Michigan Department of Health & Human Services

HL7 Implementation Guide: Newborn Screening for Critical Congenital Heart Disease (CCHD) Using Pulse Oximetry

FOR PILOT AND TRIAL IMPLEMENTATIONS ONLY

This Implementation Guide is being released for Pilot and Trial implementations ONLY. Changes are expected prior to final release for general implementations.

Version 0.9.11

MDHHS
Michigan Department of Health & Human Services

MICHIGAN
Newborn
Screening

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1. Introduction

1.1. Background

Many seemingly healthy babies with Critical Congenital Heart Disease (CCHD) may suffer negative health outcomes if the condition is not identified shortly after birth. CCHD are those heart defects requiring surgery or catheter intervention in the first year of life. International efforts have precipitated both program and legislative initiatives to promote and/or mandate universal newborn screening for Critical Congenital Heart Disease using pulse oximetry testing. When pulse oximetry screen-resultant data are able to be exchanged across information systems, the use of international standards can help insure the seamless exchange of data and improve patient safety.

1.2. Reporting Requirements and Legal Authorization to Collect

The Michigan Department of Health and Human Services (MDHHS) administers the statewide Newborn Screening (NBS) Program under authority of the Michigan Public Health Code. This allows for addition of new conditions after approval by the state Legislature. **As of April 1, 2014, screening for CCHD using pulse oximetry and reporting of the results to MDHHS is required for all Michigan newborns**.

There are three options available for submission of screening data to MDHHS including:

1) the web-based "eReports" protocol through the State of Michigan's Single Sign On portal
2) a file transfer protocol for submission of a data file extracted from the hospital's electronic medical record system; or
3) HL7 transmission through the Michigan Health Information Exchange (HIE) infrastructure.

ONLY the HL7 option is covered in this document, for details on the other options see https://www.michigan.gov/cchd/ or contact MDHHS Newborn Screening staff (see section 1.8). Submitting facilities are required to use the same reporting option for all the pulse oximetry reports for the same infant/case. The Newborn Screening Program will use the pulse oximetry screening data collected from hospitals for quality assurance, evaluation, and monitoring to help assure all infants are appropriately screened.

1.3. Common Infant Demographics

Key demographic information as specified in Section 2.4.4 and 2.3.5 must be submitted to MDHHS with each infant's CCHD results. The demographic information collected at the time of pulse oximetry screening will be used to match the infant's CCHD screening results to the blood spot card sent to the MDHHS Newborn Screening Laboratory. Like the information needed on the blood spot card to properly identify the infant, mother, and specimen submitter, it is extremely important for the state Newborn Screening Program to receive data from the required CCHD screening fields and for them to be complete and accurate. The post-discharge provider information is also vital for follow-up of missed and positive CCHD screens. In order to ensure proper matching of the CCHD and blood spot card results, it is strongly recommended that the screening facility utilize bar code scanner to enter the blood spot card ID or some other automated quality control (dual entry with comparison, conformation screen, etc.,).

1.4. Intended Audience

There are multiple intended audiences for this Guide. The first audience for this Guide is those involved in CCHD pulse oximetry screening programs including hospitals or other implementers who will transmit data from point of care devices to public health. The second audience is pulse oximeter device manufacturers and Electronic Health Record system vendors. This is an HL7 implementation guide and, as such, is a technical document. Readers are expected to have strong knowledge in HL7 standards and message flows.

1.5. Other Related Profiles

This guide is largely based on the HL7 "Implementation Guide: Newborn Screening for Critical Congenital Heart Defects (CCHD)" from the January 2013 DSTU Ballot.

1.6. Conventions

This guide assumes that the implementer has access to the HL7 2.5.1 or 2.6 version standard. This implementation guide contains some of the standards. However, some of the information has not been included. This Guide also uses standard HL7 terms, abbreviations, and usage codes. Please reference the version 2.6 HL7 standard for all details. Appendix B: Additional Background Information has additional details and background material.

This guide includes examples of values and segments. The examples appear in `Courier New` font. These examples are informational only. If there is any discrepancy between the text of the guide and the example, the text prevails. This guide also uses **bold** font for emphasis.

1.7. HL7 Version

This guide is written in version 2.6 of the HL7 messaging standard; however, all required segments and fields included in this guide are available in version 2.5.1. One item of note is the use of the CWE data type in version 2.6.1 and the corresponding use of CE in version 2.5.1. This primarily applies to OBX-2. Submitters shall use the correct data type for the HL7 version of the message they are using.

Submission of version 2.6 or 2.5.1 messages is acceptable.

1.8. MDHHS Point of Contact

Questions or comments should be directed to the MDHHS Newborn Screening Follow-up Program by email: newbornscreening@michigan.gov or toll free call at 1-866-673-9939.

1.9. Revisions of this Document

This document will be reviewed and possibly revised on an annual basis. Submitters are advised to monitor the web site for new versions. Revisions, along with major items changed, are tracked in Appendix C: Revision History.

1.10. Copyright Information

2. Specification for a CCHD ORU^R01 Message

2.1. Specification for a CCHD ORU^R01 Message

Below is the specification of the CCHD ORU^R01 message used in this Implementation Guide.

Table 1 - Specification for ORU^R01 message

Segment in Standard	Name	Cardinality	Sender	Receiver	Description
MSH	Message Header	[1..1]	R	R	The Message Header (MSH) segment contains information describing how to parse and process the message. This includes identification of message delimiters, sender, receiver, message type, timestamp, etc.
PID	Patient Identification	[1..1]	R	R	The Patient Identification (PID) segment is used to communicate infant identifying information.
NK1	Next of Kin/Associated Parties	[1..*]	C	C	The Next of Kin/Associated Parties segment is used to communicate the patient's other related parties. In CCHD, its primary use is to communicate information about the birth mother. A mother's NK1 segment is required unless there is a reason to keep the birth mother's identity confidential. See Section 3.1.5 "Confidential Mother's Identity" for guidance on cases where birth mother's identity may need to be kept confidential.
PV1	Patient Visit	[1..1]	R	R	The Patient Visit segment is used to communicate information on a visit-specific basis. In CCHD messages it is used to communicate the infant class and providers involved in the infant's care.
OBR	Observation Request	[1..1]	R	R	The Observation Request (OBR) segment is used to capture the requested observation for the CCHD newborn screening panel. It will contain information on the procedure, peripheral pulse oximetry, and the procedure modifier, intermittent testing. It is a single OBR that is associated with multiple OBX segments.

Segment in Standard	Name	Cardinality	Sender	Receiver	Description
OBX	Observation related to OBR	[1..*]	R	R	The Observation/Result (OBX) segment contains information regarding a single screening event result. This includes identification of the specific type of observation, the result for the observation, when the observation was made, etc. For CCHD screening, OBX segments shall contain information on the oxygen saturation levels, pulse rate, perfusion index, signal quality, infant's activity level during screening, sensor name and sensor wrap details, the number of prior screens, the overall interpretation of the CCHD panel at that time, oxygen saturation differences between body sites, and the reason oxygen screening not performed. Each OBX will support the CCHD Newborn Screening panel OBR. The overall interpretation of the infant's CCHD panel is a required OBX segment.

2.2. Message Transmission

Single message transmission is required per infant per screening: one screening for one infant, one message at a point in time. For this Implementation Guide a message will contain a single infant. And the infant will have a 1 to 1 requested observation for a CCHD newborn screening panel. This will be a single message at a time, not batching. There is a restriction to put one infant's message in a record. In the case where additional CCHD screenings are required per the screening protocol, one message **shall** be sent for each CCHD screening. This means that one infant may have multiple messages if additional CCHD screenings are required per the screening protocol.

2.3. Messaging Segments

2.3.1. Message Header Segment (MSH)

The message header (MSH) segment contains information describing how to parse and process the message. This includes identification of message delimiters, sender, receiver, message type, timestamp, etc.

Table 2 - Message Header Segment (MSH)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..1	ST	[1..1]	R		Field Separator	Literal value: '|' [ASCII (124)].
2	4..5	ST	[1..1]	R		Encoding Characters	Four characters, always appearing in the same order:|^~\&|. Literal value: '^~\&'.
3		HD	[1..1]	R		Sending Application	
4		HD	[1..1]	R		Sending Facility	This field uniquely identifies the sending facility associated with the device that will transmit the message on CCHD screening results. The use of an Object Identifier (OID) for this field is **required**. If your facility does not already have an OID, additional information is available at https://www.michiganhealthit.org/wp-content/uploads/MDCH-OID-Creation-and-Registration_V1.0_July_2014.docx Facilities are encouraged, but are not required, to use the same OID that is used for the reporting to the Michigan Syndromic Surveillance System (MSSS).
5		HD	[1..1]	R	CCHD	Receiving Application	This field is used to uniquely identify the receiving application that will receive the CCHD screening results. Literal value of 'CCHD' is required. An alternate value of 'CCHD^2.16.840.1.114222.4.3.2.2.3.161.1.2243^ISO' is accepted.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
6		HD	[1..1]	R	MDHHS	Receiving Facility	This field uniquely identifies the receiving facility, where CCHD screening results will be received. Literal value of 'MDHHS^2.16.840.1.114222.4.3.2.2.3.161.1^ISO' is required. The old value of 'MDCH' or 'MDCH^2.16.840.1.114222.4.3.2.2.3.161.1^ISO' are also allowable but will be phased out.
7		TS	[1..1]	R		Date/Time Of Message	
9		MSG	[1..1]	R		Message Type	For the result message Literal Value: 'ORU^R01^ORU_R01'. For the acknowledgement message Literal Value: 'ACK^R01^ACK'.
10	1..199 =	ST	[1..1]	R		Message Control ID	**Shall** be unique for the sender.
11		PT	[1..1]	R		Processing ID	Field that may be used to indicate the intent for processing the message, such as "T" (training or testing) or "P" (production). See Section 4.2 "On-boarding Instructions" for details on this field during the on-boarding process.
12		VID	[1..1]	R		Version ID	For this message, the version ID will always be literal value: "2.6" or "2.5.1"
15	2..2	ID	[0..0]	**X**	HL70155	Accept Acknowledgment Type	Due to the public health nature of this message and a need to retransmit if the message was not received, MDHHS will acknowledge all messages and ignore this value. This field points out the conditions under which accept acknowledgements should be returned regarding this message.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
16	2..2	ID	[0..0]	**X**	HL70155	Application Acknowledgment Type	Due to the public health nature of this message and a need to retransmit if the message was not received, MDHHS will acknowledge all messages and ignore this value. NOTE: Some HIEs may require this field to be populated with 'AL'. Check with your HIE for details.
17	3..3	ID	[0..1]	O	ISO 3166-1	Country Code	
18	5..15	ID	[0..*]	O	HL70211	Character Set	
19		CWE	[0..1]	O	ISO639	Principal Language Of Message	

Example:

```
MSH|^~\&|CCHD Screening Device Manager^1234^ISO|SendingFacility^1234^ISO|Receiving
Application^2.16.840.1.113883.19.3.2^ISO|PublicHealth^^ISO|20120701132554-
0400||ORU^R01^ORU_R01|20120701132554000005|P^T|2.6|||NE|AL|USA|||
```

2.3.2. Acknowledgement Segment (MSA)

This segment contains information sent while acknowledging another message.

Table 3 - Acknowledgement Segment (MSA)

Seq	Len	DT	Cardinality	Receiver	Value Set	HL7 Element Name	Comments/Description
1	2..2	ID	[1..1]	R	HL70008	Acknowledgment Code	
2	1..199=	ST	[1..1]	R		Message Control ID	

Example 1:

```
MSA|AA|20120701132554000005||1
```

Example 2:

```
MSA|AR|8983829093.100393|DOWN: Receiving system unresponsive, please retransmit in a few minutes
```

2.3.3. Error Segment (ERR)

The ERR segment is used to add error comments to acknowledgment messages.

Table 4 - Error Segment (ERR)

Seq	Len	DT	Cardinality	Receiver	Value Set	HL7 Element Name	Comments/Description
2		ERL	[0..*]	O		Error Location	
3		CWE	[1..1]	R	Table 57 - HL7 Table 0357 – Message Error Condition Codes	HL7 Error Code	Identifies the HL7 and HIE-related (MiHIN) error code. See Table 57 for more details.
4	1..1	ID	[1..*]	R	Table 56 - HL7 Table 0516 – Error Severity – ERR-4	Severity	
5		CWE	[0..1]	O		Application Error Code	
6	1..80#	ST	[0..10]	O		Application Error Parameter	
7	1..2048#	TX	[0..1]	RE		Diagnostic Information	
8	1..250#	TX	[0..1]	RE		User Message	
12		XTN	[0..*]	RE		Help Desk Contact Point	

See Section 3.2 "Error Conditions" for more details on error conditions and what is expected of the sending system when each error condition is present.

Example 1:

```
ERR||PID^5|101^required field missing^HL70357|E
```

Example 2:

```
ERR|^^^900&DOWN: The receiving system is not responsive or is down. Please retransmit the message in a few minutes&MiHINERR||900^DOWN: The receiving system is not responsive or is down. Please retransmit the
```

```
message in a few minutes^MiHINERR^^^^^^DOWN: The receiving system is not responsive or is down. Please
retransmit the message in a few minutes|E||||Your message was not received by the destination or
receiving system because it did not respond. Please retry in a few minutes if your system is not set to
auto retry.|HD|||^^^RhapsodyAdmins@michigan.gov^^^^^MDHHS Data Hub
```

2.3.4. Patient Identification Segment (PID)

This segment is used to communicate infant identification information. This segment contains infant identifying information that is usually permanent and is unlikely to change.

Table 5 - Patient Identification Segment (PID)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – Patient ID	Literal Value: '1'.
3		CX	**[1..1]**	R		Patient Identifier List	This field is used by the healthcare facility to uniquely identify the infant. Send **only** the infant's primary identifier (such as a medical record number). It is **required** that the infant's medical record number remains the same throughout the newborn screening process, including the blood spot test.
5		XPN	[1..*]	R	HL70200	Patient Name	This field contains the infant's name. NOTE: See Section 3.1.4 "Infant without a First or Middle Name – Initial Screening" for guidance on cases where the infant does not have a first or middle name at the time of screening.
6		XPN	[0..1]	O		Mother's Maiden Name	
7		TS	[1..1]	R		Date/Time of Birth	Infant's date and time of birth. The time zone component is optional. Format: YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]]]][+/-ZZZZ] Time of birth **shall** be accurate at least to the minute. If exact birth time is not known, an estimate is acceptable.
8	1..20=	IS	[1..1]	R	User Defined Table 0001	Administrative Sex	Infant's sex
10		CWE	[1..*]	R	User Defined Table 0005	Race	This field refers to the infant's race.
11		XAD	[0..*]	RE		Patient Address	The mailing address of the infant If not known, send the birth mother's or guardian's information.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
12		XAD	[0..*]	X	HL70289	County Code	
13		XTN	[0..*]	RE		Phone Number – Home	Infant's Phone number If not known, send the birth mother's or guardian's information.
15		CWE	[0..*]	O	PHVS_Language_ ISO_639-2_Alpha3	Primary Language	Need language for communication with the infant's parents or guardian (i.e., phone, email, letter, etc.)
21		CX	[0..*]	C or RE		Mother's Identifier	This field is conditional required if the birth is part of a multiple birth. It will be used to identify multiple births for the same mother. This helps to link newborns from multiple births. In the case of single births, it is RE and should be provided if known. NOTE: see Section 3.1.5 "Confidential Mother's Identity" for guidance on cases where birth mother's identity may need to be kept confidential.
22		CWE	[0..*]	RE	User Defined Table 0189	Ethnic Group	
23	1..250#	ST	[0..1]	RE		Birth Place	Location of infant's birth, i.e. hospital name. The newborn screening hospital code should be sent if known; otherwise send the full name of the birth place. NOTE: this may be different from the screening facility. In the cases where the infant was born outside a hospital, include the hospital at which the infant was first treated.
24	1..1	ID	[1..1]	R	HL70136	Multiple Birth Indicator	This field indicates if the infant was part of a multiple birth. See Section 3.1.1 "Multiple Births" for additional information on this field. This field **shall** be populated.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
25	1..2=	NM	[0..1]	C		Birth Order	This field is conditional required if the birth is part of a multiple birth. A number that indicates the infant's birth order when they were part of a multiple birth. See Section 3.1.1 "Multiple Births" for additional information on this field.
29	26	TS	[0..1]	C		Patient Death Date and Time	This field contains the date and time at which the patient death occurred. It is conditionally required if PID-30 = Y.
30	1	ID	[0..1]	C	HL70136	Patient Death Indicator	This field indicates whether the patient is deceased. It is conditionally required if the infant is deceased.
33		TS	[0..1]	O		Last Update Date/Time	
34		HD	[0..1]	CE	HL70301	Last Update Facility	It is conditionally required if known if PID-33 is populated.

