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HL7 INTERNATIONAL

IIS HL7 101: Version 2.5.1 Implementation Guide for Immunization Messaging

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Audience

- **IIS staff new to HL7**
- **EHR and IIS vendors**
- **Refresher on version HL7 V2.5.1**
- **Anyone who wants to learn HL7!**

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Upon completion of this webinar, attendees will be able to:

- Understand the role HL7 plays in data exchange
- Describe the building blocks of HL7 messages
  - Usage types (R/RE/O/C/CE)
  - Data types
  - Segment
- Key Differences between V2.5.1 and V2.3.1

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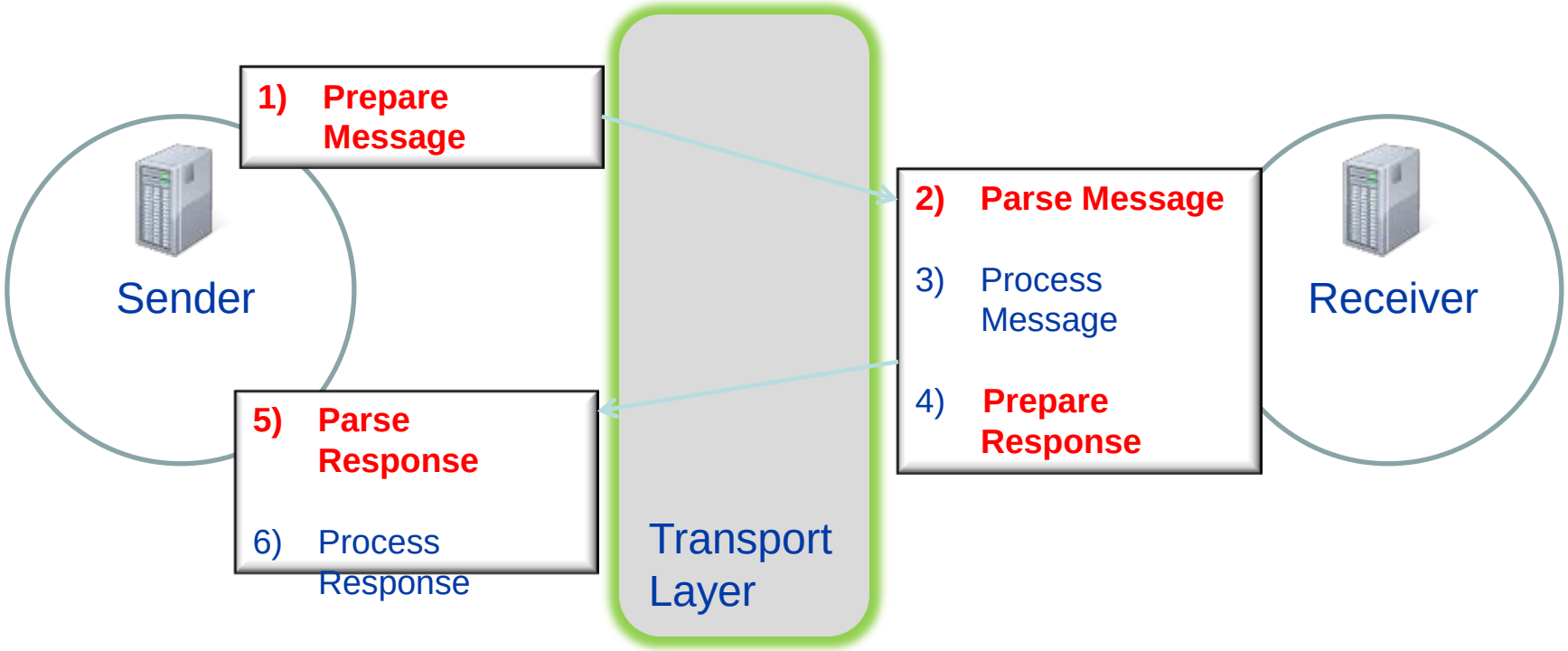
Messaging


1) Prepare Message
Sender
5) Parse Response
6) Process Response
Transport Layer
2) Parse Message
3) Process Message
4) Prepare Response
Receiver

