, MD,  
[Anthem Blue Cross and Blue Shield](#)

Hospital Representatives  
Theresa L. Edwards,  
[Bon Secours Richmond Health System](#)

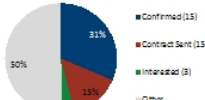
## VHI Hosts AHRQ Kickoff Meeting

March 7, 2008

In March 2008, VHI hosted a kickoff meeting for the Agency for Healthcare Research and Quality pilot project called "Adding Clinical Data to Administrative Data." The meeting gave quality, information technology and coding staff from over 30 participating hospitals the opportunity to learn more about project objectives, timelines and technicalities. VHI brought together experts in the field of present-on-admission (POA) coding, clinical pathology and statistical modeling for quality reporting to present on a range of topics from POA coding scenarios to anticipated quality reporting that VHI will provide for participants. Virginia was one of three states in the country to be awarded this cutting edge contract. Please visit our project page at [www.vhi.org/hybriddata](http://www.vhi.org/hybriddata)

### "Adding Clinical Data to Administrative Data" Status Map

% of Total Hospital Discharge Volume  
by Contract Status  
(2,006 discharges)



31 Hospitals/Systems Involved  
(as of June 1, 2008)

VHI Hosts:  
Carilion Medical Center  
University of Virginia Medical Center  
Peters Memorial Hospital  
Fountain Hospital  
Carilion Health  
Piedmont Hospital  
CVA Medical Center  
Hennepin County Hospital  
Mary Washington  
Hennepin County Hospital  
Lowell Gable Medical Center  
Poudre Community Hospital  
Montgomery Regional Hospital  
Allegheny Regional Hospital  
St. George's Richmond Community Hospital  
Rappahannock General Hospital  
John Marshall Hospital  
Carroll Medical Center  
Starrs Memorial Hospital  
Southwest Memorial Hospital  
Crestwood Medical Center  
Columbus Community Hospital  
Columbus Regional Hospital  
St. Joseph St. Mary's Hospital  
Shenandoah Regional Medical Center  
Spartanburg General Hospital  
Phonak Regional Hospital  
Carilion Franklin Memorial Hospital



Hospital symbol colors correspond to chart legend

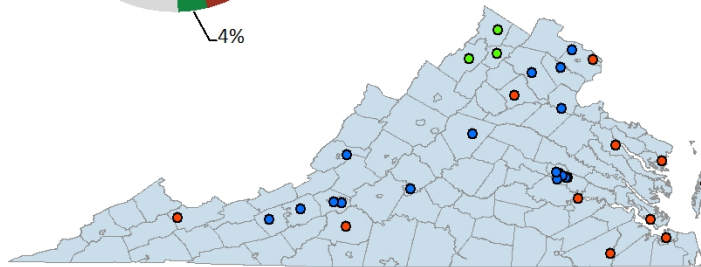
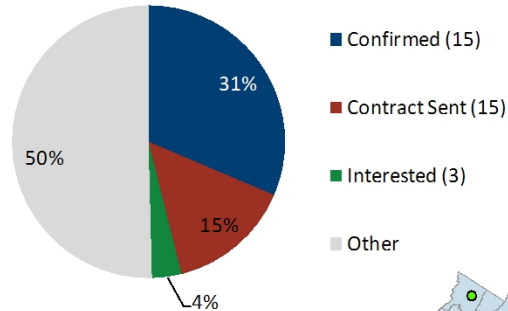
Western Memorial Hospital  
Hennepin County Hospital  
Shenandoah Memorial Hospital

Map showing the locations of hospitals involved in the "Adding Clinical Data to Administrative Data" project. Click image for larger view.

[↑ To Top](#)

## "Adding Clinical Data to Administrative Data" Status Map

% of Total Hospital Discharge Volume  
by Contract Status  
(2006 discharges)\*



Hospital symbol colors correspond to chart legend

31 Hospitals/Systems Involved  
(as of June 1, 2008)!

VCU Health System  
Carilion Medical Center  
University of Virginia Medical Center  
Prince William Hospital  
Fauquier Hospital  
Centra Health  
Retreat Hospital  
CJW Medical Center  
Henrico Doctors' Hospital  
Mary Washington  
Reston Hospital Center  
Lewis-Gale Medical Center  
Pulaski Community Hospital  
Montgomery Regional Hospital  
Alleghany Regional Hospital

Bon Secours Richmond Community Hospital  
Rappahannock General Hospital  
John Randolph Hospital  
Clinch Valley Medical Center  
Shore Memorial Hospital  
Southampton Memorial Hospital  
Northern Virginia Community Hospital  
Culpeper Regional Hospital  
Bon Secours St. Mary's Hospital  
Riverside Regional Medical Center  
Sentara Norfolk General Hospital  
Riverside Tappahannock Hospital  
Carilion Franklin Memorial Hospital

Warren Memorial Hospital  
Winchester Medical Center  
Shenandoah Memorial Hospital

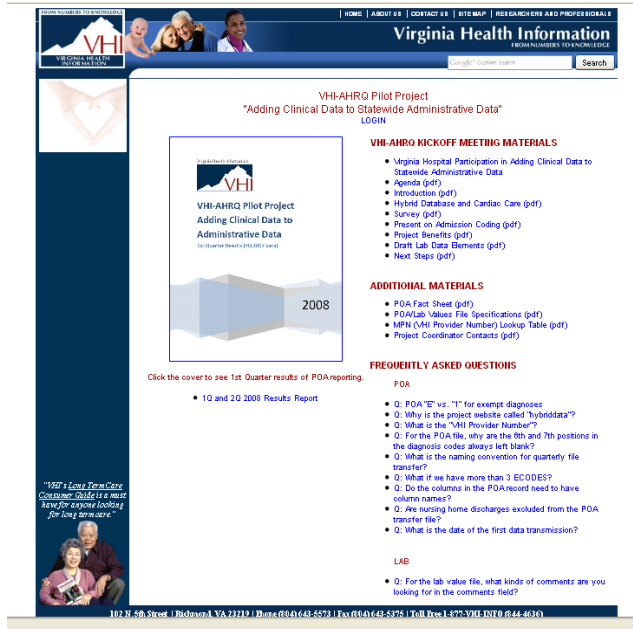


The second was the development of a Hybrid data project home page. A screen shot of the home page, as of July 2009, is given below. Quarterly reporting was added later in the project but the initial page contained three important elements.

1) VHI-AHRQ Kickoff Meeting Materials. This provided hospitals with access to all presentation given during the kickoff meeting. This section did not change throughout the project.

2) Additional Materials. This section was updated as needed. For example, the POA fact sheet, which came from CMS, changed during the project so this link was updated. We also provided a list of all project coordinators that could be used as a resource by participants.

3) Frequently Asked Questions. This section also evolved through time. Each question and the response can be viewed at [www.vhi.org/hybriddata.asp](http://www.vhi.org/hybriddata.asp)



VHI developed a comprehensive business associates' agreement and modified to meet hospital's legal requirements as necessary.

15. List the data elements ***initially*** chosen to add to your administrative data set and discuss why these elements were chosen.

Data elements initially chosen were those provided by MPA. MPA also provided the following response via email in January 2008:

“We [Virginia] will begin with the MPA list but will expand it in collaboration with pilot sites. We will substitute hemoglobin for hematocrit based on work done recently in California evaluating the clinical utility and credibility of the two almost interchangeable measures. We will consult with Cardinal Health about their experience with Atlas laboratory variables not included on the MPA list and will consider some new variables such as BNP that appear to be breaking through as potentially important risk factors. All potential variables will be ranked on two scales: one for potential utility and a second for ease of collection. These rankings will be used to guide final selection of laboratory data elements.”

