NBS DATA EXCHANGE SPECIFICATION

LIST OF REVISIONS

REVISION NO.	DATE	REVISED BY:	PAGE/S	DESCRIPTION
1	TBD	GDSP	22	Initial Submission

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1.0 INTRODUCTION

The purpose of this document is to provide an encompassing description of the structure and content of the Newborn Screening (NBS) Results Health Information Exchange (HIE) interface. This data exchange is specific to the State of California's Genetic Disease Screening Program (GDSP) and concerns both the Results message authored by GDSP as well as the Acknowledgement generated by the health care provider.

The GDSP HIE NBS messages follow the Newborn Screening Coding and Terminology Guide released by Public Health Informatics Institute (PHII) and U.S. National Library of Medicine (NLM), with the following specifications:

- **Health Level 7 (HL7) v2.5.1:** The version of HL7 used to transmit Newborn Screening Results data
- **Logical Observation Identifiers Names and Codes (LOINC):** Standardized codes that are used to identify specific lab results or disorders
- **American Health Information Community (AHIC) NBS Panel:** Specifies the set of lab results or disorders to include in the HL7 NBS Results message

2.0 HIE HL7 FORMAT OVERVIEW

The purpose of this section is to provide a high-level overview of the structure of GDSP HIE HL7 messages, as well as introduce the coding systems used to convey health information.

2.1 MESSAGE TYPES

There are two message types utilized within the GDSP HIE system:

- **NBS Results (ORU^R01)**
- **Acknowledgement (ACK^R01)**

NBS Results are classified as an "Unsolicited Observation Message, Event R01" or ORU^R01^ORU_R01 message type. This particular communication form is reserved specifically for transmitting laboratory results to foreign systems.

The Acknowledgement is meant to reply directly to this type of message, and is of the type ACK^R01.

2.2 SEGMENT DEFINITIONS

Based on the NLM guide, the NBS Results HL7 message should contain two main sections.

- **Administrative Information:** contains information that describes the newborn specimen
- **AHIC Panel:** contains all laboratory test results for NBS

Section Name	Comments	Seq.	Segment Name
Administrative Information	Required, non–repeating	MSH	Message Header
		PID	Patient Identification
		NK1	Next of Kin
		ORC	Common Order
AHIC Panel	Optional, repeating	[{OBR}]	Observation Request
		[{OBX}]	Observation Result

Table 2.2.1: NBS Message Segment Organization (ORU^R01^ORU_R01)

Each individual segment captures a certain type of information within the message, allowing for organized transmission of data. In general, messages begin with clerical details necessary for proper storage of the information, followed by a brief summary of the communicated results, trailed by the actual data being transmitted.

Within the NBS Results message:

- **Message Header (MSH):** Provides guiding message details, such as sending/receiving party information, date/time of communication, test/production environment indicator etc.
- **Patient Identifier (PID):** Offers patient information, such as medical record ID's, name, sex, race, birth order, etc.
- **Next of Kin (NK1):** Includes mother's information, such as name, date of birth, address and phone number etc.
- **Common Order (ORC):** Provides common data applicable to all tests performed, including Test Result Form (TRF) number, hospital order number, clinician information, etc.
- **Observation Request (OBR):** Contains information about specific tests/diagnostic studies that is specific to an order or result (ex. Amino acid panel, SCID panel, Report summary etc.)
- **Observation Result (OBX):** Carries the actual value of measured and computed results from the diagnostic observation, including additional information like units, range etc.

The organization of the Acknowledgement message is quite similar; beginning with non-repeating "Administrative Information" and concluding with any recognized errors within the referenced Results message.

Section Name	Comments	Seq.	Segment Name
Administrative Information	Required, non–repeating	MSH	Message Header
Acknowledgement Type	Required, non–repeating	MSA	Message Acknowledgment
Message Errors	Optional, repeating	[{ERR}]	Error

Table 2.2.2: Acknowledgement Organization (ACK^R01)

Within the Acknowledgement message:

- **Message Header (MSH):** Provides information such as sending/receiving party, date/time of communication, message identifier etc.
- **Message Acknowledgement (MSA):** Acknowledges the referenced Results message
  - AA – accepted without errors
  - AE – accepted with errors
  - AR – rejected
- **Error (ERR):** Lists error codes/messages encountered while processing the Results message