Example:

```
PID|1||MRN123||Jones^BabyGirl|James|201207121205|F||2106-3^White^HL70005~1002-5^American Indian or Alaska
Native^HL70005~2028-9^Asian^HL70005|201 Street^^Arlington^TX^99999^USA|
|^PRN^PH^^^555^5555555|eng^English^ISO6392||||||1234555|N^Not Hispanic or Latino^HL70189^^^^2.6|160000|
|Y|2|||||||201206221534|123^Lansing Central Hospital^N|
```

2.3.5. Next of Kin/Associated Parties Segment (NK1)

The NK1 segment contains information about the infant's other related parties. If a person or organization fulfills multiple contact roles, for example, a person is an emergency contact and a next of kin, it is recommended to send a NK1 segment for each contact role (NK1-7). For CCHD messages, the NK1 segment is primarily used to communicate information about the birth mother. An NK1 segment with NK1-3 of "MTH" is **required** in all messages except when birth mother's identity needs to be kept confidential. See Section 3.1.5 "Confidential Mother's Identity" for guidance on cases where birth mother's identity may need to be kept confidential. In the case of confidential birth mother's identity, a replacement NK1 is **required** with a relevant relationship (such as Guardian "GRD") in NK1-3.

Table 6 - Next of Kin/Associated Parties Segment (NK1)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	4	SI	[1..1]	R		Set ID - NK1	
2	250	XPN	[1..*]	R		Name	
3	250	CWE	[1..1]	R	Table 59 - HL7 Table 0063 - Relationship	Relationship	
4	250	XAD	[0..*]	RE		Address	
5	250	XTN	[0..*]	RE		Phone Number	
6	250	XTN	[0..*]	RE		Business Phone Number	
7	250	CWE	[0..1]	O	Table 60 - HL7 Table 0131 - Contact Role	Contact Role	
15	1	IS	[0..1]	RE	HL70001	Administrative Sex	
16	26	TS	[0..1]	RE		Date/Time of Birth	
19	250	CWE	[0..0]	**X**		Citizenship	
20	250	CWE	[0..1]	RE	ISO 639-2	Primary Language	

Example:

```
NK1|1|Jones^Mary|MTH^Mother^HL70063|201
Street^^Arlington^TX^99999^USA|^PRN^PH^^^555^5555555|^PRN^PH^^^666^5777789|
||||||||F|197507121205||||eng^English^ISO6392|
```

2.3.6. Patient Visit Segment (PV1)

The PV1 segment is used to communicate information on a visit-specific basis. For CCHD, this is important to indicate if the infant was screened in the NICU or other special care unit.

Table 7 - Patient Visit Segment (PV1)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	4	SI	[0..1]	O		Set ID	
2	1	IS	[1..1]	R	Table 58 - HL7 Table 0004 – Patient Class – PV1-2	Patient Class	This field is used by systems to categorize infants by treatment site. See Table 58 - HL7 Table 0004 – Patient Class – PV1-2 for additional details.
3	80	PL	[0..1]	O		Assigned Patient Location	This field contains the infant's initial location or where the infant is being moved. The newborn nursery is important in CCHD screening.
7	60	XCN	[0..1]	RE		Attending Doctor	This is the provider responsible for the infant's care at the screening facility. It should include the individual NPI of the provider. NOTE: the post-discharged provider is transmitted using OBXs. See section 2.3.8 Observation/Result Segments (OBX) for additional details.
9	60	XCN	[0..1]	RE		Consulting Doctor	If a cardiologist or other specialist has been involved in the CCHD screening, insert that provider's information in this field; it should include the individual NPI of the provider. NOTE: the post-discharged provider is transmitted using OBXs. See section 2.3.8 Observation/Result Segments (OBX) for additional details.

Example:

```
PV1||I|NICU^2^23||||1245319599^Attending^Theodore^^^Dr^MD^^^^^^NPI||124531459^Pediatrician^Nancy^^^Dr^MD
^^^^^^NPI|
```

2.3.7. Observation Request Segment (OBR)

In the reporting of CCHD screening data, the OBR segment identifies the requested observation, the CCHD newborn screening panel, followed by supporting information in the OBX segments. The OBR serves as the report header for the newborn CCHD screening. An OBR should contain information about the ordering provider and the collector. The OBR shall have at least three supporting OBXs that include the CCHD Newborn Screening Interpretation, Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID), and Number of Prior CCHD Screens. Additionally, OBXs including the Difference Between Preductal and Postductal Oxygen Saturation, Oxygen Saturation in Blood Preductal by Pulse Oximetry, and Oxygen Saturation in Blood Postductal by Pulse Oximetry, are conditionally required if a CCHD screening was performed. In the case that a CCHD screening was not performed, the Reason CCHD Oxygen Saturation Screening Not Performed is conditionally required. In the case of multiple births, the OBX for Birth Plurality is conditionally required. It is recommended that OBXs for Perfusion Index Blood Preductal Pulse Oximetry, Perfusion Index Blood Postductal Pulse Oximetry, Oxygen Saturation Sensor Type and Estimated Gestational Age are also included if known. There are several additional OBXs that may be optionally sent. The OBR transmitted for CCHD screening should include the collector of the screen and if appropriate, the interpreter of the results. The OBR is for a single screening event.

Table 8 - Observation Request Segment (OBR)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBR	
2		EI	[0..1]	RE		Placer Order Number	Because there is no ORC segment in this message, the Placer Order number can be sent in here. Requested if known.
3		EI	[0..1]	RE		Filler Order Number	Because there is no ORC segment in this message, the Filler Order number can be sent in here and can equal OBR-2. Requested if known.
4		CWE	[1..1]	R	73805-4 CCHD Newborn Screening Panel	Universal Service Identifier	The identifier code for the requested CCHD newborn screening panel. This code is a LOINC code. This field characterizes the requested observation for the CCHD screening. The literal value of "`73805-4^CCHD Newborn Screening Panel^LN`" is expected.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
7		TS	[1..1]	R		Observation Date/Time	The date and time of CCHD screening performed. A minimum of year, month and day must be provided when the actual date/time is known. For unknown collection date/time use "0000". HL7 requires this field in an OBR in a result message. Format: YYYYMMDD[HH[MM[SS[.S[S[S[S]]]]]]]+/-ZZZZ]
8		TS	[0..1]	O		Observation End Date/Time	This represents the end point in time when the CCHD screening was performed. Duration can be a measure of the quality of screening. Format: YYYYMMDD[HH[MM[SS[.S[S[S[S]]]]]]]+/-ZZZZ] except when reporting an unknown date of "0000".
10		XCN	[0..*]	RE		Collector Identifier	This field will identify the person, department or facility that performed the CCHD screening. This may be a nurse, doctor, certified nursing assistant (CAN) or another healthcare provider. Either the name or ID code, or both, may be present.
16		XCN	[0..*]	RE		Ordering Provider	Identifier of the provider who ordered the screening being performed. The National Provider Identifier (NPI) is recommended as the identifier.
17		XTN	[0..2]	RE		Order Callback Phone Number	This is the number that can be used for questions regarding the newborn screening.
22		TS	[1..1]	R		Results Rpt/Status Chng - Date/Time	Required field in this message. Applies to the entire report. Receipt of a subsequent message with the same Filler Number and a different status in this field implies that processing may need to occur at the receiving application level to update a previous report. Format: YYYYMMDDHHMMSS.SS[…]+/- ZZZZ This is the date of the interpretation of CCHD screening.
25	1..1	ID	[1..1]	R	HL70123	Result Status	The status of results for this order. C should be used for a correction to results. F should indicate the Final results; results stored and verified and can only be changed with a corrected result.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
28		XCN	[0..*]	RE		Result Copies To	The people who are to receive copies of the results.
32		NDL	[0..1]	RE		Principal Result Interpreter	Identifies the physician or other clinician who interpreted the observation. This could be relevant if someone overrides a result, or if they use a device that does not have an interpretation algorithm, this could contain information on whose interpretation it is. In CCHD screening, this can be the supervisory nurse who needs to sign off on CCHD screening results before they are submitted to public health.
36		TS	[0..1]	O		Scheduled Date/Time	When the date and time was scheduled.
39		CWE	[0..*]	O	Local	Collector's Comment	
44		CNE	[0..1]	RE	252465000	Procedure Code	This field is used to uniquely identify the procedure. This field should specify peripheral pulse oximetry that is used in CCHD screening. This is a SNOMED-CT code. The literal value of "`252465000^peripheral pulse oximetry^SCT`" is expected.
45		CNE	[0..*]	RE	7087005	Procedure Code Modifier	This field contains the procedure code modifier to the procedure code reported in OBR-44. In CCHD screening, this will indicate if the pulse oximetry was collected as intermittent (spot-check) values. This is a SNOMED-CT code. The literal value of "`7087005^Intermittent(spot-check)^SCT`" is expected.

Example:

```
OBR|1|999555^PublicHealth^77D77712547^HL7|123456^HOSPITAL^9999999999^NPI|73805-4^CCHD newborn screening
panel^LN|||201201311234|201201311237||^Nurse^Annie^S||||||^Smith^John^S^^Dr.|^^^^^011^555^555-
1234^123|||||201201311234|||F|||^Jones^Brad^M^^Dr.||||123&Cardiologist& Carmen|||
|201201311230|||||||252465000^peripheral pulse oximetry^SCT|7087005^Intermittent(spot-check)^SCT|
```

2.3.8. Observation/Result Segments (OBX)

The Observation/Result Segment (OBX) contains information regarding a single observation related to a single test (OBR). The OBX is an observation related to the OBR. This includes identification of the specific type of observation, the result for the observation, when the observation was made, etc. In this Implementation Guide, there are three required OBXs that include the CCHD Newborn Screening Interpretation, Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID), and Number of Prior CCHD Screens. Additionally, OBXs including the Difference Between Preductal and Postductal Oxygen Saturation, Oxygen Saturation in Blood Preductal by Pulse Oximetry, and Oxygen Saturation in Blood Postductal by Pulse Oximetry, are conditionally required if a CCHD screening was performed. In the case that a CCHD screening was not performed, the Reason CCHD Oxygen Saturation Screening Not Performed is conditionally required. In the case of multiple births, the OBX for Birth Plurality is conditionally required. It is recommended that OBXs for Perfusion Index Blood Preductal Pulse Oximetry, Perfusion Index Blood Postductal Pulse Oximetry, Oxygen Saturation Sensor Type and Estimated Gestational Age are also included if known. There are several additional OBXs that may be optionally sent.

Submitters **shall** only include CCHD-related measurements that have been selected to be used in the determination of screening outcome and these **shall** have a results status of "F" in the OBX. Do not send any CCHD-related measurements that were not used in the final determination of screening outcome. For all the preductal and postductal measurements, OBX-14 will contain the observation date/time, and OBX-18 will contain the device information. The protocol used for interpretation of the CCHD screening outcome should be recorded in any observation to which it applies, see Table 53 - CCHD Newborn Screening Protocol Used for more details. Corrected results are allowed but must be received within **12** hours of the initial result and shall have results status of "C". ONLY send items that need correction; do not send items (such as OBXs) that do not require correction. For any observation, only one copy of the OBX segment is allowed.

Michigan's OBX Optionality

A CCHD observation is made up of several OBX segments. The table below outlines the optionality of the possible OBX segments and indicates if the OBX is: Required (R), Required if Known (RE), Conditionally Required (C), Conditionally Required if Known (CE), or Optional (O).

Table 9 - Michigan's OBX Optionality

LOINC#	LOINC Name	Optionality	Section	Comments
73700-7	CCHD Newborn Screening Interpretation	R	2.3.8.1	Required in all cases. If the screening was not performed (e.g., opt-out) use literal value of "LA7304-4^Not Performed^LN" in OBX-5.
57711-4	Unique bar code number of Initial sample	R	2.3.8.2	Dried Blood Spot Filter Paper Card ID of initial DBS sample. In the case of opt out of the Blood Spot test, send the literal value of "9999999" (seven 9s) for OBX-5.
73699-1	Number of Prior CCHD Screens	R	2.3.8.3	Use "0" for initial screening or if no initial screening was performed.
73698-3	Reason CCHD Oxygen Saturation Screening Not Performed	C	2.3.8.4	Conditionally required if screening was NOT performed.
73696-7	Difference Between Preductal and Postductal Oxygen Saturation	C	2.3.8.5	Conditionally required if screening was performed.
59407-7	Oxygen Saturation in Blood Preductal by Pulse Oximetry	C	2.3.8.6	Conditionally required if screening was performed.
73798-1	Perfusion Index Blood Preductal Pulse Oximetry	CE	2.3.8.7	Conditionally required if screening was performed and known.
59418-4	Oxygen Saturation in Blood Postductal by Pulse Oximetry	C	2.3.8.6	Conditionally required if screening was performed.
73794-0	Perfusion Index Blood Postductal Pulse Oximetry	CE	2.3.8.7	Conditionally required if screening was performed and known.
57722-1	Birth Plurality	C	2.3.8.8	Conditionally required if multiple birth.
73803-9	Oxygen Saturation Sensor Type	O	2.3.8.9	
57714-8	Estimated Gestational Age	RE	2.3.8.10	
62324-9	Post Discharge provider name	RE	2.3.8.11	If not known, use a point of contact at the screening facility.
62328-0	Post Discharge provider telephone number	RE	2.3.8.12	If not known, use a point of contact at the screening facility.
62328-0	Post Discharge provider telephone (FAX) number	RE	2.3.8.13	If not known, use a point of contact at the screening facility.
62323-1	Post Discharge provider identifier	RE	2.3.8.11	

LOINC#	LOINC Name	Optionality	Section	Comments
62325-6	Post Discharge provider practice ID	RE	2.3.8.15	
62326-4	Post Discharge provider practice name	RE	2.3.8.16	
62327-2	Post Discharge provider practice address	RE	2.3.8.17	
8339-4	Birth Weight (Measured)	RE	2.3.8.18	
73804-7	Oxygen Saturation Sensor Name	O	2.3.8.19	
73802-1	Oxygen Saturation Sensor Wrap Name	O	2.3.8.20	
73801-3	Oxygen Saturation Sensor Wrap Type	O	2.3.8.21	
73800-5	Oxygen Saturation Sensor Wrap Size	O	2.3.8.22	
73799-9	Heart Rate Blood Preductal Pulse Oximetry	O	2.3.8.23	
73797-3	Signal Quality Blood Preductal Pulse Oximetry	O	2.3.8.24	
73796-5	Infant Activity During Preductal Oxygen Saturation Measurement	O	2.3.8.25	
73795-7	Heart Rate Blood Postductal Pulse Oximetry	O	2.3.8.23	
73793-2	Signal Quality Blood Postductal Pulse Oximetry	O	2.3.8.24	
73792-4	Infant Activity During Postductal Oxygen Saturation Measurement	O	2.3.8.25	

2.3.8.1. OBX CCHD Newborn Screening Interpretation

The OBX for CCHD newborn screening interpretation is a required Observation Result Segment. This OBX segment will contain the interpretation of the CCHD newborn screen at this screening event. The protocol used in making this interpretation should be recorded in OBX-17.

Table 10 - Observation/Result Segment (OBX) – CCHD Newborn Screening Interpretation

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the CCHD newborn screening interpretation will be `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	73700-7 CCHD Newborn Screening Interpretation	Observation Identifier	This code is the LOINC code for CCHD Newborn Screening Interpretation. The literal value of "`73700-7^CCHD Newborn Screening Interpretation^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 48 - CCHD Newborn Screening Interpretation	Observation Value	The values here are LOINC Codes.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The UCUM unit of measure for values without a unit of measure is "1" The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	Indicator of the normalcy of the result found in OBX-5. If the device supports a reference range, it will be useful to include a device – supplied abnormal flag. The abnormal flag along with the reference range should be available to the information systems to determine if a result requires additional follow-up from clinicians. See Table 48 - CCHD Newborn Screening Interpretation for related Abnormal Flags for result types.
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX- 19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE	Table 53 - CCHD Newborn Screening Protocol Used	Observation Method	Field can be used to transmit the procedure by which an observation was obtained. Since this OBX is for the overall CCHD Newborn Screening Interpretation, the protocol used in interpreting the screen shall be recorded. See Table 53 for more details. NOTE: This is a Michigan local code set.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: brand, model, version, instance data, serial number, and local name.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall**[1] be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.
24		XAD	[0..1]	RE		Performing Organization Address	This field contains the address of organization/service responsible for performing the CCHD screening.

[1] Contact the MDHHS Newborn Screening Staff if you need your newborn screening hospital code. See section 1.8 for contact information.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
25		XCN	[0..1]	O		Performing Organization Medical Director	Name of the Medical Director of the CCHD screening program at screening facility.

