

**CSCI 234**

*Design of Internet Protocols:  
HL7 Protocol Validation*

George Blankenship

HL7 Protocol Validation      George Blankenship      1

---

---

---

---

---

---

---

---

**Outline**

- Background
  - Operational environment
  - HL7
- Verification requirements
  - Definition of VA transactions
  - Verification of VA transactions
  - Verification of business partner transactions
- Approach
- Results

HL7 Protocol Validation      George Blankenship      2

---

---

---

---

---

---

---

---

**Doctor Visit**

- Patient is not feeling well
- Patient visits local physician
  - Physician needs supplementary tests to support a diagnosis
  - Local hospital (outpatient clinic) is able to perform tests
  - Physician writes medical order for appropriate tests
- Patient enters medical facility
  - Written order has multiple issues
    - Can it be read?
    - Is the patient identity captured correctly?
  - Electronic order has multiple issues (transfer or transcription)
    - What is the form of the order?
    - How does the patient identity correlated?
- How does the physician receive the results?

HL7 Protocol Validation      George Blankenship      3

---

---

---

---

---

---

---

---

### Intelligent Medical Device

- **Medical device with own EMR**
  - Operator/clinician enters patient information
  - Operator/clinician controls the device interaction with the patient
  - Device collections information from the patient
  - Clinician views the results of the collection
- **How does this device perform a useful function?**
  - Primary care physician is given a written report by the clinician
  - Primary care physician switch from her normal EMR display to the device's display
  - Clinician transfers the information (copy & paste) the information from the device to the EMR
  - Does this type of solution scale?
  - Is this type of solution prone to serious problems?

HL7 Protocol Validation                      George Blankenship                      4

---

---

---

---

---

---

---

---

---

---

### Home Telehealth

- **Performing medical service in the home using a device in the home, rather than visiting the home**
- **A patient with a chronic condition may be subject to a risk of contagion during a hospital visit**
- **Home device**
  - Primary point of medical care for the patient
  - Collects pertinent medical data on the patient
  - Conducts disease management dialogs
  - Conducts satisfaction surveys
  - Transmits the data to a server for analysis and storage
- **Care coordinator (nurse)**
  - Primary point of contact for the patient
  - Communicates with the patient via phone (video phone)
  - Reviews the collected data
  - Prepares reports for the clinical team (physician)

HL7 Protocol Validation                      George Blankenship                      5

---

---

---

---

---

---

---

---

---

---

### Veterans Health Administration

- **More than 1,400 sites of care**
  - 155 medical centers,
  - 872 ambulatory care and community-based outpatient clinics
  - 135 nursing homes
  - 45 residential rehabilitation treatment programs
  - 209 veterans centers
  - 108 comprehensive home-care programs
- **More than 5.5 million people receive care (2006)**
  - 78 percent of all disabled and low-income veterans are enrolled for health care
  - 65 percent of them were treated by VA
  - VA inpatient facilities treated 773,600 patients
  - VA's outpatient clinics registered nearly 60 million visits.

HL7 Protocol Validation                      George Blankenship                      6

---

---

---

---

---

---

---

---

---

---

**Home Telehealth Clinical Objectives**

- A project designed to improve care for patients with chronic conditions that can benefit from more frequent monitoring.
- Currently supports over 35,000 patients (2008)
- Better health with fewer emergencies, happier patients, and lower costs
- Clinical staff identify patients and monitor them daily through medical devices that are placed in the patient's home.
- Patient interacts with Disease Management Protocols (DMP), video and submit measurements through the home devices to be sent to collection systems
- Care Coordination nurses use the collected data to closely monitor and stabilize patients without bringing them to the hospital.

