



State Bureau Lab Orders-Results Implementation Guide

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Table of Contents

Acronyms and Abbreviations Guide.....	1
Definitions	2
1. Introduction.....	8
1.1 Purpose of Use Case	8
1.2 Message Content.....	8
1.3 Data Flow and Actors	9
2 Standard Overview	10
2.1 Message Format.....	10
3 Onboarding Process.....	11
3.1 Initial Onboarding.....	11
3.1.1 Initial Legal Process.....	11
3.1.2 Initial Technical Connectivity Process	11
3.2 Onboarding Additional Sending Facilities.....	12
4 Specifications.....	13
4.1 Message Trigger Events	13
4.2 General Message Requirements	13
4.3 Specific Segment and Field Definitions	13
4.3.1 Segment 1 – Message Header	13
4.3.2 All Remaining Segments	14
5 Troubleshooting.....	15
5.1 Production Support.....	15
6 Legal Advisory Language	16
Appendix A: Message Examples.....	18
Blood Spot Order Message Example	18
Blood Spot Result Message Example	19



Acronyms and Abbreviations Guide

ACRS®	Active Care Relationship Service®
API	Application Programming Interface
DQA	Data Quality Assurance
DSA	Data Sharing Agreement
DICOM	Digital Imaging and Communications in Medicine
EHR	Electronic Health Record
EP	Eligible Professional
FHIR	Fast Healthcare Interoperability Resources
HIE	Health Information Exchange
HIN	Health Information Network
HITSP	Health Information Technology Standards Panel
HL7	Health Level Seven
HPD	Health Provider Directory
IHE	Integrating the Healthcare Enterprise
MDHHS	Michigan Department of Health and Human Services
MIDIGATE	Medical Information Direct Gateway
MiHIN	Michigan Health Information Network Shared Services
MU	Meaningful Use
NwHIN	Nationwide Health Information Network
OID	Object Identifier

PO	Participating Organization
REST	Representational State Transfer
SOAP	Simple Object Access Protocol
SOM	State of Michigan
SCD	Statewide Consumer Directory
TDSO	Trusted Data Sharing Organization
UCS	Use Case Summary
URL	Uniform Resources Locators
VPN	Virtual Private Network
XCA	Cross Community Access
XDR	Cross-Enterprise Document Reliable Interchange
XML	Extensible Markup Language



Definitions

Active Care Relationship (ACR). (a) For health providers, a patient who has been seen by a provider within the past 24 months, or is considered part of the health provider's active patient population they are responsible for managing, unless notice of termination of that treatment relationship has been provided to MiHIN; (b) for payers, an eligible member of a health plan; (c) an active relationship between a patient and a health provider for the purpose of treatment, payment and/or healthcare operations consistent with the requirements set forth in HIPAA; (d) a relationship with a health provider asserted by a consumer and approved by the health provider; or (e) any person or TDSO authorized to receive message content under an exhibit which specifies that an ACR may be generated by sending or receiving message content under that exhibit. ACR records are stored by MiHIN in the ACRS.

Active Care Relationship Service (ACRS). The MiHIN infrastructure service that contains records for those TDSOs, their participating organizations participants or any health providers who have an active care relationship with a patient.

Applicable Laws and Standards. In addition to the definition set forth in the Data Sharing Agreement, the federal Confidentiality of Alcohol and Drug Abuse Patient Records statute, section 543 of the Public Health Service Act, 42 U.S.C. 290dd-2, and its implementing regulation, 42 CFR Part 2; the Michigan Mental Health Code, at MCLA §§ 333.1748 and 333.1748a; and the Michigan Public Health Code, at MCL § 333.5131, 5114a.

C32. HITSP Summary Documents Using HL7 Continuity of Care Document Component - http://www.hitsp.org/ConstructSet_Details.aspx?&PrefixAlpha=4&PrefixNumeric=32.

Caregiver. An individual such as a health professional or social worker who assists in the identification, prevention or treatment of an illness or disability.

Data Sharing Agreement. Any data sharing organization agreement signed by both MiHIN and a participating organization. Data sharing organization agreements include but are not limited to: Qualified Data Sharing Organization Agreement, Virtual Qualified Data Sharing Organization Agreement, Consumer Qualified Data Sharing Agreement, Sponsored Shared Organization Agreement, State Sponsored Sharing Organization Agreement, Direct Data Sharing Organization Agreement, Simple Data Sharing Organization Agreement, or other data sharing organization agreements developed by MiHIN.

Digital Imaging and Communications in Medicine (DICOM). "A standard for handling, storing, printing, and transmitting information in medical imaging."¹

eHealth Exchange. See the definition for Sequoia Project.

¹ "DICOM," *Wikipedia.org*, accessed May, 1, 2017, <https://en.wikipedia.org/wiki/DICOM>

Electronic Address. A string that identifies the transport protocol and end point address for communicating electronically with a recipient. A recipient may be a person, organization or other entity that has designated the electronic address as the point at which it will receive electronic messages. Examples of an electronic address include a secure email address (Direct via secure SMTP) or secure URL (SOAP / XDR / REST / FHIR). Communication with an electronic address may require a digital certificate or participation in a trust bundle.

Electronic Medical Record or Electronic Health Record (EMR/EHR). A digital version of a patient's paper medical chart.

Eligible Professional (EP). An Eligible Professional as defined under the Medicare and Medicaid EHR Incentive Programs.

End Point. An instance of an electronic address or ESI.

Exhibit. Collectively, a use case exhibit or a pilot activity exhibit.

Health Level 7 (HL7). An interface standard and specifications for clinical and administrative healthcare data developed by the Health Level Seven organization and approved by the American National Standards Institute (ANSI). HL7 provides a method for disparate systems to communicate clinical and administrative information in a normalized format with acknowledgement of receipt

Health Information. Any information, including genetic information, whether oral or recorded in any form or medium, that (a) is created or received by a health provider, public health authority, employer, life insurer, school or university, or healthcare clearinghouse; and (b) relates to the past, present, or future physical or mental health or condition of an individual; the provision of health care to an individual; or the past, present, or future payment for the provision of health care to an individual.

Health Information Network (HIN). An organization or group of organizations responsible for coordinating the exchange of protected health information (PHI) in a region, state, or nationally.

Health Plan. An individual or group plan that provides, or pays the cost of medical care (as “group health plan” and “medical care” are defined in section 2791(a)(2) of the Public Health Service Act, 42 U.S.C. 300gg-91(a)(2)). Health plan further includes those entities defined as a health plan under HIPAA, 45 C.F.R 160.103.

Health Professional means (a) any individual licensed, registered, or certified under applicable Federal or State laws or regulations to provide healthcare services; (b) any person holding a nonclinical position within or associated with an organization that provides or coordinates healthcare or healthcare related services; and (c) people who contribute to the gathering, recording, processing, analysis or communication of health information. Examples include, but are not limited to, physicians, physician assistants, nurse practitioners, nurses, medical assistants, home health professionals, administrative assistants, care managers, care coordinators, receptionists and clerks.



Health Provider means facilities/hospitals, health professionals, health plans, caregivers, pharmacists/other qualified professionals, or any other person or organization involved in providing healthcare.

Immunization Information System (IIS). A registry that stores immunization records.

Integrating the Healthcare Enterprise. An initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information (<http://www.ihe.net/>). IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical needs in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement, and enable care providers to use information more effectively. The NwHIN specifications utilize underlying IHE specifications for various services for health data exchange

Meaningful Use. Using certified EHR technology to improve quality, safety and efficiency of healthcare, and to reduce health disparities as further contemplated by title XIII of the the American Recovery and Reinvestment Act of 2009.

Message. A mechanism for exchanging message content between the participating organization to MiHIN services, including query and retrieve.

Message Content. Information, as further defined in an Exhibit, which is sent, received, found or used by a participating organization to or from MiHIN services. Message content includes the message content header.

Message Header (“MSH”) or Message Content Header. The MSH segment present in every HL7 message type that defines the Message’s source, purpose, destination, and certain syntax specifics such as delimiters (separator characters) and character sets. It is always the first segment in the HL7 message, with the only exception being HL7 batch messages.

Michigan Care Improvement Registry (MCIR). The IIS for the State of Michigan operated by the Michigan Department of Health and Human Services (MDHHS).

Michigan Health Information Network Shared Services. The MiHIN for the State of Michigan.

MiHIN Infrastructure Service. Certain services that are shared by numerous use cases. MiHIN infrastructure services include, but are not limited to, Active Care Relationship Service (ACRS), Health Directory, Statewide Consumer Directory (SCD), and the Medical Information DIrect GATEway (MIDIGATE®).

MiHIN Services. The MiHIN infrastructure services and additional services and functionality provided by MiHIN allowing the participating organizations to send, receive, find, or use information to or from MiHIN as further set forth in an exhibit.

Nationwide Health Information Network (NwHIN). See the definition for Sequoia Project.



Nationwide Health Information Organizations (NHIO). Nodes on the eHealth Exchange that use the NwHIN web services to facilitate exchange of information with other nodes in the network.

NwHIN Authorization Framework Specification. The purpose of this specification is to define the required exchange of information describing the initiator of a request between HIOs participating in the eHealth Exchange network. This enables a responding NHIO to evaluate the request based on the initiating NHIOs assertions and its own local policies and permissions.

NwHIN Document Submission (DS) Web Service Interface Specification. The purpose of this specification is to provide the ability to “send” data for a given patient from an exchange partner to an HIE using configuration on the sender side.

NwHIN Gateway. An implementation of the Nationwide Health Information Network specified web service interfaces. These web service interfaces communicate over secured HTTPS using Public Key Infrastructure supported by the NwHIN Operational Infrastructure.

NwHIN Interface. An implementation of the NwHIN specified web service interfaces. These web service interfaces communicate over secured HTTPS using Public Key Infrastructure supported by the NwHIN Operational Infrastructure.