Example 1:

```
OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA18592-8^In range^LN|1^No
Units^UCUM||N|||F|||201401311234|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|201401311234||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan
```

Example 2:

```
OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA18593-6^Out of range^LN|1^No
Units^UCUM||AA|||F|||201401311234|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|201401311234||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan
```

Example 3:

```
OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA19816-0^Inconclusive, repeat screen
needed^LN|1^No Units^UCUM||A|||F|||201401311234|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|201401311234||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan
```

Example 4:

```
OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA19817-8^Attempted but unsuccessful -
technical fail^LN|1^No Units^UCUM|||||F|||201401311234|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|201401311234||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan
```

Example 5:

```
OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA7304-4^Not performed^LN|1^No
Units^UCUM|||||F|||201401311234|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|201401311234||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan
```

2.3.8.2. OBX for Blood Spot Initial Sample Card ID

In order to match the CCHD reporting to the related newborn screen blood spot reporting, the identifier on the filter paper card is required in this OBX segment. In the case of opt out of the Blood Spot test, send the literal value of "9999999" (seven 9s) in OBX-5.

Table 11 - Observation/Result Segment (OBX) - Unique Bar Code of Initial Sample (Blood Spot Filter Paper Card ID)

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for OBX-5 is NM.
3		CWE	[1..1]	R	57711-4 Unique bar code number of Initial sample	Observation Identifier	LOINC is used as the coding system for this field. The literal value of "57711-4^Unique bar code number of Initial sample^LN" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	The Dried Blood Spot Filter Paper Card ID of the initial sample that corresponds to the infant **shall** be recorded in this OBX. In the case of opt out of the Blood Spot test, send the literal value of "9999999" (seven 9s).
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "1^No Units^UCUM" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. **Accuracy to at least the minutes is required.**

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name of the organization responsible for collecting the blood spot card. This may be different then the CCHD screening facility. The newborn screening hospital code should be sent in the "XON: Organization Identifier" (10th sub-element) if known; in all cases send the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element). "XON: Assigning Authority" (6th sub-element) shall be `MDHHS`. This field is required and messages will be rejected if it is missing.
24		XAD	[0..1]	RE		Performing Organization Address	This field contains the address of organization/service responsible for performing the blood spot screening.
25		XCN	[0..1]	O		Performing Organization Medical Director	Name of the Medical Director of the blood spot screening program at collecting facility.

Example 1:
OBX|2|NM|57711-4^Unique bar code number of Initial sample^LN||9745677|1^No Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol||2014042011353||||Lansing General Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|

Example 2:
OBX|2|NM|57711-4^Unique bar code number of Initial sample^LN||9999999|1^No Units^UCUM|||||F|2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol||2014042011353||||Lansing General Hospital^^^^^MDHHS^^^^160000|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|

2.3.8.3. OBX Number of Prior Screens

The OBX for the number of prior screens **shall** be an Observation Result Segment. This OBX segment will contain the number of prior CCHD screens done for this infant. This information is important in CCHD screening to document if it is the first CCHD screen or if it is a repeat screen CCHD screen. The OBX for Number of Prior Screens is a **required** Observation Result Segment. Use "0" for initial screening or if no initial screening was performed.

Table 12- Observation/Result Segment (OBX) – Number or Prior Screens

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	NM	Value Type	The Value Type for the number of prior screens shall be NM.
3		CWE	[1..1]	R	73699-1 Number of Prior Screens	Observation Identifier	The number of prior screens should be recorded in OBX-5. The literal value of "73699-1^Number of Prior Screens^LN" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	The values here are the number of prior screens done. For the initial screening use "0". Constrained to the values of 0, 1, 2
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "1^No Units^UCUM" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX- 19. **Accuracy to at least the minutes is required.**

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|3|NM|73699-1^Number of Prior Screens^LN||0|1^No Units^UCUM|||||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol||201402011105||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.4. OBX Reason Oxygen Screening Not Performed

The OBX for reason oxygen screening is not performed is an Observation Result Segment. The OBX Reason Oxygen Screening Not Performed is a conditionally required Observation Result Segment. If a CCHD screening is not performed, this OBX segment records the reason it is not performed. This OBX is used in several of the special cases described in Section 3.1.

Table 13 - Observation/Result Segment (OBX) – Reason Oxygen Saturation Screening Not Performed

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Description/Comments
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the reason oxygen saturation screening not performed is `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	73698-3 Reason Oxygen Saturation Screening Not Performed	Observation Identifier	The literal value of "`73698-3^Reason Oxygen Saturation Screening Not Performed^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 52 - Reason Oxygen Saturation Screening Not Performed	Observation Value	If a screening was not performed, the reason should be recorded and sent in this OBX.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Description/Comments
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ]. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19819-4^Prior prenatal diagnosis
of CCHD^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19820-2^Prior postnatal
diagnosis of CCHD^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 3:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19821-0^Prior Early
discharge^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 4:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19822-8^Transfer prior to
screening^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 5:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19824-4^Medically unstable and
inappropriate for screen^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version
1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 6:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19825-1^Receiving supplemental
oxygen^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example7:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19826-9^Infant deceased^LN|1^No
Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

Example 8:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19827-7^Parental refusal based
on religious beliefs^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version
1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 9:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA19828-5^Parental refusal for
reasons other than religious beliefs^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version
1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 10:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA7497-6^Equipment Failure^LN|1^No
Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

Example 11:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA20946-2^Diagnostic testing begun
in lieu of screening based on clinical suspicion for CCHD^LN|1^No
Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

Example 12:

```
OBX|7|CWE|73698-3^Reason Oxygen Saturation Screening Not Performed^LN||LA20947-0^Infant being monitored
or treated for non-CCHD condition^LN|1^No Units^UCUM|||||F|||20140510092712|||MI_v1^MI Version
1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140510092712||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.5. OBX Difference between Preductal and Postductal Oxygen Saturation

The OBX for difference between preductal and postductal oxygen saturation is an Observation Result Segment. This OBX segment is the numeric value that is the difference between the preductal oxygen saturation level and the postductal oxygen saturation level. Submitters **shall** only include CCHD-related measurements that have been selected to be used in the determination of screening outcome, and these **shall** have a results status of F in the OBX. Do not send any CCHD-related measurements that were not used in the final determination of screening outcome.

Table 14 - Observation/Result Segment (OBX) – Difference between Preductal and Postductal Oxygen Saturation

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the difference in preductal and postductal oxygen saturation levels in `NM`. It is the difference in the percentages of oxygen saturation.
3		CWE	[1..1]	R	73696-7 Difference in Preductal and Postductal Oxygen Saturation Levels	Observation Identifier	The literal value of "`73696-7^Difference in Preductal and Postductal Oxygen Saturation Levels^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This is the difference in the percent of oxygen saturation in a preductal body site and a postductal body site.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The unit is a percentage. The literal value of "`%^percent^UCUM`" is expected.
7	1..60=	ST	[0..1]	RE		References Range	The references range should reflect the MI CCHD screening protocol used for this message.
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ]. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|8|NM|73696-7^Difference in Preductal \T Postductal Oxygen Saturation
Levels^LN||2|%^percent^UCUM||N|||F|||201402011105|||MI_v1^MI Version
1^MI_CCHD_Protocol||201402011105||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.6. OBXs for Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry

In CCHD screening, measurements are done on a preductal body site location and a postductal body site location. Oxygen saturation levels in the blood are recorded using a pulse oximetry device during the screen. The oxygen saturation in the blood preductal measurement and the oxygen saturation postductal measurement should be sent in separate OBXs. There can be multiple OBXs that record oxygen saturation. The two OBX segments used to calculate the overall newborn screening interpretation should be marked with a Results Status of F. Submitters **shall** only include CCHD-related measurements that have been selected to be used in the determination of screening outcome, and these **shall** have a results status of F in the OBX. Do not send any CCHD-related measurements that were not used in the final determination of screening outcome. For all of the preductal and postductal measurements, OBX-14 will contain the observation date/time, OBX-18 will contain the device information, and OBX-23 will contain the Performing organization name/ID.

Table 15 - Observation/Result Segment (OBX) – Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the oxygen saturation is NM.
3		CWE	[1..1]	R	59407-7 Oxygen saturation in Blood Preductal by Pulse Oximetry and 59418-4 Oxygen Saturation in Blood Postductal by Pulse Oximetry	Observation Identifier	LOINC is used as the coding system for this field. **There should be two OBXs, one for oxygen saturation preductal and one for oxygen saturation postductal.**
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field records the numeric value of the oxygen saturation, a percentage.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	This unit of measure for oxygen saturation is percentage. The literal value of "`%^percent^UCUM`" is expected.
7	1..60=	ST	[0..1]	RE		References Range	The references range should reflect the MI CCHD screening protocol used for this message.
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ]. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|9|NM|59407-7^Oxygen saturation in Blood Preductal by Pulse
Oximetry^LN|1|95|%^percent^UCUM||N|||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|201402011105||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|9|NM|59418-4^Oxygen Saturation in Blood Postductal by Pulse
Oximetry^LN|1|97|%^percent^UCUM||N|||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|201402011105||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.7. OBXs for Perfusion Index Preductal and Perfusion Index Postductal by Oximetry

In CCHD screening, measurements are done on a preductal body site location and a postductal body site location. Perfusion Index indicates how strong the pulse is at the specific monitoring location and is recorded as a percentage. Perfusion Index is recorded using a pulse oximetry device during the screen. The Perfusion Index preductal measurement and the Perfusion Index postductal measurement should be sent in separate OBXs.

The Device Reference range should be sent as the measurement range and meaningful values vary among vendors of pulse oximetry vendors. There can be multiple OBXs that record perfusion index. For all of the preductal and postductal measurements, OBX-14 will contain the observation date/time, OBX-18 will contain the device information, and OBX-23 will contain the Performing organization name/ID. Submitters **shall** only include CCHD-related measurements that have been selected to be used in the determination of screening outcome and these **shall** have a results status of F in the OBX. Do not send any CCHD-related measurements that were not used in the final determination of screening outcome.

Table 16 - Observation/Result Segment (OBX) – Perfusion Index Preductal by Oximetry and Perfusion Index Postductal by Oximetry

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the perfusion index used in CCHD screening is `NM`.
3		CWE	[1..1]	R	73798-1 Perfusion Index Preductal by Oximetry 73794-0 Perfusion Index Postductal by Oximetry	Observation Identifier	LOINC is used as the coding system for this field. **There should be two OBXs, one for perfusion index preductal by oximetry and one for perfusion index postductal by oximetry.**
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field records the numeric value of the perfusion index, a percentage.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	This unit of measure is percentage. The literal value of "%`^percent^UCUM`" is expected.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
7	1..60=	ST	[0..1]	RE		References Range	
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|10|NM|73794-0^Perfusion Index Postductal by
Oximetry^LN|1|98|%^percent^UCUM||N|||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|201402011105||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|10|NM|73798-1^Perfusion Index Preductal by
Oximetry^LN|1|96|%^percent^UCUM||N|||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS
NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|201402011105||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.8. OBX for Birth Plurality

The Birth Plurality segment provides demographic information on the specimen of a multiple birth. It is conditionally required in the case of multiple births.

Table 17 - Observation/Result Segment (OBX) – Birth Plurality

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for OBX-5 is `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	57722-1 Birth Plurality	Observation Identifier	The literal value of "`57722-1^Birth Plurality^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 54 - Birth Plurality	Observation Value	LOINC codes are required.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained. In CCHD screening, in the OBX segment regarding the overall interpretation of the screen, the protocol used in interpreting the screen should be recorded in OBX 17.2.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12411-7^Singleton^LN|1^No
Units^UCUM|||||F|||20140601083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140601093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12412-5^Twins^LN|1^No
Units^UCUM|||||F|||201402011105|||MI_v1^MI Version 1^MI_CCHD_Protocol||201402011105||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 3:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12413-3^Triplets^LN|1^No
Units^UCUM|||||F|||20140603083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140603093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 4:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12414-1^Quadruplets^LN|1^No
Units^UCUM|||||F|||20140605083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140605093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 5:

```
OBX|11|CWE|57722-1^Birth Plurality^LN|| LA12415-8^Quintuplets^LN|1^No
Units^UCUM|||||F|||20140608083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140608093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 6:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12416-6^Sextuplets^LN|1^No
Units^UCUM|||||F|||20140606083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140606093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 7:

```
OBX|11|CWE|57722-1^Birth Plurality^LN||LA12453-9^Septuplets^LN|1^No
Units^UCUM|||||F|||20140608083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140608093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 8:

```
OBX|11|CWE|57722-1^Birth Plurality^LN|| LA12913-2^Octuplets or more^LN|1^No
Units^UCUM|||||F|||20140608083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140608093507||||Lansing
General Hospital^^^^^MDHHS^^^^160000
```

Example 9:

```
OBX|11|CWE|57722-1^Birth Plurality^LN|| LA12914-0^Unknown Plurality^LN|1^No
Units^UCUM|||||F|||20140608083507|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140608093507||||Lansing
```

```
General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.9. OBX CCHD Newborn Screening Sensor Type

The OBX for CCHD newborn screening sensor type is an Observation Result Segment. This OBX segment records the type of the sensor used in the CCHD screening event, single-use or reusable.

Table 18 - Observation/Result Segment (OBX) – CCHD Newborn Screening Sensor Type

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the type of the sensor used in CCHD screening is `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	73803-9 CCHD Newborn Screening Sensor Type	Observation Identifier	The literal value of "`73803-9^CCHD Newborn Screening Sensor Type^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 49 - CCHD Newborn Screening Sensor Type	Observation Value	LOINC codes are required.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|12|CWE|73803-9^CCHD Newborn Screening Sensor Type^LN||LA19810-3^Disposal (single use^LN|1^No
Units^UCUM|||||F|||20140420112530|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113530||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|12|CWE|73803-9^CCHD Newborn Screening Sensor Type^LN||LA19811-1^Reusuable^LN|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.10. OBX for Estimated Gestational Age

The Estimated Gestational Age of the infant shall be recorded in this required if known OBX segment.

Table 19 - Observation/Result Segment (OBX) – Estimated Gestational Age

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for OBX-5 is `NM`.
3		CWE	[1..1]	R	57714-8 Obstetric Estimation of Gestational Age	Observation Identifier	The Gestational Age estimation of the infant at the time of birth can be recorded in this OBX. The literal value of "`57714-8^Obstetric Estimation of Gestational Age^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field records the estimate Gestational Age of the infant in weeks.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	UCUM® is an HL7-approved code system and shall be used for units as described in the appropriate HITSP Interoperability Specification. Gestational Age should be recorded in weeks. The literal value of "`wk^week^UCUM`" is expected.
7	1..60=	ST	[0..1]	RE		References Range	
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "`0000`". **Accuracy to at least the minutes is required.**

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|13|NM|57714-8^Obstetric Estimation of Gestational
age^LN||37|wk^week^UCUM||N|||F||||2014042011255|||MI_v1^MI Version
1^MI_CCHD_Protocol||201401311234||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.11. OBX for Post Discharge Provider Name

The OBX for Post Discharge Provider Name is a Required if Known Observation Result Segment.

Table 20 - Observation/Result Segment (OBX) – Post Discharge Provider Name

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Name will be `XPN`.
3		CWE	[1..1]	R	62324-9 Post Discharge Provider Name	Observation Identifier	This code is the LOINC code for Post Discharge Provider Name. The literal value of "`62324-9^Post Discharge Provider Name^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		XPN	[1..1]	R		Observation Value	**Shall** include at least the last name of the post-discharge provider, first and additional names are required if known. If the post-discharge is not known, use a point of contact at the screening facility.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|4|XPN|62324-9^Post Discharge Provider Name^LN||John Smith Dr.|||N|||F|||201402011105|||||||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.12. OBX for Post Discharge Provider Telephone Number

The OBX for Post Discharge Provider Telephone Number is a Required if Known Observation Result Segment.

Table 21 - Observation/Result Segment (OBX) – Post Discharge Provider Telephone Number

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Telephone Number will be `XTN`.
3		CWE	[1..1]	R	62328-0 Post Discharge Provider Telephone Number	Observation Identifier	This code is the LOINC code for Post Discharge Provider Telephone Number. The literal value of "`62328-0^Post Discharge Provider Telephone Number^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		XTN	[1..1]	R		Observation Value	Field that documents the observation value. Telecommunication Use Code **should** be `WPN`, and the Telecommunication Equipment Type **shall** be `PH`. Shall include area code and phone number. If the post-discharge is not known, use a point of contact at the screening facility.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|5|XTN|62328-0^Post Discharge Provider Telephone
Number^LN||^WPN^PH^^^734^6777777^1||||||F|||201402011105||||||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.13. OBX for Post Discharge Provider Fax Number

The OBX for Post Discharge Provider Fax Number is a Required if Known Observation Result Segment.

Table 22 - Observation/Result Segment (OBX) – Post Discharge Provider Fax Number

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Fax Number will be `XTN`.
3		CWE	[1..1]	R	62328-0 Post Discharge Provider Telephone Number	Observation Identifier	This code is the LOINC code for Post Discharge Provider Fax Number. The literal value of "`62328-0^Post Discharge Provider Telephone Number^LN`" is expected
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		XTN	[1..1]	R		Observation Value	Telecommunication Use Code **should** be `WPN`, and the Telecommunication Equipment Type **shall** be `FX`. Shall include area code and phone number. If the post-discharge is not known, use a point of contact at the screening facility.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|6|XTN|62328-0^Post Discharge Provider FAX
Number^LN||^WPN^FX^^^734^6777777||||||F|||201402011105||||||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.14. OBX for Post Discharge Provider Identifier

The OBX for Post Discharge Provider Identifier is an Observation Result Segment. It is a required field if known.

