

Automating the Receipt of CMV Lab Testing Results

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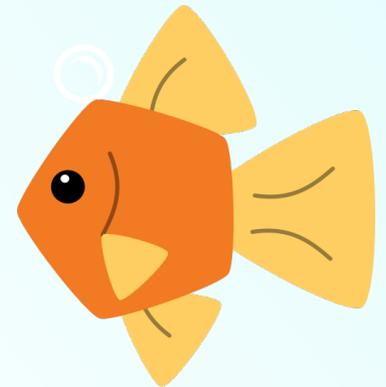


UTAH DEPARTMENT OF
HEALTH
Early Hearing Detection & Intervention

HiTrack 
EHDI Data Management System

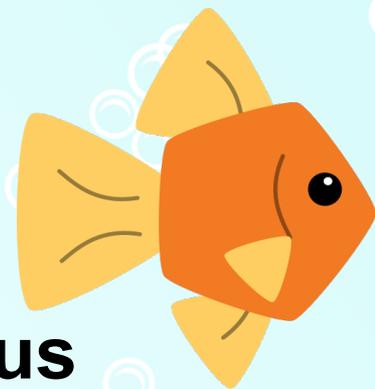
Background

- Legislation
- Reporting
- Communicable Disease Rule
- Change of Staff - Impact on data reporting



Background: **UTAH 2013**

26-10-10 UCA, “**Cytomegalovirus (CMV) Public Education and Testing**”



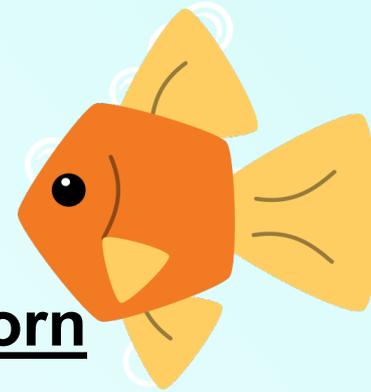
If a newborn infant fails the newborn hearing screening test(s).....

The Medical Practitioner shall:

Test the newborn infant for CMV before 21 days of age...unless the parent objects; and

Provide to the parents information re: birth defects caused by congenital CMV and available methods of treatment.

Background



R398-4-3. Clarification of when a newborn fails a hearing screen.

The newborn must fail both hearing screens, the initial hearing screen routinely done at birth **and** the subsequent follow-up screen

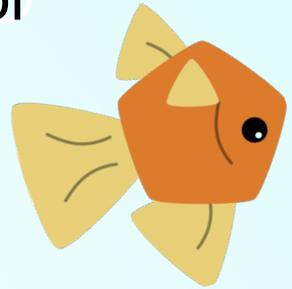
or

if/when the initial failed hearing screen is obtained after 14 days of age before the medical practitioner is required to test for CMV.

Background

R398-4-5. Reporting Requirements.

Medical practitioners are required to **submit** results of the CMV testing **to UDOH** for each newborn under their care who is referred for CMV testing **within 10 days of receiving results.**

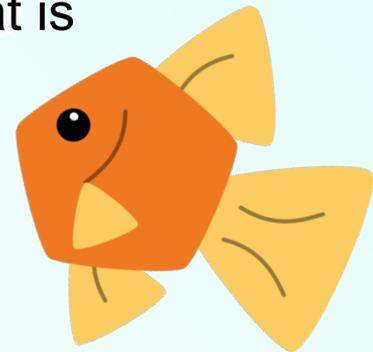


Policy Change for Data Integration

- Obtain access to EMRs
- Develop relationships with Labs
- Direct lab reporting BEST!