Data elements were removed from consideration after the results of the survey. The final list of laboratory data elements are found in Attachment 2.

**16. List any outside sources you referenced when determining which data elements to collect, such as expert input, data standards, articles, research, or other material.**

Several outside consultants were very helpful during the course of this project in Ed Hammond and Linda Hyde.

## **Project Initiation**

**17. Describe the process used to involve hospitals with the project:**

**a. Did you contact the hospital organization? What was the purpose of the contact?**

Often, there were, at least, two levels of contact for each hospital. VHI's analyst contacted the quality assurance coordinators by phone and then via email while VHI's Executive Director contacted other key personnel either by phone or in person. The purpose of these contacts was to "put a face" to the project and give hospital personnel an opportunity to ask preliminary questions. VHI also hosted two technical conference calls. See Attachment 5 for the agenda.

**b. Were all hospitals contacted or only selected hospitals? What criteria were used to select hospitals for participation if only selected hospitals were included?**

First, VHI gauged the potential interest among hospitals by relying on the initial responses to the VHHA email above. Once we determined that the interest was there, we sent a mass email to all hospital contacts with the full recruitment package.

**c. Who within the hospital did you contact (e.g., administration, IT, coders)?**

For all hospitals, the quality assurance coordinator was contacted.

For some hospitals, higher-level personnel were contacted. During recruitment, no IT or coding personnel were contacted. However, these people were invited to the kick-off meeting and sometimes became the primary contacts as the project evolved.

**d. Describe any products or materials developed as part of this pilot/planning process (presentations, reports, brochures, fact sheets, etc). Include products in an appendix if they can be shared.**

VHI hosted a Kickoff meeting modeled after Minnesota's equivalent at the Virginia Hospital and Healthcare Association in Richmond, Virginia. VHI planned for 45 participants (including staff and subcontractors) and had an actual turnout of 32 people. For Kickoff meeting materials, please see <http://www.vhi.org/hybriddata.asp>

**e. What incentive did the hospitals have to participate?**

In the recruitment package and kickoff meeting, VHI argued 6 primary benefits to participation:

- 1) Hospitals will have the opportunity to evaluate and improve data quality.
- 2) Hospitals will have the benefit of comparative performance as a guide to quality improvement.
- 3) Hospitals will help design a program with the least administrative burden and greatest value.
- 4) Hospitals will receive quality reports using the AHRQ Quality and Patient Safety Indicators.
- 5) Hospitals will receive enhanced cardiac care mortality and readmission information.
- 6) Hospitals will receive comparative information on use of POA values and other reports that hospitals suggest throughout the project.

**f. Did you offer to provide any information to hospitals in return for their participation?**

Yes. Hospitals knew that they would receive feedback and reports, listed in Items 4-6, from data submitted.

**g. What other issues did you encounter in establishing hospital buy-in to this project?**

There were significant delays in getting a signed contract from one hospital system because they felt that it was necessary to put the contract through Internal Review Board (IRB) review. The internal approval process took approximately 1 month.

**18. How did you assess a hospital's readiness to participate? If you used a survey, please include the survey questions and results in an appendix and summarize the findings here. Did the results cause you to alter your approach in any way?**

Survey Summary

There were 11 respondents to the survey representing single and multiple hospitals. 9 of 11 (81%) indicated that they could provide a "supplementary electronic file containing POA values and the "linking" variables." The dominant files types for POA submission were text (6) and EXCEL (5). 8 of 10 (80%) of respondents said that they could provide a "supplementary electronic file containing lab values and the linking variables." We also wanted to know if hospitals had the capability of submitting pre-admission labs by linking pre-admission lab results to the subsequent admission. 9 of 10 (90%) respondents indicated that they could link the results. There were a variety of primary lab vendors listed. "In-house" was listed for 3 respondents. 9 of 10 (90%) respondents indicated that most of the lab values that we requested were available. However, availability of ProBNP, Troponin T, and Neutrophil was more limited. We also found that 7 of 9 (77%) respondents did not have vital signs available electronically. 5 of 8 (63%) respondents said that they would not be able to map data element to LOINC and an equal number said that they would not be able to provide a data dictionary to VHI for mapping. For those that could do the mapping, we asked a follow-up to estimate the number of hours needed to do the mapping. The answers were "unknown but significant", "Uncertain", and "4."

Altering Approach

VHI made several significant adjustments based on the survey. First, we decided not to collect vital signs because most hospitals did not have them electronically. MPA's research indicated that vital signs did not add significantly to the power of the models so we were comfortable with this decision. Second, we decided to provide a LOINC mapping template to make the process of assigning LOINC values as easy as possible for those hospitals that indicated that they would have problems with the mapping. The template is included in Appendix X. We spent a significant amount of time in developing this template which is described in [section].

**19. Describe any administrative hurdles encountered in moving forward with this project.**

There were no major administrative barriers to project implementation.



**20. What changes were made during initiation that were not anticipated during the planning phase?**

The major changes included the decision to use a data transmission format other than HL-7 and the exclusion of vital signs.

## **Project Implementation**

**21. How many hospitals provided data?**

Out of 28 hospitals, 28 (100%) provided at least 3 quarters of POA data. 15 of 28 (54%) provided at least 3 quarters of laboratory data.

- a. Provide a general description of the types of hospitals that were recruited (such as number of community hospitals, children’s hospitals, specialty hospitals, number of beds, urban/rural, teaching/nonteaching, other key descriptors)**

<b>AHRQ Project Status</b>	<b># Hospitals</b>	<b>Mean Beds</b>	<b>Mean Profit (\$)</b>	<b>% Not-for-profit</b>	<b>% w/ Teaching status</b>	<b>% Urban</b>
Final Pilot Participant	27	327	\$24,566,692	66%	37%	88%
Contract Sent but Declined	9	151	\$11,197,654	77%	0%	22%
No Contract Sent	48	158	\$9,456,088	81%	17%	47%

- b. Discuss problems participating hospitals encountered in complying with data requests (e.g., allocation of staff and technological resources, other commitments during certain times of year, other issues).**

For hospitals that committed to the project, the technical difficulties were minimal. As a means of encouraging them to stay engaged in the project, we reminded them that understanding the technical barriers to project implementation was an objective and that we would like to understand the issues. Although some hospital staff turned over, the transitions were relatively smooth and sometimes required us to resend to the data layout package.

**c. How were these problems resolved?**

As we initiated the project, we tried to minimize some of the technical problems by allowing hospitals to submit test files of about 100 records. The following is a typical exchange from VHI to the hospital after the submission of the test file:

*“Took a look at the file this morning. Overall, looks like everything is there but I have just a few questions.*

*Is the date in the record the admit or discharge date? One or the other looks to be missing.*

*Is the value that starts with the 8 leading zeros the PCN or MRN? One or the other looks to be missing.*

*I don't see where the LOINC code has been used but I do see the test name. Will you be providing the LOINC map as well?*

*What does the 0 in the MPN field mean?*

*Is the last time in the record the observation date/time or the analysis date/time?”*

Although the field format was fixed length, sometimes, depending on the file format, this would vary. For example, the hospital identifier, a six digit number with no spaces, was sometimes sent with leading and trailing zeros. We made the decision to just accept these types of variations if they could easily be corrected on our end. For one hospital system with four participating hospitals, there were significant delays in receiving their POA files because they could not transpose the data so that each row was a patient record. Because we were eager to have them participate, we accepted the submission and transposed it on this end. This hospital system was never able to provide lab data due to system conversion. We also requested that the ECODES be extracted from diagnosis codes and placed into separate columns at the end of the file. This proved to be problematic for many hospitals because they had to write special extraction features. We finally just accepted the files without the specific ECODE columns.