Table 23 - Observation/Result Segment (OBX) – Post Discharge Provider Identifier

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Identifier will be. `ST`
3		CWE	[1..1]	R	62323-1 Post Discharge Provider Identifier	Observation Identifier	This code is the LOINC code for Post Discharge Provider Identifier. The literal value of "`62323-1^Post Discharge Provider Identifier^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		ST	[1..1]	R		Observation Value	Field that documents the observation value. Insert the individual NPI of the post-discharge provider.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|14|ST|62323-1^Post Discharge Provider
Identifier^LN||4785412589|||N|||F|||201402011105||||||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.15. OBX for Post Discharge Provider Practice ID

The OBX for Post Discharge Provider Practice ID is a required if known Observation Result Segment.

Table 24 - Observation/Result Segment (OBX) – Post Discharge Provider Practice ID

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Practice ID will be `ST`.
3		CWE	[1..1]	R	62325-6 Post Discharge Provider Practice ID	Observation Identifier	This code is the LOINC code for Post Discharge Provider Practice ID. The literal value of "`62325-6^Post Discharge Provider Practice ID^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		ST	[1..1]	R		Observation Value	Field that documents the observation value. Insert the group/practice NPI of the post-disc charge provider's practice.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|15|ST|62325-6^Post Discharge Provider Practice
ID^LN||4856978512|||N|||F|||201402011105||||||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.16. OBX for Post Discharge Provider Practice Name

The OBX for Post Discharge Provider Practice Name is an Observation Result Segment. This segment is required if known.

Table 25 - Observation/Result Segment (OBX) – Post Discharge Provider Practice Name

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Name will be `ST`.
3		CWE	[1..1]	R	62326-4 Post Discharge Provider Practice Name	Observation Identifier	This code is the LOINC code for Post Discharge Provider Name. The literal value of "`62326-4^Post Discharge Provider Practice Name^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		ST	[1..1]	R		Observation Value	Insert the name of the post-discharge provider's practice name.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	UCUM® is an HL7-approved code system and shall be used The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|16|ST|62326-4^Post Discharge Provider Practice Name^LN||Lansing Pediatric
Associates|||N|||F|||201402011105||||||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.17. OBX for Post Discharge Provider Practice Address

The OBX for Post Discharge Provider Practice Address is an Observation Result Segment. This segment is required if known.

Table 26 - Observation/Result Segment (OBX) – Post Discharge Provider Practice Address

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the Post Discharge Provider Practice Address will be `XAD`.
3		CWE	[1..1]	R	62327-2 Post Discharge Provider Practice Address	Observation Identifier	This code is the LOINC code for Post Discharge Provider Practice Address. The literal value of "`62327-2^Post Discharge Provider Practice Address^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		XAD	[1..1]	R		Observation Value	Insert the full address of the post-discharge provider's location. The physical or mailing address is preferred.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|17|XAD|62327-2^Post Discharge Provider Practice Address^LN||2414 Lake Lansing
Rd^Lansing^MI^48912|||N|||F|||201402011105||||||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.18. OBX for Birth Weight

The Birth Weight of the infant can be recorded in an optional OBX segment.

Table 27 - Observation/Result Segment (OBX) – Birth Weight

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for OBX-5 is NM.
3		CWE	[1..1]	R	8339-4 Body Weight Measured at Birth	Observation Identifier	The birth weight of the infant can be recorded in this OBX. The literal value of "8339-4^Body Weight Measured at Birth^LN" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field specifies the measured parameter as a numeric value. This field records the Birth Weight of the infant in grams.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	Birth weight **shall** be recorded in grams. The literal value of "g^gram^UCUM" is expected.
7	1..60=	ST	[0..1]	RE		References Range	
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on an infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|18|NM|8339-4^ Body Weight Measured at Birth^LN||3000|g^gram^UCUM|||||F|||20140420112 53|||MI_v1^MI Version 1^MI_CCHD_Protocol||20140420113 53||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.19. OBX CCHD Newborn Screening Sensor Name

The OBX for CCHD newborn screening sensor name is an Observation Result Segment. This optional OBX segment records the name of the sensor used in the CCHD screening event.

Table 28 - Observation/Result Segment (OBX) – CCHD Newborn Screening Sensor Name

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the name of the sensor used in CCHD screening is `ST`.
3		CWE	[1..1]	R	73804-7 CCHD Newborn Screening Sensor Name	Observation Identifier	The literal value of "`73804-7^CCHD Newborn Screening Sensor Name^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		ST	[1..1]	R	String of the Manufacture, Model	Observation Value	This is the name of the sensor used in CCHD screening. Use a string of the Manufacture and Model in the format of: "`Manufacture, Model, AnyAdditionalDetails`"
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|19|ST|73804-7^CCHD Newborn Screening Sensor Name^LN||Masimo Radical- 7|1^No
Units^UCUM|||||F|||20140420112533|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113533|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.20. OBX CCHD Newborn Screening Wrap Name

The OBX for CCHD newborn screening sensor wrap name is an Observation Result Segment. This optional OBX segment records the name of the sensor wrap used in the CCHD screening event.

Table 29 - Observation/Result Segment (OBX) – CCHD Newborn Screening Wrap Name

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the sensor wrap name used in CCHD screening is `ST`.
3		CWE	[1..1]	R	73802-1 CCHD Newborn Screening Sensor Wrap Name	Observation Identifier	The literal value of "`73802-1^CCHD Newborn Screening Sensor Wrap Name^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		ST	[1..1]	R	String of the Manufacture, Model	Observation Value	Use a string of the Manufacture and Model in the format of: "`Manufacture, Model, AnyAdditionalDetails`"
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name.
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.

Example:

```
OBX|20|ST|73802-1^CCHD Newborn Screening Sensor Wrap Name^LN|13|Masimo LNOP|1^No
Units^UCUM|||||F|||20140420112531||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113531|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.21. OBX CCHD Newborn Screening Sensor Wrap Type

The OBX for CCHD newborn screening sensor wrap type is an Observation Result Segment. This optional OBX segment records the wrap type of the sensor used in the CCHD screening event; cloth, foam or Velcro.

Table 30 - Observation/Result Segment (OBX) – CCHD Newborn Screening Sensor Wrap Type

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the sensor wrap type used in CCHD screening is `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	73801-3 CCHD Newborn Screening Sensor Wrap Type	Observation Identifier	The literal value of "`73801-3^CCHD Newborn Screening Sensor Wrap Type^LN`" is expected.
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 50 - CCHD Newborn Screening Sensor Wrap Type	Observation Value	LOINC is used as the coding system for this field. See Table 50 - CCHD Newborn Screening Sensor Wrap Type for values.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results. C should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|21|CWE|73801-3^CCHD Newborn Screening Sensor Wrap Type^LN|14|LA19813-7^Cloth|1^No
Units^UCUM|||||F|||20140420112531||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113531|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|21|CWE|73801-3^CCHD Newborn Screening Sensor Wrap Type^LN|14|LA16576-3^Foam|1^No
Units^UCUM|||||F|||20140420112 53|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113 53||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 3:

```
OBX|21|CWE|73801-3^CCHD Newborn Screening Sensor Wrap Type^LN|14|LA19814-5^Velcro|1^No
Units^UCUM|||||F|||20140420112 53|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|20140420113 53||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.22. OBX CCHD Newborn Screening Sensor Wrap Size

The OBX for CCHD newborn screening sensor wrap size is an Observation Result Segment. This optional OBX segment records the wrap size of the sensor used in the CCHD screening event.

Table 31 - Observation/Result Segment (OBX) – CCHD Newborn Screening Sensor Wrap Size

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the sensor wrap size used in CCHD screening is `CWE` (or `CE` for version 2.5.1 message).
3		CWE	[1..1]	R	73800-5 CCHD Newborn Screening Wrap Size	Observation Identifier	The literal value of "`73800-5^CCHD Newborn Screening Wrap Size^LN`" is expected
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 51 - CCHD Newborn Screening Sensor Wrap Size	Observation Value	This is the sensor wrap size used in CCHD screening. LOINC is used as the coding system for this field. See Table 51 - CCHD Newborn Screening Sensor Wrap Size for values
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	0		References Range	NA
8	1..20=	CWE	[0..*]	0	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results. `C` should be used for a correction to results.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19. Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "0000". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be MDHHS. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|22|CWE|73800-5^CCHD Newborn Screening Wrap Size^LN|15|LA13524-6^Adult|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353|
```

Example 2:

```
OBX|22|CWE|73800-5^CCHD Newborn Screening Wrap Size^LN|15|LA19834-3^Pediatric|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 3:

```
OBX|22|CWE|73800-5^CCHD Newborn Screening Wrap Size^LN|15|LA8983-4^Small|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 4:

```
OBX|22|CWE|73800-5^CCHD Newborn Screening Wrap Size^LN|15|LA8982-6^Medium|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 5:

```
OBX|22|CWE|73800-5^CCHD Newborn Screening Wrap Size^LN|15|LA8981-8^Large|1^No
Units^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353|||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.23. OBXs for Pulse rate Preductal and Pulse rate in Postductal by Oximetry

In CCHD screening, measurements are done on a preductal body site location and a postductal body site location. Pulse rate is recorded using a pulse oximetry device during the screen. The pulse rate preductal measurement and the pulse rate postductal measurement should be sent in optional separate OBXs. There can be multiple OBXs that record pulse rate. For all of the preductal and postductal measurements, OBX-14 will contain the observation date/time, OBX-18 will contain the device information, and OBX-23 will contain the Performing organization name/ID.

Table 32 - Observation/Result Segment (OBX) – Pulse Rate Preductal by Pulse Oximetry and Pulse Rate Postductal by Pulse Oximetry

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the pulse rate preductal and postductal used in CCHD screening is `NM`.
3		CWE	[1..1]	R	73799-9 Pulse Rate Preductal by Oximetry 73795-7 Pulse Rate Postductal by Oximetry	Observation Identifier	LOINC is used as the coding system for this field. **There should be two OBXs, one for pulse rate preductal by oximetry and one for pulse rate postductal by oximetry.**
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field records the numeric value of the pulse rate in beats per minute.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	This unit of measure is per minute. The literal value of "`/min^per minute^UCUM`" is expected.
7	1..60=	ST	[0..1]	RE		References Range	
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. `F` should be used for the final results used in the overall interpretation of the CCHD screening event. `C` should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example1:

```
OBX|23|NM|73795-7^Pulse Rate Postductal by Oximetry^LN||97|/min^per
minute^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|23|NM|73799-9^Pulse Rate Preductal by Oximetry^LN||95|/min^per
minute^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

2.3.8.24. OBXs Signal Quality Preductal and Signal Quality Postductal by Oximetry

In CCHD screening, measurements are done on a preductal body site location and a postductal body site location. Signal Quality is recorded using a pulse oximetry device during the screen. The Signal Quality preductal measurement and the Signal Quality postductal measurement should be sent in separate OBXs. The Device Reference range should be sent as the measurement range and meaningful values vary among vendors of pulse oximetry vendors. There can be multiple OBXs that record Signal Quality. For all of the preductal and postductal measurements, OBX-14 will contain the observation date/time, OBX-18 will contain the device information, and OBX-23 will contain the Performing organization name/ID.

Table 33 - Observation/Result Segment (OBX) – Signal Quality Preductal by Oximetry and Signal Quality Postductal by Oximetry

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	This field identifies the data type used for OBX-5. The Value Type for the Signal Quality used in CCHD screening is `NM`.
3		CWE	[1..1]	R	73797-3 Signal Quality Preductal by Oximetry 73793-2 Signal Quality Postductal by Oximetry	Observation Identifier	LOINC is used as the coding system for this field. **There should be two OBXs, one for Signal Quality preductal by oximetry and one for Signal Quality postductal by oximetry.**
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		NM	[1..1]	R		Observation Value	This field records the numeric value of the Signal Quality, a percentage.
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`%^percent^UCUM`" is expected.
7	1..60=	ST	[0..1]	RE		References Range	
8	1..20=	CWE	[0..*]	RE	HL70078	Abnormal Flags	

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Comments/Description
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|24|NM|73799-9^Pulse Rate Preductal by Oximetry^LN||95|/min^per
minute^UCUM|||||F|||2014042011253|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical-
7~^Version~^13863~^Pulse OX Device Floor3|2014042011353||||Lansing General
Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|24|NM|73793-2^Signal Quality Postductal by
Oximetry^LN||97|%^percent^UCUM|||||F|||20140420112530||MI_v1^MI Version
1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device
Floor3|20140420113530||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

2.3.8.25. OBXs Infant's Activity Level at the Time of the Preductal Screen and Infant's Activity Level at the Time of the Postductal Screen

In CCHD screening, measurements are done on a preductal body site location and a postductal body site location. Infant's activity level can vary from one side to the other, for example, if the infant awakens during the screening. The infant's activity level at the time of the preductal screen and the infant's activity level at the time of the postductal screen should be sent in separate OBXs. For all of the preductal and postductal measurements, OBX- 14 will contain the observation date/time, OBX-18 will contain the device information, and OBX-23 will contain the Performing organization name/ID.

Table 34 - Observation/Result Segment (OBX) – Infant's Activity Level at the Time of the Preductal Screen and Infant's Activity Level at the Time of the Postductal Screen

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Description/Comments
1	1..4	SI	[1..1]	R		Set ID – OBX	
2	2..3	ID	[1..1]	R	HL70125	Value Type	The Value Type for the infant's activity level at the time of the screen is CWE (or CE for version 2.5.1 message).
3		CWE	[1..1]	R	73796-5 Infant's Activity Level at the Time of the Preductal Screen 73792-4 Infant's Activity Level at the Time of the Postductal Screen	Observation Identifier	LOINC is used as the coding system for this field. **There should be two OBXs, one for infant's activity level at the time of the preductal screen and one for infant's activity level at the time of the postductal screen.**
4	1..20=	ST	[0..1]	CE		Observation Sub-ID	
5		CWE	[1..1]	R	Table 45 - Infant's Activity Level at Time of Screen	Observation Value	This field records infant's activity level at the time of the screen as a LOINC code.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Description/Comments
6		CWE	[0..1]	CE	Unified Code for Units of Measure (UCUM)	Units	The literal value of "`1^No Units^UCUM`" is expected. An empty field is also acceptable.
7	1..60=	ST	[0..1]	O		References Range	NA
8	1..20=	CWE	[0..*]	O	HL70078	Abnormal Flags	NA
11	1..1	ID	[1..1]	R	HL70085	Observation Result Status	This field contains the observation result status. F should be used for the final results used in the overall interpretation of the CCHD screening event. C should be used for a correction to results.
14		TS	[1..1]	R		Date/Time of the Observation	The date/time of observation is intended to carry the clinically relevant time of the observation. For observations carried out directly on the infant, for instance, such as a CCHD screening, the time the observation was performed also happens to be the clinically relevant time of the observation. The date/time the testing was performed should be reported in OBX-19 Format: YYYYMMDDHHMM[SS[.S[S[S[S]]]]]+/-ZZZZ] except when reporting an unknown date of "`0000`". **Accuracy to at least the minutes is required.**
17		CE	[0..*]	RE		Observation Method	Field can be used to transmit the procedure by which an observation was obtained.
18		EI	[0..*]	RE	Local	Equipment Instance Identifier	This field contains the equipment instance responsible for the production of the observation. In CCHD screening the relevant fields to report on a piece of equipment are: Brand, model, version, instance data, serial number, local name
19		DTM	[0..1]	RE		Date/Time of the Analysis	Date and times supplied by the device. This time stamp may not be as accurate as the OBX-14 date and time stamp.

Seq	Len	DT	Cardinality	Sender	Value Set	HL7 Element Name	Description/Comments
23		XON	[1..1]	**R**		Performing Organization Name	This field contains the name and ID of the organization responsible for performing the CCHD screening. The newborn screening hospital code **shall** be sent in the "XON: Organization Identifier" (10th sub-element); the full name of the screening facility/hospital in "XON: Organization Name" (1st sub-element) should be sent. "XON: Assigning Authority" (6th sub-element) **shall** be `MDHHS`. This field is required and messages will be rejected if it is missing.