HL7 Protocol Validation George Blankenship 7

---

---

---

---

---

---

---

---

**VistA Integration Project Overview**

- Built upon commercial systems from multiple small vendors
- The project links emerging technologies from COTS vendors with the existing VA electronic medical record (EMR) system (VistA)
- Funded at \$2.6 M for FY07
- Design
  - Automatic insertion of collected data in patient EMR
  - Automatic report generation for insertion in patient EMR
  - Redundant collection systems
  - Geographically distributed collection systems
  - Regular testing of operations switch between collection systems

HL7 Protocol Validation George Blankenship 8

---

---

---

---

---

---

---

---

**VistA Integration IT Objective**

- Shared patient data
  - Fewer entry errors
  - Accurate patient data
  - Beneficial patient outcomes
- Requires common (shared) patient identity (medical record number – MRN)
- Requires common (recognized) messages
- Requires reconciliation algorithm for discrepancies

HL7 Protocol Validation George Blankenship 9

---

---

---

---

---

---

---

---

### Deployment Objectives

- Phased deployment
- HL7 Messages and Date standardized
- Uses existing VA HL7 infrastructure
- Patient vital signs stored in the HDR
- Patient vital signs available to clinical staff via currently available tools
- Patient progress notes automatically generated and delivered to VistA
- Average transaction latency of 10 seconds

HL7 Protocol Validation George Blankenship 10

---

---

---

---

---

---

---

---

---

---

### Legacy Data Flow

1. Manual - VA staff requests patient be considered for enrollment by sending VistA consult.
2. Manual - Care Coordinator completes the VistA consult action.
3. Manual - Care Coordinator manually releases registration of patient on the vendor Home Telehealth system.
4. Manual - Care Coordinator links device with patient record and arranges to have device installed in the patient's home.
5. The patient uses the in-home device to capture vital signs and respond to any questions.
6. Device exchanges information with vendor server, normally once per day.
7. Using Vendor Viewer, Care Coordinator logs into vendor system to review patient information.
8. Care Provider and Care Coordinator can contact the Care Coordinator to review the condition of the Home Telehealth patient.
9. Manual - Care Coordinator enters draft 28 day Progress Notes to facility VistA server.

HL7 Protocol Validation George Blankenship 11

---

---

---

---

---

---

---

---

---

---

### VistA Integration Data Flow

1. VA staff requests patient be considered for enrollment by sending VistA consult.
2. Care Coordinator completes the VistA consult action.
3. Care Coordinator releases registration of patient from Home Telehealth service using VistA
  - a) VistA sends HL7 sign-up message with patient identification to vendor system.
  - b) Vendor authenticates for MPI updates via the interface engine.
4. Care Coordinator links device with patient record and arranges to have device installed in the patient's home.
5. The patient uses the in-home device to capture vital signs and respond to any questions.
6. Device exchanges information with vendor server, normally once per day.
7. Using Vendor Viewer, Care Coordinator logs into vendor system to review patient information.
8. Care Provider and Care Coordinator can review Home Telehealth and VistA information in VA Viewer.
9. Vendor server sends draft 28 day Progress Notes to Care Coordinator on facility VistA server for editing and signature.

HL7 Protocol Validation George Blankenship 12  
Sept 2006

---

---

---

---

---

---

---

---

---

---

## Home Telehealth Transactions

- **Sign up/Activation**
  - This transaction gives the vendor server an accurate copy of the patient demographics. This transaction will start (restart) the use of a home device according to the parameters from the medical order. The activation transaction is used to start the collection of 28-day progress note information.
- **Observation**
  - This transaction sends the patient vitals to the HDR server
- **MPI Subscription**
  - This transaction informs the MPI that the vendor server has a copy of the patient demographics and database indices. The MPI will send updates as it detects changes.
- **MPI Update**
  - This transaction informs the vendor server of an update to a patient's demographics or database index.
- **Acknowledgements**
  - This transaction supplies either a message acknowledgment (acceptance) or an application acknowledgement. Every other transaction includes the acknowledgement transaction.
- **Medical order**
  - This transaction gives the vendor server the parameters needed to define the use of a home device. This transaction should imply an activation transaction
- **Inactivation**
  - This transaction will suspend the collection of vitals by a home device. 28-day progress note information will not be collected during a period that a patient is inactive.
- **Progress alarm**
  - This transaction will build a draft progress note containing an alarm for an "out of range" vital sign.
- **Progress note**
  - This transaction will build a draft progress note containing the patient's 28-day progress.