**d. Describe key hospital characteristics that led to successful hospital participation.**

On average, larger, urban hospitals with larger profit margins participated in the pilot. However, obtaining data was easiest from smaller hospitals where the data quality contact was directly connected to IT support or through hospital systems that were able to export a single file for multiple hospitals. Data submission was more problematic for large, teaching

hospitals not affiliated with systems.

- e. **Did you assess fiscal impact to hospitals for participation? If so, what resources did hospitals need to participate?**

As of July 31, 2009, we have not assessed the fiscal impact. However, it is our intention to do so using the template survey provided by Florida.

22. Describe issues encountered in standardizing data elements.

- a. **Did you use HL-7 and/or LOINC?**

- i. **If not, why not? What other coding method was selected and why was it chosen?**

HL7

VHI did not use a full compliant HL7 message for this project. Some hospitals did indicate the capability to export in an HL-7 format and that it would be fairly straightforward. For example, one hospital wrote:

*"We already have a lab interface [name of interface] in HL7 format. Is it ok to send you our lab data in this format? If so, we'll just need to filter out the tests you're not requesting and can have a test file ready by July."*

However, during the kick-off meeting, many hospitals indicated that they did not have HL-7 capability. Although the idea of using the pilot to "force" them to provide information in a fully compliant HL-7 format as a means of "getting them used to it" was considered, VHI decided that this would be inappropriate for this purpose for four reasons: 1) the project was voluntary and VHI did not want to risk excluding hospitals that could not provide HL-7 easily 2) the universe of data elements needed for a fully compliant HL-7 message was much larger than needed for this project 3) this project was not a real-time transaction of data which is one of the primary reasons for using HL-7 and 4) VHI was also inexperienced with the format.

Ed Hammond was very helpful in explaining the HL-7 format to VHI {see Attachment 6}. VHI worked through several examples of how to construct a message for this project before deciding on an HL7-like file format.

- ii. If so, describe any challenges and how they were resolved.

Once VHI discovered that LOINC mapping would be very challenging for some hospitals, it was decided to develop a simplified map, with

examples and instructions, for just those lab elements of interest. The following table was provided as an example for instructing hospitals on how to complete the LOINC worksheet. VHI did not request that the maps be returned for verification. According to Michael Pine and Associates, Inc. the quality of the lab data suggests that Virginia hospitals were successful in mapping LOINC values without significant technical assistance.

Example LOINC Code Worksheet

#	Test Name	Spec. Type	Unit	LOINC Code	LOINC Name	Comment	TO BE COMPLETED BY HOSPITAL				
							Spec. Type	Unit	Normal Range	Method	Comment
25A	O2 Sat. Arterial	Arterial Blood	%	2708-6	O2 % BldA	FIO2 if available	Arterial Blood	%	94-100	Pulse oximetry	ABG11 FIO2 not available
28	Sodium	Serum / Plasma	mEq/l = mmol/l	2951-2	Sodium SerPl-sCnc		Serum	mEq/l	135-145	Ion exchange-gravimetric	Na1
							Serum	mmol/l	135-145	Flame photometry	Na2
32B	White Blood Count	Whole Blood	10 <sup>9</sup> cells/ul	6690-2	WBC # Bld Auto		Whole Blood	10 <sup>9</sup> cells/ul	4.3-10.8	Flow cytometry	WBC101

**b. Include a copy of your format for data collection in the appendix.**

Please see Attachment 1 for the data file format and technical specifications.

**c. What advice would be useful to other states in understanding/employing HL-7 and/or LOINC?**

Although VHI spent a significant amount of time to understand the pros/cons of the HL-7 format, it was decided not to use it for 2 reasons:

- 1) If hospitals were even aware of the standard at all, most hospitals that VHI surveyed indicated that they would face significant barriers to exporting in a HL-7 format.
- 2) Given that VHI was expecting quarterly transfers of batch files and that HL-7 was designed for real-time transactions, VHI did not think it would be appropriate to impose the format unnecessarily.

**23. Did you use any specific communications or tools with hospitals to ease their collection efforts?**

**a. Describe the communications/tools and furnish copies in an appendix.**

VHI took several steps to help ensure that participation in the pilot would be as easy as possible. First, in all of the data layout packages, VHI provided very specific examples. For example, the table below was provided to help describe valid POA formats.

**POA Coding Scenarios for Data Verification for  
"Adding Clinical Data to Administrative Data" project**

	VALID?	POSITION NUMBER								REASON
		1	2	3	4	5	6*	7*	8 <sup>POA</sup>	
3 Digit DX code Pneumonia, Organism unspecified	YES	4	8	6	-	-	-	-	N	POA value in the 8th position
	NO	4	8	6	N	-	-	-	-	POA value not in 8th position
	NO	4	8	6	-	-	-	-	-	No POA value
	YES	4	8	6	-	-	-	-	1	POA value in the 8th position
4 Digit DX code Urinary Tract Infection	YES	5	9	9	0	-	-	-	Y	POA value in the 8th position
	NO	5	9	9	0	Y	-	-	-	POA value not in 8th position
	NO	5	9	9	0	-	-	-	-	No POA value
	YES	5	9	9	0	-	-	-	1	POA value in the 8th position
5 Digit DX code Decubitus Ulcer on Heel-Bedsore or Pressure Ulcer	YES	7	0	7	0	Z	-	-	W	POA value in the 8th position
	NO	7	0	7	0	Z	W	-	-	POA value not in 8th position
	NO	7	0	7	0	Z	-	-	-	No POA value
	YES	7	0	7	0	Z	-	-	1	POA value in the 8th position
ECODE (4 digit)** Foreign Object Left in Body during Procedure	YES	E	8	Z	1	-	-	-	N	POA value in the 8th position
	NO	E	8	Z	1	N	-	-	-	POA value not in 8th position
	NO	E	8	Z	1	-	-	-	-	No POA value
	YES	E	8	Z	1	-	-	-	U	POA value in the 8th position
ECODE (5 digit) Foreign Object Left in Body during Procedure	YES	E	8	Z	1	4	-	-	N	POA value in the 8th position
	NO	E	8	Z	1	4	W	-	-	POA value not in 8th position
	NO	E	8	Z	1	4	-	-	-	No POA value
	YES	E	8	Z	1	4	-	-	U	POA value in the 8th position

<sup>POA</sup> The 8th position is always reserved for the POA indicator (see next page for valid POA indicators)  
 \* The 6th and 7th positions are always left blank for data submission during this project but consistent with UB04 reporting requirements  
 \*\* The ECODE always starts with an "E" in the first position

**b. How did the communications/tools assist the hospitals?**

**24. Describe the process and technologies used for hospitals to transmit the data, and your organization to receive them. What problems were encountered with data transmission and how were they resolved?**

VHI also provided a web-based data upload site. Although this site was sometimes insufficient for transmitting very large files (> 30 MB) and FedEx was used as the fallback, overall the hospitals were competent users of the site. A screenshot of the upload page is found below.