Example 1:

```
OBX|25|CWE|73796-5^Infant's Activity Level at the Time of the Preductal Screen^LN||LA19830-1^Awake and quiet^LN|1^No Units^UCUM|||||F|||20140420112 53|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140420113 53||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

Example 2:

```
OBX|25|CWE|73792-4^Infant's Activity Level at the Time of the Postductal Screen^LN||LA19830-1^Awake and quiet^LN|1^No Units^UCUM|||||F|||20140420112 53|||MI_v1^MI Version 1^MI_CCHD_Protocol|MDHHS NS~^Radical- 7~^Version~^13863~^Pulse OX Device Floor3|20140420113 53||||Lansing General Hospital^^^^^MDHHS^^^^160000
```

3. Special Cases and Error Conditions

3.1. Special Cases

3.1.1. Multiple Births

In the special case when the infant that is being reported was part of a multiple birth, several of the PID fields are conditional required. These include PID-21 "Mother's Identifier", PID-24 "Multiple Birth Indicator" and PID-25 "Birth Order". PID-21 is used to link all the babies from a multiple birth to a common mother and should be populated with the mother's main medical record number or equivalent for the birthing center if known. NOTE: see Section 3.1.5 "Confidential Mother's Identity" for guidance on cases where birth mother's identity may need to be kept confidential. PID-24 **shall** be populated with the literal value of "Y" for all infants in a multiple birth. PID-25 **shall** be populated with the numerical value for the order of birth. Additionally, an OBX for Birth Plurality is conditionally required. See Section 2.3.8.8 "OBX for Birth Plurality" for additional details.

Example PID Segment for Multiple Birth:

```
PID|1||MRN123||Jones^BabyGirl|James|201207121205|F||2106-
3^White^HL70005~1002- 5^American Indian or Alaska Native^HL70005
~2028-9^Asian^HL70005|201 Street^Arlington^TX^99999^USA|
|^PRN^PH^^^555^5555555|eng^English^ISO6392|||98766|||1234555|N^Not
Hispanic or Latino^HL70189^^^^2.6|HospitalABC||Y|2||||||
|201206221534|123^Lansing Central Hospital^N|
```

Example OBX for Birth Plurality:

```
OBX|10|NM|57722-1^Birth Plurality^LN||LA12413-3^Triplets^LN|1^No
Units^UCUM|||||F|||2009071413552||||20140420112730||||Lansing General
Hospital^^^^^MDHHS^^^^160000|176 Murray
Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|
```

3.1.2. Death of the Infant

In any of the cases described below, the message **shall** include a populated MSH, PID, PVI, NK1, OBR and the three required OBXs. Additionally the "Reason CCHD Oxygen Saturation Screening Not Performed" OBX is conditionally required and it **shall** have OBX-5 populated with "Infant deceased" and LOINC code of LA19826-9. Additional PID-30 **shall** be set to "Y" and PID-29 should be set to the date/time of death if known.

Example OBX:

```
OBX|4|CWE|73698-3^Reason Oxygen Saturation Screening Not
Performed^LN||LA19826-9^Infant deceased|1^No Units^UCUM||||
|F|2014042011253|MI_v1^MI Version 1^MI_CCHD_Protocol||2014042011353|
Lansing General Hospital^^^^MDHHS^^^160000|176 Murray
Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|
```

3.1.2.1. Death Prior to Initial CCHD Screening

In the event that an infant dies prior to any CCHD screening, submitters **should** submit a message described in Section 3.1.2 "Death of the Infant". This message must be separate from any message that contains pulse ox values, (i.e., must be a new and separate message) and would be in lieu of the initial screening message.

3.1.2.2. Death after Initial but Prior to Completing Required Rescreening

In the event that the initial CCHD screening indicates that rescreening is required and the infant dies prior to completing the rescreening, submitters **shall** submit a message described in Section 3.1.2 "Death of the Infant". This is required to close out the case on the CCHD application. This message must be separate from any message that contain pulse ox values, (i.e., must be a new and separate message) and would be in lieu of the next screening message.

3.1.3. Parental or Guardian Refusal

Parent or legal guardian may opt out of CCHD screening. In these cases, a message **shall** be submitted with a populated MSH, PID, PVI, NK1, OBR and the three required OBXs. Additionally the "Reason CCHD Oxygen Saturation Screening Not Performed" OBX is conditionally required and it **shall** have OBX-5 populated with the relevant item from Table 52 - Reason Oxygen Saturation Screening Not Performed. This message must be separate from any message that contains pulse ox values, (i.e., must be a new and separate message) and would be in lieu of the initial or next screening message.

Example OBXs:

```
OBX|4|CWE|73698-3^Reason Oxygen Saturation Screening Not
Performed^LN||LA19827-7^Parental refusal based on religious beliefs|1^No
Units^UCUM|||||F|2014042011253|MI_v1^MI Version 1^MI_CCHD_Protocol|
|2014042011353|Lansing General Hospital^^^^^MDHHS^^^^160000|176 Murray
Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|
```

OR

```
OBX|4|CWE|73698-3^Reason Oxygen Saturation Screening Not
Performed^LN||LA19828-5^Parental refusal for reasons other than religious
beliefs|1^No Units^UCUM|||||F|2014042011253|MI_v1^MI Version
1^MI_CCHD_Protocol||2014042011353|Lansing General Hospital^^^^^MDHHS^^^^160000
|176 Murray Ave^^Lansing^MI^48906^USA^P|Jairam^Rajan|
```

3.1.4. Infant without a First or Middle Name – Initial Screening

In the special case that an infant has not received a first or middle name at the time of screening, submitters **shall** use the literal value "Baby" for the first name. The use of "Baby Boy" or "Baby Girl" is also acceptable. The middle name is considered "RE" and may be blank. In all cases, the infant's identifier in PID-3 **shall** remain the same, assuming that any required rescreening happens at the same facility.

3.1.4.1. Infant That Receives a Name between Screenings

In the case that an infant requires additional or repeat screening but does not have a first or middle name for the earlier screening(s) and receives one before the last screening, submitters **shall** use the

literal value "Baby" for the first name for any reports without a first name and include the first name on the next available report. The use of "Baby Boy" or "Baby Girl" is also acceptable. The middle name is considered "RE" and may be blank until a middle name is available and then should be sent. In all cases, the infant's identifier in PID-3 **shall** remain the same, assuming that any required rescreening happens at the same facility.

3.1.5. Confidential Mother's Identity

If the birth mother's identity must remain confidential, contact information for the baby's point of contact, either an adoptive or foster mother, must be provided in a corresponding NK1 segment. If contact information on new parents, foster parents, or the adoption agency is not available, staff will be unable to contact the family if necessary. In these cases the PID-21.1 field should be blank or filled in with the literal value of "XXXXXXXXXX" (10 Xs). Since PID-21 is conditional required in the case of multiple births, if a multiple birth also required the birth mother's identity to be confidential, senders shall send the literal value of "XXXXXXXXXX". In both cases, a birth mother's NK1 segment should not be sent. It is up to the CCHD screening facility to determine when mother's identity needs to be kept confidential.

3.1.6. Abbreviating the Screening Protocol

This situation applies to the case where rescreening is indicated by the protocol, but it has been determined by the screening facility that additional follow-up should start prior to completing the full rescreening protocol. In these cases, a message should be submitted with a populated MSH, PID, PVI, NK1, OBR and an OBX. The OBX shall be populated with OBX-3 of "Reason CCHD Oxygen Saturation Screening Not Performed" and LOINC code of 73698-3, and OBX-5 populated with the relevant item from Table 52 - Reason Oxygen Saturation Screening Not Performed. "Diagnostic testing begun in lieu of screening based on clinical suspicion for CCHD" (LA20946-2) or "Infant being monitored or treated for non-CCHD condition" (LA20947-0) are the suggested items for OBX-5, but the CCHD facility should choose the most relevant item for the case. This message will allow the screening case to be closed and any relevant follow-up started. This message must be separate from any message that contains pulse ox values, (i.e., must be a new and separate message) and would be in lieu of the next screening message.

3.1.7. Multiple or Continuous CCHD Screenings

In some cases an infant may be in a care setting (i.e., NICU) or be under additional monitoring that would include oxygen saturation and other related CCHD observations that would result in additional CCHD-related observations being generated. In these cases, do **NOT** send these additional CCHD-related observations. Only send the official CCHD screening per the Michigan screening protocol.

3.2. Error Conditions

This section describes the error conditions that might happen, related message acknowledgments, and expected or required actions of the submitter. CCHD's default is to ACK all messages, even successful messages.

In the cases where a message was not completely successful, the submitter will receive an ACK with an 'AE' or 'AR' Acknowledgment Code. Table 35 below outlines the various error connections and

corresponding Acknowledgment Code (MSA-1) and Error Codes (ERR-3). Any message that receives an Acknowledgment Code of "AR" **will** require error handling. Any message that receives and Acknowledgment Code of "AE" and Severity (ERR-4) of "E" **will** require error handling. Any message that receives and Acknowledgment Code of "AE" and Severity (ERR-4) of "W" or "I" may require error handling. See below for more details.

Table 35 - Example Error Conditions and Related MSA and ERR Codes

Error Condition	MSA-1	ERR-3[2]
Missing Required Segment	AR or AE	100
Missing Required Field	AR or AE	101
Data Type Error	AR or AE	102
Wrong Message Type	AR	200
Unsupported Event Code	AR	201
Unsupported HL7 Version ID	AR	203
Unknown Key Identifier	AR	204
Application Internal Error	AR or AE	207
CCHD Application Unavailable	AR	900
CCHD Application Down for Planned Maintenance	AR	901
Unauthorized Submitter	AR	952

See Appendix D: CCDH Error Code Explanation for full listing of all the error conditions for CCHD, including MSA-1, ERR-5, ERR-8, error condition description, and likely causes.

3.2.1. Successful Messages – AA

Any message that receives an Acknowledgment Code of "AA" is considered a successful message, and no error handling is needed.

3.2.2. Non-Fatal Processing Errors – AE

Any message that receives an Acknowledgment Code of "AE" is considered to have a non-fatal processing error(s) and *may* require error handling. All "AE" messages should be investigated by the original sender. "AE" messages are added to the CCHD application but are also flag as errors. CCHD staff may contact the submitter to investigate "AE" messages.

3.2.3. Fatal Processing Errors – AR

Any message that receives an Acknowledgment Code of "AR" is considered to have a fatal processing error (s) and *will* require error handling. All "AR" messages require some level of error handling, but in some cases it can be automated. For example, if a receiving system is down, an automatic re-transmission after 10 minutes is appropriate. See System Unresponsive – Special Case below for more details.

[2] This is a combination of the HL7 Table 0357 and additional HIE-related (MiHIN) error codes.

If there are any errors, especially in the MSH, PID and required OBX segments, then the message is rejected, and MDHHS will respond with an ACK error message.

Examples of issues that may cause a message to be rejected include:

- Message violates HL72.6 or HL7 2.5.1 standards.
- Message is missing required field or segment.
- Value is not valid for the given type (e.g. there is an alphanumeric data value in a date field) or is not a recognized valid value.
- Value is inconsistent with other values given in the same message.

In all cases, "AR" messages are NOT added to the CCHD application and the submitter needs to correct the issue(s) and resubmit the message. In the case that multiple screenings are required for the infant, any "AR" errors must be corrected prior to the next screening/message being submitted.

3.2.4. System Unresponsive – Special Case

Since these messages will flow though HIEs and include multiple hops, a special error case is needed if the intermediary hops are available but the end destination is not. In this case an ACK with AR and a special unresponsive ERR-3 Error Code and MSA-3 Text Message entries are used. It is recommended that the sending system retransmit the message once every ten (10) minutes until it receives a responsive ACK. The special unresponsive ERR-3 Error Code and MSA-3 Text Message entries are any items listed in Table 57 - HL7 Table 0357 – Message Error Condition Codes. This currently includes 900 "Receiving system unresponsive" and 901 "Receiving system down for maintenance." In most cases the HIE will already handle this error; contact your HIE for more information.

3.2.5. Data Mismatch – Special Cases

In the case that the data received in a message is mismatched with other data in the same message (for example, if right hand OR foot reading is <=89% the outcome is not 'Fail'), the message would be ACKed with and MSA-1 of "AE", an ERR-3 of "207" and an ERR-4 of "E". This message would require error handling but may not require resubmission. These will be addressed on a case-by-case basis by the CCHD team.

In the case of a CCHD pulse ox result is dated prior to the infants birth date/time, the message would be ACKed with and MSA-1 of "AR", an ERR-3 of "207" and an ERR-4 of "E". This message would require error handling and would likely require resubmission.

3.2.6. Results Received Out Of Order or Missing Results – Special Case

In the case that a 2nd or 3rd CCHD pulse ox result is received and the prior corresponding result has not been received (for example, a message for the infant with OBX-3 = 73699-1 "Number of Prior Screens" with an OBX-5 set to "1"indacteing the 2nd screening and a no prior message for that infant received with an OBX-5 of "0" for the initial screening) or the case where the later result is dated/timed before the prior result, the message would be ACKed with and MSA-1 of "AR", an ERR-3 of "207" and an ERR-4 of "E". This message would require error handling and would likely require resubmission of one or more of the results.

3.3. Health Information Exchanges (HIE) and Related Requirements

3.3.1. Message Header Validation

Health Information Exchanges or other intermediaries should evaluate the message header for required fields before submission to the State.

Table 36 - Message Header Validation

MSH Field	Field Name	Requirements
MSH-4	Sending Facility	Must be populated with an OID
MSH-5	Receiving Application	Must be populated with 'CCHD'
MSH-6	Receiving Facility	Must be populated with 'MDHHS^2.16.840.1.114222.4.3.2.2.3.161.1^ISO'. The old value of 'MDCH' or 'MDCH^2.16.840.1.114222.4.3.2.2.3.161.1^ISO' are also allowable but will be phased out.
MSH-11	Processing ID	"T" (training or testing) or "P" (production). See Section 4.2 "On-boarding Instructions" for details on this field during the on-boarding process.
MSH-12	Version ID	Must be populated with a valid HL7 version, current supported versions are 2.5.1 and 2.6

3.3.2. ACK Messages Handling

Health Information Exchanges or other intermediaries will receive ACK messages from MDHHS and shall return these messages back to the provider site that submitted them to MDHHS. The return of all ACK messages, including 'AA' messages, is required. In cases where returning the ACK to the original sender site would cause undue harm, this requirement can be waved on a case by case basis.

4. Message Transport and On Boarding

4.1. Message Transport Options

Messages must be sent through Michigan's Health Information Exchange (HIE) infrastructure or other MDHHS approved methods to MDHHS's Data Hub. Michigan's HIE infrastructure includes the Michigan Health Information Network (MiHIN) Shared Services and its related Health Information Exchanges (a.k.a., Qualified Organizations). To learn more, visit http://mihin.org/exchanges/. For additional information, contact the staff listed in Section 1.8 "MDHHS Point of Contact".

4.2. On-boarding Instructions

The on-boarding process is designed to ensure that all messages are complete and of good quality prior to allowing a new submitter to enter into production. It is a multi-step process, described below.

4.2.1. Pre-Production Quality Assurance Testing and Validation

To ensure the structure and content of the message meets the quality assurance requirements of the CCHD team, all submitting hospitals and health systems must complete a testing and validation or onboarding process before the messages are approved for production. During this phase, real messages are sent, just as in production, but MSH-11 "Processing ID" is to be set to the literal value of "T". Messages are reviewed for completeness and quality by the CCHD onboarding team. Only after correcting any quality issues with the message are submitters allowed to enter full production. Hospitals and health systems interested in beginning the testing and validation process should contact Altarum at NBS.Help@altarum.org

4.2.2. Onboarding

Prior to entering into full production, submitters are required to go through a data/message quality phase for Onboarding. During this phase, real messages are sent, just as in production, but MSH-11 "Processing ID" is to be set to the literal value of "T". Messages are reviewed for completeness and quality by CCHD staff. Only after correcting any quality issues with the message are submitters allowed to enter full production. During Onboarding, submitters may be required to report CCHD items via a different process. All Onboarding must be coordinated with CCHD staff. Contact the CCHD staff listed in Section 1.8 "MDHHS Point of Contact" to start testing and onboarding.

4.2.3. Production

Once a submitter has completed Onboarding and received the approval to enter into production from CCHD staff, they must change MSH-11 "Processing ID" to be set to the literal value of "P". **Submitters are advised to include this requirement in any internal project scope or contract with an external organization conducting the configuration of the CCHD interface.**

4.2.4. Testing After Entering into Production

If for any reason a submitter wishes to test messages after entering into production (e.g., during an EHR upgrade) they may use Pre-Production Quality Assurance Testing and Validation tool. If additional testing is required, they may also request an additional round of Onboarding testing. This must be coordinated with CCHD staff, and the MSH-11 "Processing ID" must be set to the literal value of "T" for

any test message. Production messaging can continue during additional rounds of Onboarding testing as long as the MSH-11 "Processing ID" is set to the literal value of "P" for production messages, and CCHD staff have approved.

4.2.5. Required Retesting

Submitters are required to go through Onboarding retesting when switching from one EHR or interface engine product to another. Submitters are encouraged to undergo Onboarding retesting for any major EHR or interface engine version upgrade. All retesting must be coordinated with CCHD staff.

5. Code Tables

Many, but not all, of the Tables are included here, others are available as part of the HL7 standard.

5.1. PID Tables

Table 37 - HL7 Table 0200 – Name Type – PID 5

Value	Description
A	Alias Name
B	Name at Birth
C	Adopted Name
L	Legal Name
U	Unspecified

Table 38 - User-defined Table 0001 – Administrative Sex – PID 8

Value	Description
F	Female
M	Male
O	Other
U	Unknown
A	Ambiguous
N	Not applicable

Table 39 - User-defined Table 0005 – Race – PID 10

Value	Description
1002-5	American Indian or Alaska Native
2028-9	Asian
2054-5	Black or African American
2076-8	Native Hawaiian or Other Pacific Islander
2106-3	White
2131-1	Other Race
2118-8	Middle Eastern Descent

Table 40 - User-defined Table 0189 – Ethnic Group – PID 22

Value	Description
H	Hispanic or Latino
N	Not Hispanic or Latino
U	Unknown

Table 41- Multiple Birth Indicator - PID 24

Value	Description
Y	the infant was part of a multiple birth
N	the infant was a single birth

5.2. Observation Tables

Table 42 - HL7 Table 0123 – Result Status – OBR 25

Value	Description
O	Order received; specimen not yet received
I	No results available; specimen received, procedure incomplete
S	No results available; procedure scheduled, but not done
A	Some, but not all, results available
P	Preliminary: A verified early result is available, final results not yet obtained
C	Correction to results
R	Results stored; not yet verified
F	Final results; results stored and verified. Can only be changed with a corrected result.
X	No results available; Order canceled.
Y	No order on record for this test. (Used only on queries)
Z	No record of this patient. (Used only on queries)

Table 43 - Procedures Code

Procedures Code	Definition	Code System
7087005	Intermittent (spot-check) pulse oximetry	SNOMED-CT
255238004	Continuous pulse oximetry	SNOMED-CT

Table 44 - HL7 Table 0125 – Value Type – OBX 2

Value	Description
AD	Address
CE	Coded Entry
CWE	Coded with Exceptions
CF	Coded Element With Formatted Values
CK	Composite ID With Check Digit
CN	Composite ID And Name
CP	Composite Price
CX	Extended Composite ID With Check Digit
DT	Date
ED	Encapsulated Data
FT	Formatted Text (Display)
MO	Money
NM	Numeric
PN	Person Name
RP	Reference Pointer
SN	Structured Numeric
ST	String Data.
TM	Time
TN	Telephone Number
DTM	Time Stamp (Date & Time)
TX	Text Data (Display)
XAD	Extended Address

Value	Description
XCN	Extended Composite Name And Number For Persons
XON	Extended Composite Name And Number For Organizations
XPN	Extended Person Name
XTN	Extended Telecommunications Number

Table 45 - Infant's Activity Level at Time of Screen

Code	Definition	Code System
LA11864-8	Sleeping	LOINC
LA19830-1	Awake and quiet	LOINC
LA19831-9	Awake and crying	LOINC
LA19832-7	Feeding	LOINC

Table 46 - HL7 Table 0085 – Observation Result Status Codes Interpretation – OBX 11

Value	Description	Comment
C	Record coming over is a correction and thus replaces a final result	
~~D~~	~~Deletes the OBX record~~	Not supported in this guide
F	Final results; Can only be changed with a corrected result.	
~~I~~	~~Specimen in lab; results pending~~	Not supported in this guide
~~N~~	~~Not asked; used to affirmatively document that the observation identified in the OBX was not sought when the universal service ID in OBR-4 implies that it would be sought.~~	Not supported in this guide
~~O~~	~~Order detail description only (no result)~~	Not supported in this guide
~~P~~	~~Preliminary results~~	Not supported in this guide
~~R~~	~~Results entered -- not verified~~	Not supported in this guide
~~S~~	~~Partial results. Deprecated. Retained only for backward compatibility as of V2.6.~~	~~Deprecated~~
~~X~~	~~Results cannot be obtained for this observation~~	Not supported in this guide
~~U~~	~~Results status change to final without retransmitting results already sent as 'preliminary.' E.g., radiology changes status from preliminary to final~~	Not supported in this guide
~~W~~	~~Post original as wrong, e.g., transmitted for wrong patient~~	Not supported in this guide

Table 47 - Observation Site – OBX 20

Code	Definition	Code System
239919000	Left Foot	SNOMED-CT

Code	Definition	Code System
239830003	Right Foot	SNOMED-CT
368455003	Right Hand	SNOMED-CT

Table 48 - CCHD Newborn Screening Interpretation

Code	Definition	Code System	Required Abnormal Flag	Comment
LA18592-8	In range	LOINC	N	
LA18593-6	Out of range	LOINC	AA	
LA19816-0	Inconclusive, repeat screen needed	LOINC	A	
LA19817-8	Attempted but unsuccessful – technical fail	LOINC		Messages with option are required to include a “Reason Oxygen Screening Not Performed” OBX
LA7304-4	Not Performed	LOINC		Messages with option are required to include a “Reason Oxygen Screening Not Performed” OBX

Table 49 - CCHD Newborn Screening Sensor Type

Code	Definition	Code System
LA19810-3	Disposable (Single Use)	LOINC
LA19811-1	Reusable	LOINC

Table 50 - CCHD Newborn Screening Sensor Wrap Type

Code	Definition	Code System
LA19813-7	Cloth	LOINC
LA16576-3	Foam	LOINC
LA19814-5	Velcro	LOINC

Table 51 - CCHD Newborn Screening Sensor Wrap Size

Code	Definition	Code System
LA13524-6	Adult	LOINC
LA19834-3	Pediatric	LOINC
LA8983-4	Small	LOINC
LA8982-6	Medium	LOINC
LA8981-8	Large	LOINC

Table 52 - Reason Oxygen Saturation Screening Not Performed

Code	Definition	Code System	Comments
LA19819-4	Prior prenatal diagnosis of CCHD	LOINC	
LA19820-2	Prior postnatal diagnosis of CCHD	LOINC	
~~LA19821-0~~	~~Early discharge~~	~~LOINC~~	Not a valid option
LA19822-8	Transfer prior to screening	LOINC	
~~LA19823-6~~	~~Infant in NICU~~	~~LOINC~~	Not a valid option, use NICU Protocol, see Table 53.
LA19824-4	Medically unstable and inappropriate for screen	LOINC	
~~LA19825-1~~	~~Receiving supplemental oxygen~~	~~LOINC~~	Not a valid option
LA19826-9	Infant deceased	LOINC	
LA19827-7	Parental refusal based on religious beliefs	LOINC	
LA19828-5	Parental refusal for reasons other than religious beliefs	LOINC	
~~LA7497-6~~	~~Equipment failure~~	~~LOINC~~	Not a valid option
LA20946-2	Diagnostic testing begun in lieu of screening based on clinical suspicion for CCHD	LOINC	Note: recent addition to LOINC Normative Answer List (LL2458-9)
LA20947-0	Infant being monitored or treated for non-CCHD condition	LOINC	Note: recent addition to LOINC Normative Answer List (LL2458-9)

Table 53 - CCHD Newborn Screening Protocol Used

Code	Definition	Code System	Comment*
MI_v1	MI Version 1	MI_CCHD_Protocol	CCHD Screening protocol used for infants **not in** the NICU or other special care environment. The literal value of "`MI_v1^MI Version 1^MI_CCHD_Protocol`" is expected.
MI_NICU_v1	MI NICU Version 1	MI_CCHD_Protocol	CCHD Screening protocol used for infants **in** the NICU or other special care environment. The literal value of "`MI_NICU_v1^MI NICU Version 1^MI_CCHD_Protocol`" is expected.

* See http://www.michigan.gov/cchd/ for more details.

Table 54 - Birth Plurality

Code	Definition	Code System	Comment
LA12411-7	Singleton	LOINC	
LA12412-5	Twins	LOINC	
LA12413-3	Triplets	LOINC	
LA12414-1	Quadruplets	LOINC	
LA12415-8	Quintuplets	LOINC	
LA12416-6	Sextuplets	LOINC	
LA12453-9	Septuplets	LOINC	
LA12913-2	Octuplets or more	LOINC	
LA12914-0	Unknown plurality	LOINC	

5.3. MSA Tables

Table 55 - HL7 Table 0008 – Acknowledgment Code – MSA-1

Value	Description
AA	Original mode: Application Accept - Enhanced mode: Application acknowledgment: Accept
AE	Original mode: Application Error - Enhanced mode: Application acknowledgment: Error
AR	Original mode: Application Reject - Enhanced mode: Application acknowledgment: Reject
~~CA~~	~~Enhanced mode: Accept acknowledgment: Commit Accept~~
~~CE~~	~~Enhanced mode: Accept acknowledgment: Commit Error~~
~~CR~~	~~Enhanced mode: Accept acknowledgment: Commit Reject~~

5.4. ERR Tables

Table 56 - HL7 Table 0516 – Error Severity – ERR-4

Value	Description	Comment
W	Warning	Transaction successful, but there may issues
I	Information	Transaction was successful but includes information e.g., inform patient
E	Error	Transaction was unsuccessful
F	Fatal Error	Message not processed due to application or network failure condition

Table 57 - HL7 Table 0357 – Message Error Condition Codes

Value ERR-3^1	Description ERR-3^2 & MSA-3	Comment ERR3^9 & ERR8	Code Set ERR3^3	Typical Severity
0	Message accepted	Success. Optional, as the AA conveys success. Used for systems that must always return a status code.	HL70357	NOT USED
100	Segment sequence error	Error: The message segments were not in the proper order, or required segments are missing.	HL70357	E
101	Required field missing	Error: A required field is missing from a segment	HL70357	E
102	Data type error	Error: The field contained data of the wrong data type, e.g., an NM field contained "FOO".	HL70357	E

Value ERR-3^1	Description ERR-3^2 & MSA-3	Comment ERR3^9 & ERR8	Code Set ERR3^3	Typical Severity
103	Table value not found	Error: A field of data type ID or IS was compared against the corresponding table, and no match was found.	HL70357	Varies
200	Unsupported message type	Rejection: The Message Type is not supported.	HL70357	E
201	Unsupported event code	Rejection: The Event Code is not supported.	HL70357	E
202	Unsupported processing id	Rejection: The Processing ID is not supported.	HL70357	E
203	Unsupported version id	Rejection: The Version ID is not supported.	HL70357	Varies
204	Unknown key identifier	Rejection: The ID of the patient, order, etc., was not found. Used for transactions other than additions, e.g., transfer of a non-existent patient.	HL70357	E
205	Duplicate key identifier	Rejection: The ID of the patient, order, etc., already exists. Used in response to addition transactions (Admit, New Order, etc.).	HL70357	Varies
206	Application record locked	Rejection: The transaction could not be performed at the application storage level, e.g., database locked.	HL70357	E
207	Application internal error	Rejection: A catchall for internal errors not explicitly covered by other codes.	HL70357	Varies
900	Receiving system unresponsive	Down: The receiving system is not responsive or is down. Please retransmit the message in 10 minutes.	**MIHINERR**	E
901	Receiving system down for maintenance	Down: The receiving system is down for planned maintenance. Please consult mihin.org for known system maintenance windows or retransmit the message in 10 minutes.	**MIHINERR**	Varies
950	General routing error	Routing: A catchall for all other routing errors.	**MIHINERR**	Varies
951	Destination is unknown	Routing: The destination or receiving system is unknown.	**MIHINERR**	E
952	Not authorized	Routing: The sending system is not authorized to send to this destination.	**MIHINERR**	E

NOTE: This is a combination of the HL7 Table 0357 and additional HIE-related (MiHIN) error codes.

5.5.PV1 Tables

Table 58 - HL7 Table 0004 – Patient Class – PV1-2

Value	Description	Comments
B	Obstetrics	Use when the infant is **not in** the NICU or other

Value	Description	Comments
		special care unit
C	Commercial Account	
E	Emergency	
I	Inpatient	Use when the infant is **in** the NICU or other special care unit
N	Not Applicable	
O	Outpatient	Possible future use for ambulatory settings.
P	Preadmit	
R	Recurring patient	
U	Unknown	

5.6.NK1 Tables

Table 59 - HL7 Table 0063 - Relationship

Value	Description
SEL	Self
SPO	Spouse
DOM	Life partner
CHD	Child
GCH	Grandchild
NCH	Natural child
SCH	Stepchild
FCH	Foster child
DEP	Handicapped dependent
WRD	Ward of court
PAR	Parent
MTH	**Mother**
FTH	**Father**
CGV	Care giver
GRD	**Guardian**
GRP	Grandparent
EXF	Extended family
SIB	Sibling
BRO	Brother
SIS	Sister
FND	Friend
OAD	Other adult
EME	Employee
EMR	Employer
ASC	Associate
EMC	Emergency contact
OWN	Owner
TRA	Trainer
MGR	Manager

Value	Description
NON	None
UNK	Unknown
OTH	Other

Table 60 - HL7 Table 0131 - Contact Role

Values	Description
E	Employer
C	Emergency Contact
F	Federal Agency
I	Insurance Company
N	Next-of-Kin
S	State Agency
O	Other
U	Unknown

Appendix A: Sample Message

A sample message is included for reference. Please refer to HL7 V 2.6 ORU^R01 for details about the fields.

