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Evaluation of the LOINC Mapping Process Report

The Agency for Health Care Administration (AHCA), Florida Center for Health Information and Policy Analysis, was awarded a contract from the Agency for Healthcare Research and Quality (AHRQ) for a pilot project that ran from October 2007 through September 2009 to study new ways to approach hospital quality measure. A total of 22 hospitals participated in this pilot project. Two of these participating hospitals were independent hospitals while the others were part of three hospital systems: Broward health, BayCare Health System, Memorial Healthcare System. A major interest of this pilot project was to evaluate the efforts and resources that the hospitals required to perform the tasks of this project, in particular mapping of the 31 selected clinical laboratory elements into the standardized nomenclature of Logical Observation Identifiers Names and Codes (LOINC) and joining the standardized data to the demographic and administrative data collected on all patients admitted from April 1, 2007 to December 31, 2007.

An evaluation survey was developed by AHCA's team and sent to participating hospitals to gather their feedback on the process of translating their lab values to LOINC. The survey consisted of 20 questions that addressed the hospital description, resources needed, data compilation, LONC mapping, data transmission, communication tools, barriers encountered and their resolutions, and the lessons learned.

This document represents a compilation of the hospitals' responses and feedback. They are displayed in the same format of the evaluation survey. Each question is followed by the answers provided by the participating hospitals.

General Hospital Description

The participating hospitals included 17 general hospitals and 5 pediatric hospitals two of theses are teaching institutions. Half of the 22 hospitals or eleven of them are high volume with 200 or more beds. Table 1 provides a description of the participating 22 hospitals including the type of the hospital and the number of beds.

Table 1. Description of Participating Hospitals

Broward Health	Type of Hospital	# of Beds	Teaching?	Other Descriptors
Broward General Medical Center	Medical Center	716	No	
Coral Springs Medical Center	Medical Center	200	No	
Imperial Point Medical Center	Medical Center	204	No	
North Broward Medical Center	Medical Center	409	No	
Chris Evert Children's Hospital	Pediatric Medical Center	141	No	
BayCare Health System				
Mease Countryside Hospital	Community	300	No	
Mease Dunedin Hospital	Community	143	No	
Morton Plant Hospital	Community	687	No	
Morton Plant North Bay Hospital	Community	122	No	
St. Anthony's Hospital	Community	365	No	
St. Joseph's Hospital	Community	527	No	
St. Joseph's Children's Hospital	Children's	164	No	
St. Joseph's Women's Hospital	Women's	192	No	
South Florida Baptist Hospital	Community	147	No	
Memorial Healthcare System				
Memorial Hospital Miramar	Community	100	No	
Memorial Hospital Pembroke	Community	301	No	
Memorial Hospital West	Community	236	No	
Memorial Regional Hospital	Community	690	No	
Memorial Regional Hospital South	Community	100	No	
Joe DiMaggio Children's Hospital	Children's	100	No	
Miami Children's Hospital	Children's	268	Yes	Free Standing
All Children's Hospital	Children's	216	Yes	

Note: Throughout this document, the term hospital refers both to one hospital and to a hospital system. Also the hospitals are not identified by their name; instead they are listed as Hospital One, Two, Three, Four, and Five.

Hospital Resources

What technical or other resources where utilized during participation in this project?

Most hospitals utilized the IT team for extracting the data or for using the AHCA secure FTP site for uploading the data. More specific details for each of the participating hospitals are presented below:

- The IT System Analyst was called in to create the actual data extracts that were submitted for Analysis.
- Initially we had the programming and operations teams working with me but when we discovered that this was essentially a one-time data submission, only a single programming resource was required.
- We utilized the following groups to accomplish the report: LIS group, CCL report group, Database team and Cerner support. We partnered with the Broward group which had already written a script to obtain the data, so we only had to modify the script with our system's code values, decreasing the report writing time.
- IT Lab analyst and database SQL report writers were brought in to access the data.
- IT resources were used to send the requested file to AHCA's secure FTP site. IT and Lab Departments collaborated on data harvesting, removal of confidential information and uploading to the secure AHCA FTP site

Personnel involved in this project: titles, tasks, and number of hours spent:

The number of hours each participating hospital's personnel spent on this pilot project varied from 33 hours to 132 hours. In general most of the time spent was by the IT or systems analyst team members as shown in Table 2