HL7 Protocol Validation                      George Blankenship                      13

---

---

---

---

---

---

---

---

---

---

## Messaging Background

- **Overview of the HL7 standard**
- **Processing concept**
- **Home Telehealth Example**
  - Transactions
  - Operating/testing environment
  - Messages
- **HL7 messages**
  - Message structure
  - Transaction concerns
- **HL7 parsing**

HL7 Protocol Validation                      George Blankenship                      14

---

---

---

---

---

---

---

---

---

---

## Objective of HL7

- **Data safety**
  - Patient information is moved electronically
  - Minimizes key errors
  - Independent indices identify recognizable data
- **Information clarity**
  - Standardized vocabulary
  - Standardized encoding
- **Ease of integration**

HL7 Protocol Validation                      George Blankenship                      15

---

---

---

---

---

---

---

---

---

---

**CCOW**

- **Clinical Context Object Workgroup**
- **Applications executing on a single workstation display data with in a single context though independent**
- **Unified view of data from disparate healthcare applications**
- **Patient context**
  - Data displayed is from the same patient
  - Data may be from different systems
- **Encounter context**
  - Data displayed is from the same encounter
- **User context**
  - "Single sign on"
  - Access controls used are based upon single user
  - User does not have to enter credentials when switching between systems

HL7 Protocol Validation      George Blankenship      16

---

---

---

---

---

---

---

---

---

---

**Overview of HL7 Standard**

- **Objective of HL7 Standard**
  - Electronic data exchange in all healthcare environments
  - Special emphasis on inpatient acute care facilities
  - Simplification of implementation of interfaces
- **HL7 Committee**
  - Established in March 1987
  - Conference hosted by Dr. Sam Schultz (Hospital of the University of Pennsylvania)
  - Members are healthcare providers, vendors and consultants
  - Standardize the format and protocol for the exchange of data among healthcare computer application systems
  - Meetings are held approximately every four months
  - HL7 sanctioned national groups: United States, Australia, Canada, China, Finland, Germany, India, Japan, Korea, New Zealand, Southern Africa, Switzerland, Taiwan, The Netherlands, and the United Kingdom

HL7 Protocol Validation      George Blankenship      17

---

---

---

---

---

---

---

---

---

---

**What Is HL7**

- **Form, content and meaning of message between peer applications**
  - P2P model
  - Transaction model
  - Syntax and semantics of the messages
- **Transaction sets**
  - Patient administration
  - Order entry
  - Query
  - Financial management
  - Observation reporting
  - Master files
  - Medical records/information management
  - Master file update information (document management)
  - Scheduling
  - Patient referral
  - Patient care
  - Laboratory automation
  - Application management
  - Personnel management

HL7 Protocol Validation      George Blankenship      18

---

---

---

---

---

---

---

---

---

---

### What Is HL7 Not

- **Silent on the issues of privacy and authentication of data**
- **No provision for enforcement of security and access control policy**
- **No definition of the relationships such as patients, physicians, and providers**
- **No definition of typical transaction processing features such as audit trails**
- **Does not include an explicit data model or composite data dictionary**
- **Does not discuss the logical and physical construction of the patient longitudinal health record**
- **Makes no attempt to provide messages that could support the coordination of database activities across multiple information systems in a heterogeneous computing environment**

HL7 Protocol Validation      George Blankenship      19

---

---

---

---

---

---

---

---

### Processing Concept

- **Asynchronous transactions (trigger events)**
  - Data is sent to peer system and processed in the non real-time
  - Healthcare events create the need for data to flow among systems
  - Admission of a patient needs to be distributed to other systems
  - Patient observations need to be distributed to other systems
- **Synchronous transactions (work synchronization)**
  - Data is sent to a peer system and processed in near real-time
  - Inquiry for patient identity or demographics
  - Issuance of orders for medical procedures