```
MSH|^~\&|CCHD Screening Device
        Manager^1234^ISO|SendingFacility^1234^ISO|Receiving
        Application^2.16.840.1.113883.19.3.2^ISO|PublicHealth^2.16.840.1.11
        3883.19.3.2^ISO|20120701132554-
        0400||ORU^R01^ORU_R01|20120701132554000005|P^T|2.6|||NE|AL|USA||||D
        evic e-Ack^^2.16.840.1.114222.4.10.3^ISO

PID|1||MRN123||Jones^BabyGirl|James|201201300005|F ||2106-
        3^White^HL70005~1002-5^American Indian or Alaska
        Native^HL70005|201
        Street^Arlington^TX^99999^USA||^PRN^PH^^^555^5555555||eng^English^I
        SO6392|||98766|||1234555|N^Not Hispanic or
        Latino^HL70189|HospitalABC||||||||||201201311234||

PV1||I|NICU^2^23||||1245319599^Smith^Theodore^^^Dr^MD^^^^^^NPI|||||||||
        ||||||||||||||||||||||||||||||||||||

OBR|1|CWE|999555^PublicHealth^77D77712547^HL7|123456^
        HOSPITAL^9999999999^NPI|73805-4^CCHD newborn screening
        panel^LN|||201201311234|201201311237||^Nurse^Annie^S||||||^Smith^Jo
        hn^S^^Dr.|^^^^^011^555^555-
        1234^123|||||201201311234|||F|||^Jones^Brad^M^^Dr.||||123&Cardiolog
        ist& Carmen||||||Infant was asleep|||||252465000^peripheral
        pulse oximetry^SCT|7087005^Intermittent(spot-check)^SCT|

OBX|1|CWE|73700-7^CCHD newborn screening interpretation^LN|1|LA18592-
        8^In range^LN||||||F|||201201311234|||^Kemper's
        Protocol|^Masimo~^Radical- 7~^Version~^13863~^Pulse OX Device
        Floor3|201201311234||||^Hospital|||

OBX|2|NM|57711-4^Unique bar code number of Initial sample^LN
        |1|1707801||||||F|||201201311233|||||201201311233||||^Hospital|||

OBX|3|CWE|73699-1^Number of Prior
        Screens^LN|1|0||||||F|||201201311234||||^Masimo~^Radical-
        7~^Version~^13863~^Pulse OX Device
        Floor3|201201311234||||^Hospital|||
```

```
OBX|4|NM|73696-7^Difference between preductal and postductal oxygen
       saturation^LN|1|2|||N|||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|5|CWE|73804-7^CCHD newborn screening sensor name^LN|1|Masimo,
       Radical||||||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|6|CWE|73803-9^CCHD newborn screening sensor type^LN|1|LA19810-
       3^Single-use^LN||||||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|7|CWE|73801-3^CCHD newborn screening sensor wrap type^LN|1|LA19813-
       7^Cloth^LN||||||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|8|CWE|73800-5^CCHD newborn screening sensor wrap size^LN|1|LA8983-
       4^size small^LN||||||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|9|CWE|73698-3^Reason oxygen screening not performed^LN|1|LA19821-
       0^Early Discharge^LN||||||F|||201201311234||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311234||||^Hospital|||

OBX|10|NM|59407-7^Oxygen saturation in Preductal by Pulse
       Oximetry^LN|1|98|%^percent||N|||F|||201201311232||||^Masimo~^Rad
       ical- 7~^Version~^13863~^Pulse OX Device
       Floor3|201201311232||||^Hospital|||

OBX|11|NM|73799-9^Pulse rate Preductal by Oximetry^LN|1|125|/min|100-
       150|N|||F|||201201311232||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311232||||^Hospital|||
```

```
OBX|12|NM|73798-1^Perfusion Index Preductal by
       Oximetry^LN|1|20|%^percent|1-
       20|N|||F|||201201311232||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse    OX Device
       Floor3|201201311232||||^Hospital|||

OBX|13|NM|73797-3^Signal Quality Preductal by
       Oximetry^LN|1||||N|||F|||201201311232||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311232||||^Hospital|||

OBX|14|CWE|73796-5^Infant's activity level at the time of the Preductal
       screen^LN|1|LA11864-
       8^asleep^LN|||N|||F|||201201311232||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311232||||^Hospital|||