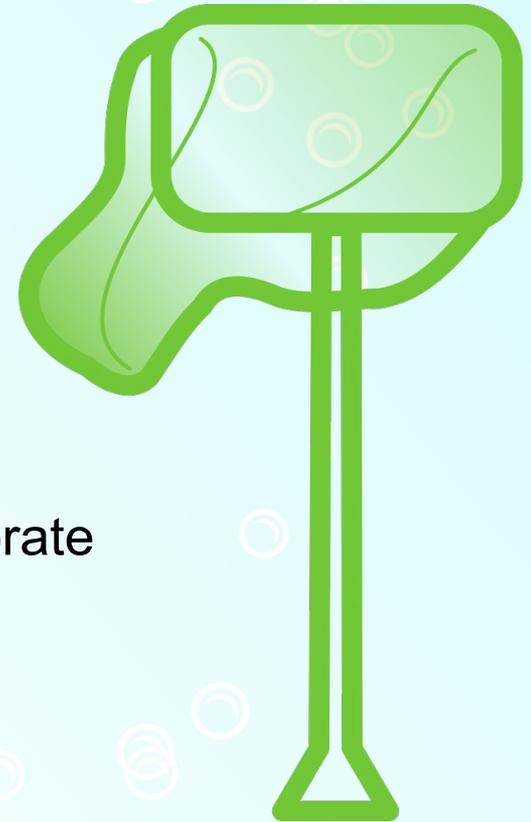
Utah Rule R-386-702 Communicable Disease Rule (2/11/16)

7) added "Cytomegalovirus (CMV), congenital" via ELR. This is already reportable as per Section R398-4-5. Inclusion in Rule R386-702 will reinforce the reporting requirement, and facilitate laboratory reporting that is indicative of this condition



Need Analysis and Kickoff

- Less reporting of CMV testing occurred than anticipated.
- Change in Staff
 - New Leadership willing to collaborate
- Automation needed to reduce effort and data entry errors, ensure receipt of results
 - “Grey List” holding folder
- October 2017 brainstorming meetings



HiTrack Lab Testing Module - 2013 to current

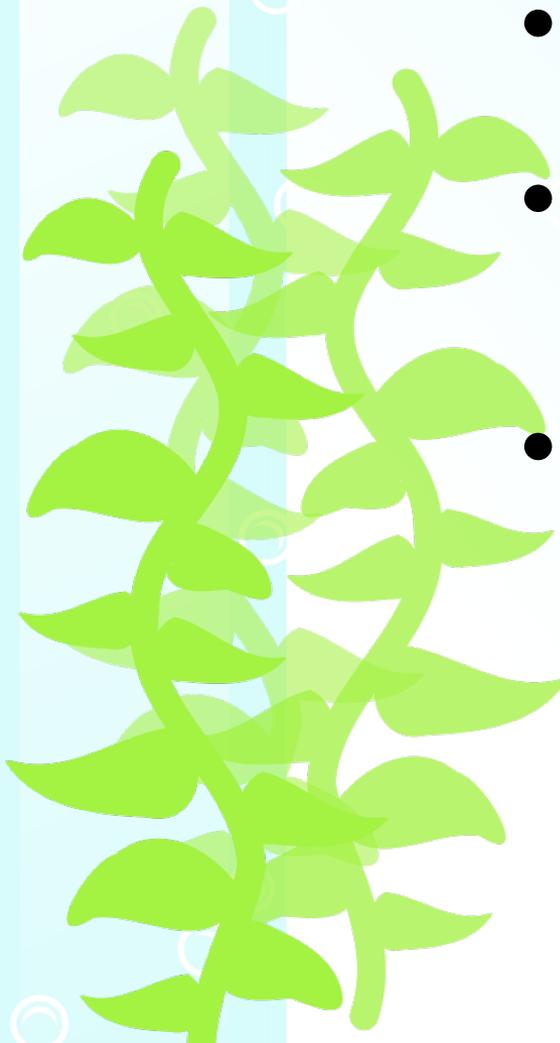
The screenshot displays the HiTrack EHR Data Management System interface. At the top, there are navigation elements: 'Appointments Today', 'Notifications', and a facility dropdown set to 'James Facility'. The user 'james' is logged in. The main header reads 'Lab Testing 1'. On the left, a patient record for 'Fischer Nemo' is shown with details: '3/29/2019 12:00 AM 7000', 'Need Evaluation Appt. In Progress', and 'EVALUATION IN PROCESS'. A sidebar on the left lists various patient services, with 'Lab Testing' highlighted. The central 'History' table contains one entry:

Test Date	Type	Result	Physician	Facility
4-1-2019	CMV - Saliva	Detected		Bright Waters Lab Co.