2.3 SEGMENT ENCODING RULES

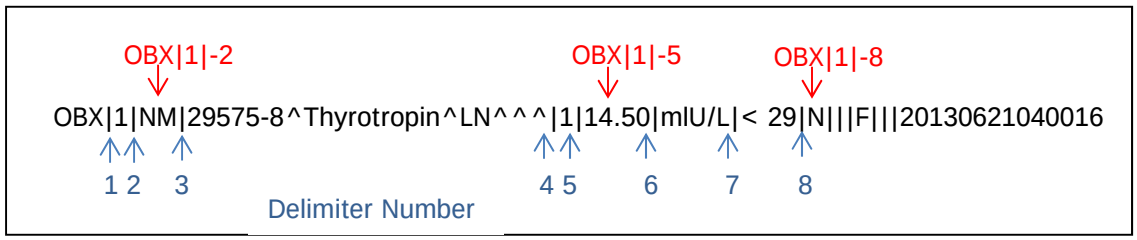

Figure 2.3.1: Field Separation Example Segment

Segment encoding rules are listed below:

- Segments always begin with a 3-character header (e.g. OBR, OBX, MSH, PID, NK1) that indicates segment type
- Segments always end with a carriage return character, indicated as <CR>
- Vertical bars or pipes (|) separate 2 adjacent data fields in a segment
- Hats (^) separate subfields
- Ampersands (&) separate subfield components
- Tildes (~) separate repeating values within a field

For segments that may be repeated more than once in a message (e.g. OBR, OBX, ERR) the first field carries the respective sequence number of that segment. The sequence number is a simple count that begins with 1, and maintains order when segments are repeated within a message.

The sequence numbers can also be nested, to show ownership of certain segments by another governing segment. For example, an OBR segment describing a test panel is usually followed by multiple OBX segments, which carry the bulk of the test results. This is illustrated below.

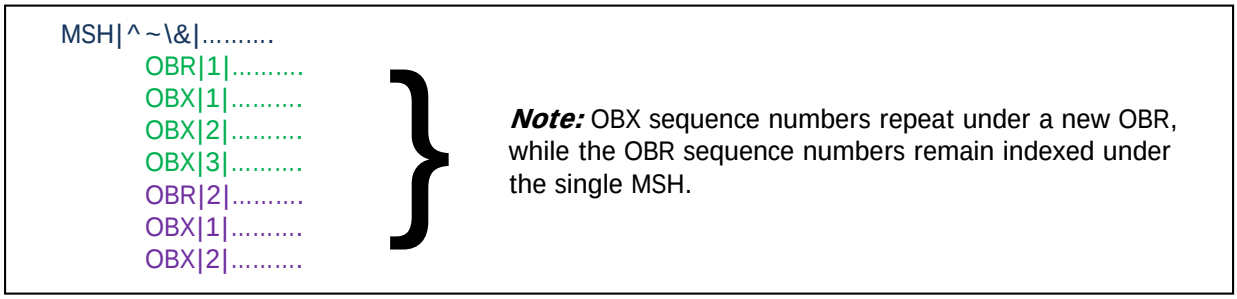

Figure 2.3.2: Segment Sequencing Example

2.4 LOINC AND LOCAL CODES

For the vast majority of NBS Results observations, GDSP utilizes the universal LOINC codes to identify specific lab results or disorders. However, the current Newborn Screening LOINC dictionary does not include codes for a few observed or computed analytes, requiring a custom local code in its absence.

The HL7 standard allows the transmission of *both* a LOINC and a local code with every observation, but GDSP protocol dictates the local code subfield is always left blank unless a LOINC code does not exist. Local codes are subfields of the 'Observation Identifier' field, OBX-3. The field format is as follows:

- LOINC-Code^Print-Text^LN^*Local-Code^Print-Text^L*

Below are examples of transmission of LOINC and Local codes.

- **LOINC Example:** OBX|4|ST|53160-8^Propionylcarnitine(C3)^LN^^^|1|5.17|umol/L|4.62-5.50|N|||F|||20090714074205
- **Local Code Example:** OBX|4|ST|^^^3403^C3^L|1|5.17|umol/L|4.62-5.50|N|||F|||20090714074205

Note that the LN identifier is used for a LOINC code; while L is used for a local code is present. The few cases in which a local code is needed have been identified, and are shown in Table 2.4.1 below.