OBX|15|NM|59418-4^Oxygen saturation in Postductal by Pulse
       Oximetry^LN|1|96|%^percent||N|||F|||201201311233||||^Masimo~^Rad
       ical- 7~^Version~^13863~^Pulse OX Device
       Floor3|201201311233||||^Hospital|||

OBX|16|NM|73795-7^Pulse rate Postductal by
       Oximetry^LN|1|125|/min|100-
       150|N|||F|||201201311233||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311233||||^Hospital|||

OBX|17|NM|73794-0^Perfusion Index Postductal by
       Oximetry^LN|1|20|%^percent|1-
       20|N|||F|||201201311233||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse    OX Device
       Floor3|201201311233||||^Hospital|||

OBX|18|NM|73793-2^Signal Quality Postductal by
       Oximetry^LN|1||||N|||F|||201201311233||||^Masimo~^Radical-
       7~^Version~^13863~^Pulse OX Device
       Floor3|201201311233||||^Hospital|||

OBX|19|CWE|73792-4^Infant's activity level at the time of the
       Preductal screen^LN|1| LA11864-
```

```
        8^asleep^LN|||N|||F|||201201311233||||^Masimo~^Radical-
        7~^Version~^13863~^Pulse OX Device
        Floor3|201201311233||||^Hospital|||

OBX|20|NM|57714-8^Obsetric estimation of Gestational
        Age^LN|1|38|wk^week||N|||F|||201201311233|||||201201311233||||^Ho
        spital|||

OBX|21|NM|8339-4^Body weight measured at
        birth^LN|1|4435|g^gram||N|||F|||201201311233|||||201201311233||||^H
        ospital|||
```

Appendix B: Additional Background Information

Messaging Infrastructure

HL7 Messaging Infrastructure

This section will contain a basic description of the terms and definitions which are used in this document in order to understand the Health Level 7 standard. More detail may be found in the HL7 2.6 standard in Chapters 2, 2A and 2B.

HL7 Definitions

This section contains the definitions that are used to compose an HL7 message.

Message: A message is the entire unit of data transferred between systems in a single transmission. It is made up of segments arranged in a particular order.

Segment: A segment is a logical grouping of data fields. Segments may be required or optional, may occur only once, or may be allowed to repeat. Each segment is named and is identified by a segment ID, a unique 3-character code.

Segment ID: 3 character code that identifies the segment. Example: MSH for Message Header

Field: A field is a string of characters and is of a specific data type. Each field is identified by the segment it is in and its position within the segment

Component: A component is one of a logical grouping of items that comprise the contents of a coded or composite field. Within a field having several components, not all components are required to be valued.

Data Type: The unit that is used to construct or restrict the contents of the data field. They are 2 or 3 letter codes. " Table 65 - Data Types" contains all data types used in this message and "**Error! Not a valid bookmark self-reference.**" contains all data types from HL7 Table 0440.

Item number: Each field is assigned a unique item number. Fields used in more than one segment will retain their unique item number across segments.

Code Sets/Systems: Most data elements will have associated lists of acceptable values in tables supported by a standards organization such as HL7 or CDC. These code sets will include definitions to support common usage.

Delimiters: Delimiter characters are used to separate segments, fields, and components in an HL7 message. The delimiter values are given in MSH-2 and used throughout the message. Applications must use agreed upon delimiters to parse the message. Messages used in this Guide shall use the following delimiters:

```
<CR> = Segment Terminator;

| = Field Separator;
```

```
^ = Component Separator;

& = Sub-Component Separator;

~ = Repetition Separator;