HL7 Protocol Validation      George Blankenship      20

---

---

---

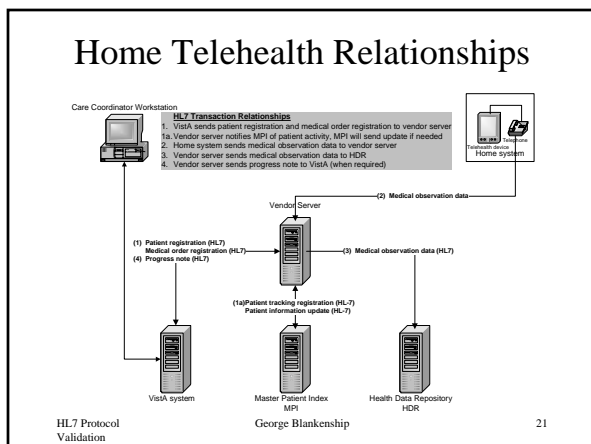
---

---

---

---

---




---

---

---

---

---

---

---

---

### Patient Sign Up Messages

For the latest submission to NPL Library: [B. J. Scott's Security Reference](#) [PHS 2000 Letter to Health Plans about the Vendor Accreditation List](#)  
[The Accredited Vendor List](#) [The Accredited Vendor List](#) [The Accredited Vendor List](#)  
[The Accredited Vendor List](#) [The Accredited Vendor List](#) [The Accredited Vendor List](#)

Vendor Name	Vendor ID	Vendor ID	Vendor ID	Vendor ID
ADT504	KUMAZZMANN	ATUMERMAN	KUMAZZKALCASH	ADT504
				ATUMERMAN
GRAND2	GRAND2	GRAND2		
KUMAZZKALCASH				
KUMAZZ	KUMAZZ	KUMAZZ		

For the latest submission to NPL Library: [B. J. Scott's Security Reference](#) [PHS 2000 Letter to Health Plans about the Vendor Accreditation List](#)  
[The Accredited Vendor List](#) [The Accredited Vendor List](#) [The Accredited Vendor List](#)  
[The Accredited Vendor List](#) [The Accredited Vendor List](#) [The Accredited Vendor List](#)

HL7 Protocol Validation George Blankenship 22

---

---

---

---

---

---

---

---

---

---

---

---

### Conformance Testing Platform

HL7 Protocol Validation George Blankenship 23

---

---

---

---

---

---

---

---

---

---

---

---

### System Test Platform

HL7 Protocol Validation George Blankenship 24

---

---

---

---

---

---

---

---

---

---

---

---



## Message Sequences

- **Message**
  - Routed to destination application at a destination facility
  - Requests message acknowledgement
  - Requests application acknowledgement
- **Message acknowledgement**
  - Message is accepted/cannot be accepted for processing
  - Interface Engine (IE) – transaction is queued for routing
  - End system – transaction is queued for processing
- **Application acknowledgement**
  - Requested transaction has/has not been processed
- **Each message has a unique identifier**

HL7 Protocol Validation                      George Blankenship                      25

---

---

---

---

---

---

---

---

---

---

## HL7 Message Structure

- **Message divided into segments**
- **Segments define information space**
  - *MSH* – overall information and routing
  - *PID* – patient identification
- **Segments are divided into fields**
  - Field position defines content
  - Field content has a defined type (*CE, ST, ...*)
  - *MSH-4* – source application
  - *PID-3* – patient MRNs (Medical Record Numbers)
- **Fields are divided into components and subcomponents**
  - Component and subcomponent position defines content
  - Component and subcomponents have a defined type
  - *HD* field type (name space, universal id, universal id type)
  - *EI* field type (entity identifier, namespace ID, universal ID, universal ID type)
  - *CE* field type (identifier, text, name of coding system, alternate identifier, alternate text, name of alternate coding system)

HL7 Protocol Validation                      George Blankenship                      26

---

---

---

---

---

---

---

---

---

---

## Fields, Components and Repeats

- **Message segments end with a separator (<CR>)**
  - <segment name> text <CR>
  - Segment names that begin with a “z” are locally defined
- **Segment units delimited by specific separators defined in the *MSH* segment**
  - *MSH-field*<component><repeat><escape><subcomponent>
- **Segment unit is a field**
  - Starts with a field separator
  - Ends with a field separator or the end of the segment
- **Field unit is a component**
  - Starts with a field or component separator
  - Ends with a component separator or the end of the field
- **Component unit is a subcomponent**
  - Starts with a component or subcomponent separator
  - Ends with a subcomponent separator or the end of the component
- **VA uses the set {^~|&} as the separators and delimiters**
  - <name>^<field>^<component>~<component>~<subcomponent>~&<subcomponent>~<CR>
  - <name>^<field>~<field>^<field>^<field>~<field>~<component>~<component>~<CR>