Use Cases Supported by Implementation Guide

- **Send/receive immunization history (VXU)**
- **Request Immunization History (Query (QBP)/Response(RSP))**
  - **Return immunization history**
  - **Return list of candidates**
  - **Report no candidates found**
- **Return acknowledgment (ACK)**

Core Data Elements

- **Support IIS functional responsibilities**
- **Accommodate federal mandates**
- **Drive usage and conformance decisions**

- **See Appendix B of the Implementation Guide for specific how to examples**

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Core Data Elements-Demographic

- Patient ID
- Patient name
- Birth date
- Mother's maiden name
- Gender
- Race
- Ethnicity
- Address
- Phone
- Responsible person info
- IIS status
- Birth order

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Core Data Elements- Immunization

- Vaccine
- Vaccination date
- Lot number
- Expiration date
- Route and site
- Ordering clinician
- Administering clinician
- Historical vs administered
- Funding eligibility
- Vaccine Info Statement data

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Core Data Elements-Observations

- **Reactions**
- **Contraindications**
- **Precautions**
- **Refusal reason**
- **History of vaccine preventable disease**

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HL7 Message

- Defined purpose
- Composed of segments (like sentences)
- Each segment has a defined purpose
- Each segment is composed of “fields” with defined purpose
- Each field has a defined data type and position in a segment.
- Each field and sub-field is demarcated by separator

Sample HL7 message

MSH|^~\&|MYEHR|DCS|||20090531145259||VXU^V04^VXU_V04|3533469|P|2.5.1||||AL <CR>

PID|1||432155^^^DCS^MR||Patient^Johnny^New^^^^L||20090414150308|M||||123 Any St^^Somewhere^WI^54000^^L<CR>

NK1|1|Patient^Sally|MTH^mother^HL70063|123 Any St^^Somewhere^WI^54000^^L<CR>

ORC|RE||197023^DCS|||||||^Clerk^Myron|||||||DCS^Dabig Clinical System^StateIIS<CR>

RXA|0|1|20090415132511|20090415132511|31^Hep B Peds NOS^CVX|999|||01^historical record^NIP0001|||||||| <CR>

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HL7 Building Blocks-1

- **Separators**
  - **<CR> = Segment Terminator;**
  - **| = Field Separator;**
  - **^ = Component Separator;**
  - **& = Sub-Component Separator;**
  - **~ = Repetition Separator;**
  - **\ = Escape Character .**

HL7 Building Blocks-2

- **Cardinality**
  - **[1..1] = once and only once**
  - **[0..1] = no more than once**
  - **[0..*] = optional and repeating**

Benefits of Conformance Rules

- **Clearly states what each side is responsible for**
  - **R and RE must be implemented on sending system and receiving system**
- **Improves conditional specifications**
- **Supports conformance statements**
- **Supports core data element requirement specification**

Conformance/Usage (R)

Usage	Sender	Receiver
R – Required	The application **SHALL** implement “R” elements. The application **SHALL** populate “R” elements with a non-empty value.	The application **SHALL** populate “R” elements with a non-empty value. The receiving application **SHALL** process (save/print/archive/etc.) the information conveyed by a required element. A receiving application **SHALL** raise an exception due to the absence of a required element. A receiving application **SHALL NOT** raise an error due to the presence of a required element.

Conformance/Usage (RE)

Usage	Sender	Receiver
RE – Required but may be empty	The application **SHALL** implement "RE" elements. The application **SHALL** populate "RE" elements with a non-empty value if there is relevant data.	The application **SHALL** implement "RE" elements. The receiving application **SHALL** process (save/print/archive/etc.) the information conveyed by a required but may be empty element. The receiving application **SHALL** process the message if the element is omitted (that is, an exception **SHALL NOT** be raised because the element is missing).

Conformance/Usage (X,O)

Usage	Sender	Receiver
X – Not supported	The application (or as configured) **SHALL NOT** implement "X" elements. The application **SHALL NOT** populate "X" elements.	The application (or as configured) **SHALL NOT** implement "X" elements. None, if the element is not sent. If the element is sent the receiving application may process the message, **SHALL** ignore the element, and **MAY** raise an exception. The receiving application **SHALL NOT** process
O - Optional	None. The usage indicator for this element has not yet been defined.	None. The usage indicator for this element has not yet been defined.