NwHIN Messaging Platform Specifications The purpose of this specification is to define a base set of messaging standards and web service protocols which must be implemented by each node in the eHealth Exchange network and applies to all eHealth Exchange transactions.

NwHIN Patient Discovery Web Service Interface Specification. The purpose of this specification is to define the mechanism by which one eHealth Exchange node can query another to reciprocally establish patient identity and to determine if a node may be a source of information for a specific patient.

NwHIN Query for Documents Web Service Interface Specification. The purpose of this specification is to define the mechanism by which an initiating eHealth Exchange node can request a patient-specific list of available documents from a responding node using the patient ID obtained by a prior Patient Discovery transaction.

NwHIN Retrieve Documents Web Service Interface Specification. The purpose of this specification is to define the mechanism by which an Initiating eHealth Exchange node can retrieve specific documents from a responding node using the Document Reference IDs obtained using a prior Query for Documents transaction.

Notice. A message transmission that is not message content and which may include an acknowledgement of receipt or error response, such as an ACK or NACK.

Pilot Activity. The activities set forth in the applicable exhibit and typically includes sharing message content through early trials of a new use case that is still being defined and is still under development and which may include participating organization



feedback to MiHIN to assist in finalizing a use case and use case exhibit upon conclusion of the pilot activity.

Principal. A person or a system utilizing a federated identity through a federated organization.

REST. REST stands for Representational State Transfer, which is an architectural style, and an approach to communications that is often used in the development of web services.

Sequoia Project, The. An organization that manages the nationwide network formerly known as NwHIN now called eHealth Exchange, which uses a set of standards, services and policies that enable secure health information exchange (HIE) over the Internet

SOAP. SOAP originally defined as Simple Object Access Protocol is a lightweight protocol intended for exchanging structured information in a decentralized, distributed environment. It uses XML technologies to define an extensible messaging framework providing a message construct that can be exchanged over a variety of underlying protocols. The framework has been designed to be independent of any particular programming model and other implementation specific semantics. For the eHealth Exchange to be a truly scalable, secure and interoperable network, a common transport layer is essential. The messaging platform is based on SOAP 1.2 messages over HTTP.

Specifications. Specifications provide a standard set of service interfaces that enable the exchange of interoperable health information among the health information exchanges.

Statewide Consumer Directory (SCD). A MiHIN infrastructure service that helps organizations provide tools to consumers, which allow the consumers to manage how their personal Health Information can be shared and used. The Statewide Consumer Directory is essentially a Software Development Kit (SDK) with a robust set of APIs that can be used by consumer-facing applications that enable consumers to take an active role in viewing and editing their preferences for how their health information is shared.

Trusted Data Sharing Organization (TDSO). An organization that has signed any form of agreement with MiHIN for data sharing.

Use Case. (a) A use case agreement previously executed by a participating organization; or (b) the use case summary, use case exhibit and a use case implementation guide that participating organization or TDSO must follow to share specific message content with the MiHIN.

Use Case Exhibit. The legal agreement attached as an exhibit to the master use case agreement that governs participation in any specific use case.

Use Case Implementation Guide (UCIG). The document providing technical specifications related to message content and transport of message content between participating organization, MiHIN, and other TDSOs. use case implementation guides are made available via URLs in exhibits.



Use Case Summary. The document providing the executive summary, business justification and value proposition of a use case. Use case summaries are provided by MiHIN upon request and via the MiHIN website at www.mihin.org.

XCA. The IHE (Integrating the Healthcare Enterprise®) standard for Cross-Community Access which provides specifications to query and retrieve patient relevant health information held by other communities.



1. Introduction

1.1 Purpose of Use Case

Allows participants to electronically and efficiently deliver demographic and test order information for specimens that were sent to the state lab for testing, and in turn receive the results of those tests much more quickly

Under certain circumstances lab specimens, such as blood spot samples, are sent to a state's bureau of laboratories for testing. These specimens are typically sent along with requests to receive lab results as soon as possible.

Processing these requests quickly can be critical. Newborn screening labs such as blood spot can detect life-changing and, often, life-threatening genetic and metabolic disorders. The results can lead to immediate treatments for conditions such as:

- Phenylketonuria
- Cystic fibrosis
- Sickle cell disease

Enabling electronic result delivery from state laboratory systems gives providers faster access to results so they can act on that information in an optimal window for effective treatment. Benefits include:

- Quickly and efficiently identifying and addressing threats to public health
- Allowing primary care providers to promptly review results within the context of the patient's history and treatment plan

This scenario allows for that more rapid and efficient delivery of lab results to providers by re-using the same technology already in place for transporting and delivering other types of public health information (i.e., immunizations, reportable labs, and syndromic surveillance messages). Lab results flow through the same electronic pathways but in this case from the state to providers.

This scenario also allows for implementation of a broad Health Level 7 (HL7) messaging process for test order receipt and test outcome delivery from the state bureau of laboratories.

1.2 Message Content

For this use case, Message Content means HL7 2.xx, OML^021 for a lab order. Message content means HL7 2.xx, ORU^ R01 for a lab result. Message content means HL7 2.xx ORL^022 for lab order acceptance (dependent on orders originating system).



1.3 Data Flow and Actors

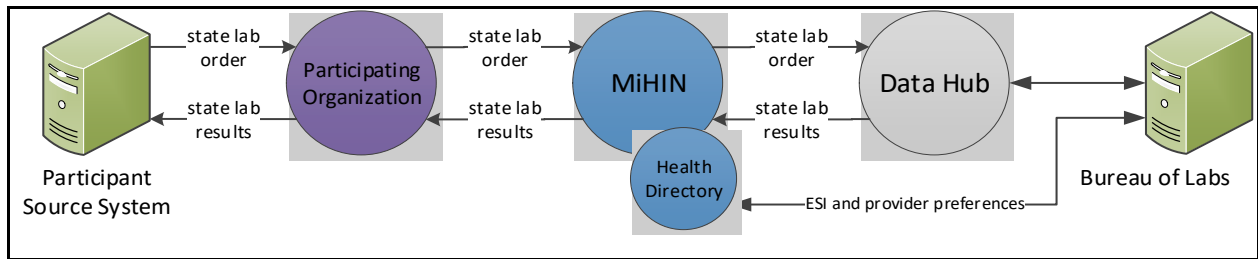


Figure 1. Data flow to send lab orders to state bureau of labs and receive results

1. Ordering provider sends lab order to the state's health information network (HIN) via a trusted data sharing organization (participating organization)
2. HIN routes order to a bureau of labs via the state's data hub
3. When lab results are ready, the bureau queries the state's Health Directory to obtain electronic service information (ESI) and preferences for ordering provider and any copied provider(s)
4. Bureau adds ESI to the lab results message and routes to HIN via the state's data hub
5. HIN routes the results to ordering provider and copied provider based on ESI

For more information about this use case, refer to the documents linked below:

<https://mihin.org/state-bureau-lab-orders-results/>



2 Standard Overview

2.1 Message Format

Current message formats supported by the state bureau of labs are HL7 v2.5.1 (preferred) and HL7 v2.3.1. Future versions of HL7 messages may be implemented and supported, such as Fast Healthcare Interoperability Resources (FHIR). For more information, refer to this website:

<http://www.hl7.org/implement/standards/fhir>

Examples of order and result messages can be found in Appendix A.



3 Onboarding Process

3.1 Initial Onboarding

For organizations to share data with MiHIN under this use case, the organization undergoes two onboarding processes simultaneously. The two onboarding processes are legal onboarding and technical connectivity onboarding. These may occur in parallel – i.e., the organization can review and complete legal agreements with MiHIN while simultaneously establishing and testing technical connectivity. To initiate these two parallel onboarding processes, notify MiHIN via <http://mihin.org/requesthelp/>.

3.1.1 Initial Legal Process

The first time an organization undergoes the legal onboarding process with MiHIN, the organization negotiates and enters into a master organization agreement and master use case agreement which then allows the organization to enter into one or more use cases via use case exhibits.

Once an organization has entered into a master organization agreement, the organization can enter into an unlimited number of use cases with MiHIN. All of MiHIN's use cases are available at:

<http://mihin.org/about-mihin/resources/>

3.1.2 Initial Technical Connectivity Process

MiHIN considers itself “transport agnostic” and offers multiple options for organizations to establish technical connectivity to transport data to MiHIN. Organizations should select one or more connectivity methods for message transport based on their technical capabilities, and put in a service request at www.mihin.org/requesthelp. Currently MiHIN accepts the following transport methods:

- LLP over IPsec VPN – Lower-Layer Protocol over Internet Protocol Security Virtual Private Network

For VPN connectivity two VPNs are required. A primary VPN will facilitate regular traffic. A secondary will be established for fail-over purposes.

Additional transport methods may be added in the future. These can include NwHIN, XCA, REST/RESTFUL APIs, FHIR, and others.

The following steps describe the technical onboarding process. However, MiHIN typically conducts “onboarding kickoff” meetings with new organizations to go through each of these steps in detail and answer any questions.

1. The organization selects one or more supported transport methods and establishes connectivity with MiHIN. This step varies based on the method selected:
 - a. LLP over IPsec VPN – MiHIN's site-to-site VPN request form must be completed, sent and approved by MiHIN. Send a request via www.mihin.org/requesthelp to obtain the VPN request form. A pre-shared key is then exchanged between the organization



- and MiHIN to initialize the connection. The LLP over IPsec VPN is the most efficient transport for very high volumes of messages.
2. Test messages are sent by the organization to MiHIN.
 - a. All test messages must have a “T” in the Message Header – field 11
 - b. Test traffic is routed via MiHIN to the appropriate destination. For Bureau of Labs, the destination is the state data hub.
 - c. The end destination monitors for inbound test traffic and confirm receipt with MiHIN, which confirms with the organization.
 3. For the Bureau of Labs use case, the state deems the sending facility to have entered into Data Quality Assurance Status (DQA) once they have successfully received a properly formatted message from the sending facility via the organization through MiHIN.
 - a. Until completion of the DQA process, sending facilities should continue to dually send their lab orders and results through MiHIN as well as continuing to send using any current method.
 4. The state declares the sending facility to be at production status after another period of successful testing and exiting DQA status.
 - a. At this time, the sending facility may then send production messages through the organization to MIHIN. The sending facility now places a “P” (for production) value in the MSH-11 instead of the “T” used during testing.