\ = Escape Character.
```

Message syntax: Each message is defined in special notation that lists the segment 3-letter identifiers in the order they will appear in the message. Braces, {}, indicate that one or more of the enclosed group of segments may repeat, and brackets, [ ], indicate that the enclosed group of segments is optional. Note that segments may be nested within the braces and brackets. This will indicate that the nested segments are units within a subgroup of segments. Their Usage is relative to the parent segment in the group.

Basic Message Construction Rules

Encoding Rules for Sending

1. Encode each segment in the order specified in the abstract message format. MSH must be the first segment. OBX segments must immediately follow the corresponding OBR.
2. Place the Segment ID first in the segment.
3. Precede each data field with the field separator.
4. Encode the data fields in the order and data type specified in the segment definition table.
5. End each segment with the segment terminator.
6. Components, subcomponents, or repetitions that are not valued at the end of a field need not be represented by component separators.
7. Components, subcomponents, or repetitions that are not valued, but precede components, subcomponents or repetitions that are valued must be represented by appropriate separators.
8. If a field allows repetition (Cardinality maximum > 1), then the length of the field applies to EACH repetition.

Encoding Rules for Receiving

1. If a data segment that is expected is not included, treat it as an error.
2. If a data segment is included that is not expected, ignore it; this is not an error.
3. If data fields are found at the end of a data segment that are not expected, ignore them; this is not an error.

Implications of the Encoding Rules

The approach for this HL7 version is so that it can act as a base that other Implementation Guides can use by either:

1. Extending this standard by adding additional supported segments and/or fields
   OR
2. Constraining this standard by explicitly excluding segments, fields, and/or code values.

In this spirit, segment types other than MSH, PID, OBR and OBX may be included but are not supported and therefore may be ignored by the receiver implementing this Implementation Guide.

If a field is an encoded value, and the code value for that field is not recognized or cannot be processed by the receiver, then if that field is optional, the receiver should ignore the value. If the field is required, but the segment that the field is in is an optional segment, then the receiver should ignore the entire segment. So, if the field is a required field in a required segment, and the code is invalid, then the entire message should be rejected.

This Implementation Guide also endeavors to specify coded values as those associated with a specific value set rather than explicitly enumerating the values in use at this time. It is possible that over time the codes for a given value set may add values that the receiver cannot process. That could be because the code is in fact invalid, because the current value set used by the receiver is out of date, or because the code value is one that they receiver is not prepared to process. In any of these cases the encoded field error should be treated as described above. Thus it is worth noting that a message can validly be rejected by a receiver even though the message itself is technically valid. Such a rejection just indicates that this specific exchange cannot be performed.

Table 61 - Usage Code Interpretations for Fields, Components and Sub-Components

Usage Code	Interpretation	Comment
R	Required	A conforming sending application shall populate all “R” elements with a non-empty value. Conforming receiving application shall process or ignore the information conveyed by required elements. A conforming receiving application must not raise an error due to the presence of a required element, but may raise an error due to the absence of a required element.
RE	Required but may be empty	The element may be missing from the message, but must be sent by the sending application if there is relevant data. A conforming sending application must be capable of providing all "RE" elements. If the conforming sending application knows the required values for the element, then it must send that element. If the conforming sending application does not know the required values, then that element will be omitted. Receiving applications will be expected to process or ignore data contained in the element, but must be able to successfully process the message if the element is omitted (no error message should be generated because the element is missing).

Usage Code	Interpretation	Comment
C	Conditional	This usage has an associated condition predicate. This predicate is an attribute within the message. If the predicate is satisfied: A conformant sending application must always send the element. A conformant receiving application must process or ignore data in the element. It may raise an error if the element is not present. If the predicate is NOT satisfied: A conformant sending application must NOT send the element. A conformant receiving application must NOT raise an error if the condition predicate is false, and the element is not present, though it may raise an error if the element IS present.
CE	Conditional but may be empty	This usage has an associated condition predicate. This predicate is an attribute within the message. If the predicate is satisfied: If the conforming sending application knows the required values for the element, then the application must send the element. If the conforming sending application does not know the values required for this element, then the element shall be omitted. The conforming sending application must be capable of knowing the element (when the predicate is true) for all 'CE' elements. If the element is present, the conformant receiving application shall process or ignore the values of that element. If the element is not present. The conformant receiving application shall not raise an error due to the presence or absence of the element. If the predicate is not satisfied: The conformant sending application shall not populate the element. The conformant receiving application may raise an application error if the element is present.
O	Optional	This element may be present if specified in local profile. Local partners may develop profiles that support use of this element. In the absence of a profile, conformant sending applications will not send the element. Conformant receiving applications will ignore the element if it is sent, unless local profile specifies otherwise. Conformant receiving applications may not raise an error if it receives an unexpected optional element.

Usage Code	Interpretation	Comment
X	Not Supported	The element is not supported. Sending applications should not send this element. Receiving applications should ignore this element if present. A receiving application may raise an error if it receives an unsupported element. Any profile based on this Guide should not specify use of an element that is not supported in this Guide.

Table 62 - Usage Code Interpretation for Segments

Usage Code	Interpretation	Comment
R	Required	A conforming sending application shall include all “R” segments. Conforming receiving application shall process all required segments. A conforming receiving application must process all required segments. It should raise an error due to the absence of a required segment. A conforming receiving application must process all required segments. It should raise an error due to the absence of a required segment.
RE	Required but may be empty	The segment may be missing from the message, but must be sent by the sending application if there is relevant data. A conforming sending application must be capable of providing all "RE" segments. If the conforming sending application has data for the required segment, then it must send that segment. Receiving applications will be expected to process the data contained in the segment. It must be able to successfully process the message if the segment is omitted (no error message should be generated because the segment is missing).
O	Optional	This segment may be present if specified in local profile. Local partners may develop profiles that support use of this segment. In the absence of a profile, conforming sending applications will not send the element. Conformant receiving applications will ignore the element if it is sent, unless local profile specifies otherwise.
X	Not Supported	The segment is not supported. Sending applications should not send this element. Receiving applications should ignore this element if present. Any profile based on this Guide should not specify use of an element that is not supported in this Guide.

Message Attributes Common to All Messages

The following describe how message specifications will be illustrated in this Guide. These terms will be used in the tables specifying messages throughout this Guide.

Table 63 - Message Attributes

Attribute	Description

Attribute	Description
Segment	Three-character code for the segment and the abstract syntax (i.e., the square and curly braces) [XXX] Optional { XXX } Repeating XXX Required (not inside any braces) [{ XXX }] Optional and Repeating [XXX [YYY]] YYY is nested within the segment block starting with XXX. It is an optional sub-segment to XXX. The whole block is optional. NOTE: for Segment Groups there will not be a segment code present, but the square and curly braces will still be present.
Name	Name of the Segment or Segment group element.
Usage	Usage of the segment. Indicates if the segment is required, optional, or not supported in a message. See table with Usage Code Interpretation above.
Cardinality	Indicator of the minimum and maximum number of times the element may appear. [0..0] Element never present. [0..1] Element may be omitted and it can have at most, one occurrence. [1..1] Element must have exactly one Occurrence. [0..n] Element may be omitted or may repeat up to n times. [1..n] Element must appear at least once, and may repeat up to n times. [0..*] Element may be omitted or repeat for an unlimited number of times. [1..*] Element must appear at least once, and may repeat unlimited number of times. [m..n] Element must appear at least m and, at most, n times.

Segment Attributes Common to All Segments

Table 64 - Segment Attributes

Abbreviation	Description
Seq	Sequence of the elements (fields) as they are numbered in the segment
Len	Recommended maximum length of the element. Lengths are provided only for primitive data types. Lengths should be considered recommendations, not absolutes. The receiver may truncate fields, components, and sub-components longer than the recommended length. The receiver should not fail to process a message simply because fields, components, or sub-components are too long.
Data Type	Data type used for HL7 element. Data type specifications can be found in Chapter 4.

Abbreviation	Description
Usage	Indicates whether the field is supported in this Guide. Indicates if the field, component, or subcomponent is required, optional, or conditional in the corresponding segment, field, or component. See Usage Code Interpretation, above. NOTE: A required field in an optional segment does not mean the segment must be present in the message. It means that if the segment is present, the required fields within that segment must be populated. The same applies to required components of optional fields. If the field is populated, then the required component must be populated. The same applies to required sub-components of optional components. If a component is populated, the required sub-components of that component must also be populated.
Cardinality	Indicator of the minimum and maximum number of times the element may appear. [0..0] Element never present. [0..1] Element may be omitted and can have at most, one occurrence. [1..1] Element must have exactly one occurrence. [0..n] Element may be omitted or may repeat up to n times. [1..n] Element must appear at least once, and may repeat up to n times. [0..*] Element may be omitted or repeat for an unlimited number of times. [1..*] Element must appear at least once, and may repeat unlimited number of times. [m..n] Element must appear at least m and, at most, n times.
Item #	Unique item identifier in HL7
HL7 Element Name	HL7 descriptor of the element in the segment.
Comment	Lists any constraints imposed and other comments in this Guide

HL7 Data Types

The foundation of successful interoperability is data types. In each message, a field, component or sub-component has a data type. When systems communicate between each other, agreement on the data type for each component ensures good communication. Refer to HL7 Table 0440 – Data Types for more details and other data types not used in the ORU^R01 message for CCHD. The following is a list of data types used in the ORU^R01 message for CCHD.

Table 65 - Data Types

Data type	Data Type Name	Segment Location
CNE	Coded with No Exceptions	OBR 44, OBR 45
CWE	Coded with Exceptions	MSH 19, ERR 3, ERR 5, PID 10, PID 15, PID 22, OBR 4, OBR 31, OBR 39, OBX 3, OBX 6, OBX 8, OBX 15, OBX 20, OBX 17
CX	Extended Composite ID with Check Digit	PID 3, PID 18, PID 21
DTM	Date/Time	OBX 19
EI	Entity Identifier	OBR 2, OBR 3, OBX 18
ERL	Error Location	ERR 2
HD	Hierarchic Designator	MSH 3, MSH 4, MSH 5, MSH 6, PID 34
ID	Coded Values for HL7 Tables	MSH 15, MSH 16, MSH 17, MSH 18, MSA 1, ERR 4, PID 24, OBR 24, OBR 25, OBX 2, OBX 11
IS	Coded value for User-Defined Tables	PID 8
MSG	Message Type	MSH 9
NDL	Name with Date and Location	OBR 32
NM	Numeric	MSH 13, MSA 4, PID 25, OBX 2, OBX 5
PL	Person Location	PV1-3
PT	Processing Type	MSH 11
SI	Sequence ID	PID 1, OBR 1, OBX 1
ST	String	MSH 1, MSH 2, MSH 10, MSA 2, ERR 6, PID 23, OBR 18, OBR 19, OBR 20, OBR 21, OBX 4, OBX 7
TS	Time Stamp	MSH 7, PID 7, PID 33, OBR 7, OBR 8, OBR 22, OBR 36, OBX 14
TX	Text Data	ERR 7, ERR 8
VID	Version Identifier	MSH 12
XAD	Extended Address	PID 11, PID 12, OBX 24
XCN	Extended Composite ID Number and Name	OBR 10, OBR 16, OBR 28, OBX 25
XON	Extended Composite Name and ID Number for Organizations	OBX 23
XPN	Extended Person Name	PID 5, PID 6
XTN	Extended telecommunications number	ERR 12, PID 13, OBR 17

Appendix C: Revision History

Version	Date	Author	Comments
0.9.1	04/15/2014	J. Shaw	Draft released as "FOR PILOT AND TRIAL IMPLEMENTATIONS ONLY"
0.9.5	1/15/2015	J. Shaw	2nd release as "FOR PILOT AND TRIAL IMPLEMENTATIONS ONLY"
0.9.6	3/17/2015	J. Shaw	3rd release as "FOR PILOT AND TRIAL IMPLEMENTATIONS ONLY". Changes to Post Discharge Provider information to RE and other document cleanup.
0.9.7	8/19/2015	J. Shaw	Changes for MDHHS new name and changes to OBX-14 to be accurate to at least the minutes.
0.9.8	9/16/2015	J. Shaw	Corrected gender error in sample message in Appendix A.
0.9.9	11/7/2016	J. Shaw	Corrected Blood Spot ID LOINC code from 57716-3 to 57711-4
0.9.10	08/23/2022	D. Willhite	Add LOINC 57716-3. Change 73803-9 from RE to O. Add 2118-8 to Race Code table. Change OBX-25 from RE to O for CCHD Newborn Screening Interpretation and Blood Spot Initial Sample Card ID. Crossed off Early Discharge, Receiving Supplemental Oxygen and Equipment Failure from Table 52. Replaced 57711-4 with 57716-3.
0.9.11	01/24/2023	D. Willhite	Changed 57716-3 to 57711-4.

Appendix D: CCDH Error Code Explanation

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
100^Segment sequence error^HL70357	CCHD-FR0402	OBX not found for LOINC 73700-7	Used when "CCHD Newborn Screening Interpretation" OBX is not in message.	• Missing required segment	OBX CCHD Newborn Screening Interpretation	AR
100^Segment sequence error^HL70357	CCHD-FR0402A	OBX not found for LOINC 73699-1	Used when "Number of Prior CCHD Screens" OBX is not in the message.	• Missing required segment	OBX Number of Prior Screens	AR
100^Segment sequence error^HL70357	CCHD-FR0402E	OBX not found for LOINC 73698-3	Used when "Reason CCHD Oxygen Saturation Screening Not Performed" OBX is not in the message.	• Missing conditional required segment	OBX Reason Oxygen Screening Not Performed	AR
100^Segment sequence error^HL70357	CCHD-FR0402F	OBX not found for LOINC 73696-7	Used when "Difference Between Preductal and Postductal Oxygen Saturation" OBX is not in the message.	• Missing conditional required segment	OBX Difference between Preductal and Postductal Oxygen Saturation	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
100^Segment sequence error^HL70357	CCHD-FR0402G	OBX not found for LOINC 59407-7	Used when "Oxygen Saturation in Blood Preductal by Pulse Oximetry" OBX is not in the message.	• Missing conditional required segment	OBXs for Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry	AR
100^Segment sequence error^HL70357	CCHD-FR0402H	OBX not found for LOINC 59418-4	Used when "Oxygen Saturation in Blood Postductal by Pulse Oximetry" OBX is not in the message.	• Missing conditional required segment	OBXs for Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry	AR
100^Segment sequence error^HL70357	CCHD-FR0402I	OBX not found for LOINC 57722-1	Used when "Birth Plurality" OBX is not in the message.	• Missing conditional required segment • Error in Multiple Birth Indicator (PID-24)	OBX for Birth Plurality	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
100^Segment sequence error^HL70357	CCHD-FR060104	The message segments were not in the proper order, or required segments are missing	Used when no NK1 segment is found.	• Missing required segment	Next of Kin/Associated Parties Segment (NK1)	AR
100^Segment sequence error^HL70357	CCHD-FR060102	The message segments were not in the proper order, or required segments are missing	Used when NK1 segment was missing but enough other information was provided to all for infant's screening records to be match.	• Missing required field	Next of Kin/Associated Parties Segment (NK1)	AE
101^Required field missing^HL70357	1006^Required field missing	*NULL*	Used when an HL7 required field is empty.	• Missing required field		AR
101^Required field missing^HL70357	CCHD-FR0403	Version ID	Used when MSH-12 is empty.	• Missing required field	Message Header Segment (MSH)	AR
101^Required field missing^HL70357	CCHD-FR060103A	Baby's DOB	Used when infant's date of birth (DOB) is missing from the message.	• Missing required field (PID-7)	Patient Identification Segment (PID)	AR
101^Required field missing^HL70357	CCHD-FR060103C	Birth Order	Used when the Birth Order (PID-25) is missing if Multiple Birth Indicator (PID-24) is Y.	• Error in Multiple Birth Indicator (PID-24) • Missing conditional required field	Patient Identification Segment (PID)	AR
101^Required field missing^HL70357	CCHD-FR060103D	Last Name	Used when the last name is missing from NK1-2.	• Missing required field	Next of Kin/Associated Parties Segment (NK1)	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
101^Required field missing^HL70357	CCHD-FR0603	Baby's DOB	Used when infant's date of birth (DOB) is missing from the message.	• Missing required field (PID-7)	Patient Identification Segment (PID)	AR
101^Required field missing^HL70357	CCHD-FR0604	Birth Order	Used when the Birth Order (PID-25) is missing if Multiple Birth Indicator (PID-24) is Y.	• Error in Multiple Birth Indicator (PID-24) • Missing conditional required field	Patient Identification Segment (PID)	AR
101^Required field missing^HL70357	CCHD-FR0622A	Reason Not Performed OBX not allowed with pulse screening related OBX(s)	Used when "Reason CCHD Oxygen Saturation Screening Not Performed" OBX is provided and "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and/or "Oxygen Saturation in Blood Postductal by Pulse Oximetry" OBXs are provided and do **not** have values of 0.	• Logic error ○ "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and/or "Oxygen Saturation in Blood Postductal by Pulse Oximetry" OBXs should not be included in a message that has a "Reason CCHD Oxygen Saturation Screening Not Performed" OBX	OBX Reason Oxygen Screening Not Performed	AR
101^Required field missing^HL70357	CCHD-FR060101	Last Name	Used when the last name is missing from NK1-2 but enough other information was provided to all for infant's screening records to be match.	• Missing required field	Next of Kin/Associated Parties Segment (NK1)	AE

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
102^Application internal error^HL70357	CCHD-FR0618A	Perfusion Index Postductal is not numeric for LOINC 73794-0	Used when a non-numeric value is provided in OBX-5 for "Perfusion Index Blood Postductal Pulse Oximetry".	• Data type error • Data entry error	OBXs for Perfusion Index Preductal and Perfusion Index Postductal by Oximetry	AR
102^Application internal error^HL70357	CCHD-FR0618B	Postductal Saturation Percentage is not numeric for LOINC 59418-4	Used when a non-numeric value is provided in OBX-5 for "Oxygen Saturation in Blood Postductal by Pulse Oximetry".	• Data type error • Data entry error	OBXs for Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry	AR
102^Application internal error^HL70357	CCHD-FR0618C	Perfusion Index Preductal is not numeric for LOINC 73798-1	Used when a non-numeric value is provided in OBX-5 for "Perfusion Index Blood Preductal Pulse Oximetry".	• Data type error • Data entry error	OBXs for Perfusion Index Preductal and Perfusion Index Postductal by Oximetry	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
102^Application internal error^HL70357	CCHD-FR0618D	Saturation Difference is not numeric for LOINC 73696-7	Used when a non-numeric value is provided in OBX-5 for "Difference Between Preductal and Postductal Oxygen Saturation".	• Data type error • Data entry error	OBX Difference between Preductal and Postductal Oxygen Saturation	AR
102^Application internal error^HL70357	CCHD-FR0618E	Preductal Saturation Percentage is not numeric for LOINC 59407-7	Used when a non-numeric value is provided in OBX-5 for "Oxygen Saturation in Blood Preductal by Pulse Oximetry".	• Data type error • Data entry error	OBXs for Oxygen Saturation in Blood Preductal by Pulse Oximetry and Oxygen Saturation in Blood Postductal by Pulse Oximetry	AR
203^Unsupported version id^HL70357	CCHD-FR010401	Rejection: The Version ID is not supported	Used when MSH-12 includes a not supported version.	• MSH-12 does not equal 2.5.1 or 2.6	Message Header Segment (MSH) & HL7 Version	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
204^Unknown key identifier^HL70357	CCHD-FR0610A	Prior pulse ox screening not found for LOINC 73699-1	Used in the case that multiple screens were needed for the infant and the 2nd or 3rd screening comes in and the prior screening (1st or 2nd) could not be found in the CCHD application.	• Messages sent out of order • Prior screen was rejected for other error and corrected message not received • Change to infant's demographics (name, MRN, birth order, etc.) or NK1 information preventing a match		AR
204^Unknown key identifier^HL70357	CCHD-FR0610B	Second pulse ox screening not found for LOINC 73699-1	Used in the case that multiple screens were needed for the infant and the 3rd screening comes in and the prior screening (2nd) could not be found in the CCHD application.	• Messages sent out of order • Prior screen was rejected for other error and corrected message not received • Change to infant's demographics (name, MRN, birth order, etc.) or NK1 information preventing a match		AR
207^Application internal error^HL70357	CCHD-IG02040701	Invalid value for LOINC 73700-7	Used when OBX-5 of "CCHD Newborn Screening Interpretation" has a value that is not from the supported table.	• Value not selected from the table in the Implementation Guide	Table 48 - CCHD Newborn Screening Interpretation	AR
207^Application internal error^HL70357	CCHD-IG02040711	Invalid value for LOINC 57722-1	Used when OBX-5 of "Birth Plurality" has a value that is not from the supported table.	• Value not selected from the table in the Implementation Guide	Table 54 - Birth Plurality	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
207^Application internal error^HL70357	CCHD-FR0608A	Screening Date is less than Baby's DOB for LOINC 59407-7	Used in the case that the screening date/time in the message is prior to the Baby's date of birth (DOB).	• Time stamp error		AR
207^Application internal error^HL70357	CCHD-FR0608B	Screening Date is less than Baby's DOB for LOINC 59407-7	Used in the case that the screening date/time in the message is prior to the Baby's date of birth (DOB).	• Time stamp error		AR
207^Application internal error^HL70357	CCHD-FR0609	Screening Date is before prior Screening Date for LOINC 59407-7	Used in the case that a 2nd or 3rd screening date/time is prior to the previous screening data/time.	• Time stamp error • Incorrect number of prior screens included in message		AR
207^Application internal error^HL70357	CCHD-FR0611A	Duplicate pulse ox screening for LOINC 73699-1	Used when a duplicate message is received for the same infant and screening.	• Incorrect number of prior screens included in message • Corrected result sent without "C" in OBX-11		AR
207^Application internal error^HL70357	CCHD-FR0611B	Duplicate pulse ox screening 2 for LOINC 73699-1	Used when a duplicate message is received for the same infant and screening.	• Incorrect number of prior screens included in message • Corrected result sent without "C" in OBX-11		AR
207^Application internal error^HL70357	CCHD-FR0611C	Duplicate pulse ox screening 3 for LOINC 73699-1	Used when a duplicate message is received for the same infant and screening.	• Incorrect number of prior screens included in message • Corrected result sent without "C" in OBX-11		AR
207^Application internal error^HL70357	CCHD-FR0620	Hospital Code for LOINC 73700-7	Used when the Newborn Screening Hospital Code is not in OBX-23.10	• Missing required field • Invalided Newborn Screening Hospital Code in OBX-23.10	OBX CCHD Newborn Screening Interpretation	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
207^Application internal error^HL70357	CCHD-FR0613	Outcome is not Fail for LOINC 73700-7	Used when the values provided for "Oxygen Saturation in Blood Preductal by Pulse Oximetry" and/or "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not support the interpretation in the message.	• Logic error ○ if right hand OR foot reading is <=89%, and the outcome is not "Fail" • Calculation error		AE
207^Application internal error^HL70357	CCHD-FR0614	Outcome is Fail or Rescreen for LOINC 73700-7	Used when the values provided for "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not support the interpretation in the message.	• Logic error ○ if right hand or foot reading is =>95% and difference is <= 3, and the outcome is "Fail' or "Rescreen", • Calculation error		AE
207^Application internal error^HL70357	CCHD-FR0615A	Outcome is not Rescreen for LOINC 73700-7	Used when the values provided for "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not support the interpretation in the message.	• Logic error ○ if right hand or foot reading is =>95% and difference is <= 3, and the outcome is "Fail' or "Rescreen" • Calculation error		AE
207^Application internal error^HL70357	CCHD-FR0615B	Outcome is not Fail for pulse ox screening 3 LOINC 73700-7	Used when the values provided for "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not support the interpretation in the message.	• Logic error ○ if right hand or foot reading is =>95% and difference is <= 3, and the outcome is "Fail' or "Rescreen" • Calculation error		AE

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
207^Application internal error^HL70357	CCHD-FR0616A	Outcome is not Rescreen for LOINC 73700-7	Used when the value provided for "Difference Between Preductal and Postductal Oxygen Saturation" does not support the interpretation in the message.	• Logic error ○ where the "Difference is 4% or higher", and the outcome is not "Rescreen" for Pulse Ox 1, not "Rescreen" for Pulse Ox 2, not "Fail" for Pulse Ox 3, • Calculation error		AE
207^Application internal error^HL70357	CCHD-FR0616B	Outcome is not Fail for LOINC 73700-7	Used when the values provided for "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not support the interpretation in the message.	• Logic error ○ where the "Difference is 4% or higher", and the outcome is not "Rescreen" for Pulse Ox 1, not "Rescreen" for Pulse Ox 2, not "Fail" for Pulse Ox 3, • Calculation error		AE
207^Application internal error^HL70357	CCHD-FR0617	Calculation error for LOINC 73696-7	Used when the values provided for "Oxygen Saturation in Blood Preductal by Pulse Oximetry" and "Oxygen Saturation in Blood Postductal by Pulse Oximetry" do not calculate to the value in the "Difference Between Preductal and Postductal Oxygen Saturation" OBX in the message.	• Calculation error		AE

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
207^Application internal error^HL70357	CCHD-FR0622B	Reason Not Performed OBX not allowed with pulse screening related OBX(s)	Used when "Reason CCHD Oxygen Saturation Screening Not Performed" OBX is provided and "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and/or "Oxygen Saturation in Blood Postductal by Pulse Oximetry" OBXs are provided but have values of 0.	• Logic error ○ "Difference Between Preductal and Postductal Oxygen Saturation," "Oxygen Saturation in Blood Preductal by Pulse Oximetry," and/or "Oxygen Saturation in Blood Postductal by Pulse Oximetry" OBXs should not be included in a message that has a "Reason CCHD Oxygen Saturation Screening Not Performed" OBX		AE
900^Receiving system unresponsive^MIHINERR	CCHD-FR0401	NBS CCHD system is unavailable. Please retransmit in a few minutes	Used when the CCHD application is down or unresponsive.		System Unresponsive – Special Case	AR
901^Receiving system down for maintenance^MIHINERR	CCHD-FR0406	NBS CCHD is down for maintenance. Please retransmit in a few minutes	Used when the CCHD application is down for planned maintenance.		System Unresponsive – Special Case	AR
952^Unauthorized submitter^MIHINERR	CCHD-FR0405	Unauthorized submitter	Used when the submitter's Newborn Screening Hospital Code is not authorized to submit messages. Note there are separate authorizes for onboard/test and production.	• Contact NBS staff to change submitter's Newborn Screening Hospital Code to "Authorized" • Invalided Newborn Screening Hospital Code in OBX-23.10	On-boarding Instructions	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
207^Application internal error^HL70357	CCHD-FR0623	Difference between Preductal and Postductal Oxygen Saturation shall not be a negative value for LOINC 73696-7.	Used when the difference between Preductal and Postductal Oxygen Saturation is a negative value.	• Calculation error • Values swapped for Preductal and Postductal Oxygen Saturation		AR
207^Application internal error^HL70357	CCHD-FR0624	Number of Prior Screenings segment must have a value of 0, 1, or 2.	Used when the Number of Prior Screenings is not a valid number per the Michigan protocol. If the number of prior screens is invalid, several other edits and validations are not processed on the message.	• Logic Error	OBX Number of Prior Screens	AR
207^Application internal error^HL70357	CCHD-FR0625	OBR-25 must have a value of F (final) or C (Corrected).	Used when any value other than F or C is sent for the Observation Result Status (OBX-11). Only final and corrected results are supported.		Observation/ Result Segments (OBX)	AR
207^Application internal error^HL70357	CCHD-FR0626	For any OBX segments, only one copy of the OBX segment for LOINC <LOINC code> is allowed (no repeated OBX).	Used with multiple copies or conflicting copies of OBX segments are sent. Send only one OBX per observation. <LOINC code> is replaced with the actual LOINC for the duplicated OBX.		Observation/ Result Segments (OBX)	AR
100^Segment sequence error^HL70357	CCHD-FR060201	OBX not found for LOINC 57711-4	Used when "Unique bar code number of Initial sample" (Blood Spot Filter Paper Card ID) OBX is not in message.	Missing required segment	OBX for Unique bar code number of Initial sample	AR

ERR-3	ERR-5	ERR-8	Error Condition	Likely causes	Reference	MSA-1
101^Required field missing^HL70357	CCHD-FR060103B	Blood Spot Kit ID for LOINC 57711-4	Used when Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID) OBX is missing.	Missing required field	OBX for Unique bar code number of Initial sample	AR
101^Required field missing^HL70357	CCHD-FR060202	Blood Spot Kit ID in LOINC 57711-4	Used when Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID) OBX is missing.	Missing required field	OBX for Unique bar code number of Initial sample	AR
101^Required field missing^HL70357	CCHD-FR0621A	Hospital Name for LOINC 57711-4	Used when Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID) OBX does not contain the Newborn Screening Hospital Name of the site that collected the Blood Spot in OBX-23.1	Missing required field	OBX for Unique bar code number of Initial sample	AE
101^Required field missing^HL70357	CCHD-FR0621B	Hospital Code for LOINC 57711-4	Used when Unique bar code number of Initial sample (Blood Spot Filter Paper Card ID) OBX does not contain the Newborn Screening Hospital Code of the site that collected the Blood Spot in OBX-23.10	• Missing required field • Invalided Newborn Screening Hospital Code in OBX-23.10	OBX for Unique bar code number of Initial sample	AE

Definitions

ERR-5 = From HL7 “Application specific code identifying the specific error that occurred.” These are the CCHD application error codes and are only meaning for to the CCHD application technical team and would support troubleshooting as to why the message received AR/AE. They also help to uniquely identify the error condition.

ERR-8 = From HL7 “The text message to be displayed to the application user.” These are additional “plain English” explanations of the error condition and are included to support troubleshooting by the submitter.

MSA-1 = From HL7 “This field contains an acknowledgment code.” These are to distinguish between “Non-Fatal Processing Errors” (AE) and “Fatal Processing Errors” (AR). “AE” messages are added to the CCHD application but are also flag as errors. CCHD staff may contact the submitter to investigate “AE” messages. “AR” messages are NOT added to the CCHD application and the submitter needs to correct the issue(s) and resubmit the message. In the case that multiple screenings are required for the infant, any “AR” errors must be corrected prior to the next screening/message being submitted. See Section 3.2 Error Conditions for more details.

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