HL7 Protocol Validation                      George Blankenship                      27

---

---

---

---

---

---

---

---

---

---

### Sign Up/Activation Message ADT-A04

- MSH^~|&^DG HOME TELEHEALTH^552-DEVCRN.FO-ALBANY.MED.VA.GOV-DNS^HTAPPL^200TX-XYZ.MED.VA.GOV-DNS^20060216231542-0500^ADT-A04^120060216231542^T^2.4^^AL^AL^USA^AAAA
- EVN^A04^20060216231542-0500^^2^32885-Blankenship-George^^~^~^USVHA&0363-L~^~^NI-FACILITY&STATION&L^20060216231542-0500^
- PID^1^^1234567890v123456^^~^~^USVHA-NI-VA FACILITY ID&200 M&L^^|123456789^^~^~^USVHA-PI-DAYTDEV&552&L^^|123456789^^~^~^USSA-SS-VA FACILITY ID&STATION&L^^^Patient-Veterans-Aloysius^^~^~^L^Government^^~^~^M^20060216^M^^W^1335 East/West Highway^^Silver Sprung-MD-20910^^(703) 555-1212^(301) 734-0000^^M^C^^American^^veteran^^20060216231542-0500^N^AAAA
- PD1^AAA^33250-Doctor-Fine^^~^~^~^USVHA-L~^~^NI-facility&station &L^AAAA
- PV1^AAA^123456789^^~^~^~^USVHA^^~^~^DAYTDEV&552&L^^^AAAA

HL7 Protocol Validation                      George Blankenship                      28

---

---

---

---

---

---

---

---

---

---

---

---

### Acknowledgements ACK

- Message acknowledgement
- MSH^~|&^HTAPPL^200TX-XYZ.MED.VA.GOV-DNS^DG HOME TELEHEALTH^552-DEVCRN.FO-ALBANY.MED.VA.GOV-DNS^20060216231542-0500^^ACK-A04^220060216231542^T^2.4^^AL^NE^NE^USA^AAAA
- MSA^CA^120060216231542^AAAA
- ERR^-0.000000-0.000000-0&Message accepted
- Application acknowledgement
- MSH^~|&^HTAPPL^200TX-XYZ.MED.VA.GOV-DNS^DG HOME TELEHEALTH^552-DEVCRN.FO-ALBANY.MED.VA.GOV-DNS^20060216231543-0500^^ACK-A04^320060216231543^T^2.4^^AL^NE^NE^USA^AAAA
- MSA^AA^120060216231542^AAAA
- ERR^-0.000000-0.000000-0&Message accepted

HL7 Protocol Validation                      George Blankenship                      29

---

---

---

---

---

---

---

---

---

---

---

---

### Message Header

- *MSH* is leading segment of every message
- Defines field/component delimiters and repeating delimiters
- Identifies source application/facility
- Identified destination application/facility
- Defines message identifier
- Defines message type
- Defines acknowledgement requirements

HL7 Protocol Validation                      George Blankenship                      30

---

---

---

---

---

---

---

---

---

---

---

---

### Acknowledgement

- **MSA segment present to perform acknowledgement**
- **MSA-1 defines acknowledgement type**
  - Cx – message acknowledgement (commit ACK)
  - Ax – application acknowledgement (accept ACK)
- **MSA-2 identifies message being acknowledged (Control ID)**
- **ERR segment contains information on errors**

HL7 Protocol Validation      George Blankenship      31

---

---

---

---

---

---

---

---

### Patient Identification

- **PID segment conveys patient identification**
- **Best method of identification is a universal MRN**
- **Reality is every system has local MRN**
  - Local MRN is correlated to global MRN
  - MPI maintains the correlation and distributes updates
- **VA uses local MRN (VA facility), US MRN (SSN), and national MRN**
  - Local MRN has only local significance and difficult to relate to other locations
  - SSN useful with external systems, but patients can change SSNs