When files needed to be transmitted via FedEx, most hospitals chose to zip and password protect the files. Hospitals provided the passwords as emails. One hospital sent a USB drive, with proprietary encryption software installed. Although slightly more involved, this did not cause any problems.

## Data Analysis

### 25. How were the clinical data linked to the administrative data, and how was the correctness of the linkage verified?

#### POA

As mentioned previously, all hospitals were given the opportunity to submit test files with a small number of POA enhanced records. Using SAS, we wrote code to import files according to the fixed file format that we requested and this was applied, unaltered as the first attempt to read the data. Although the field lengths sometimes were off only by a few digits, this would often lead to compounding errors throughout the file. It was rare for the hospital to submit data exactly as requested however, unless the error was egregious, we would accept the file as submitted. Eventually, a combination of SAS, ACCESS, and EXCEL was used to read files. The import procedure within ACCESS was very useful because it provides a visual ruler for counting field lengths.

For all data submissions, at a minimum VHI requested a patient control number (PCN) and medical record number (MRN). The PCN was the primary means of linkage to the administrative data. While this unique identifier was usually

consistent between the two data sets, sometimes the PCN submitted for the pilot would be in a different format. Often, the formatting difference was attributable to segments (such as trailing and leading zeros) of the identifiers. The difference probably occurred because the pilot project bypassed routine VHI data standardization.

Once the PCN was standardized, the first step to ensure that the linkage was effective was to perform a count of discharges by hospital for the quarter of interest. [Provide some descriptive statistics of variance.] This step often revealed when more records than necessary were being included in the POA data. The difference in counts revealed that some hospitals were sending outpatient data.

We usually provided an immediate email back to the sender to indicate that the POA counts were within a reasonable range of what had been submitted for their administrative data. This process sometimes involved sending a small subset of problematic records back to the sender. These records were typically uploaded to the same hospital-specific web page used for submitting the data.

At this time, we also started to develop preliminary POA reports and hold conference calls with our subcontractors to discuss results. Initially, these reports were sent to the hospitals in “real-time” as the data was received but the release time, format, and content evolved significantly through time. One of the earliest versions is shown below. You can see the admin vs. POA record count above the table which shows the distribution of the POA indicator through 18 diagnosis codes and 3 ECODE fields. We applied an automated highlight to occur when the percentage of POA flags in any given DX field was greater than 10%. We also began developing potentially hospital acquired conditions reports based on fact sheets available from CMS.



"Adding Clinical Data to Administrative Data"  
**DRAFT REPORT OF POA DISTRIBUTION FOR HOSPITAL 1**  
 Discharges Oct-Dec 2007

Admin Records 1,568 POA Records 1,547

DX# ECODE#	ICD9 Present	POA=Y	%	POA=N	%	POA=E	%	POA=U	%	POA=W	%
<b>DX1</b>	<b>1,532</b>	<b>1,096</b>	<b>71.5</b>	<b>182</b>	<b>11.9</b>	<b>213</b>	<b>13.9</b>	<b>41</b>	<b>2.7</b>	<b>2</b>	<b>0.1</b>
DX2	1,549	1,284	82.9	43	2.8	215	13.9	7	0.5	.	.
DX3	1,354	1,015	75.0	105	7.8	186	13.7	48	3.5	.	.
DX4	1,184	909	76.8	97	8.2	152	12.8	26	2.2	1	0.1
DX5	1,078	830	77.0	73	6.8	146	13.5	29	2.7	.	.
DX6	970	746	76.9	72	7.4	130	13.4	22	2.3	.	.
DX7	899	668	74.3	75	8.3	129	14.3	27	3.0	.	.
DX8	829	586	70.7	59	7.1	158	19.1	26	3.1	.	.
DX9	769	519	67.5	59	7.7	166	21.6	25	3.3	.	.
DX10	701	453	64.6	51	7.3	178	25.4	19	2.7	.	.
DX11	645	385	59.7	55	8.5	182	28.2	23	3.6	.	.
DX12	582	333	57.2	40	6.9	184	31.6	25	4.3	.	.
DX13	518	285	55.0	31	6.0	176	34.0	26	5.0	.	.
DX14	468	223	47.6	26	5.6	202	43.2	17	3.6	.	.
DX15	411	181	44.0	36	8.8	181	44.0	13	3.2	.	.
DX16	368	162	44.0	25	6.8	166	45.1	15	4.1	.	.
DX17	308	129	41.9	19	6.2	147	47.7	13	4.2	.	.
DX18	261	99	37.9	19	7.3	135	51.7	8	3.1	.	.
<b>ECODE1</b>	<b>270</b>	<b>184</b>	<b>68.1</b>	<b>60</b>	<b>22.2</b>	<b>16</b>	<b>5.9</b>	<b>10</b>	<b>3.7</b>	.	.
<b>ECODE2</b>	<b>72</b>	<b>37</b>	<b>51.4</b>	<b>18</b>	<b>25.0</b>	<b>14</b>	<b>19.4</b>	<b>3</b>	<b>4.2</b>	.	.
ECODE3	.	.	.	.	.	.	.	.	.	.	.
<b>TOTAL</b>	<b>14,768</b>	<b>10,124</b>	<b>68.6%</b>	<b>1,145</b>	<b>7.8%</b>	<b>3,076</b>	<b>20.8%</b>	<b>423</b>	<b>2.9%</b>	<b>3</b>	<b>0.0%</b>

Code Present - The number of records having the DX#ECODE# indicated  
 POA=Y - The number of records where the value Y (YES) was found in the position reserved for the POA value  
 POA=N - The number of records where the value N (NO) was found in the position reserved for the POA value  
 POA=E - The number of records where the value (I or E) (EXEMPT) was found in the position reserved for the POA value  
 POA=U - The number of records where the value U (INSUFFICIENT) was found in the position reserved for the POA value  
 POA=W - The number of records where the value W (UNDETERMINED) was found in the position reserved for the POA value  
 Highlighting indicates that POA=N was reported for >=10% of all POA values reported for the DX#ECODE# indicated



"Adding Clinical Data to Administrative Data"  
**DRAFT REPORT OF POTENTIALLY HOSPITAL ACQUIRED CONDITIONS**  
**FOR HOSPITAL 1**  
 Discharges Oct-Dec 2007

CMS CONDITION (ICD9 CODE)	POA=N	%	POA=Y	%	POA=U	%	TOTAL
Clostridium difficile- Assoc. Dis (008.45)	3	15.8	16	84.2	0	0.0	19
Deep Vein Thrombosis (453.40)	0	0.0	4	100.0	0	0.0	4
Deep Vein Thrombosis (453.41)	1	9.1	9	81.8	1	9.1	11
Deep Vein Thrombosis (453.42)	1	14.3	5	71.4	1	14.3	7
Pressure Ulcer (707.03)	0	0.0	12	92.3	1	7.7	13
Pressure Ulcer (707.07)	0	0.0	5	100.0	0	0.0	5
Pressure Ulcer (707.09)	0	0.0	3	100.0	0	0.0	3
Pulmonary Embolism (415.19)	8	30.8	17	65.4	1	3.8	26
Staph. Septicemia (998.59)	3	37.5	5	62.5	0	0.0	8
Vasc. Cath. Assoc. Inf. (999.31)	0	0.0	3	100.0	0	0.0	3
<b>TOTAL</b>	<b>16</b>	<b>16.2</b>	<b>79</b>	<b>79.8</b>	<b>4</b>	<b>4.0</b>	<b>99</b>

CMS flagged conditions are based on information found at <http://www.cms.hhs.gov/HOSPITALAcqCond/>