Conformance/Usage (C)

Usage	Sender	Receiver
C(a/b) - conditional	The usage code has an associated condition predicate that determines the operational requirements (usage code) of the element. If the condition predicate associated with the element is true, follow the rules for ***a*** which **SHALL** be one of “R”, “RE”, “O” or X”: If the condition predicate associated with the element is false, follow the rules for ***b*** which **SHALL** be one of “R”, “RE”, “O” or X”.	The usage code has an associated condition predicate that determines the operational requirements (usage code) of the element. If the condition predicate associated with the element is true, follow the rules for ***a*** which **SHALL** be one of “R”, “RE”, “O” or X”: If the condition predicate associated with the element is false, follow the rules for ***b*** which **SHALL** be one of “R”, “RE”, “O” or X”.

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Processing Rules

- **Unexpected segment received-ignore**
- **Required segment missing-error**
- **Unexpected data field filled-ignore**
- **Required data field missing-error (segment empty)**
- **Bad data in field-error (field empty)**

Consequences of Errors

- **Bad or missing data in R field => Segment is empty, send error**
- **Bad data in RE field => Field is empty, send error**
- **Missing data in RE field => Field is empty, no error**
- **Bad or missing data in O field => Field is empty, no error**

Data Types Specify How Data Are Formatted

- DTM-Date time
- SAD-Street Address
- XAD-Extended Address
- CE-Coded Entry
- CE_TX-Coded Entry, Text Only
- EI-Entity Identifier
- XCN- Extended Composite ID Number and Name for Persons

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DTM-Date/Time

- **Primitive data type**
  - **No components or data type**
- **Len 4..24**
- **Format**
  - **YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]]]][+/-ZZZZ]**
- **20120912 = September 12, 2012**

HD-Hierarchical Designator

SEQ	COMPONENT NAME	Data Type	Usage	LEN	Conditional Predicate	Value Set
1	Namespace ID	IS	C(R/O)	1..20	If the HD.2 (Universal ID) is not valued	HL70300 HL70361 HL70362 HL70363
2	Universal ID	ST	C(R/O)	1..199	If the HD.1 (Namespace ID) is not valued	
3	Universal ID Type	ID	C(R/X)	1..6	If the HD.2 (Universal ID) is valued	ISO

HD data type example

- **|NMspcID^^|**
- **|^1.3.6.4.1.5518^ISO|**
- **|NMspcID^1.3.6.4.1.5518^ISO|**

CE-Coded Entry

SEQ	Component Name	Data Type	Usage	LEN	Conditional Predicate
1	Identifier	ST	R	1..50	
2	Text	ST	RE	1..999	
3	Name of Coding System	ID	R	1..20	
4	Alternate Identifier	ST	RE	1..50	
5	Alternate Text	ST	RE	1..999	
6	Name of Alternate Coding system	ID	C(R/X)	1..20	If CE-4 (Alternate Identifier) is valued

Sample MSH-Message Header Segment

Who sends/who gets/what is it/when was it sent

MSH|^~\&|MYEHR|DCS|||20090531145259||VXU^V04^VXU_V04|3533469|P|2.5.1||||AL <CR>

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MSH (partial)

SEQ	ELEMENT NAME	Data Type	Usage	Cardinality	LEN	Conditional Predicate	Value set
1	Field Separator	ST	R	[1..1]	1..1		|
2	Encoding Characters	ST	R	[1..1]	4..4		^~\&
3	Sending Application	HD	RE	[0..1]			HL70361
4	Sending Facility	HD	RE	[0..1]			HL70362
5	Receiving Application	HD	RE	[0..1]			HL70361
6	Receiving Facility	HD	RE	[0..1]			HL70362
7	Date/Time Of Message	TS	R	[1..1]			

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Sample PID

Who is this message about?