3.2 Onboarding Additional Sending Facilities

When an organization wishes to onboard additional sending facilities, those facilities must first register with the state. Once successful, the registration information from the state, including the Facility ID Number, must be sent to <http://mihin.org/requesthelp/>.

The new sending facility should then begin sending test messages to the State Bureau of Labs in the same fashion as the initial facility as detailed in section 3.1.2, making sure that to place a “T” value in MSH-11. The State Bureau of Laboratories deems the sending facility to be in DQA and eventually Production Status.

For the state of Michigan, the following implementation guides developed by the Michigan Department of Health and Human Services will assist with blood spot lab requests available at the following link:

http://www.michigan.gov/mdhhs/0,5885,7-339-71551_2945_5103-362966--,00.html



4 Specifications

4.1 Message Trigger Events

The HL7 message type for lab orders is OML and the trigger event is 021.

4.2 General Message Requirements

For general rules that apply to the entire message, refer to the Bureau of Laboratories Testing and Submission Guide, located at:

http://www.michigan.gov/mdhhs/0,5885,7-339-71551_2945_5103-362966--,00.html

4.3 Specific Segment and Field Definitions

4.3.1 Segment 1 – Message Header

#	Element Name	DT	Usage	Cardinality	Value Set	Description/Comments
1	Field Separator	ST	R	[1..1]		
2	Encoding Characters	ST	R	[1..1]		Constrained to the literal values '^~\&' or '^~\&#', always appearing in the same order.
3	Sending Application	HD	R		HL70361	Will contain 'NDBS^2.16.840.1.114222.4.3.2.2.3.16 1.1.6327^ISO'
4	Sending Facility	HD	R		HL70362	Will contain 'MDHHS^2.16.840.1.114222.4.3.2.2.3.161.1^ISO'
5	Receiving Application		R			This field may be changed by the HIE(s) to properly address/route the message. Contact your HIE for more information on what this field will include.
6	Receiving Facility	HD	R		HL70362	This field may be changed by the HIE(s) to properly address/route the message. Contact your HIE for more information on what this field will include. If acknowledgments are in use, this facility originates any related acknowledgment message.
7	Date/Time Of Message	TS	R	[1..1]		
8	Security		O			
9	Message Type	MSG	R	[1..1]		

#	Element Name	DT	Usage	Cardinality	Value Set	Description/Comments
10	Message Control ID	ST	R	[1..1]		String that identifies the message instance from the sending application. Example formats for message control IDs include GUID, timestamp plus sequence number, OID plus sequence number or sequence number. The important point is that care must be taken to ensure that the message control id is unique within the system originating the message.
11	Processing ID	PT	R	[1..1]		
12	Version ID	VID	R	[1..1]		HL7 version number used to interpret format and content of the message. Constrained to the literal value '2.5.1'. Note that receivers must examine MSH-21 (Message Profile Identifier) to understand which message profile the message instance conforms with.
13	Sequence Number		0			
14	Continuation Pointer		0			
15	Accept Acknowledgment Type	ID	0		HL70155	
16	Application Acknowledgment Type	ID	0		HL70155	
17	Country Code		0			
18	Character Set		0			
19	Principal Language Of Message		0			
20	Alternate Character Set Handling Scheme		0			
21	Message Profile Identifier	EI	0	[1..*]		The sender asserts that the message conforms to a given profile and/or valid combination of components.

4.3.2 All Remaining Segments

The message header is the only segment which MiHIN requires to be formatted in a certain way. MiHIN does not evaluate or verify any other part of the message. For all remaining segments and fields, follow the standards which can be retrieved here: www.hl7.org



5 Troubleshooting

5.1 Production Support

	Severity Levels			
	1	2	3	4
Description	Critical Impact/ System Down: Business critical software is down or critical interface has failed. The issue is impacting all production systems, causing all participating organizations' or other organizations' ability to function to be unusable.	Significant Business Impact: Software component severely restricted. Entire organization is unable to continue business functions, causing all communications and transfer of messages to be halted.	Partial Failure or Downtime: Program is useable and less significant features unavailable. The service is online, though may not working as intended or may not currently working as intended or may not currently be accessible, though other systems are currently available.	Minimal Business: A non-critical software component is malfunctioning, causing minimal impact, or a test system is down.
Example	All messages to and from MiHIN are unable to be sent and received, let alone tracked	MiHIN cannot communication (send or receive) messages between single or multiple participating organizations, but can still successfully communicate with other organizations.	Messages are lost in transit; messages can be received but not sent.	Additional feature requested.
Primary Initiation Method	Phone: (517) 336-1430	Phone: (517) 336-1430	Web form at http://mihin.org/requesthelp	Web form at http://mihin.org/requesthelp
Secondary Initiation Method	Web form at http://mihin.org/requesthelp	Web form at http://mihin.org/requesthelp	Email to help@mihin.org	Email to help@mihin.org
Tertiary Initiation Method	Email to help@mihin.org	Email to help@mihin.org	N/A	N/A
Initial Response	Within 2 hours	Within 2 hours	1 business day	1 business day
Resolution Goal	24 hours	24 hours	3 business days	7 business days

A list of common questions regarding the State Bureau Lab Orders-Results Use Case can be found at:

<https://mihin.org/state-bureau-lab-orders-results-use-case-2/>

If you have questions, please contact the MiHIN Help Desk:

- www.mihin.org/requesthelp
- Phone: (517) 336-1430
- Monday – Friday 8:00 AM – 5:00 PM (Eastern)



6 Legal Advisory Language

This reminder applies to all UCEs or PAEs covering the exchange of electronic health information:

The data sharing agreement establishes the legal framework under which PO can exchange messages through the HIN Platform, and sets forth the following approved reasons for which messages may be exchanged:

- a. By health care providers for Treatment, Payment and/or Health Care Operations consistent with the requirements set forth in HIPAA;
- b. Public health activities and reporting as permitted by HIPAA and other Applicable Laws and Standards;
- c. To facilitate the implementation of “meaningful use” criteria as specified in the American Recovery and Reinvestment Act of 2009 and as permitted by HIPAA;
- d. Uses and disclosures pursuant to an Authorization provided by the individual who is the subject of the Message or such individual’s personal representative in accordance with HIPAA;
- e. By Data Sharing Organizations for any and all purposes, including but not limited to pilot programs and testing, provided that such purposes are consistent with Applicable Laws and Standards; and
- f. **For any additional purposes as specified in any UCE or PAE, provided that such purposes are consistent with Applicable Laws and Standards.**

Under these agreements, “***Applicable Laws and Standards***” means all applicable federal, state, and local laws, statutes, acts, ordinances, rules, codes, standards, regulations and judicial or administrative decisions promulgated by any governmental agency, including the State of Michigan, or the Michigan Health Information Technology Commission as any of the foregoing may be amended, modified, codified, reenacted, promulgated or published, in whole or in part, and in effect from time to time which is enforceable against a Party. Without limiting the generality of the foregoing, “Applicable Laws and Standards” includes HIPAA “; the federal Confidentiality of Alcohol and Drug Abuse Patient Records statute, section 543 of the Public Health Service Act, 42 U.S.C. 290dd-2, and its implementing regulation, 42 CFR Part 2; the Michigan Mental Health Code, at MCLA §§ 333.1748 and 333.1748a; and the Michigan Public Health Code, at MCL § 333.5131, 5114a.

It is each PO’s obligation and responsibility to ensure that it is aware of Applicable Laws and Standards as they pertain to the content of each message sent, and that its delivery of each message complies with the Applicable Laws and Standards. This means, for example, that if a UCE is directed to the exchange of physical health information that may be exchanged without patient authorization under HIPAA, the PO must not deliver any message containing health information for which an express patient authorization or consent is required (e.g., mental or behavioral health information).

Disclaimer: The information contained in this implementation guide was current as of the date of the latest revision in the Document History in this guide. However, Medicare and Medicaid policies are subject to change and do so frequently. HL7 versions and formatting are also subject to updates. Therefore, links to any source documents have been provided within this guide for reference. MiHIN will apply its best efforts to keep all information in this guide up-to-date. It is ultimately the responsibility of the Participating Organization and Sending Facilities to be knowledgeable of changes outside of MiHIN's control.