Table 2: Personnel's Title, Tasks, and Number of Hours Spent

	Personnel Title	Task performed	Number of Hours
Hospital One	VP of Information Technology	Project Manger	30
	VP of Medical Affairs	Executive Sponsor	30
	I/T Sr. Systems Analyst	Program download	40
Hospital Two	Consulting systems analyst	Procedure mapping; create the data catalog, and data extraction	21
	Administrative Support	Attended Conference calls and meetings	12
Hospital Three	Mgr LIS	Sample Data extract and LOINC mapping, point person for questions from other teams	20
	CCL team	Modified and ran scripts to extract data and create the data catalog	16
	Database	Security and FTP	5
	Security team	Opened ports for FTP	1
	Cerner Corporate Support	Helped with some database issues	3
Hospital Four	Manager, IT Clinical Systems	Data extract	100
Hospital Five	Manager, Revenue Cycle Applications.	FTP files	2
	Lab System support analyst	Data extraction	10
	Outcomes Research Manager CV	Project Coordination	120

Data Compilation

What process steps were needed to perform the data requirements of this project?

All hospitals participated in the 3M/AHCA initial meeting where they were introduced to 3M's team and they were provided with a list of the required data elements. From that date on, hospitals worked independently and at their own pace from submitting their data catalog to 3M to uploading their data on the FTP site. Table 3 represents the hospitals' description of the process steps performed.

Table 3 Steps Performed by Each Hospital

Hospital One	1. Identifying the data elements to be captured. 2. Data Specifications were submitted for review. 3. Conference Calls and follow-up e-mails to address any questions/ issues with Data Requirements. 4. Specifications finalized and extracts were then created and submitted via FTP.
Hospital Two	1. Map requested procedures and other data elements to clinical data repository
Hospital Three	1. Obtained script from Broward 2. Completed sample data extract and LOINC mapping 3. Modified script with our systems code values 4. Added confirmed LOINC codes to the scripts 5. Scripts were run against database and data stored 6. Security team opened ports 7. Database team sent the data via FTP
Hospital Four	1. Linking of LOINC data and AHCA hosp data to existing system tables 2. Extract of patient data from SoftLab database 3. Extract of Result data from SoftLab database 4. Conversion to required format and export 5. Upload to FTP site
Hospital Five	1. Defining data parameters 2. Development of Access queries 3. Importing of Access table into Excel 4. Transmission of file

What issues were encountered in complying with data requests?

The issues the hospitals encountered in complying with data requests varied from none, to time constraints and to the impact of their system upgrading. The following Table 4 contains the barriers that some hospitals indicated that they faced and the way they resolved them. Also in this table the lessons learned or suggestions based on these barriers are recorded. One of the hospitals' replied "none" to all, therefore Table 4 contains the responses of only 4 hospitals.

Table 4. Issues Encountered in Complying with Data Requests

		Barriers	**How was issue resolved?**	**Lessons learned**
Hospital Two	Staff	None		
	Technological	Date range requested covered a different system than one in current use	Look up historical data catalog	Prefer to use current lab system data
	Fiscal	none		
	Other commitments during certain times of year	Concurrent system upgrade project and move of servers off site	Extended time taken to complete	
	Other issues	none		
Hospital Three				
	Staff	Time, Every team is under time constraints right now	A couple of other projects were put on the back burner	
	Technological	1. Amount of data being pulled back in report put a significant increase on system resources 2. We had the scripts error out twice after running for 20 hours due to the amount of data being returned	Scripts were broken up into smaller time frames and the scripts were run during off hours when system resources aren't as high.	Scripts can use some fine tuning to run more efficient
	Fiscal			
	Other commitments during certain times of year	This occurred during our phase 2 scheduled build period of our EMR project so resources were extremely tight.	Resources were pulled from build to complete the report	
	Other issues			

Table 4 (continued). Issues Encountered in Complying with Data Requests

		Barriers	How was issue resolved?	Lessons learned
Hospital Four	Staff	Time availability, staffing shortage	Staff worked in off hours	
	Technological	Database structure on lab system	Multiple extracts with links was required	
	Fiscal			
	Other commitments during certain times of year			
	Other issues	Definitions of data fields were changed during the course of the project.	Additional programming time was required to accommodate the change in data	
Hospital Five	Staff	Coordination of multiple staff members and departments. Project approval by multiple departments	Cross Dept Coordination, working groups and increased collaboration. Interdepartmental coordination and cross collaboration used to secure project approval.	Coordinate early and often.
	Technological	Patient Data unavailable for year requested (2007) without significant increase in data extraction efforts	Patient data extraction for 2008 was approved by AHCA and 3M	Stay flexible in order to achieve your goals
	Fiscal	None		
	Other commitments during certain times of year	None		
	Other issues	None		

LOINC Mapping

What process steps were needed for your staff to perform the LOINC mapping requirements of this project?