PID|1||432155^^^DCS^MR||Patient^Johnny^New^^^^L||20090414150308|M||
|123 Any St^^Somewhere^WI^54000^^L<CR>

PID-Patient Identifier Segment

- **PID-3 Patient ID list**
  - **Sender's ID**
  - **IIS ID**
  - **MEDICAID number**
- **PID-5 Patient Name (list)**
- **PID-6 Mother's Maiden Name**

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PID--1

SEQ	Element Name	Data Type	Usage	Cardinality	Conditional Predicate
1	Set ID - PID	SI	C(R/O)	[0..1]	If MSH-21 is valued “Z31^CDCPHINVS”
2	Patient ID	CX	X		
3	Patient Identifier List	CX	R	[1..*]	
4	Alternate Patient ID - 00106	CX	X		
5	Patient Name	XPN	R	[1..*]	

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PID--2

SEQ	Element Name	Data Type	Usage	Cardinality	Conditional Predicate
6	Mother's Maiden Name	XPN	RE	[0..1]	
7	Date/Time of Birth	TS	R	[1..1]	
8	Administrative Sex	IS	RE	[0..1]	
9	Patient Alias	XPN	X		
10	Race	CE	RE	[0..*]	
11	Patient Address	XAD	RE	[0..*]	

Sample RXA

Immunization administered record. Every immunization record is associated with an order (ORC)

ORC|RE||197023^DCS|||||||^Clerk^Myron|||||||DCS^Dabig Clinical System^StateIIS<CR>

RXA|0|1|20090415132511|20090415132511|31^Hep B Peds NOS^CVX|999|||01^historical record^NIP0001|||||||| <CR>

ORC|RE||197027^DCS|||||||^Clerk^Myron||^Pediatric^MARY^^^^^^^L^^^^^^ ^^^^^MD<CR>

RXA|0|1|20090731132511|20090731132511|48^HIB PRP-T^CVX|0.5|mL^^UCUM||00^new immunization record^NIP0001|^Sticker^Nurse|^^^DCS_DC||||33k2a||PMC^sanofi^MVX|||CP<CR>

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RXA-Treatment Administration

SEQ	ELEMENT NAME	Data Type	Usage	Cardinality	LEN	Conditional Predicate	Value set
5	Administered Code	CE	R	[1..1]			CVX
9	Administration Notes	varies	C(R/O)	[1..*]		If RXA-20 is valued “CP” or “PA”	NIP 0001
11	Administered-at Location	LA2	RE	[0..1]			
15	Substance Lot Number	ST	C(R/O)	[0..*]		If the value in RXA-9.1 (Administration Notes) is valued “00”	
17	Substance Manufacturer Name	CE	C(R/O)	[0..*]		If the value in RXA-9.1 (Administration Notes) is valued “00”,	MVX
18	Substance/Treatment Refusal Reason	CE	C(R/X)	[0..*]		If the RXA-20 (Completion Status) is valued “RE “	NIP002

OBX-Observation Segment Uses

- **Vaccination Funding Program Eligibility Status**
- **Vaccine Information Statement data**
- **Adverse Events**
- **History evaluation (was it a valid dose?)**
- **Forecast of next dose due**
- **Contraindications**

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OBX-Observation Segment

SEQ	ELEMENT NAME	Data Type	Usage	Cardinality	LEN	Conditional Predicate	Value set
1	Set ID – OBX	SI	R	[1..1]	1..4		
2	Value Type	ID	R	[1..1]	2..3		HL70125
3	Observation Identifier	CE	R	[1..1]			NIP003
4	Observation Sub-ID	ST	R	[1..1]	1..20		
5	Observation Value	varies	R	[1..1]			varies

OBX-Observation Segment

- **OBX-4-Observation Sub-id**
  - **Groups related observations**

- **For example:**
- **OBX|1|LN|^observation 1 part 1^^^^^|1|…**
- **OBX|2|LN|^ observation 1 part 2^^^^^|1|…**
- **OBX|3|DT|^a different observation^^^^^|2|…**

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OBX-continued

- **OBX-14 Date/time of observation**
- **OBX-17 Observation Method**
  - **For VFC only**
  - **Recorded for each administered immunization**
  - **Recorded for each visit and associated with each immunization**

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VXU—Required Segments

Segment	Cardinality	Usage
MSH	[1..1]	R
PID	[1..1]	R
PD1	[0..1]	RE
NK1	[0..*]	RE
Begin Order group	[0..*]	RE
ORC	[1..1]	R
RXA	[1..1]	R
RXR	[0..1]	RE
OBX	[0..*]	RE
NTE	[0..1]	RE
End Order Group		