Local Code	Local Code Description	Parent LOINC Code (OBR)	Parent Panel
99717-1	C05DC / C03DC Ratio	57085-3	Organic acid newborn screen panel
99717-2	Biotinidase	57087-9	Biotinidase newborn screening panel
99717-3	Arginine/Ornithine Ratio	53261-4	Amino acid newborn screen panel
99717-4	Ornithine/Citrulline Ratio	53261-4	Amino acid newborn screen panel
99717-5	CA Accession Number	57717-1	Newborn screen card data panel

Table 2.4.1: GDSP Local Codes and Parent Panels

2.5 ERROR CODES

GDSP utilizes the HL7 coding system to indicate errors identified within a NBS Results message. It is the HIE receiver's responsibility to identify the error, and then notify GDSP of this error within the Acknowledgement message structure. The error code is placed within the error segment as shown below:

- ERR|1|OBR-5|101^Missing Required field^HL70357

The list of all possible error codes is included below in Table 2.5.1.

Code	Name
0	Message accepted
100	Segment sequence error
101	Required field missing
102	Data type error
103	Table value not found
200	Unsupported message type
201	Unsupported event code
202	Unsupported processing id
203	Unsupported version id
204	Unknown key identifier
205	Duplicate key identifier
206	Application record locked
207	Application internal error

Table 2.5.1: Possible Error Codes

3.0 NBS RESULTS SEGMENT STRUCTURE

The purpose of this section is to describe segment by segment the format and content of the NBS Results message. GDSP only utilizes certain fields within the HL7-defined ORU^R01^ORU_R01 message type. This detailed breakdown, combined with the provided example messages and external resources, aims to sufficiently describe the HL7 Results message for use within GDSP HIE.

Please note that the Usage column outlines if a field is required (“R”), conditionally used depending on test results (“O”), or not supported/used by GDSP HIE, (“X”).

3.1 MESSAGE HEADER (MSH)

The Message Header segment is a required, non-repeating portion of the NBS Results message which provides guiding message details critical to the successful transmission of data. GDSP utilizes 10 fields within this segment, as shown below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	ST	Element Code	Message Header	MSH
1	R	ST	Field Separator	Field separator character	|
2	R	ST	Encoding Characters	Lists delimiters used	^~\&
3	R	HD	Sending Application	Will always be SISGDSP	SISGDSP
4	R	HD	Sending Facility	Will always be SISGDSP	SISGDSP
5	O	HD	Receiving Application	HIE Partner nomenclature(SISHIERECEIVER[^EntityId^L,M,N])	SISHIERECEIVER^11265318^L,M,N
6	O	HD	Receiving Facility	Residing clinician NPI number	^^L,M,N
7	R	TS	Date/Time Of Message	Date/time the sending application created the message	20130621040015
8	X	ST	Security		
9	R	MSG	Message Type	Message type, trigger event, and structure ID	ORU^R01^ORU_R01
10	R	ST	Message Control ID	Unique ID for the message	220274931
11	R	PT	Processing ID	T for test, P for production	P
12	R	VID	Version ID	Specifies HL7 version	2.5.1
13	X	NM	Sequence Number		
14	X	ST	Continuation Pointer		
15	X	ID	Accept Acknowledgment Type		
16	X	ID	Application Acknowledgment Type		
17	X	ID	Country Code		
18	X	ID	Character Set		
19	X	CE	Principal Language Of Message		
20	X	ID	Alternate Character Set Handling Scheme		

21	X	EI	Message Profile ID		

Table 3.1.1: Message Header Field Structure

Message Header Example:

MSH|^~\&|SISGDSP|SISGDSP|SISHIERECEIVER^11265318^L,M,N|^^L,M,N|20130621040015||ORU^R01^ORU_R01|220274931|T|2.5.1|||||||^||