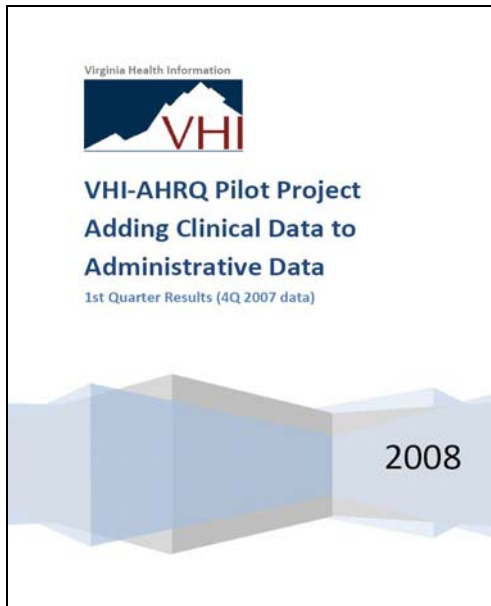
These reports were also used as an additional data quality checks and to generate further discussion during meetings with subcontractors. Non-identifiable versions were also presented to VHI's Board of Directors as a means of demonstrating pilot progress.

Through the course of subcontractor meetings, additional tables were requested such as the "Top 50 Diagnoses NOT PRESENT ON ADMISSION in the principal diagnosis" and "Top 50 Diagnoses EXEMPT FROM POA REPORTING in the principal diagnosis". Additional information was added to the "Top 50 Diagnoses NOT PRESENT ON ADMISSION in the principal diagnosis" table that indicated



when the “condition may be inconsistent with the definition of a principal diagnosis or POA coding guidelines.” This was our attempt to draw hospital attention to potential coding problems.

This report evolved into an 8 table quarterly report called “VHI-AHRQ Pilot Project Adding Clinical Data to Administrative Data: 1<sup>st</sup> Quarter Results (4Q 2007 data)”. The cover for this report is shown below and the full contents can be read at <http://www.vhi.org/hybriddata.asp>



The summary included the paragraph

“Based on initial commitments to the project, VHI expected to receive 99,350 hospital discharges with the POA indicator added for 4Q 2007. VHI received 92,749 (93%) discharges. Although minor issues with formatting, coding conventions, and data extraction were encountered along the way, the POA phase of the project has been very successful.”

By the release of the second quarterly report (see Attachment 7) representing 1Q and 2Q 2008 discharges, the information had expanded significantly because of the addition of several important tables:

- AHRQ Hospital Patient Safety Indicators (PSI) with Pre-POA and Post-POA rates specific to their hospital and for all pilot sites aggregated.
- AHRQ Patient Safety Indicators (PSI) Comparison of Pilot Data, a National Inpatient Sample, and a Veterans Administration Sample (shown below)
- AHRQ Hospital Patient Safety Indicators (PSI) with Pre-POA and Post-POA rates specific to their hospital and for all pilot sites aggregated.



Table 12 Patient Safety Indicators (PSI) Comparison (1Q and 2Q 2008 Aggregated Data for 27 Pilot Hospitals)		Virginia PRE POA	Virginia POST-POA	National Inpatient Sample (2006)	Veterans Administration Sample (2001- 2005)	
Indicator Number	Indicator Description	Obs Rate	Obs Rate	Risk Adj Rate	Obs Rate	Risk Adj Rate
1*	Complications of anesthesia	0.50	0.50	0.66	0.74	0.73
2	Death in low mortality DRGs	0.70	0.70	0.43	2.83	
3	Decubitus Ulcer	33.10	8.70	24.57	15.20	15.92
4	Death among surgical inpatients w/serious treatable comp.	151.70	180.90	114.00	137.18	137.60
5*	Foreign body left in during procedure, secondary DX field**	0.00	1000.00	0.09	0.12	
6	Iatrogenic pneumothorax, secondary DX field	0.60	0.50	0.61	0.85	1.13
7	Selected Infections due to medical care, secondary DX field	2.20	1.60	2.19	1.95	1.67
8*	Post-operative hip fracture	0.30	0.10	0.31	0.39	0.53
9	Post-operative hemorrhage or hematoma	2.60	2.30	2.40	3.19	2.71
10	Post-operative physiologic and metabolic derangements	1.30	0.50	0.42	2.08	1.90
11	Post-operative respiratory failure	7.70	6.70	10.39	13.36	10.28
12	Post-operative pulmonary embolism or deep vein thrombosis	15.40	8.70	11.18	11.29	9.40
13	Post-operative sepsis	15.10	15.90	15.06	6.80	5.60
14*	Post-operative wound dehiscence	2.70	2.70	2.63	6.47	3.61
15	Accidental puncture or laceration, secondary DX field	3.70	3.30	4.57	2.96	4.53
16*	Transfusion reaction, secondary DX field	0.00	0.00	0.00		
17	Birth trauma-Injury to Neonate	4.00	4.00	1.58		
18	OB Trauma-vaginal delivery with instrument	149.90	149.90	160.55		
19	OB Trauma-vaginal delivery without instrument	32.00	32.00	36.20		
20	OB Trauma-cesarean section	5.50	5.50	3.93		
Source:		Virginia Health Information	AHRQ	Shimada et al 2008		

\* Virginia's numerator <=30

\*\* Currently, the numerator/denominator for PSI 5 is 1 resulting in a rate of 1,000. See the aggregate PSI report for the number of PSI 5 events.

## LAB

Initially, VHI began the process of data quality monitoring and report writing from the POA and lab files simultaneously. When the pace of POA submission began to pick-up, VHI began to concentrate data management effort on the POA side. Before that time, VHI did develop a number of internal lab reports based on subcontractor requests. As with POA, VHI counted unique patients in the lab files and compared to administrative data files. A more sophisticated report was the distribution of lab tests by discharge timeframe.

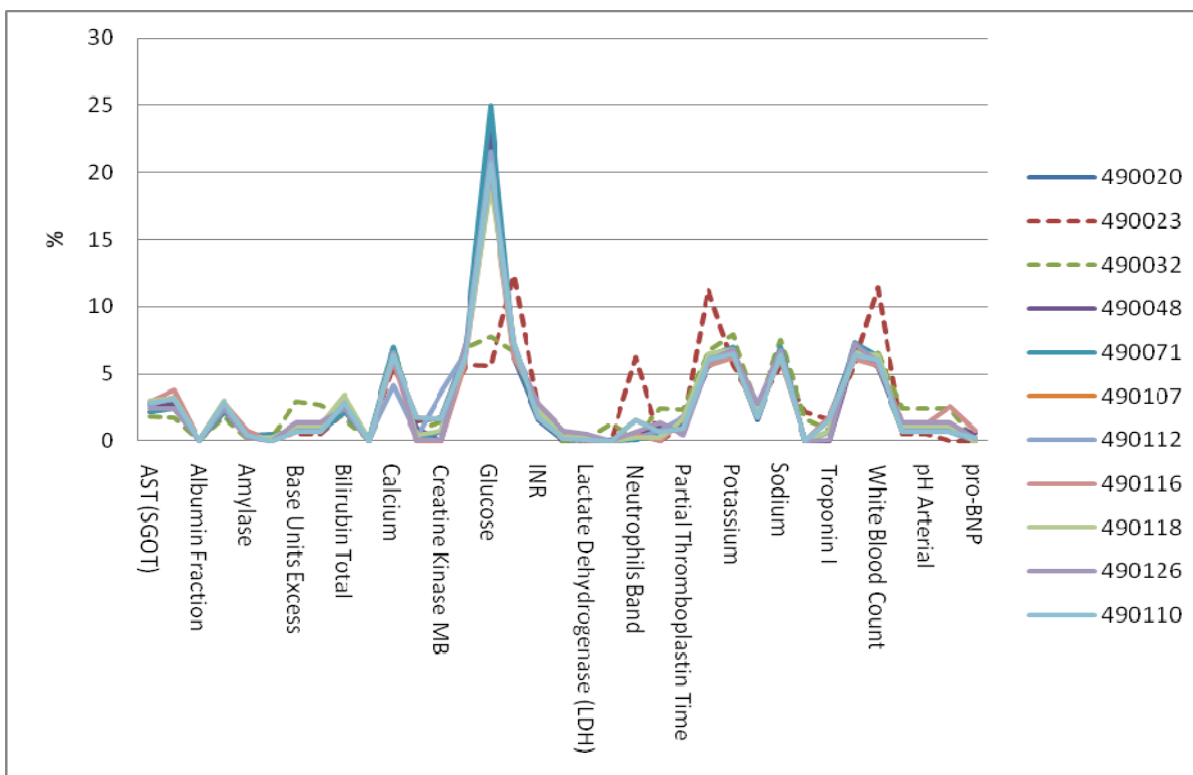
Draft Lab Value Distribution Report  
Discharges OCT 1 2007 thru DEC 31 2007