HL7 Protocol Validation      George Blankenship      32

---

---

---

---

---

---

---

---

### Patient Demographics

- **PID and PDI segments contain patient demographics**
- **Demographics include names, spouse, date of birth, addresses, phone numbers, mother's maiden name, and a host of other stuff**
- **Demographics are a poor method to identify a patient**

HL7 Protocol Validation      George Blankenship      33

---

---

---

---

---

---

---

---

### Episode of Care

- PVI segment identifies an episode of care
- An episode of care is a convenient method to tie a set of related medical record entries together
- A significant problem in health care is the misidentification of a patient. If all of the data collected from a given episode are identified by an single index, a misidentified patient can be easily corrected.

HL7 Protocol Validation George Blankenship 34

---

---

---

---

---

---

---

---

---

---

### Vital Sign Observation ORU-R01

- MSH~||&^HDRVTL\$^200TX-XYZ.MED.VA.GOV-DNS^HTH HDR^200H-DEVCRN.FO-ALBANY.MED.VA.GOV-DNS^20051130004711-0500^ORU-R01^820051130004711^T^2.4^^AL^NE^USA^^^
- PID^1^^1234567890^123456---USVHA-NI-VA FACILITY ID&200M&L---|123456789---|USVHA-PI-DAYTDEV&552&L---|123456789---|USSA-SS-VA FACILITY ID&STATION&L---^^Patient-Veterans-Aloysius---L^Government-----M^20051130^M^^W^1335 East/West Highway---Silver Sprung-MD-20910^(703) 555-1212^(301) 734-0000^M^C^^^American^^^veteran^^20051130004711-0500^N^^^
- ORC^RE^^220051130004711-Telehealth XYZ Corp^^CM^^^^^^HT-----Telehealth XYZ Corp^^^^200Tx-Telehealth XYZ Corp-L^^^^^^
- OBR^1^^220051130004711-Telehealth XYZ Corp^4500638-TEMPERATURE-99VA120.51^^220051130004711-0500^^^^^^^^^^^^^^^^^^^^F^^^^^^^^^^^^^^^^^^^^
- OBX^1^ST^4500638-TEMPERATURE-99VA120.51^^99.1^4500991-F-VHA\_ER T^^^^F^^20051130004711-0500^^4500983-DEVICE ENTERED-VHA\_ER T^Telehealth XYZ Corp-model 123Bv1.2-model 789r.2^
- OBX^1^CE^Qualifiers^^4500642-ORAL-99VA120.52^^^^^^^^^^^^^^^^
- ZSC^1^683^NONVIDEO HOME TELEHEALTH MONIT^0.000000^

HL7 Protocol Validation George Blankenship 35

---

---

---

---

---

---

---

---

---

---

### Patient Data

- Patient data exchanged with peer systems
- Patient data stored for use by other systems
- Observation data clarity
  - Date and time of observation
  - Data identified with observation name, value, units, method of collection, and ancillary information
  - Each item requires the use of a standardized values (single vocabulary)

HL7 Protocol Validation George Blankenship 36

---

---

---

---

---

---

---

---

---

---

### Parsing HL7 Message

- **HL7 parsing tools are vital the an HL7 implementation**
- **Parsing tools separates the HL7 encoding from the transaction processing**
- **Data base oriented tools**
  - Triggers embedded in the data base generate HL7 message (transaction)
  - Special data base tables are created to process the HL7 messages
- **Transaction oriented tools**
  - Receipt of message generates a parsing routine that creates processing threads
  - Processing thread create messages to be sent

HL7 Protocol Validation George Blankenship 37

---

---

---

---

---

---

---

---

---

---

### Validation Approach

- **Validation of accurate capture of the VA HL7 definition**
  - Vendor system emulator
  - Emulation of all message sequences
  - Emulation of all encodings
- **Validation of accurate implementation of VA HL7 definition**
  - VA system emulator
  - Emulation of all VA systems
  - Emulation of all message sequences
  - Emulation of all encodings
- **Common code base**
  - Same message encoder used for both emulators