3.2 PATIENT IDENTIFICATION (PID)

The Patient Identification segment is a required, non-repeating portion of the NBS Results message which provides permanent patient identifying and demographic information. GDSP utilizes 10 fields within this segment, which are highlighted in Table 3.2.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	SI	Element Code	Patient Identification	PID
1	R	SI	Set ID -PID	Will always be 1	1
2	X	CX	Patient ID		
3	R	CX	Patient Identifier List	Unique identifier for baby (e.g. Medical Record Number)	999004015^^^&NPI ^MR
4	X	CX	Alternate Patient ID – PID		
5	O	XPN	Patient Name	Baby's name(s), including aliases	GOMEZ^^^^^^B
6	X	XPN	Mother's Maiden Name		
7	R	DTM	Date/Time of Birth	Baby's date of birth	201303261026
8	O	IS	Administrative Sex	Baby's sex	F
9	X	XPN	Patient Alias		
10	O	CE	Race	Baby's race	2106-3^White
11	X	XAD	Patient Address		
12	X	IS	County Code		
13	X	XTN	Phone Number - Home		
14	X	XTN	Phone Number – Business		
15	X	CWE	Primary Language		
16	X	CWE	Marital Status		
17	X	CWE	Religion		
18	X	CX	Patient Account Number		
19	X	ST	SSN Number - Patient		
20	X	DLN	Driver's License Number – Patient		
21	X	CX	Mother's Identifier		
22	O	CWE	Ethnic Group	Baby's ethnicity	2186-5^Not Hispanic or Latino^^^^
23	X	ST	Birth Place		

Field	Usage	Data Type	Element Name	Description	Sample Data
24	O	ID	Multiple Birth Indicator	Y/N indicating birth multiplicity	N
25	O	NM	Birth Order	Incremental # for the order of birth the baby was born in	1
26	X	CWE	Citizenship		
27	X	CWE	Veterans Military Status		
28	X	CWE	Nationality		
29	X	DTM	Patient Death Date and Time		
30	X	ID	Patient Death Indicator		
31	X	ID	Identity Unknown Indicator		
32	X	IS	Identity Reliability Code		
33	X	DTM	Last Update Date/Time		
34	X	HD	Last Update Facility		
35	X	CWE	Species Code		
36	X	CWE	Breed Code		
37	X	ST	Strain		
38	X	CWE	Production Class Code		
39	X	CWE	Tribal Citizenship		

Table 3.2.1: Patient Identification Field Structure

Patient Identification Example:

PID|1||999004015^^^&NPI^MR||GOMEZ^^^^^^^B||201303261026|F||2106-3^White||||||||||||2186-5^Not Hispanic or Latino^^^^||N|1

3.3 NEXT OF KIN (NK1)

The Next of Kin segment is a required, non-repeating portion of the NBS Results message which provides identifying information for the mother. GDSP utilizes 6 fields within this segment, which are highlighted in Table 3.3.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	SI	Element Code	Next of Kin	NK1
1	R	SI	Set ID - NK1	Will always be 1	1
2	R	XPN	Name	Baby's mother's name	GOMEZ^LALA
3	R	CWE	Relationship	Will always be mother	MTH^Mother
4	O	XAD	Address	Address of the mother	2592 DUET DR, # APT125&^^W SACRAMENTO^CA^9

Field	Usage	Data Type	Element Name	Description	Sample Data
					5691-4520^USA
5	O	XTN	Phone Number	Phone number of mother	^^^^^916^3720117
6	X	XTN	Business Phone Number		
7	X	CE	Contact Role		
8	X	DT	Start Date		
9	X	DT	End Date		
10	X	ST	Next of Kin / Associated Parties Job Title		
11	X	JCC	Next of Kin / Associated Parties Job Code/Class		
12	X	CX	Next of Kin / Associated Parties Employee Number		
13	X	XON	Organization Name - NK1		
14	X	CE	Marital Status		
15	X	IS	Administrative Sex		
16	O	TS	Date/Time of Birth	Date of mother's birth	19770926
17	X	IS	Living Dependency		
18	X	IS	Ambulatory Status		
19	X	CE	Citizenship		
20	X	CE	Primary Language		
21	X	IS	Living Arrangement		
22	X	CE	Publicity Code		
23	X	ID	Protection Indicator		
24	X	IS	Student Indicator		
25	X	CE	Religion		
26	X	XPN	Mother's Maiden Name		
27	X	CE	Nationality		
28	X	CE	Ethnic Group		
29	X	CE	Contact Reason		
30	X	XPN	Contact Person's Name		
31	X	XTN	Contact Person's Telephone Number		
32	X	XAD	Contact Person's Address		