Patient population = 27,299 Number of Hospitals insystem = 10

NAME	Total # of Patients Receiving Test	Average # of Tests per Patient	Total # of Tests	A. >30 Days Prior to Admit Day		B. 30 to 8 Days Prior to Admit		C. 7 to 1 Days Prior to Admit		D. Admit Day		E. 1 Day After Admit Day		F. 2 Days After Admit Day		G. 3 Days to 1 Day Prior to Discharge		H. Discharge Day		I. After Discharge Day			
				N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
AST (SGOT)	17,619	3.1	26,438	4	0.01	293	0.8	2,524	6.9	12,211	35.16	5,101	14	2,811	7.71	11,746	32.34	1,143	3.34	5	0.01		
Albumin	17,749	3.3	40,350	4	0.01	293	0.73	2,526	6.26	12,265	31.88	5,383	13.34	3,225	7.99	14,560	36.08	1,488	3.69	5	0.01		
Alkaline Phosphatase	17,817	2.1	36,406	4	0.01	293	0.8	2,524	6.93	12,806	35.17	5,091	13.98	2,803	7.7	11,747	32.27	1,134	3.11	5	0.01		
Amylase	2,982	1.4	4,213			2	0.05	445	10.56	2,103	49.92	518	12.3	304	7.22	748	17.75	88	2.09	5	0.12		
BNP	2,322	1.4	3,314					221	6.67	1,578	47.62	425	12.82	297	8.96	727	21.94	66	1.99				
Base Units Excess	3,535	3.3	11,772			16	0.14	240	1.87	2,957	25.12	1,641	13.94	1,069	9.08	9,690	88	219	1.86				
Bicarbonate	3,337	3.3	11,776			16	0.14	220	1.87	2,959	25.13	1,642	13.94	1,069	9.08	9,651	87.99	219	1.86				
Bilirubin Total	18,009	2.1	38,531	4	0.01	293	0.76	2,525	6.55	12,954	33.62	5,426	14.24	3,275	8.5	12,897	32.95	1,288	3.34	9	0.02		
C Reactive Protein	675	1.4	786			16	2.04	8	1.02	144	18.32	156	19.85	89	11.32	342	43.51	31	3.94				
Calcium	19,724	3.8	75,216	4	0.01	548	0.73	3,385	4.5	14,958	19.89	12,666	16.84	8,727	11.6	30,879	41.05	4,042	5.37	7	0.01		
Creatine Kinase (CPK)	3,998	2.2	8,929					569	6.37	4,487	50.25	2,243	25.12	500	5.6	10,020	114.2	100	1.12	30	0.11		
Creatine Kinase MB*	7,181	3.4	24,158	2	0.01	190	0.79	1,223	5.06	8,695	35.99	4,826	19.98	3,779	7.36	6,892	27.7	746	3.09	5	0.02		
Creatinine Serum	22,189	4.0	57,463	5	0.01	737	0.84	3,802	4.23	16,638	38.96	14,347	16.35	9,987	11.39	37,296	62.62	6,813	11.89	7	0.01		
Glucose*	23,711	10.9	259,208	5	0	742	0.28	4,377	1.89	32,326	12.39	37,162	14.34	28,652	11.69	141,626	54.54	12,894	4.9	1,823	0.7		
Hemoglobin	25,393	3.6	91,036	5	0.01	778	0.85	4,603	5.06	19,708	21.65	16,330	17.94	10,491	11.52	34,493	37.89	4,622	5.08	5	0.01		
INR	10,460	2.6	27,639	4	0.01	354	1.28	1,361	4.92	6,853	24.79	3,485	12.61	2,783	10.07	16,737	38.85	1,062	7.46				
Inhaled oxygen*	1,939	2.2	4,276			77	1.8	1,224	28.62	613	14.34	375	8.77	1,927	45.07	60	1.4						
Lactate Dehydrogenase (LDH)	1,135	1.4	1,630			15	0.92	99	3.01	673	41.29	196	12.02	138	8.47	909	51.23	45	2.76	6	0.31		
Lactic Acid	883	1.3	482			15	3.11	167	34.66	109	21.37	51	10.38	134	27.2	12	2.49						
Neutrophils Band	5,118	2.6	15,254			74	0.56	766	5.63	3,787	28.57	2,352	17.75	1,475	11.13	4,111	31.02	709	5.35				
O2 Saturation Arterial	2,821	3.2	8,989			14	0.16	197	2.19	2,375	26.42	1,332	14.82	814	9.06	4,079	45.38	178	1.98				
Partial Thromboplastin Time	3,585	2.2	16,883	3	0.02	342	1.81	1,248	6.61	6,134	32.48	2,547	13.49	1,544	8.18	6,699	35.16	426	2.26				
Platelet Count	24,695	3.3	81,132	6	0.01	744	0.92	4,448	5.48	18,498	22.73	13,202	16.27	8,657	10.67	31,553	38.89	4,080	5.03	4	0		
Potassium	22,160	4.0	88,780	6	0.01	738	0.83	3,811	4.29	16,994	19.07	14,618	16.47	10,197	11.49	37,667	42.43	4,802	5.41	7	0.01		
Prothrombin Time	10,462	2.6	27,688	4	0.01	354	1.28	1,361	4.92	6,853	24.76	3,489	12.6	2,785	10.66	16,773	38.91	1,066	7.46				
Sodium	22,138	3.9	85,561	5	0.01	737	0.85	3,795	4.38	16,629	18.71	14,303	16.52	9,594	11.47	36,490	42.15	1,880	4.41	7	0.01		
Troponin I	5,157	2.3	11,779			1	0.01	572	4.86	5,775	49.03	3,537	30.03	611	5.19	1,178	10	103	0.87	2	0.02		
Urea Nitrogen Blood (BUN)	22,171	3.9	87,465	5	0.01	737	0.84	3,799	4.34	16,624	19.01	14,326	16.38	9,566	11.39	37,217	42.55	1,783	4.47	7	0.01		
White Blood Count	24,492	3.3	79,954	6	0.01	744	0.93	4,241	5.55	18,013	22.53	13,057	16.33	8,519	10.65	31,145	38.95	4,027	5.04	4	0.01		
pCO2 Arterial	3,537	3.3	11,781			16	0.14	220	1.87	2,969	25.15	1,642	13.94	1,069	9.07	9,652	87.98	219	1.86				
pH Arterial	3,537	3.3	11,782			16	0.14	220	1.87	2,969	25.15	1,642	13.94	1,070	9.08	9,652	87.97	219	1.86				
pO2 Arterial	3,534	3.4	12,183			16	0.13	251	1.9	3,008	23.33	1,656	13.92	1,082	8.96	9,714	65.9	226	1.85				
pro-BNP	1,170	1.3	1,509					145	9.61	954	63.22	105	6.96	56	3.71	225	14.91	24	1.59				
Missing/Invalid LOINC	608	1.3	811			3	0.37	62	7.64	242	29.84	123	15.17	70	8.63	280	34.53	31	3.82				
All	27,299		1,306,474	61	0.01	9,122	0.7	55,970	4.28	288,988	22.09	205,385	15.72	136,294	10.43	647,656	61.92	61,466	4.7	1,922	0.15		