Appendix A: Message Examples

Blood Spot Order Message Example

MSH|^~\&|MDHHSDataHub|MDHHS|NMBS^2.16.840.1.114222.4.3.2.2.3.161.1.6627^I
SO|MDHHS^2.16.840.1.114222.4.3.2.2.3.161.1^ISO|20160430124905-
0500||OML^O21^OML_O21|TC04SE1FR0606AA|T|2.5.1||AL|AL||||LOI_NG_PRN_Profil
e^^2.16.840.1.113883.9.88^ISO~LAB_FI_Component^^2.16.840.1.113883.9.80^ISO~L
OI_PH_Component^^2.16.840.1.113883.9.94^ISO~LAB_TO_Component^^2.16.840.1.11
3883.9.22^ISO~LOI_NB_Component^^2.16.840.1.113883.9.24^ISO

PID|1||7180efa53db94e4f825b6379e49cf7db||Jones^Aiden|Jones|20160108063205-
0400|M||2054-5^Black or African American^HL70005|590 S CONCORD
STREET^^FLINT^MI^48503^USA|^PRN^PH^^^810^5551212|^WPN^PH^^^810^55
55631|||||9856782^^^MR|N^Not Hispanic or Latino^HL70189|GREAT LAKES
FAMILY MEDICINE|N||||N

NK1|1|Jones^Angelica|MTH^Mother^HL70063|210 NE Hosler
Street^^Flint^MI^48503^USA|^PRN^PH^^^810^5559891|||||||F|19920522|||eng^
English^ISO6392

ORC|NW|ORD723222^^2.16.840.1.113883.3.72.5.24^ISO|1713604|||||201601092104
05-
0400|||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^
^NPI^^^^^^MD|^WPN^PH^^^810^5556711~^WPN^FX^^^810^5556889|201601
091853|^oral requestconfirmation^HL70119||||4|GREAT LAKES FAMILY
MEDICINE^9999991111|156 S French
Circle^Flint^MI^USA|^WPN^PH^^^810^5556711~^WPN^FX^^^810^5556889|||||V
O^Voice^HL70483

OBR|1|ORD723222^^2.16.840.1.113883.3.72.5.24^ISO|1713604|54089-8^Newborn
screening panel
AHIC^LN|||201601091853|201601100920||9999992156^Estrada^Danielle^^^Dr^^^
NPI|||FNA Fasting not asked of the patient at time
of procedure|||9999992156^Estrada^Danielle^^^Dr^^^NPI|^WPN^PH^^^810^55567
11~^WPN^FX^^^810^5556889|||||||2566377682^Bowers^Snorre^^^^^NPI

OBR|2|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57128-
1^Newborn Screening Report summary
panel^LN|||201601091853||^VH|||201601091121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^^^^MD|||||201601090918||
|F



OBX|1|CE|57721-3^Reason for lab test in Dried blood spot^LN||LA12421-6^Initial screen^LN||N||F

OBX|2|CE|57718-9^Sample quality of Dried blood spot^LN||LA12432-3^Acceptable^LN||N||F

OBX|3|CE|57130-7^Newborn screening report - overall interpretation^LN||LA12431-5^Out of range requiring immediate second-tier testing for at least one condition^LN||A||F

OBX|4|CE|57131-5^Newborn conditions with positive markers [Identifier] in Dried blood spot^LN|1|LA12509-8^MCAD^LN^128596003^Medium-chain acyl-coenzyme A dehydrogenase deficiency^SCT||A||F

OBX|5|CE|57131-5^Newborn conditions with positive markers [Identifier] in Dried blood spot^LN|1|LA16207-5^Hemoglobinopathies^LN^80141007^Hemoglobinopathy^SCT||A||F

OBX|6|CE|57720-5^Newborn conditions with equivocal markers [Identifier] in Dried blood spot^LN||LA12532-0^BIO^LN^8808004^Biotinidase deficiency^SCT||A||F

Blood Spot Result Message Example

MSH|^~\&|NDBS^2.16.840.1.114222.4.3.2.2.3.161.1.6327^ISO|MDHHS^2.16.840.1.114222.4.3.2.2.3.161.1^ISO|EHRSYSTEM|GREAT LAKES FAMILY MEDICINE^9999992156^NPI|20160109210405-0400||ORU^R01^ORU_R01|123|P|2.5.1

PID|1||7180efa53db94e4f825b6379e49cf7db^^^GREAT LAKES FAMILY MEDICINE&9999991111&NPI^MR||JONES^AIDEN|JONES|20160108|M||2054-5^Black or African American^HL70005|590 S CONCORD STREET^^FLINT^MI^48503^USA||810-555-1212||||||N^Not Hispanic or Latino^HL70189||Y|1||||

NK1|1|Jones^Angelica^^^^L|MTH^Mother^HL70063|210 NE Hosler Street^^Flint^MI^48503^USA|810-555-9891||||||S|F|19920522||||||999991136^^^SSA&2.16.840.1.113883.4.1&ISO^SS~22222222A2^^^MI^MA

ORC|RE|128993^GREAT LAKES FAMILY MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|||||20160109210405-0400||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^NPI^^^^^^MD||||||GREAT LAKES FAMILY MEDICINE^^^^NPI&2.16.840.1.113883.4.6&ISO^NPI^^^9999991111|156 S French Circle^^Flint^MI^48503^USA|810-555-6711|||||I



OBR|1|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54089-
8^Newborn screening panel American Health Information Community
(AHIC)^LN|||201601091853|||^VH|||201601100920||9999992156^Estrada^Danielle
^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601090918|
||F

OBR|2|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57128-
1^Newborn Screening Report summary
panel^LN|||201601091853|||^VH|||201601091121||9999992156^Estrada^Danielle^
^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601090918||
|F

OBX|1|CE|57721-3^Reason for lab test in Dried blood spot^LN||LA12421-6^Initial
screen^LN||N||F

OBX|2|CE|57718-9^Sample quality of Dried blood spot^LN||LA12432-
3^Acceptable^LN||N||F

OBX|3|CE|57130-7^Newborn screening report - overall interpretation^LN||LA12431-
5^Out of range requiring immediate second-tier testing for at least one
condition^LN||A||F

OBX|4|CE|57131-5^Newborn conditions with positive markers [Identifier] in Dried
blood spot^LN|1|LA12509-8^MCAD^LN^128596003^Medium-chain acyl-coenzyme A
dehydrogenase deficiency^SCT||A||F

OBX|5|CE|57131-5^Newborn conditions with positive markers [Identifier] in Dried
blood spot^LN|1|LA16207-
5^Hemoglobinopathies^LN^80141007^Hemoglobinopathy^SCT||A||F

OBX|6|CE|57720-5^Newborn conditions with equivocal markers [Identifier] in Dried
blood spot^LN||LA12532-0^BIO^LN^8808004^Biotinidase deficiency^SCT||A||F

OBX|7|FT|57724-7^Newborn screening short narrative summary^LN||SUMMARY:
Newborn Metabolic Screen REQUIRES FOLLOW UP.br\Sample Quality:
Acceptable.br\Amino Acids, In range.br\Fatty acids, ABNORMAL MCAD
SCREEN.br\Organic acids, In range.br\TSH (CH), In range.br\17-OH-Progesterone
(CAH), No evidence of CAH.br\Biotinidase, BORDERLINE BIOT SCREEN.br\IRT
(Cystic Fibrosis), No evidence of cystic fibrosis.br\Hemoglobins, ABNORMAL HGB
SCREEN due to a type of hemoglobin that could not be identified.br\||N||F

OBX|8|FT|57129-9^Full newborn screening summary report for display or
printing^LN||NEWBORN METABOLIC SCREEN.br\Patient's Name: Aiden
Jones.br\Date of birth: 08 Jan 2016, Time of birth: 06:32 am.br\Sex: Male.br\Age at
collection: 30 hours.br\Mother's name: Angelica Jones.br\Accession number:



200902, Collected: 09 Jan 2016, Received: 10 Jan 2016\br\ Ordering physician: Dr. Danielle Estrada\br\SUMMARY: Newborn Metabolic Screen REQUIRES FOLLOW UP\br\ Sample Quality: Acceptable\br\ Amino Acids, In range\br\ Fatty acids, ABNORMAL MCAD SCREEN\br\ Screen positive for medium chain acyl-CoA dehydrogenase deficiency (MCAD). Immediate clinical follow-up and contact with metabolic specialist indicated. Result phoned to Dr. Lauren Duran (586) 555-3497 2016-01-10, 2:34 pm, by Nurse Nancy. C8 = 19.71 umol/L (< 0.25 umol/L), C6 = 2.81 umol/L (< 0.25 umol/L), C10:1 = 0.71 umol/L (< 0.20 umol/L), C8/C10 = 11.324 (< 4.000), C8/C2 = 0.813 (< 0.050).\br\...\br\ (full example report not included in this message for brevity)\br\|||A|||F

OBX|9|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|1|LA12463-8^HEAR^LN^15188001^Hearing loss^SCT|||N|||F

OBX|10|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|2|LA20349-9^CCHD^LN|||N|||F

OBX|11|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|3|LA12466-1^3-MCC^LN^13144005^Methylcrotonyl-CoA carboxylase deficiency^SCT|||N|||F

OBX|12|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|4|LA12471-1^ASA^LN^41013004^Argininosuccinate lyase deficiency^SCT|||N|||F

OBX|13|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|5|LA12474-5^BKT^LN^237953006^Mitochondrial 2-methylacetoacetyl-CoA thiolase deficiency - potassium stimulated^SCT|||N|||F

OBX|14|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|6|LA12476-0^CBL A^LN^73843004^Cobalamin A disease^SCT|||N|||F

OBX|15|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|7|LA12477-8^CBL B^LN^82245003^Cobalamin B disease^SCT|||N|||F

OBX|16|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|8|LA12482-8^CIT-I^LN^398680004^Citruillinaemia^SCT|||N|||F

OBX|17|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|9|LA12496-8^HCY^LN^11282001^Homocystinuria^SCT|||N|||F



OBX|18|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|10|LA12487-7^CUD^LN^21764004^Renal carnitine transport defect^SCT|||N|||F

OBX|19|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|11|LA12493-5^GA-1^LN^76175005^Glutaric aciduria, type 1^SCT|||N|||F

OBX|20|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|12|LA12499-2^HMG^LN^410059004^Hydroxymethylglutaric aciduria^SCT|||N|||F

OBX|21|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|13|LA12505-6^IVA^LN^87827003^Isovaleryl-CoA dehydrogenase deficiency^SCT|||N|||F

OBX|22|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|14|LA12509-8^MCAD^LN^128596003^Medium-chain acyl-coenzyme A dehydrogenase deficiency^SCT|||A|||F

OBX|23|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|15|LA12510-6^MCD^LN^360369003^Holocarboxylase synthase deficiency^SCT|||N|||F

OBX|24|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|16|LA12513-0^MSUD^LN^27718001^Maple syrup urine disease^SCT|||N|||F