Field	Usage	Data Type	Element Name	Description	Sample Data
33	X	CX	Next of Kin/Associated Party's Identifiers		
34	X	IS	Job Status		
35	X	CE	Race		
36	X	IS	Handicap		
37	X	ST	Contact Person Social Security Number		
38	X	ST	Next of Kin Birth Place		
39	X	IS	VIP Indicator		

Table 3.3.1: Next of Kin Field Structure

Next of Kin Example:

NK1|1|GOMEZ^LALA|MTH^Mother|2592 DUET DR, # APT125&^^W SACRAMENTO^CA^95691-4520^USA|^^^^^916^3720117||||||||||19770926

3.4 COMMON ORDER (ORC)

The Common Order segment is a required, non-repeating portion of the NBS Results message which is used to transmit information that is common to all orders. GDSP utilizes 7 fields within this segment, which are highlighted in Table 3.4.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	SI	Element Code	Common Order	ORC
1	R	ID	Order Control	Will always be RE	RE
2	R	EI	Placer Order Number	Form Number, as specified on the TRF for blood sample	8887008015^FormNumber
3	X	EI	Filler Order Number		
4	R	EI	Placer Group Number	Hospital's Patient Identifier Number, if provided on Test Request Form (TRF)	W12312312^HospOrderNum
5	X	ID	Order Status		
6	X	ID	Response Flag		
7	X	TQ	Quantity/Timing		
8	X	EIP	Parent		
9	X	TS	Date/Time of Transaction		
10	X	XCN	Entered By		
11	X	XCN	Verified By		
12	O	XCN	Ordering Provider	Clinician name and NPI number ordering the laboratory test	11356370^CUNNINGHAM^REBECCA^^^^^^^NPI

Field	Usage	Data Type	Element Name	Description	Sample Data
13	X	PL	Enterer's Location		
14	X	XTN	Call Back Phone Number		
15	X	TS	Order Effective Date/Time		
16	X	CE	Order Control Code Reason		
17	X	CE	Entering Organization		
18	X	CE	Entering Device		
19	X	XCN	Action By		
20	X	CE	Advanced Beneficiary Notice Code		
21	R	XON	Ordering Facility Name	Name and code of the facility placing the order message	SCRIPPS MERCY HOSPITAL^^^^^^^^^^R498
22	R	XAD	Ordering Facility Address	Address of the facility placing the order message	1809 National Avenue&^^San Diego^CA 92113^
23	O	XTN	Ordering Facility Phone Number	Phone number of the facility placing the order message	^^^^^619^5152300
24	X	XAD	Ordering Provider Address		
25	X	CE	Order Status Modifier		
26	X	CE	Advanced Beneficiary Notice Override Reason		
27	X	TS	Filler's Expected Availability Date/Time		
28	X	CE	Confidentiality Code		
29	X	CE	Order Type		
30	X	CNE	Enterer Authorization Mode		
31	X	CE	Parent Universal Service Identifier		

Table 3.4.1: Common Order Field Structure

Common Order Example:

ORC|RE|8887008015^FormNumber||^|||||||^LIN^ERIN^^^^^^^^|||||||||SCRIPPS MERCY HOSPITAL^^^^^^^^^R498|1809 National Avenue&^^San Diego^CA 92113^|^^^^^619^5152300