Another report shows, graphically, the types of lab tests, as a percentage of all of the requested lab tests, being sent by hospital. This chart helped us see that hospital 490023 was providing substantially more Neutrophil Band data than the other hospitals in the pilot at that time.



**26. Describe the procedures you employed to ensure that the information you received was reasonable and accurate. How did you decide what data were reasonable enough to use (e.g., checks for missing data, appropriate lab tests for diagnoses, reasonableness of lab results, lab data confirmation of POA, data appropriate for field, outliers)? Include details in the appendix (e.g. list of edit checks).**

In addition to the data quality checks already mentioned, one of the most useful means of checking for reasonableness was requesting similar POA distributions from California, New York, and Florida. Although the analysis was never formal, seeing the basic distribution in other states did give us a good sense that Virginia data seemed to be reasonable. The multi-state comparison is shown below. This table has not yet been shared with participating hospitals.

Multi-state Comparison	New York+		Virginia*		Florida**		California ***	
Principal Diagnosis	n	%	n	%	n	%	n	%
Exempt (allows blank, 1, E, or Y)	101,117	2.97	9,311	10.04	130,282	9.76	74,179	1.85
Y	2,840,069	83.49	75,619	81.53	1,177,292	88.17	3,787,112	94.38
N	284,228	8.36	3,117	3.36	26,271	1.97	127,001	3.16
U	161,509	4.75	73	0.08	1,340	0.10	23,680	0.59
W	14,389	0.42	28	0.03	91	0.01	730	0.02
Missing (but not exempt)	NA		2,340	2.52	-	0.00	not validated	#VALUE!
Exempt (but miscoded, any value other than blank, 1, E, or Y)	189	0.01	2,261	2.44	-	0.00	72	0.00
Total of Principal Diagnosis	3,401,501	100.00	92,749	100.00	1,335,276	100.00	4,012,774	100.00
*Q4 2007 (26 hospitals)								
**Q1-Q3 2008								
*** Full year 2007 (454 hospitals) -no validation for 2007 or first half of 2008, validation will begin with report period Jul-Dec 2008								
(Invalid=72 miscoding, other than the acceptable values)								
+ Q4 2007 (235 hospitals)								

**27. Describe analyses performed, methods/process used, statistical modeling, and results/outcomes, if applicable. Include details of models used in an appendix.**

As of July 31, 2009, VHI has applied 15 POA data screens, developed to measure the quality of POA coding, by Michael Pine and Associates, Inc. These screens give a sense of the reliability of medical coding in the hospital and were initially developed using New York State SPARCS data from 2003 through 2005 from 108 hospitals. A simplified example of how one of these screens is applied is found below:

*A patient is admitted to the hospital for high-risk pneumonia. The patient also has lung cancer which gets coded. The lung cancer is considered a chronic condition and should almost never be coded as hospital-acquired. In other words, the POA indicator on the ICD9 code for the lung cancer should be a "Y" for "yes, the condition was present on admission."*

The interim results of this specific screen in Virginia's participating hospitals indicated that 19% (5 hospitals) reported a chronic condition, such as cancer, as being not present on admission (POA indicator="N") in more than 2%<sup>1</sup> of their high-risk medical condition codes such as pneumonia. In other words, a cancerous condition was coded as hospital acquired too often in these hospitals. Each of these hospitals received a score of 3, on a scale of 1 to 4, for this screen. This and 14 additional screens were averaged for a composite screening score.

Interim results using the composite score indicated that 6 of 26 participating hospitals would fail POA coding quality. However, after further analysis, a data quality problem was identified in the original data submissions from two of the screened-out hospitals. VHI requested a new submission. To date, one hospital has successfully re-submitted while the other is still processing.

Lab data results will be presented as an Addendum to the final report.

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<sup>1</sup> The 2% level was determined by Michael Pine and Associates, Inc.

## Project Results

### **28. Describe your project's overall success during the pilot/planning process.**

#### **a. Identify major accomplishments.**

Although we do not have direct evidence that the pilot project led to legislation requiring the submission of POA in Virginia, we believe that because of the positive working relationship with participating hospitals and the overall success of the project reduced any potential barriers to adoption.

According to our pilot project partners, our model of data collection was very effective. So, to the extent that this model is reproducible, we believe that it is a major accomplishment. We also believe that our reporting was innovative and as timely as possible, helping VHI to build an even stronger foundation of collaboration on quality improvement issues with the hospital community.

#### **b. How does the end result compare to the initial vision of the project?**

VHI met all aspects of our proposed vision of the contract.

- VHI proposed and succeeded in recruiting hospitals to participate in this effort. AHRQ requirements were for a minimum of 5 hospitals. VHI had 27 hospitals participating
- Our goal of collecting and incorporating POA and laboratory data with our administrative data set was also met. Hospitals were able to provide this information to VHI.
- VHI sought and completed a preliminary analysis before the September, 2009 end of the contract. An analytical dataset was developed, delivered and preliminary analysis was conducted. Further analysis will continue after the end of the contract.
- In addition, working with hospitals to obtain POA information led to full scale implementation of POA values to part of regular quarterly submissions of hospital discharge data to VHI for all hospitals.

#### **c. What unexpected hurdles did you encounter and how were they resolved?**

One of the largest unexpected hurdles was the file size of the laboratory data. Not only was our online uploading tool insufficient for handling this capacity but we also crashed one of our hard drives during overnight processing.

**29. List the clinical data elements you were able to add to your administrative data set (please specify—POA, lab values, vital signs).**

**a. Why were these elements chosen?**

The POA indicator has been officially added to the administrative data as of July 31, 2009. We are awaiting results of the laboratory models to see if requiring lab data submission will be feasible.

**b. Were there any data elements you had hoped to include but were not able to collect?**

No.

**c. If so, what were those data elements and what barriers did you find to adding them?**

**30. Describe your methods and any related challenges in the following areas, if not already discussed:**

**a. Hospital participation**

The following is a list of important issues to keep in mind for garnering hospital participation: formalizing the relationship through contractual obligations even though the project is voluntary, a balanced communication pattern that respects their time, willingness to provide on and off-site technical support, immediate feedback after data submission if only to say that the files were received, comprehensive reporting so that hospitals do not feel like data is going into “black box”, when asking for hospitals to go above and beyond showing them that you understand the voluntary nature of the project and that their time is important, being able to discuss the project at multiple levels from those in the hospital interesting in the statistical methods to those interested in medical coding improvement (e.g., one hospital was interested in hierarchical modeling), meeting with hospital contacts in other professional venues, and providing marketable materials that they can share internally.