HL7 Protocol Validation George Blankenship 38

---

---

---

---

---

---

---

---

---

---

### Validation Plan

- **Integration Test Lab (ITL)**
  - System test platform
  - Validation of requirements capture
  - Validation of requirements implementation
  - Validation of message recovery algorithms
- **Field test**
  - Limited deployment of operational system
  - Monitoring of all transactions
  - Capture disposition of all messages
- **Full operational capability**
  - Monitoring of all systems using HL7 message probes
  - Calculation of transactional latency

HL7 Protocol Validation George Blankenship 39

---

---

---

---

---

---

---

---

---

---

### VA Emulator

HL7 Protocol Validation

George Blankenship

40

---

---

---

---

---

---

---

---

---

---

---

---

### Vendor Emulator

HL7 Protocol Validation

George Blankenship

41

---

---

---

---

---

---

---

---

---

---

---

---

### VA Emulator (Active Listener)

HL7 Protocol Validation

George Blankenship

42

---

---

---

---

---

---

---

---

---

---

---

---



## Operational Log

```

10/29/2008 15:15:55 <HomeTelehealth> (listenPort) listen on 54503 for VA in
10/29/2008 15:15:55 <HomeTelehealth> (openPort) listening for traffic from HT vendors
10/29/2008 15:17:30 <HL7Connection> (HL7Connection) new connection to localhost:1138/1
10/29/2008 15:17:30 <HL7Connection> (addServerClientConnection) new server client connection (localhost:54503:051) for
localhost:1138/1
10/29/2008 15:17:30 <HL7Connection> (connectFromRemote) new connection on localhost:54503:051 from localhost:1138/1
10/29/2008 15:17:30 <HL7Connection> (socket localhost:54503:051 connected) lock connection localhost:1138/1
10/29/2008 15:17:30 <HL7Connection> (connectFromRemote) monitor localhost:1138/1 for input
10/29/2008 15:17:30 <HL7Connection> (messageReceived) lock connection localhost:1138/1
10/29/2008 15:17:30 <HL7Connection> (messageReceived) received message from localhost:1138/1 of length 1143
10/29/2008 15:17:30 <default> <messageReceived> message segment of 1143 bytes received from localhost:1138/1 raw message body
follows:
MSH^~&^HTAPPL^200TX-LOCALHOST~DNS^TIUHL7^552-LOCALHOST~DNS^20081029151730-
0400^MDM-T02^520081029151730^D^2.4^AL^AL^USA^
EVNT02^20081029151730-
0400^2^32885-Blankenship-George^---USVHAR&0363-L^---NI-FACILITY&STATION&L^20081029151730-0400^
PID^~1234567890123456^---USVHA-NI-VA FACILITY ID&200M&L1234567890^---USVHA-PT-VA
FACILITY&552&L123456789^---USSA-SS-VA FACILITY
ID&STATION&L^Patient-Veterans-alyosis^---L-Government^---M^19461222^m^m^1335 East West Highway--Silver
Spring-MD--2010^2011 734-0400^2011 734-0227^M^C^American^veteran^20081029151730-0400^N^
PV1^~C^CCT NON VIDEO MONITOR REVIEW^12345^---USVHA-VA facility&552&L^*****NEW^
TXA^PR^R^EXT^20081029151730-0400^20081029151730-
0400^3350-Doctor-Fine^---facility&station&L^33250-Doctor-Fine^-----facility&station&L^12345^USVHA
^20081029151730-HT^Care Coordination Home Telehealth Summary of Episode Note^PA^U^AC^end of collection period^
OBX^1^TX^Patient, Veterans alyosis has been supported by the Home Telehealth Program.(The following information was submitted by
the veteran through their Home Telehealth system). - 28 sec
message body precedes
    
```