3.5 OBSERVATION REQUEST (OBR)

The Observation Request segment is an optional, repeating portion of the NBS Results message which conveys information specific to a certain diagnostic test. GDSP utilizes 8 fields within this segment, which are highlighted in Table 3.5.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	SI	Element Code	Observation Request	OBR
1	R	SI	Set ID - OBR	Sequence Number of OBR	5
2	R	EI	Placer Order Number	Form Number, as specified on the TRF for blood sample	8887008015^FormNumber
3	X	EI	Filler Order Number		
4	R	CE	Universal Service ID	Code for the specific Observation Request	53261-4^Amino acid newborn screen panel^^^^
5	X	ID	Priority - OBR		
6	X	TS	Requested Date/Time		
7	O	TS	Observation Date/Time #	Specimen collection date/time	201008072055
8	X	TS	Observation End Date/Time #		
9	X	CQ	Collection Volume		
10	X	XCN	Collector Identifier		
11	X	ID	Specimen Action Code		
12	X	CE	Danger Code		
13	X	ST	Relevant Clinical Info.		
14	O	TS	Specimen Receiver Date/Time	Transfusion date	201303271026
15	X	SPS	Specimen Source		
16	R	XCN	Ordering Provider	Provider ordering the laboratory test (Clinician with NPI)	11356370^CUNNINGHAM^REBECCA^^^^^^^NPI
17	X	XTN	Order Callback Phone Number		
18	X	ST	Place Field 1		
19	X	ST	Place Field 2		
20	X	ST	Filler Field 1		
21	X	ST	Filler Field 2		
22	R	TS	Message generation time - Date/Time	Time when the message was generated	20130621040016
23	X	MOC	Charge To Practice		
24	X	ID	Diagnostic Serv Set ID		
25	R	ID	Result Status	Will always be F – Final	F
26	X	PRL	Parent Result		
27	X	TQ	Quantity/Timing		
28	X	XCN	Result Copies To		
29	X	EIP	Parent ID		
30	X	ID	Transportation Mode		

Field	Usage	Data Type	Element Name	Description	Sample Data
31	X	CE	Reason for Study		
32	X	NDL	Principal result Interpreter		
33	X	NDL	Assistant Result Interpreter		
34	X	NDL	Technician		
35	X	NDL	Transcriptionist		
36	X	TS	Scheduled Date/Time		
37	X	NM	Number of Sample Containers		
38	X	CE	Transport Logistics of Collected Sample		
39	X	CE	Collector's Comment		
40	X	CE	Transport Arrangement Responsibility		
41	X	ID	Transport Arranged		
42	X	ID	Escort Required		
43	X	CE	Planned Patient Transport Comment		
44	X	CE	Procedure Code		
45	X	CE	Procedure Code Modifier		
46	X	CE	Placer Supplemental Service Information		
47	X	CE	Filler Supplemental Service Information		
48	X	CE	Medically Necessary Duplicate Procedure Reason		
49	X	IS	Result Handling		
50	X	CE	Parent Universal Service Identifier		

Table 3.5.1: Observation Request Field Structure

Observation Request Examples:

OBR|2|8887008015^FormNumber||57128-1^Newborn Screening Report summary panel^^^^|||201303271026|||||||^LIN^ERIN^^^^^^|||||20130621040016|||F

OBR|5|8887008015^FormNumber||53261-4^Amino acid newborn screen panel^^^^|||201303271026|||||||^LIN^ERIN^^^^^^|||||20130621040016|||F

A list of the different NBS Data Sets covered within an NBS Results Message, as well as the corresponding Sequence Number and Universal Service ID, can be found in Table 3.5.2 below.

Sequence Number	Panel Name	Universal Service ID
1	Report Type	54089-8
2	Report Summary	57128-1
3	Screen Card Data Panel	57717-1
4	Newborn Screening Panel	57794-0
5	Amino Acid Panel	53261-4
6	Acylcarnitine Panel	58092-8
7	Fatty Acid Panel	57084-6
8	Organic Acid Panel	57085-3
9	Cystic Fibrosis Panel	54078-1
10	CAH Panel	57086-1
11	Thyroid Panel	54090-6
12	Galactosemia Panel	54079-9
13	Hemoglobinopathies Panel	54081-5
14	Biotinidase Panel	57087-9
15	SCID Panel	62333-0

Table 3.5.2: Observation Request Segment Order

3.6 OBSERVATION RESULT (OBX)

The Observation Result segment is an optional, repeating segment of the NBS Results message which conveys a single observation fragment specific to a certain diagnostic test. Each OBX segment has a parent OBR segment, to which the communicated result belongs. Only 13 of the 15 OBR segments within the NBS Results message have trailing OBX's, but there can be numerous Result segments under a single Observation Request. GDSP utilizes 10 fields within this segment, which are highlighted in Table 3.6.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	SI	Element Code	Observation Result	OBX
1	R	SI	Set ID - OBR	Sequence Number of OBX	18
2	R	ID	Value Type	Data type of Observation value	NM
3	R	Variable	Observation Identifier	Unique identifier for the observation	47732-3^Proline [Moles/volume] in Dried blood spot^LN^^^
4	R	ST	Observation Sub-ID	Secondary Sequence Number if OBX-3 is repeated under an OBR	1
5	O	Variable	Observation Value	Result of the observation	750
6	O	CE	Units	Units of the Observation Value, blank if units do not apply	µmol/L
7	O	ST	Reference Range	Interpretation range that applies to the Observation Value, blank if range does not apply	< 1500
8	R	IS	Abnormal Flags	Indicator of result normalcy	N
9	X	NM	Probability		