**b. Hospital training and education**

VHI tried to help inform hospitals on the quality of coding through the various tables provided in the quarterly reporting. We will also be providing the results of the POA screens developed by Michael Pine and Associates, Inc.

**c. Data formats, coding, and standardization**

VHI struggled with whether or not to require the use of HL7. VHI understood the value of HL7 and that it had an important role to play in the real-time transmission of data, but, in the end, it was decided that the priority of the project was to get the data as quickly and easily as possible without excluding hospitals with no ability to transmit HL7 messages.

**d. Data transmission**

For the most part, hospitals were willing to send the data by any means necessary. Some sent flash drives with special encryption software while other sent CDs via FedEx. Hospitals were always willing to send even when it cost them money.

**e. Data cleaning**

See above.

**f. Data merging**

See above.

**g. Data security**

VHI applied standard security procedures to incoming data. First, the upload site via the web was secure. Second, once the files were received they were downloaded to a desktop. Any files received via CD were locked in a cabinet.

**h. Data risk adjustment**

Michael Pine and Associates, Inc. presented preliminary results at the final partners meeting in September 2009. We have not yet had an opportunity to analyze his findings. We will do so as an addendum to this final report.

**i. Model results**

See above.

**j. Summary findings**

See above.

**31. Explain your process for assessing the value of adding clinical data to administrative data sets and the outcome of your assessment. What did the added data contribute to your analyses? What were the benefits to users?**



On the POA side, VHI successfully generated hospital-level reports of potentially hospital acquired conditions and POA-adjusted versions of the AHRQ quality indicators. VHI showed hospitals in Virginia the value of the POA indicator by demonstrating significant differences in rates for certain indicators before and after the use of the POA indicator. VHI also demonstrated that the distribution of POA values was very similar to what other states found, building additional confidence in the data set for future use.

On the lab side, VHI anticipates analytical results by November 2009.

**32. How do you expect this information will be used in your state (e.g., enhanced analysis of quality indicators, transparency initiatives, academic research)?**

VHI currently publishes the AHRQ quality indicators on its website at [www.vhi.org/aqi.asp](http://www.vhi.org/aqi.asp). VHI expects to update this site with POA-enhanced administrative data will POA reporting is complete. VHI also produces a Cardiac Care report at [http://www.vhi.org/cardiac\\_reports.asp](http://www.vhi.org/cardiac_reports.asp) VHI intends to improve the risk-adjustment methodology of this report by using laboratory data. VHI also intends on using the results of this project to demonstrate the importance of laboratory reporting to all hospitals in Virginia in order to expand data collection efforts. Finally, VHI will also use the results to continue to engage a wide variety of stakeholders in data-driven transparency initiatives.

**33. How likely is it that your state will continue to collect this clinical data or to expand collection beyond current participating hospitals?**

VHI believes it is very likely.

**34. Do you plan to disseminate the results of the pilot/planning project? If so, how? Who is your audience (general public, HIT, coders, others)?**

VHI plans on creating a series of reports using the POA screens developed by MPA, Inc. as well as reports based on outcomes from the lab data analysis. Hospitals will receive hard-copies of these reports but will also have a face-to-face meeting to disseminate results. VHI currently has meetings planned with hospitals, health insurance companies, physicians, and consumers to present results and discuss ways to move forward with quality improvement using this data.

**35. Are you expecting to encounter political or other challenges in dissemination?**

No major challenges are expected. VHI will be able to anticipate additional challenges in November 2009.

## Review

- 36. What do you believe were the critical success factors to facilitating the involvement of hospitals in your pilot/planning process (e.g. state team, state infrastructure, relationships, data issues, etc)?**

Please see above.

- 37. FOR THE PILOT PROJECT: Describe your state's plans for continuing the work of the pilot. In what ways can AHRQ be of assistance to you in this?**

VHI has entered into a contract with the Brookings Institute to convene a group of stakeholders (health insurance companies, physicians, and hospitals) to discuss the value of adding clinical data to administrative data. This work is ongoing but we expect to have results in December 2009.

- 38. FOR THE PLANNING PROJECT: Explain how you feel your project, as planned, would perform as a pilot.**

Not applicable.

- 39. What would you do differently if you were to start over (e.g., contact more or different departments within a facility, host more meetings, put additional mechanisms in place to facilitate collection, collect additional information)?**

Given the relative ease of collecting the POA data, VHI would have spent more time focusing on lab data collection. Although VHI had more hospitals participating than required by AHRQ, VHI would have liked to get more complete laboratory reporting. VHI had 4 quarters of data from 14 hospitals, 2 quarters from 3 hospitals, 1 quarter from 6 hospitals, and no lab data from 4 hospitals. Although the data files themselves were quite large, per MPA, Inc. the final sample size was limited for several conditions being analyzed.

VHI might request the data less frequently. Even though the data was coming from the same hospital (and sometimes even the same person) the format was frequently different than the previous quarter. This meant that two files had to be checked against each other from the same hospital. Having the hospitals submit quarterly was useful in terms of keeping the project "fresh in their minds" but less frequent submission may have reduce the

probability of multiple errors through time. VHI would also have increased the capacity of the website to handle very large data files.

**40. What support do you believe other states will need to build upon your experience (e.g. tools, communications examples, technical assistance)?**

It was very important to have a basic knowledge of the distribution of POA values (i.e., tables showing descriptive statistics from other states).

**41. What are the most important lessons that you learned during this process?**

There was nothing surprising about what VHI encountered during the process. Constant communication and feedback to hospitals are key. VHI had to remain cognizant of hospitals commitments of time and effort to this project and adjust expectations accordingly.

**42. What would you recommend as AHRQ's next steps in helping states add clinical data to administrative data sets?**

In order to make a commitment to adding clinical data to administrative data states would greatly benefit from additional information in specific areas. Virginia Health Information notes that further work is necessary to demonstrate the benefits of a HYBRID dataset to the public, health care providers and the organizations that will develop a HYBRID dataset.

In VHI's work with hospitals, health insurance companies, physicians and as a health data organization VHI sees the value of further defining applications for the clinically enhanced administrative data, evaluating their value, and assessing the feasibility of and developing a business case for HYBRID datasets. In considering these issues, a number of related questions arise:

- What is the level of improvement in health outcomes measurement across a variety of health outcome measures, both for AHRQ and other quality measures?
- What are the most important laboratory tests needed to assess these health outcomes measures?
- What are the initial implementation costs at a hospital level for submission? How can hospitals use this information for internal quality improvement?

- Can these lessons be applied to those developing electronic health records for further analysis of laboratory data outside the hospital environment?
- What are the start-up and ongoing costs to develop and operate a hybrid dataset?

Virginia Health Information believes AHRQ's sponsorship of the pilot contracts "Adding Clinical Data to Administrative Data" has demonstrated that HYBRID datasets can be developed for use. An important next step for AHRQ is to further sponsor pilot efforts with VHI and others to demonstrate the value to outcomes measurement and outline the business case for implementation of HYBRID datasets on an operational level.

**43. Are you willing and interested in helping other states as they work toward adding clinical data to administrative data sets?**

VHI has enjoyed the opportunity to work collaboratively with its partners on this project and look forward to sharing our collective experience with other states as appropriate.