OBX|25|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|17|LA12515-5^MUT^LN^124680001^Deficiency of methylmalonyl-CoA mutase^SCT|||N|||F

OBX|26|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|18|LA12520-5^PKU^LN^7573000^Classical phenylketonuria^SCT|||N|||F

OBX|27|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|19|LA12523-9^PROP^LN^69080001^Propionic acidemia^SCT|||N|||F

OBX|28|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|20|LA12527-0^TFP^LN^237999008^Mitochondrial trifunctional protein deficiency^SCT|||N|||F

OBX|29|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|21|LA12528-8^TYR-1^LN^410056006^Tyrosinaemia type I^SCT|||N|||F



OBX|30|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|22|LA12531-2^VLCAD^LN^237997005^Very long chain acyl-CoA dehydrogenase deficiency^SCT|||N|||F

OBX|31|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|23|LA12507-2^LCHAD^LN^307127004^Isolated long chain hydroxyacyl-CoA dehydrogenase deficiency^SCT|||N|||F

OBX|32|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|24|LA12532-0^BIO^LN^8808004^Biotinidase deficiency^SCT|||A|||F

OBX|33|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|25|LA12533-8^CAH^LN^124214007^Deficiency of steroid 11-beta-monooxygenase^SCT|||N|||F

OBX|34|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|26|LA12537-9^CF^LN^190905008^Cystic fibrosis^SCT|||N|||F

OBX|35|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|27|LA12538-7^CH^LN^190268003^Congenital hypothyroidism^SCT|||N|||F

OBX|36|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|28|LA12543-7^GALT^LN^398664009^Deficiency of UTP-hexose-1-phosphate uridylyltransferase^SCT|||N|||F

OBX|37|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|29|LA12614-6^Hb SS-disease (sickle cell anemia)^LN^127040003^Hereditary hemoglobinopathy disorder homozygous for hemoglobin S^SCT|||N|||F

OBX|38|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|30|LA12616-1^Hb SC-disease^LN^35434009^Sickle cell-hemoglobin C disease^SCT|||N|||F

OBX|39|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|31|LA12615-3^Hb S beta-thalassemia^LN^127041004^Sickle cell-beta-thalassemia^SCT|||N|||F

OBX|40|CE|57719-7^Conditions tested for in this newborn screening study [Identifier] in Dried blood spot^LN|32|LA12566-8^SCID^LN^31323000^Severe combined immunodeficiency disease^SCT|||N|||F

OBR|3|128993^GREAT LAKES FAMILY MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57717-1^Newborn screen card data



panel^LN|||201601091853|||^VH|||201601090920||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601090918||
|F

OBX|1|ST|57716-3^State printed on filter paper card [Identifier] in NBS
card^LN||MI||N||F

OBX|2|ST|57723-9^Unique bar code number of Current sample^LN||97893203||N||F

OBX|3|CE|57722-1^Birth plurality of Pregnancy^LN||LA6112-2^LN||N||F

OBX|4|TM|57715-5^Birth time^LN||0632-0500||N||F

OBX|5|NM|57714-8^Obstetric estimation of gestational age^LN||37|wk||N||F

OBX|6|NM|8339-4^Birth weight Measured^LN||2920|g||N||F

OBX|7|NM|58229-6^Body weight Measured --when specimen taken^LN||2750|g||||F

OBX|8|TX|62323-1^Post-discharge provider ID [Identifier]^LN||999992168||||F

OBX|9|TX|62324-9^Post-discharge provider name in Provider^LN||Dr Lauren
Duran||||F

OBX|10|TX|62325-6^Post-discharge provider practice ID^LN||9999991105||||F

OBX|11|TX|62326-4^Post-discharge provider practice name^LN||Bayside Medical
Group||||F

OBX|12|TX|62327-2^Post-discharge provider practice address^LN||616 Peach Street,
Flint, Michigan 48503||||F

OBX|13|TN|62328-0^Post-discharge provider practice telephone number^LN||(810)
555-1514||||F

OBX|14|TX|62329-8^Birth hospital facility ID [Identifier] in
Facility^LN||9999991111||||F

OBX|15|TX|62330-6^Birth hospital facility name^LN||GREAT LAKES FAMILY
MEDICINE||||F

OBX|16|TX|62331-4^Birth hospital facility address^LN||156 S French Circle, Flint,
Michigan 48503||||F

OBX|17|TN|62332-2^Birth hospital facility phone number in Facility^LN||(810) 555-
6711||N||F

OBX|18|CE|67704-7^Feeding types^LN|1|LA14041-0^Lactose free formula (including
soy or hydrolyzed)^LN||||F

OBX|19|CE|67704-7^Feeding types^LN|2|LA16914-6^Breast milk^LN||||F



OBX|20|CE|57713-0^Infant NICU factors that affect newborn screening interpretation^LN|1|LA12419-0^Infant in ICU at time of specimen collection^LN|||||F

OBX|21|CE|57713-0^Infant NICU factors that affect newborn screening interpretation^LN|2|LA12417-4^Any blood product transfusion (including ECMO)^LN|||||F

OBX|22|DTM|62317-3^Date of last blood product transfusion^LN||201601091723|||||F

OBX|23|CE|67706-2^Maternal factors that affect newborn screening interpretation^LN||LA46-8^Other^LN|||||F

OBX|24|TX|67707-0^Other maternal factors that affect newborn screening interpretation Narrative^LN||Mother has Lupus|||||F

OBR|4|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57794-0^Newborn screening test results panel - Dried blood spot^LN|||201601091853|||VH|||201601091121||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601090918|||F

OBR|5|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|53261-4^Amino acid newborn screen panel^LN|||201601091853|||VH|||201601091121||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBX|1|CE|46733-2^Amino acidemias newborn screen interpretation^LN||LA18592-8^In range^LN|||N|||F

OBX|2|TX|57710-6^Amino acidemias newborn screening comment-discussion^LN||Any baby with clinical features suggestive of a metabolic disorder requires clinical and diagnostic follow-up regardless of whether the NBS result is normal or abnormal.|||N|||F

OBX|3|CE|57793-2^Amino acidemia disorder suspected [Identifier] in Dried blood spot^LN||LA137-2^None^LN|||N|||F

OBX|4|CE|46746-4^Phenylketonuria and variants/Biopterin defects newborn screen interpretation^LN||LA18592-8^In range^LN|||N|||F

OBX|5|TX|58231-2^Phenylketonuria and variants/Biopterin defects newborn screening comment-discussion^LN||Any baby with clinical features suggestive of a



metabolic disorder requires clinical and diagnostic follow-up regardless of whether the NBS result is normal or abnormal.||||N|||F

OBX|6|CE|46743-1^Maple syrup urine disease newborn screen interpretation^LN||LA18592-8^In range^LN||||N|||F

OBX|7|TX|58230-4^Maple syrup urine disease newborn screening comment-discussion^LN||Any baby with clinical features suggestive of a metabolic disorder requires clinical and diagnostic follow-up regardless of whether the NBS result is normal or abnormal.||||N|||F

OBX|8|NM|47539-2^3-Methylhistidine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|9|NM|53232-5^5-Oxoproline+Pipicolate [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|10|NM|53394-3^5-Oxoproline+Pipicolate/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|11|NM|53150-9^Alanine+Beta Alanine+Sarcosine [Moles/volume] in Dried blood spot^LN||1236.06|umol/L|<1500|N|||F

OBX|12|NM|53393-5^Alloisoleucine+Isoleucine+Leucine+Hydroxyproline+Valine/Phenylalanine+Tyrosine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|13|NM|53152-5^Alloisoleucine+Isoleucine+Leucine+Hydroxyproline [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|14|NM|53153-3^Alloisoleucine+Isoleucine+Leucine+Hydroxyproline/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|15|NM|53154-1^Alloisoleucine+Isoleucine+Leucine+Hydroxyproline/Alanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|16|NM|47562-4^Arginine [Moles/volume] in Dried blood spot^LN||5.89|umol/L|<90|N|||F

OBX|17|NM|53398-4^Arginine/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|18|NM|53062-6^Argininosuccinate [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|19|NM|53200-2^Argininosuccinate/Arginine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F



OBX|20|NM|53155-8^Asparagine+Ornithine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|21|NM|53395-0^Asparagine+Ornithine/Serine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|22|NM|53396-8^Asparagine+Ornithine/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|23|NM|47573-1^Aspartate [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|24|NM|42892-0^Citrulline [Moles/volume] in Dried blood spot^LN||19.4|umol/L|<55|N|||F

OBX|25|NM|54092-2^Citrulline/Arginine [Molar ratio] in Dried blood spot^LN||5.63|{Ratio}|5.1-6.0|N|||F

OBX|26|NM|53157-4^Citrulline/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|27|NM|53399-2^Citrulline/Tyrosine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|28|NM|47623-4^Glutamate [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|29|NM|47633-3^Glycine [Moles/volume] in Dried blood spot^LN||528|umol/L|<999|N|||N

OBX|30|NM|47643-2^Histidine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|31|NM|53158-2^Homocitrulline [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|32|NM|47689-5^Lysine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|33|NM|47700-0^Methionine [Moles/volume] in Dried blood spot^LN||45.97|umol/L|44-49|N|||F

OBX|34|NM|53397-6^Methionine/Alloisoleucine+Isoleucine+Leucine+Hydroxyproline [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|35|NM|53156-6^Methionine/Phenylalanine [Molar ratio] in Dried blood spot^LN||0.82|{Ratio}|0.76-1.0|N|||F

OBX|36|NM|29573-3^Phenylalanine [Moles/volume] in Dried blood spot^LN||104.61|umol/L|99-135|N|||F



OBX|37|NM|35572-7^Phenylalanine/Tyrosine [Molar ratio] in Dried blood spot^LN||2.46|{Ratio}|1.64-2.50|N|||F