Only one of the hospitals had used LOINC before this pilot project. The description of the process steps was presented in a similar method for all of the hospitals. Starting from the submission of the data elements, the revisions, to the LOINC mapping Final report.

Table 5. LOINC Processing Among Participating Hospitals

Hospital Two	1. Map requested procedures to current reference data
Hospital Three	1. Data looked up manually in system for requested tests
	2. Spreadsheet of data completed
	3. We added the LOINC codes that we could
	4. Spreadsheet sent to Pam Banning for review
	5. Received spreadsheet back from Pam with a few questions
	6. Researched questions and responded
	7. Received completed spreadsheet back from Pam
	8. Supplied CCL team with list of LOINC codes to use.
Hospital Four	1. Submission of data to 3m
	2. Creation of a translation table
	3. Crosswalk between data extract and translation table
Hospital Five	1. Multiple teleconferences with AHCA and 3M Staff to coordinate project timelines, data extraction requirements, data parameters, and to resolve outstanding issues.
	2. Multiple reviews and team meetings of AHCA and 3M project guidelines

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What issues, challenges or barriers were encountered in standardizing data elements?

For some hospitals, the time required to conduct the LOINC translation was the main barrier encountered. These hospitals had to pull staff resources from other projects to complete the requirements of this pilot project. Hospitals Two and Four are examples of this, as shown in Table 5. In the first instance the LOINC processing was completed in one step, and in the second in three steps. This relatively straightforward LOINC translation can be compared to Hospitals Three and Five. These hospitals needed more assistance in mapping and translating their laboratory values to LOINC and required more assistance from 3M's LOINC consultant to clarify the requested procedures and to update the definitions. They also used more staff resources, as more people were brought into the project. This can be seen in the number of questions about the translation process, and in the amount of training interaction that occurred. From this relatively small sample of hospitals two distinct responses to LOINC mapping and translation can be seen. One response was where the hospital found the translation relatively easy and another was where extensive re-training and communication was necessary. In all cases, a strong LOINC mapping training component is essential.

<u>Did you benefit from consultations with 3M's during LOINC mapping?</u>

All participating hospitals indicated that they benefited from consultations with 3M's LOINC mapping expert, who compiled the hospitals' extract data and performed the actual mapping. They appreciated the explanations and clarifications of the LOINC coding and the meaning of the requested procedures. Mostly, they appreciated the professionalism displayed by 3M's LOINC consultant (Pam Banning), her flexibility, focus on the project completion and overall great job in working with the hospital teams.

<u>Do you think that you could have completed the LOINC mapping in-house without the help of an expert?</u>

From the results of Table 5, it appears that some hospitals could conduct LOINC mapping on their own, while other cannot. One hospital team member wrote that it was possible to complete the LOINC mapping in-house without the help of the expert. Another hospital team completed the mapping in house using the final mapping report of another hospital in the project, and translated about 90% of the lab values into LOINC codes correctly. Only 10% of the translations had to be by 3M's consultant.

The hospitals that needed more training indicated that they could not have completed the LOINC mapping in-house on their own without the LOINC expert's assistance. The LOINC training also worked in reverse, with one hospital updating three clinical procedures (blood culture, ionized calcium, and PO2) following 3M's evaluation.

<u>What advice would be useful to other states in understanding/employing LOINC?</u>

From the responses submitted by the participating hospitals, it is clear that up-front training on LOINC is essential for success. Also, the verification and quality assurance processes that need to occur while completing the LOINC translation need to be stressed. Converting unique lab values to LOINC can be complicated and requires attention to procedural details. This complexity needs to be stressed during the training period.

The following are the participating hospitals' comments:

- It requires a second look to verify that the procedure requested is actually the one being mapped – i.e., check you mapping twice then verify with a 3M specialist!
- It would help to have a more extensive presentation into the process of LOINC coding.
- Provide lessons learned from pilot states undertook the LOINC process before starting the project. Provide complete process and requirements to hospitals prior to embarking on project. Include specific lessons learned, timelines, project barriers, solutions to barriers.

Communication Tools

<u>Describe the communication processes</u>

The project managers maintained ongoing communication via emails, conference calls and face-to-face meetings throughout the duration of this pilot project.