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Application/Observation Conformance

- **If sender administered the dose then the following are required:**
  - **Eligibility Category for Vaccine Funding Program**
  - **Vaccine Information Statement (VIS)**
    - **Document type code**
      - **Target vaccine(s)**
      - **Edition date**
    - **Presentation Date**

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Patient Eligibility Category for Vaccine Funding Program

- **IZ-23: If RXA-9.1 (Administration Note.code) is “00” then the message SHALL include an OBX segment associated with the RXA with OBX-3.1 shall equal “64994-7” . This OBX will indicate the Patient Eligibility Category for Vaccine Funding Program.**

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Recording VFC eligibility

- **RXA|0|1|20090531132511|20090531132511|48^HIB PRP-T^CVX|0.5|mL^mL^UCUM||00^administered^NIP0001|^Sticker^Nurse|^^^DCS_DC|||33k2a||PMC^sanofi^MVX<CR>**
-
- **OBX|1|CE|64994-7^vaccine fund pgm elig cat^LN|1|V04^VFC eligible NA_AN^HL70064|||||F|||20090531132511|||XVC40^per imm^CDCPHINVS <CR>**

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Funding Program Eligibility

Code	Label
V01	Not VFC eligible (applies to all doses given by non-VFC provider)
V02	VFC eligible-Medicaid/Medicaid Managed Care
V03	VFC eligible- Uninsured
V04	VFC eligible- American Indian/Alaskan Native
V05	VFC eligible-Federally Qualified Health Center Patient (under-insured)
V06	Deprecated [VFC eligible- State specific eligibility (e.g. S-CHIP plan)]
V07	Local-specific eligibility
V08	Deprecated [Not VFC eligible-underinsured]

Vaccine Information Statement (VIS)

- **Clinicians must record the presentation date, edition date and vaccine of VIS for each immunization administered**
  - **Childhood vaccines plus Td**
  - **New table in IG lists vaccines of interest (PHVS_VISVaccines_IIS)**

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VIS Approach

- **Existing approach**
  - **Vaccine target**
  - **Edition date**
  - **Presentation date**
- **Bar-code approach**
  - **Bar coded GDTI (numeric string)**
  - **Presentation Date**

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Bar Code Approach

- **RXA|0|1|20091010||03^MMR^CVX|0.5|ML^^ISO+||00^new immunization record^NIP0001 ||||||EZ342|20111001|MSD^^MVX|||CP<CR>**
-
- **OBX|1|CE| 69764-9^document type^LN|1|25308869830001271120420^MMR^ cdcgs1vis||||||F<CR>**
-
- **OBX|2|TS|29769-7^VIS Presentation Date^LN|1|20091010||||||F<CR>**

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Differences Between Version 2.3.1 and Version 2.5.1

- **V2.5.1 is much more constrained and conformant to HL7 standard**
- **ORC segment is required for all RXA**
- **Deprecated fields are not supported**
- **Some value sets are changed or replaced**

PD1-12 (Protection Indicator) is corrected in V 2.5.1

- **The meaning of the values is reversed**
- **Now**
  - **Y means you must protect**
  - **N means you don’t need to protect**
  - **Empty means that the need for protection has not been determined**

V2.5.1 Release 1.4 Differences

- **Release 1.4 tightened the specifications over previous releases of the V2.5.1 Implementation Guide**
- **Pre-adopted usage specifications from V 2.7.1**
- **Documented conformance statements**

Value Sets—PHIN VADS

- **PHIN VADS is source of truth for value sets for immunization messaging**
- **http://phinvads.cdc.gov/vads/SearchHome.action**

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CDC Resources

- http://www.cdc.gov/vaccines/programs/iis/index.html
- Code sets
- Implementation Guide
- Errata/supplement
- Tools
  - Usage/Business Rules spreadsheet
- MIROW guides

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NIST Message Test Tool

- **Test your message against strict interpretation of IG**
- **Get NIST test messages**

- **http://hl7v2-iz-testing.nist.gov/mu-immunization/**

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Questions?

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