OBX|38|NM|47732-3^Proline [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|39|NM|53392-7^Proline/Phenylalanine [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|40|NM|47742-2^Serine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|41|NM|53231-7^Succinylacetone [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|42|NM|47784-4^Threonine [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|43|NM|53159-0^Tryptophan [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|44|NM|35571-9^Tyrosine [Moles/volume] in Dried blood spot^LN||281.53|umol/L|205-223|H|||F

OBX|45|NM|47799-2^Valine [Moles/volume] in Dried blood spot^LN||76|umol/L|<250|N|||F

OBX|46|NM|53151-7^Valine/Phenylalanine [Molar ratio] in Dried blood spot^LN||1.44|{Ratio}|<4.0|N|||F

OBR|6|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|58092-8^Acylcarnitine newborn screen

panel^LN|||201601091853|||^VH|||201601101121||9999992156^Estrada^Danielle^
^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|58088-6^Acylcarnitine newborn screen interpretation^LN||LA12431-5^Out of range requiring immediate second-tier testing for at least one condition^LN|||A|||F

OBX|2|TX|58093-6^Acylcarnitine newborn screening comment-discussion^LN||ABNORMAL MCAD SCREEN. Screen positive for medium chain acyl-CoA dehydrogenase deficiency (MCAD). Immediate clinical follow-up and contact with metabolic specialist indicated. Result phoned to (XXX) XXX-XXXX; YYYY-MM-DD, HHMMh, by NAME.|||A|||F

OBR|7|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57084-6^Fatty



acid oxidation newborn screen

panel^LN||201601091853||^VH|||201601101121||9999992156^Estrada^Danielle^
^Dr^^NPI&2.16.840.1.113883.4.6&ISO^L^^NPI^^^^^^MD|||||201601100918||
|F

OBX|1|CE|46736-5^Fatty acid oxidation defects newborn screen
interpretation^LN|1|LA12431-5^Out of range requiring immediate second-tier testing
for at least one condition^LN||A||F

OBX|2|CE|57792-4^Fatty acid oxidation conditions suspected [Identifier] in Dried
blood spot^LN||LA12509-8^MCAD^LN^128596003^Medium-chain acyl-coenzyme A
dehydrogenase deficiency^SCT||A||F

OBX|3|TX|57709-8^Fatty acid oxidation defects newborn screening comment-
discussion^LN||ABNORMAL MCAD SCREEN. Screen positive for medium chain acyl-CoA
dehydrogenase deficiency (MCAD). Immediate clinical follow-up and contact with
metabolic specialist indicated. Result phoned to (XXX) XXX-XXXX; YYYY-MM-DD,
HHMMh, by NAME.||A||F

OBX|4|NM|38481-8^Carnitine free (C0) [Moles/volume] in Dried blood
spot^LN||11.88|umol/L|7.50-12.00|N||F

OBX|5|NM|53233-3^Carnitine free (C0)/Palmitoylcarnitine (C16) [Molar ratio] in Dried
blood spot^LN||67.04|{Ratio}|<999|N||F

OBX|6|NM|54462-7^Malonylcarnitine (C3-DC) [Moles/volume] in Dried blood
spot^LN||0.13|umol/L|<1.40|N||F

OBX|7|NM|53234-1^Carnitine free (C0)/Stearoylcarnitine (C18) [Molar ratio] in Dried
blood spot^LN||99|{Ratio}|<999|N||F

OBX|8|NM|53235-8^Carnitine free (C0)/Palmitoylcarnitine (C16)+Stearoylcarnitine
(C18) [Molar ratio] in Dried blood spot^LN||45.87|{Ratio}|<999|N||F

OBX|9|NM|53236-6^Carnitine.free (C0)+Acetylcarnitine (C2)+Propionylcarnitine
(C3)+Palmitoylcarnitine (C16)+Oleoylecarnitine (C18:1)+Stearoylcarnitine
(C18)/Citrulline [Molar ratio] in Dried blood spot^LN||0.09|{Ratio}|<999|N||F

OBX|10|NM|50157-7^Acetylcarnitine (C2) [Moles/volume] in Dried blood
spot^LN||31.78|umol/L|<999|N||F

OBX|11|NM|53166-5^Butyrylcarnitine+Isobutyrylcarnitine (C4) [Moles/volume] in
Dried blood spot^LN||0.84|umol/L|0.75-1.02|N||N

OBX|12|NM|53167-3^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Acetylcarnitine (C2)
[Molar ratio] in Dried blood spot^LN||0|{Ratio}|<999|N||F



OBX|13|NM|53168-1^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Propionylcarnitine (C3) [Molar ratio] in Dried blood spot^LN||0.26|{Ratio}|<999|N|||F

OBX|14|NM|53169-9^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||2.04|{Ratio}|<18.00|N|||F

OBX|15|NM|50102-3^3-Hydroxybutyrylcarnitine (C4-OH) [Moles/volume] in Dried blood spot^LN||0.59|umol/L|0.43-0.66|N|||F

OBX|16|NM|45211-0^Hexanoylcarnitine (C6) [Moles/volume] in Dried blood spot^LN||2.81|umol/L|<0.25|H|||F

OBX|17|NM|53173-1^3-Hydroxyhexanoylcarnitine (C6-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|18|NM|45207-8^Glutarylcarnitine (C5-DC) [Moles/volume] in Dried blood spot^LN||0.05|umol/L|<999|N|||F

OBX|19|NM|53174-9^Octenoylcarnitine (C8:1) [Moles/volume] in Dried blood spot^LN||0.52|umol/L|0.21-0.7|N|||F

OBX|20|NM|53175-6^Octanoylcarnitine (C8) [Moles/volume] in Dried blood spot^LN||19.71|umol/L|<0.25|H|||NF

OBX|21|NM|53176-4^Octanoylcarnitine (C8)/Acetylcarnitine (C2) [Molar ratio] in Dried blood spot^LN||0.813|{Ratio}|<0.050|H|||F

OBX|22|NM|53177-2^Octanoylcarnitine (C8)/Decanoylcarnitine (C10) [Molar ratio] in Dried blood spot^LN||11.324|{Ratio}|<4.000|H|||F

OBX|23|NM|53178-0^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|24|NM|53402-4^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC)/Butyrylcarnitine+Isobutyrylcarnitine (C4) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|25|NM|53179-8^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC)/Decanoylcarnitine (C10) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|26|NM|53180-6^Decadienoylcarnitine (C10:2) [Moles/volume] in Dried blood spot^LN||0.07|umol/L|<0.12|N|||F

OBX|27|NM|45198-9^Decenoylcarnitine (C10:1) [Moles/volume] in Dried blood spot^LN||0.71|umol/L|<0.20|H|||F

OBX|28|NM|45197-1^Decanoylcarnitine (C10) [Moles/volume] in Dried blood spot^LN||0.31|umol/L|0.28-0.40|N|||F



OBX|29|NM|53182-2^3-Hydroxydecanoylcarnitine (C10:1-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|30|NM|53183-0^Glutaryl carnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|31|NM|53403-2^Glutaryl carnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Butyrylcarnitine+Isobutyrylcarnitine (C4) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|32|NM|53184-8^Glutaryl carnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/3-Hydroxyisovalerylcarnitine (C5-OH) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|33|NM|53185-5^Glutaryl carnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||3.63|{Ratio}|0.21-0.72|H|||F

OBX|34|NM|53186-3^Glutaryl carnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Palmitoylcarnitine (C16) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|35|NM|45200-3^Dodecanoylcarnitine (C12:1) [Moles/volume] in Dried blood spot^LN||0.31|umol/L|0.28-0.50|N|||F

OBX|36|NM|45199-7^Dodecanoylcarnitine (C12) [Moles/volume] in Dried blood spot^LN||0.77|umol/L|0.44-0.80|N|||F

OBX|37|NM|53188-9^3-Hydroxydodecanoylcarnitine (C12:1-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|38|NM|53189-7^3-Hydroxydodecanoylcarnitine (C12-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|39|NM|53190-5^Tetradecadienoylcarnitine (C14:2) [Moles/volume] in Dried blood spot^LN||0.12|umol/L|0.09-0.15|N|||F

OBX|40|NM|53191-3^Tetradecanoylcarnitine (C14:1) [Moles/volume] in Dried blood spot^LN||0.48|umol/L|0.37-0.71|N|||F

OBX|41|NM|53192-1^Tetradecanoylcarnitine (C14) [Moles/volume] in Dried blood spot^LN||0.61|umol/L|0.50-0.80|N|||F

OBX|42|NM|53193-9^Tetradecanoylcarnitine (C14:1)/Acetylcarnitine (C2) [Molar ratio] in Dried blood spot^LN||0.51|{Ratio}|0.37-.070|N|||F

OBX|43|NM|53194-7^Tetradecanoylcarnitine (C14:1)/Dodecanoylcarnitine (C12:1) [Molar ratio] in Dried blood spot^LN||1.53|{Ratio}|<999|N|||F



OBX|44|NM|53195-4^Tetradecenoylcarnitine (C14:1)/Palmitoylcarnitine (C16) [Molar ratio] in Dried blood spot^LN||0.47|{Ratio}|0.37-0.70|N|||F

OBX|45|NM|53196-2^3-Hydroxytetradecadienoylcarnitine (C14:2-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|46|NM|53197-0^3-Hydroxytetradecenoylcarnitine (C14:1-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|47|NM|50281-5^3-Hydroxytetradecanoylcarnitine (C14-OH) [Moles/volume] in Dried blood spot^LN||0.09|umol/L|<999|N|||F

OBX|48|NM|53198-8^Palmitoleylcarnitine (C16:1) [Moles/volume] in Dried blood spot^LN||0.09|umol/L|<999|N|||F

OBX|49|NM|53199-6^Palmitoylcarnitine (C16) [Moles/volume] in Dried blood spot^LN||6.13|umol/L|5.86-7.16|N|||F