All hospital teams indicated that in general these communication processes were efficient and useful. In particular, the calls that included all of the hospitals were very useful to them. During these calls, hospital staff were able to compare issues that had come up during the LOINC mapping and trade techniques for overcoming problems. To provide more effective

communication, one hospital recommended having a more structured conference call format; another hospital suggested that scheduling face-to-face meetings with the hospital teams, the Agency and 3M to address the LOINC mapping processes would have been beneficial.

Transmission of Data

Were issues encountered during data transmission?

There were issues surrounding the use of a secure FTP server both within the Agency and with the hospitals. The use of a secure FTP site for reporting by hospitals is routinely used by the Agency; however there were a number of mistakes made by the Agency IT team that could have been avoided:

- The secure FTP site needed additional space allocation to receive the hospital files. After the additional space was added, they were able to FTP the files to their server.
- The secure FTP site was not properly mapped initially, so that some hospitals logged into another hospital's FTP site.
- The Agency's secure FTP sites time out after 90 days. Because of delays in uploading the lab data, when the hospitals were ready to upload, the secure FTP site was closed. We had to re-open them, and go through the same problems listed above.

For the participating hospitals, hospital firewalls and policies contributed to problems with the secure FTP site. On the one hand, hospital teams could not download the FTP software because of firewalls and hospital policies against loading non-authorized software on hospital PCs. Hospital firewalls also prevented connecting to the Agency's secure FTP site. These problems required assistance from the IT departments, and having IT staff take care of uploading the data.

The main issues encountered were:
- Recruiting IT staff to undertake the upload;
- Difficulties downloading the FTP software;
- Trouble logging into the secure FTP site.

Please state any feedback regarding the format used to transfer the data.

For this pilot project the hospitals uploaded their data as tab separated value files. In general, the hospital CIOs agreed at the beginning of the project that sending the data as a text file would be much easier than sending it using HL7, because the dataset represented a one-time data pull that was ill-suited to an HL7 transfer. They were satisfied with the FTP transfer format because they contended that formatting the dataset for HL7 would have required considerable effort and resources. Only one hospital indicated that it would have preferred using one of their standard formats such as a comma separated value file or HL7.

Please complete this sentence: "My experience in the LOINC mapping process was…"

The survey asked an open-ended question: "My experience in the LOINC mapping process was…" The answers to this question were varied, and positive. They are listed below:

- Informative.
- Satisfactory.
- Educational giving me a better understanding of LOINC coding.

- Positive with minimal effort required.
- Interacting with the professionals at AHCA and 3M has been a truly rewarding experience. The opportunity to get involved in a project that has such a great impact on Public Health, Outcomes and the quality of care has been invaluable and has greatly increased our hospital's ability to collaborate on healthcare quality and improvement projects.

In the future, would you consider standardizing your entire data element into LOINC?

All of the hospitals answered 'Yes'. They all acknowledged that the future of laboratory reporting would entail standardization into a format like LOINC. The following statements are the reasons presented by the hospitals for considering standardizing their laboratory data elements into LOINC:

- The LOINC concept has been in existence for about 8 –10 years, but it appears to have only recently (within the last 2 years) been adopted as a universal nomenclature for mapping disparate Laboratory test data. We are currently using the LOINC concept to map all of our bio-surveillance data in Theradoc, which is used in the identification (via Alerts). We are also in the process of implementing an ELR (Electronic Laboratory Results) interface out of Theradoc, utilizing the same LOINC nomenclature, which will electronically transmit all State Reportable Infectious Disease agents directly to the Florida DOH and Reports of infectious disease agents.
- We are expecting updates to our reference database which will include CAP, LOINC and other standards. The increased requests for supplying data to various organizations will make this almost mandatory.
- As our LIS vendor expands its LOINC coding options we will consider setting up LOINC coding for the entire database.
- LOINC is expected to develop into a fully adopted standard, and our current system supports its use.

Describe key characteristics that led to your successful participation.

Our success in this project was due to working with the right people and maintaining ongoing communications with all members of the project. We had tremendous commitment from the participating hospitals and support from AHCA and 3M HIS. The hospitals working with us found the project interesting and useful for their future laboratory reporting. Once all the legal issues were ironed out for contacts and data exchange, and we received the go-ahead with the project, all of the teams came together to complete the project in a timely fashion.

One hospital system indicated that by having the Mater Patient index for all the hospitals, a single lab system for all the hospitals, a centralized support of lab system, an open data base connectivity with lab system database were the key for their successful participation.

A major determinant of our success came from the flexibility, collaboration, cooperation, dedication, perseverance, and coordination of all parties involved in the project.