HL7 Protocol Validation George Blankenship 46

## Validate Message Header

```

10/29/2008 15:17:30 <MessageEngine> (onTIUMessage) receive MDMT02
(TIU) message from localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getMSHdata) collect MSH data from
message received on connection localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getMSHdata) switch remote system
to HTAPPL:200TX (Telehealth XYZ Corp/LOCALHOST)
10/29/2008 15:17:30 <HomeTelehealth> (getMSHdata) MSH data receiving
TIUHL7/552-LOCALHOST~dns sending
HTAPPL^~/200TX-LOCALHOST~dns control 520081029151730
(D)MDM-T02 ACKs: AL/AL Wed Oct 29 15:17:30 EDT 2008
10/29/2008 15:17:30 <HomeTelehealth> (sendAcceptACK) send message
ACK to station 200TX using connection localhost:1138/1
    
```

HL7 Protocol Validation George Blankenship 47

## Validate Message Body

```

10/29/2008 15:17:30 <HomeTelehealth> (getVNdms) collect EVN data from message received on connection localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getVNdms received event TIU) operator 32885.NI Blankenship, George USVHA--0603-FACILITY-STATION-L facility --- time
Wed Oct 29 15:17:30 EDT 2008 Wed Oct 29 15:17:30 EDT 2008
10/29/2008 15:17:30 <HL7Connection> (messageReceived) message received on localhost:54503:051 to localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getPatientData) collect patient data from message received on connection localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getPatientData) patient's identity is ICN 1234567890123456
10/29/2008 15:17:30 <HomeTelehealth> (getPatientData) patient's identity is DFN 1234567890123456
10/29/2008 15:17:30 <HomeTelehealth> (getPatientData) patient's identity is SSN 123456789
10/29/2008 15:17:30 <HomeTelehealth> (getPatientData) patient Patient, Veterans alyosis ICN 1234567890123456 SSN 123456789 DFN 1234567890123456 DOB 19461222
provider -_consult 1234567890123456
10/29/2008 15:17:30 <default> (getPatientPresent) patientID found with key ICN 1234567890123456
10/29/2008 15:17:30 <HomeTelehealth> (getPatientVisit) collect patient visit data from message received on connection localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getPatientVisit) consult consult 123456789
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData) collect progress note data from message received on connection localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (0) Patient, Veterans alyosis has been supported by the Home Telehealth Program.
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (1) The following information was submitted by the veteran through their Home Telehealth system.
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (2) - 28 sessions of the Cognitive Heart Failure dialog
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (3) - 28 sessions of the Chronic Pain dialog
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (4) - 28 BLKCH PRESSURE observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (5) - 28 PAIN observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (6) - 28 PULSE observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (7) - 28 PULSE OXYMETER observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (8) - 28 TEMPERATURE observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (9) - 28 BLEED GLUCOSE observations
10/29/2008 15:17:30 <HomeTelehealth> (getProgressNoteData ORX line (10) - 28 WEIGHT observations
10/29/2008 15:17:30 <default> (getPatientICN) patientID found with key ICN 1234567890123456
10/29/2008 15:17:30 <default> (getPatient) patient is now Patient, Veterans alyosis DFN 1234567890123456
10/29/2008 15:17:30 <default> (getPatient) patient key (0) 1234567890123456
10/29/2008 15:17:30 <default> (getPatient) set PID 1 from Alt ID
10/29/2008 15:17:30 <default> (getPatient) patient is now Patient, Veterans alyosis DFN 1234567890123456
10/29/2008 15:17:30 <default> (getPatient) patient key (0) 1234567890123456
10/29/2008 15:17:30 <HL7Connection> (messageReceived) client socket received message from localhost:1138/1
10/29/2008 15:17:30 <HomeTelehealth> (sendApplicationACK) send application ACK to station 200TX
    
```

HL7 Protocol Validation George Blankenship 48



## Results of Validation Approach

- Validated capture of requirements using messages exchanged with VA systems
  - VistA (patient sign up/inactivation)
  - VistA (patient progress notes)
  - MPI (vendor registration as treating facility)
  - MPI (patient updates)
  - HDR (patient vital signs)
  - Census (weekly census extract)
- Validation of requirements implementation
  - Four vendor in TTL
  - Error recovery
- No major issues were revealed during the field testing
  - No vendor has had to roll back from VistA Integration mode to legacy mode
  - National rollout in progress with a projected completion date of 3/09

HL7 Protocol  
Validation

George Blankenship

49

---

---

---

---

---

---

---

---

---

---