OBX|50|NM|50121-3^3-Hydroxypalmitoleylcarnitine (C16:1-OH) [Moles/volume] in Dried blood spot^LN||0.13|umol/L|0.10-0.15|N|||F

OBX|51|NM|50125-4^3-Hydroxypalmitoylcarnitine (C16-OH) [Moles/volume] in Dried blood spot^LN||0.17|umol/L|0.09-0.19|N|||F

OBX|52|NM|53201-0^3-Hydroxypalmitoylcarnitine (C16-OH)/Palmitoylcarnitine (C16) [Molar ratio] in Dried blood spot^LN||0.03|{Ratio}|<0.20|N|||F

OBX|53|NM|45217-7^Linoleoylcarnitine (C18:2) [Moles/volume] in Dried blood spot^LN||0.63|umol/L|0.62-0.65|N|||F

OBX|54|NM|53202-8^Oleoylcarnitine (C18:1) [Moles/volume] in Dried blood spot^LN||2.42|umol/L|2.39-2.50|N|||F

OBX|55|NM|53241-6^Stearoylcarnitine (C18) [Moles/volume] in Dried blood spot^LN||0.26|umol/L|<0.31|N|||F

OBX|56|NM|53400-8^Stearoylcarnitine (C18)/Propionylcarnitine (C3) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|57|NM|50109-8^3-Hydroxylinoleoylcarnitine (C18:2-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|58|NM|50113-0^3-Hydroxyoleoylcarnitine (C18:1-OH) [Moles/volume] in Dried blood spot^LN||0.09|umol/L|0.08-0.10|N|||F

OBX|59|NM|50132-0^3-Hydroxystearoylcarnitine (C18-OH) [Moles/volume] in Dried blood spot^LN||0.08|umol/L|0.07-0.10|N|||F

OBR|8|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57085-



3^Organic acid newborn screen

panel^LN||201601091853||^VH|||201601101121||9999992156^Estrada^Danielle^
^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|46744-9^Organic acidemias newborn screen interpretation^LN||LA18592-
8^In range^LN||N||F

OBX|2|CE|57791-6^Organic acidemia conditions suspected [Identifier] in Dried blood
spot^LN||LA137-2^None^LN||N||F

OBX|3|TX|57708-0^Organic acidemias defects newborn screening comment-
discussion^LN||Any baby with clinical features suggestive of a metabolic disorder
requires clinical and diagnostic follow-up regardless of whether the NBS result is
normal or abnormal.||N||F

OBX|4|NM|50157-7^Acetylcarnitine (C2) [Moles/volume] in Dried blood
spot^LN||31.78|umol/L|<999|N||F

OBX|5|NM|53237-4^Acrylylcarnitine (C3:1) [Moles/volume] in Dried blood
spot^LN||99|umol/L|<999|N||N

OBX|6|NM|53160-8^Propionylcarnitine (C3) [Moles/volume] in Dried blood
spot^LN||5.17|umol/L|4.62-5.50|N||F

OBX|7|NM|53161-6^Propionylcarnitine (C3)/Methionine [Molar ratio] in Dried blood
spot^LN||99|{Ratio}|<999|N||F

OBX|8|NM|53162-4^Propionylcarnitine (C3)/Carnitine.free (C0) [Molar ratio] in Dried
blood spot^LN||0.03|{Ratio}|<999|N||F

OBX|9|NM|53163-2^Propionylcarnitine (C3)/Acetylcarnitine (C2) [Molar ratio] in
Dried blood spot^LN||0.15|{Ratio}|<999|N||F

OBX|10|NM|54462-7^Malonylcarnitine (C3-DC) [Moles/volume] in Dried blood
spot^LN||0.13|umol/L|<1.40|N||F

OBX|11|NM|53164-0^Propionylcarnitine (C3)/Palmitoylcarnitine (C16) [Molar ratio]
in Dried blood spot^LN||0.69|{Ratio}|<2.0|N||F

OBX|12|NM|53166-5^Butyrylcarnitine+Isobutyrylcarnitine (C4) [Moles/volume] in
Dried blood spot^LN||0.84|umol/L|0.75-1.02|N||F

OBX|13|NM|53167-3^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Acetylcarnitine (C2)
[Molar ratio] in Dried blood spot^LN||0|{Ratio}|<999|N||F

OBX|14|NM|53168-1^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Propionylcarnitine
(C3) [Molar ratio] in Dried blood spot^LN||0.26|{Ratio}|<999|N||F



OBX|15|NM|53169-9^Butyrylcarnitine+Isobutyrylcarnitine (C4)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||2.04|{Ratio}|<18.00|N|||F

OBX|16|NM|53170-7^Tiglylcarnitine (C5:1) [Moles/volume] in Dried blood spot^LN||0.1|umol/L|0.09-0.24|N|||F

OBX|17|NM|45207-8^Glutarylcarnitine (C5-DC) [Moles/volume] in Dried blood spot^LN||0.05|umol/L|<999|N|||F

OBX|18|NM|45216-9^Isovalerylcarnitine+Methylbutyrylcarnitine (C5) [Moles/volume] in Dried blood spot^LN||0.43|umol/L|0.39-0.48|N|||F

OBX|19|NM|53238-2^Isovalerylcarnitine+Methylbutyrylcarnitine (C5)/Carnitine.free (C0) [Molar ratio] in Dried blood spot^LN||0.00|{Ratio}|<0.05|N|||F

OBX|20|NM|53239-0^Isovalerylcarnitine+Methylbutyrylcarnitine (C5)/Acetylcarnitine (C2) [Molar ratio] in Dried blood spot^LN||0.00|{Ratio}|<0.04|N|||F

OBX|21|NM|53240-8^Isovalerylcarnitine+Methylbutyrylcarnitine (C5)/Propionylcarnitine (C3) [Molar ratio] in Dried blood spot^LN||0.31|{Ratio}|<999|N|||F

OBX|22|NM|53401-6^Isovalerylcarnitine+Methylbutyrylcarnitine (C5)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|23|NM|50106-4^3-Hydroxyisovalerylcarnitine (C5-OH) [Moles/volume] in Dried blood spot^LN||0.26|umol/L|<999|N|||F

OBX|24|NM|53171-5^3-Hydroxyisovalerylcarnitine (C5-OH)/Carnitine.free (C0) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|25|NM|53172-3^3-Hydroxyisovalerylcarnitine (C5-OH)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||0.436|{Ratio}|0.35-0.70|N|||F

OBX|26|NM|53178-0^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|27|NM|53402-4^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC)/Butyrylcarnitine+Isobutyrylcarnitine (C4) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|28|NM|53179-8^3-Hydroxyoctanoylcarnitine (C8-OH)+Malonylcarnitine (C3-DC)/Decanoylcarnitine (C10) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|29|NM|45222-7^Methylmalonylcarnitine (C4-DC) [Moles/volume] in Dried blood spot^LN||3.16|umol/L|<999|N|||F



OBX|30|NM|53181-4^Methylmalonylcarnitine (C4-DC)/3-Hydroxyisovalerylcarnitine (C5-OH) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|31|NM|53183-0^Glutarylcarnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|32|NM|53403-2^Glutarylcarnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Butyrylcarnitine+Isobutyrylcarnitine (C4) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|33|NM|53184-8^Glutarylcarnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/3-Hydroxyisovalerylcarnitine (C5-OH) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|34|NM|53185-5^Glutarylcarnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Octanoylcarnitine (C8) [Molar ratio] in Dried blood spot^LN||3.63|{Ratio}|0.21-0.72|H|||F

OBX|35|NM|53186-3^Glutarylcarnitine (C5-DC)+3-Hydroxydecanoylcarnitine (C10-OH)/Palmitoylcarnitine (C16) [Molar ratio] in Dried blood spot^LN||99|{Ratio}|<999|N|||F

OBX|36|NM|53187-1^Methylglutarylcarnitine (C6-DC) [Moles/volume] in Dried blood spot^LN||0.11|umol/L|0.10-0.12|N|||F

OBX|37|NM|53165-7^Formiminoglutamate [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBX|38|NM|67708-8^Malonylcarnitine (C3-DC)+3-Hydroxybutyrylcarnitine (C4-OH) [Moles/volume] in Dried blood spot^LN||0.26|umol/L|<999|N|||F

OBX|39|NM|67709-6^Methylmalonylcarnitine (C4-DC)+3-Hydroxyisovalerylcarnitine (C5-OH) [Moles/volume] in Dried blood spot^LN||3.16|umol/L|<999|N|||F

OBX|40|NM|67710-4^Glutarylcarnitine (C5-DC)+3-Hydroxyhexanoylcarnitine (C6-OH) [Moles/volume] in Dried blood spot^LN||99|umol/L|<999|N|||F

OBR|9|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54078-1^Cystic fibrosis newborn screening

panel^LN|||201601091853|||^VH|||201601101121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|46769-6^Cystic fibrosis newborn screen interpretation^LN||LA18592-8^In range^LN|||N|||F



OBX|2|TX|57707-2^Cystic fibrosis newborn screening comment-discussion^LN||No evidence of cystic fibrosis. CF mutation analysis not performed. Further testing is only required if there is clinical suspicion of cystic fibrosis. Symptoms include poor growth, loose stools or evidence of malabsorption, persistent cough, or respiratory concerns.||N||F

OBX|3|NM|2077-6^Chloride [Moles/volume] in Sweat^LN||99|mmol/L|<999|N||F

OBX|4|NM|48633-2^Trypsinogen I Free [Mass/volume] in Dried blood spot^LN||99|ug/L|<999|N||F

OBR|10|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54076-5^Endocrine newborn screening panel^LN||201601091853||^VH||201601101121||999992156^Estrada^Danielle^Dr^^NPI&2.16.840.1.113883.4.6&ISO^L^^NPI^^^^^^MD||||201601100918||F