Field	Usage	Data Type	Element Name	Description	Sample Data
10	X	ID	Nature of Abnormal Test		
11	R	ID	Observation Result Status	Will always be F – Final	F
12	X	TS	Effective Date of Ref. Range Values		
13	X	ST	User Defined Access Checks		
14	R	TS	Message generation time - Date/Time	Time when the message was generated	20130621040016
15	X	CE	Producer's Reference		
16	X	XCN	Responsible Observer		
17	X	CE	Observation Method		
18	X	EI	Equipment Instance Identifier		
19	X	TS	Date/Time of the Analysis		
20	X		Reserved for V2.6		
21	X		Reserved for V2.6		
22	X		Reserved for V2.6		
23	X	XON	Performing Org. Name		
24	X	XAD	Performing Org. Address		
25	X	XCN	Performing Org. Medical Director		

Table 3.6.1: Observation Result Field Structure

Observation Result Examples:

OBX|1|NM|^^^99717-2^Biotinidase^L|1|15.00|ERU|>10|N|||F|||20130621040016

OBX|3|TM|57715-5^Time of birth^LN^^^|1|1026|||N|||F|||20130621040016

4.0 ACKNOWLEDGEMENT SEGMENT STRUCTURE

The purpose of this section is to describe segment by segment the format and content of the Acknowledgment message, which is in response to the NBS Results message. GDSP utilizes the HL7-defined ACK^R01 message type. This detailed breakdown, combined with the provided example messages and external resources, aims to sufficiently describe the Acknowledgement message for use within GDSP HIE.

Please note that Usage column outlines if a field is required (“R”), conditionally used depending on test results (“O”), or not supported in GDSP HIE, (“X”).

4.1 MESSAGE HEADER (MSH)

The Message Header segment is a required, non-repeating segment of the Acknowledgement message which provides message routing details critical to the successful transmission of data. GDSP utilizes 10 fields within this segment, which are highlighted in Table 4.1.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	ST	Segment Code	Message Header	MSH
1	R	ST	Field Separator	Field separator character	|
2	R	ST	Encoding Characters	Lists delimiters used	^~\&
3	R	HD	Sending Application	HIE Partner nomenclature	SISHIERECEIVER^9414049^L,M,N
4	R	HD	Sending Facility	Residing clinician NPI number	^97854631^L,M,N
5	R	HD	Receiving Application	Will always be SISGDSP	SISGDSP
6	R	HD	Receiving Facility	Will always be SISGDSP	SISGDSP
7	R	TS	Date/Time Of Message	Date/time of message creation	20130612211009
8	X	ST	Security		
9	R	MSG	Message Type	Message type, trigger event, and structure ID	ACK^R01^ACK OR ACK^R01
10	R	ST	Message Control ID	Unique ID for the message	220261238
11	R	PT	Processing ID	T for test, P for production	P
12	R	VID	Version ID	Specifies HL7 version	2.5.1
13	X	NM	Sequence Number		
14	X	ST	Continuation Pointer		
15	X	ID	Accept Acknowledgment Type		
16	X	ID	Application Acknowledgment Type		
17	X	ID	Country Code		
18	X	ID	Character Set		
19	X	CE	Principal Language Of Message		
20	X	ID	Alternate Character Set Handling Scheme		
21	X	EI	Message Profile ID		

Table 4.1.1: Message Header Field Structure

Message Header Example:

MSH|^~\&|SISHIERECEIVER^9414049^L,M,N|^97854631^L,M,N|SISGDSP|SISGDSP|20130612211009||ACK^R01|220261238|P|2.5.1|||||||^||