OBR|11|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57086-1^Congenital adrenal hyperplasia (CAH) newborn screening panel^LN||201601091853||^VH||201601101121||999992156^Estrada^Danielle^Dr^^NPI&2.16.840.1.113883.4.6&ISO^L^^NPI^^^^^^MD||||201601100918||F

OBX|1|CE|46758-9^Congenital adrenal hyperplasia newborn screen interpretation^LN||LA18592-8^In range^LN||N||F

OBX|2|NM|53347-1^11-Deoxycorticosterone [Mass/volume] in Dried blood spot^LN||99|ng/dL|<999|N||F

OBX|3|NM|53338-0^11-Deoxycortisol [Mass/volume] in Dried blood spot^LN||99|ug/dL|<999|N||F

OBX|4|NM|38473-5^17-Hydroxyprogesterone [Mass/volume] in Dried blood spot^LN||182|ng/mL|<190|N||F

OBX|5|NM|53336-4^17-Hydroxyprogesterone+Androstenedione/Cortisol [Mass Ratio] in Dried blood spot^LN||99|{ratio}|<999|N||F

OBX|6|NM|53341-4^21-Deoxycortisol [Mass/volume] in Dried blood spot^LN||99|ug/dL|<999|N||F

OBX|7|NM|53343-0^Androstenedione [Mass/volume] in Dried blood spot^LN||99|ng/dL|<999|N||F

OBX|8|NM|53345-5^Cortisol [Mass/volume] in Dried blood spot^LN||99|ug/dL|<999|N||F



OBR|12|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54090-
6^Thyroid newborn screening
panel^LN|||201601091853|||^VH|||201601091121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|46762-1^Congenital hypothyroidism newborn screen
interpretation^LN||LA18592-8^In range^LN||N||F

OBX|2|TX|57705-6^Congenital hypothyroidism newborn screening comment-
discussion^LN||Any baby with clinical features suggestive of a metabolic disorder
requires clinical and diagnostic follow-up regardless of whether the NBS result is
normal or abnormal.||N||F

OBX|3|NM|31144-9^Thyroxine (T4) [Mass/volume] in Dried blood
spot^LN||10.36|ug/dL|<25|N||F

OBX|4|NM|29575-8^Thyrotropin [Units/volume] in Dried blood
spot^LN||1.2|m[IU]/L|<8|N||F

OBR|13|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54079-
9^Galactosemia newborn screening
panel^LN|||201601091853|||^VH|||201601091121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|46737-3^Galactosemias newborn screen interpretation^LN||LA18592-8^In
range^LN||N||F

OBX|2|TX|57704-9^Galactosemias newborn screening comment-discussion^LN||Any
baby with clinical features suggestive of a metabolic disorder requires clinical and
diagnostic follow-up regardless of whether the NBS result is normal or
abnormal.||N||F

OBX|3|NM|54084-9^Galactose [Mass/volume] in Dried blood
spot^LN||1.6|mg/dL|<11|N||F

OBX|4|NM|42906-8^Galactose 1 phosphate uridyl transferase [Enzymatic
activity/volume] in Dried blood spot^LN||99|U/g{Hb}|<999|N||F

OBX|5|NM|40842-7^Galactose 1 phosphate [Mass/volume] in Dried blood
spot^LN||99|mg/dL|<999|N||F

OBR|14|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|54081-



5^Hemoglobinopathies newborn screening
panel^LN|||201601091853|||^VH|||201601101121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|46740-7^Hemoglobin disorders newborn screen
interpretation^LN||LA18593-6^Out of range^LN|||N|||F

OBX|2|TX|57703-1^Hemoglobin disorders newborn screening comment-
discussion^LN||An unidentified hemoglobin was detected that cannot be interpreted by
newborn screening. Suggest hematology referral and diagnostic testing at an
appropriate age.|||N|||F

OBR|15|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D777777^CLIA|64116-
7^Hemoglobin observations newborn screening
panel^LN|||201601091853|||^VH|||201601101121||9999992156^Estrada^Danielle^
^^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||201601100918||
|F

OBX|1|CE|64117-5^Most predominant hemoglobin in Dried blood spot^LN||LA16208-
3^Hb F^LN|||N|||F

OBX|2|CE|64118-3^Second most predominant hemoglobin in Dried blood
spot^LN||LA16223-2^Hb unidentified^LN|||N|||F

OBX|3|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|1|LA16208-3^Hb F^LN|||N|||F

OBX|4|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|2|LA16209-1^Hb A^LN|||N|||F

OBX|5|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|3|LA13002-3^Hb C^LN|||N|||F

OBX|6|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|4|LA13003-1^Hb D^LN|||N|||F

OBX|7|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|5|LA13005-6^Hb E^LN|||N|||F

OBX|8|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|6|LA16218-2^Hb G^LN|||N|||F

OBX|9|CE|64122-5^Hemoglobins that can be presumptively identified based on
available controls in Dried blood spot^LN|7|LA16220-8^Hb H^LN|||N|||F



OBX|10|CE|64122-5^Hemoglobins that can be presumptively identified based on available controls in Dried blood spot^LN|8|LA16222-4^Hb O-Arab^LN||N||F

OBX|11|CE|64122-5^Hemoglobins that can be presumptively identified based on available controls in Dried blood spot^LN|9|LA13007-2^Hb S^LN||N||F

OBX|12|CE|64122-5^Hemoglobins that can be presumptively identified based on available controls in Dried blood spot^LN|10|LA16223-2^Hb unidentified^LN||N||F

OBR|16|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|57087-9^Biotinidase newborn screening

panel^LN||201601091853||^VH|||201601101121||9999992156^Estrada^Danielle^
^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^^^^^MD|||||201601100918||
|F

OBX|1|CE|46761-3^Biotinidase deficiency newborn screen interpretation^LN||LA4259-3^Borderline^LN||A||F

OBX|2|TX|57699-1^Biotinidase deficiency newborn screening comment-discussion^LN||Borderline abnormal screen for biotinidase deficiency (BIOT). Slightly decreased biotinidase activity, unlikely to be significant. Suggest clinical follow-up and repeat newborn metabolic screen.||A||F

OBX|3|ST|38478-4^Biotinidase [Presence] in Dried blood spot^LN||reduced enzyme activity||A||F

OBR|17|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|62333-0^Severe combined newborn screening immunodeficiency (SCID) panel in Dried blood

spot^LN||201601091853||^VH|||201601090920||9999992156^Estrada^Danielle^
^Dr^^^NPI&2.16.840.1.113883.4.6&ISO^L^^^NPI^^^^^^^MD|||||201101051142||
F

OBX|1|CE|62321-5^Severe combined immunodeficiency newborn screen interpretation^LN||LA18592-8^In range^LN||N||F

OBX|2|TX|62322-3^Severe combined immunodeficiency newborn screening comment-discussion^LN||Any baby with clinical features suggestive of an immune system disorder requires clinical and diagnostic follow-up regardless of whether the NBS result is normal or abnormal.||N||F

OBX|3|NM|62320-7^T-cell receptor excision circle [# /volume] in Dried blood spot by Probe and target amplification method^LN||100|{copies}|>60|N||F

OBR|18|128993^GREAT LAKES FAMILY

MEDICINE^9999991111^NPI|999555^MISPHLAB^77D7777777^CLIA|73738-



7^Newborn screening test results panel - Point of
Care^LN|||201601091853|||^VH|||||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.1
6.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBR|19|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D777777^CLIA|54111-
0^Newborn hearing loss
panel^LN|||201601091853|||^VH|||||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.
16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBX|1|TX|57700-7^Hearing loss newborn screening comment/discussion^LN||Any
baby with clinical features suggestive of hearing loss requires clinical and diagnostic
follow-up regardless of whether the NMS result is normal or abnormal.|||N|||F

OBX|2|CE|54106-0^Newborn hearing screen method^LN||LA10388-9^Auditory brain
stem response^LN|||N|||F

OBR|20|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D777777^CLIA|73744-
5^Newborn hearing screen panel of Ear -
right^LN|||201601091853|||^VH|||||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.
16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBX|1|CE|54109-4^Newborn hearing screen of Ear - right^LN||LA10392-
1^Pass^LN|||N|||F

OBR|21|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D777777^CLIA|73741-
1^Newborn hearing screen panel of Ear -
left^LN|||201601091853|||^VH|||||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.16
.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBX|1|CE|54108-6^Newborn hearing screen of Ear - left^LN||LA10392-
1^Pass^LN|||N|||F

OBR|22|128993^GREAT LAKES FAMILY
MEDICINE^9999991111^NPI|999555^MISPHLAB^77D777777^CLIA|73805-4^CCHD
newborn screening
panel^LN|||201601091853|||^VH|||||9999992156^Estrada^Danielle^^^Dr^^^NPI&2.
16.840.1.113883.4.6&ISO^L^^^NPI^^^MD|||||201601100918|||F

OBX|1|CE|73700-7^CCHD newborn screening interpretation^LN||LA18592-8^In
range^LN|||N|||F

OBX|2|NM|73806-2^Newborn age in hours^LN||36|h|||N|||F



OBX|3|CE|73699-1^Number of prior CCHD screens [#] Qualitative^LN||LA6111-4^0^LN|||N|||F

OBX|4|NM|59407-7^Oxygen saturation in Blood Preductal by Pulse oximetry^LN||99%|>95|N|||F

OBX|5|CE|73796-5^Infant activity during preductal oxygen saturation measurement^LN||LA19830-1^Awake and quiet^LN|||N|||F

OBX|6|NM|59418-4^Oxygen saturation in Blood Postductal by Pulse oximetry^LN||97%|>95|N|||F

OBX|7|CE|73792-4^Infant activity during postductal oxygen saturation measurement^LN||LA11864-8^Sleeping^LN|||N|||F

OBX|8|NM|73696-7^Oxygen saturation.preductal-oxygen saturation.postductal [Mass fraction difference] in Bld.preductal and Bld.postductal^