4.2 MESSAGE ACKNOWLEDGEMENT (MSA)

The Message Acknowledgement segment is a required, non-repeating portion of the Acknowledgement message which acknowledges the referenced Results message. GDSP utilizes 2 fields within this segment, which are highlighted in Table 4.2.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	ST	Segment Code	Message Acknowledgement	MSA
1	R	ID	Acknowledgement Code	AA – accepted without errors AE – accepted with errors AR - rejected	AE
2	R	ST	Message Control ID	Unique ID for referenced Results message, found in MSH-9	220274233
3	X	ST	Text Message		
4	X	NM	Expected Sequence Number		
5	X		Delayed Acknowledgement Type		
6	X	CE	Error Condition		

Table 4.2.1: Message Acknowledgement Field Structure

Message Acknowledgement Example:

MSA|AE|220274233||||

4.3 ERROR (ERR)

The Error segment is an optional, repeating portion of the Acknowledgement message which lists error codes and messages encountered while processing the Results message. This segment is required if the Acknowledgement Code within the previous MSA segment is Acknowledgement Error (AE) or Acknowledgement Rejected (AR). GDSP utilizes 3 fields within this segment, which are highlighted in Table 4.3.1 below.

Field	Usage	Data Type	Element Name	Description	Sample Data
0	R	ST	Segment Code	Error	ERR
1	R	SI	Set ID - ERR	Sequence Number of ERR	1
2	O	ERL	Error Location	Location of error in NBS Results message, if error involves entire message, leave blank	OBR-5
3	O	CWE	HL7 Error Code	Unique error code as defined by the HL7 standard	207^Please see ERR.8 for

Field	Usage	Data Type	Element Name	Description	Sample Data
					details^HL70357
4	O	ID	Severity	Code which represents severity of the error	E
5	X	CWE	Application Error Code		
6	X	ST	Application Error Parameter		
7	X	TX	Diagnostic Information		
8	O	TX	User Message	Optional explanatory text	Ordering provider NPI is missing.
9	X	IS	Inform Person Indicator		
10	X	CWE	Override Type		
11	X	CWE	Override Reason Code		
12	X	XTN	Help Desk Contact Point		

Table 4.3.1: Error Field Structure

Error Example:

ERR|1||207^Please see ERR.8 for details^HL70357|E||||Ordering provider NPI is missing. |

5.0 APPENDIX

The purpose of this section is to provide information and guidance regarding the additional resources available for participation within GDSP HIE. These resources, in conjunction with this Data Exchange Specification, should assist in providing a comprehensive understanding of the NBS Results transfer via HL7 v2.5.1 standard.

5.1 SAMPLE HL7 MESSAGES

These example messages are included within the Onboarding Package, and illustrate a fully assembled HL7 message for use within GDSP HIE. The NBS Results Sample Message may be used for acceptance testing, to illustrate how fields are parsed into organized data. Provider-generated Acknowledgements may be compared to the Acknowledgment Sample message for field accuracy. These Samples may also be run through the provided software tools to illustrate how a message is properly constructed or deconstructed.

5.2 TOOLS

Two tools are included within the Onboarding Package that can be used to revise and correct any inconsistencies in HL7 message processing.

- **NBS Results Message Generator** – Assists user in generating a properly formatted HL7 NBS message, so that it may be used in acceptance testing
- **Acknowledgement Message Validation** – Verifies that a user-generated acknowledgment message is acceptable by GDSP SIS

These tools cover both aspects of a provider's role while participating in GDSP HIE: accepting NBS Results by parsing the information successfully, and generating a properly formatted Acknowledgement for acceptance by SIS. While these are not the only two requirements for successful onboarding to HIE, they are critical steps to a smooth transition into this data exchange program.

5.3 REFERENCE MATERIALS

GDSP has collected some of the most relevant HL7 documentation for inclusion within the Onboarding Package. Some of these describe LOINC codes applicable to NBS Results; others provide a more detailed breakdown of HL7 message structure. These documents should be used as needed to supplement GDSP literature, but keep in mind they are not specific to HIE in any way.

Author	Website	Document	Description
NLM	http://www.nlm.nih.gov/	HL7 Message Guidance	Provides further guidance on NBS message structure and components
		NBS Code List	Lists forms, LOINC codes, and answers applicable to NBS
		Error Conditions Code List	Lists acknowledgement error codes and supporting information
PHII	www.phii.org	NBS Implementation Guide	Describes current HL7 applications to NBS, and EHR business process flow
AHIC	none	NBS LOINC Code List	Lists LOINC codes involved in the NBS panel and their name, data type, etc.

Table 5.3.1: Reference Material