An 'Edit Lab Testing Entry' dialog box is open in the foreground, mirroring the data in the table above. It includes fields for Stage (Laborator), Type (CMV - Saliva), Result (Detected), Date (4-1-2019), Facility (Bright Waters Lab Co.), Physician, and Notes. A timestamp at the bottom of the dialog reads 'Changed by james on 1-13-2020 3:37 PM'. The dialog also features a trash icon and a checkmark icon.

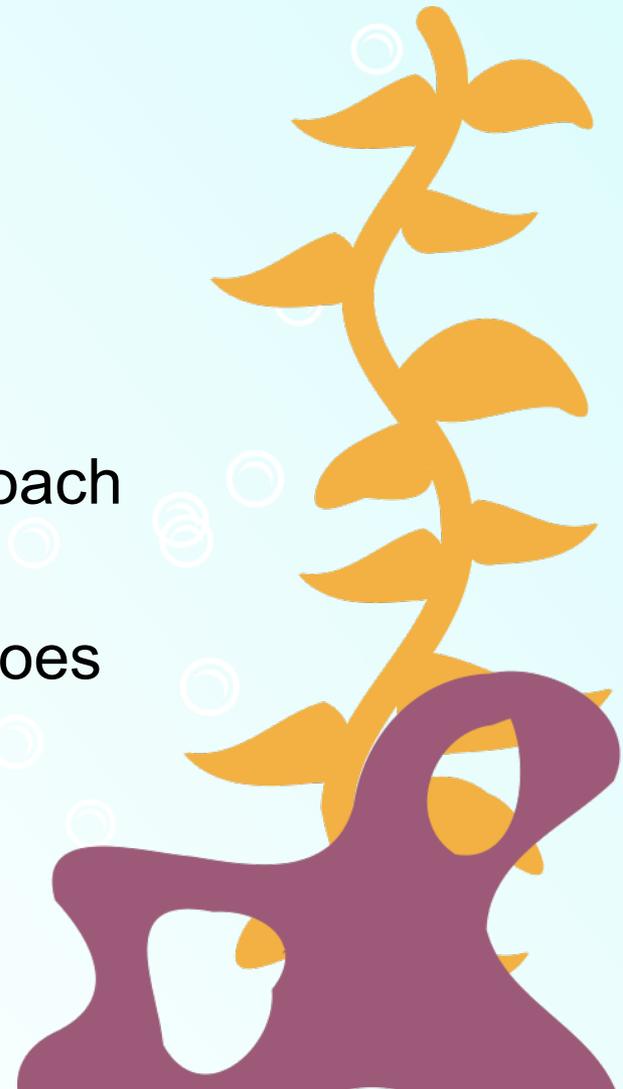
Data Privacy Agreements

- Essential Requirement for developing automated CMV receipt
- Pre-existing privacy agreements covered HiTrack team
 - Data Privacy is part of software contract
- HiTrack staff HIPAA certified



Scope of Work

- Chose One Lab to Start - Pilot
 - Initial research showed that each lab reported a unique “flavor” of HL7v2 messages
- Iterative
 - “Small test of change” approach used
 - Include more labs as time goes on



Technical Research Phase

- Learning HL7 version 2
 - Message Structure
 - Field Domain Values
- Lab specific idiosyncrasies
 - Fields Used
 - Result Output Differences
 - Text (human readable)
 - Numeric (interpreted)

Lab Field Use Differences

HiTrack Field VV Source >>	LabCorp (231)	ARUP (231)	Quest Diag (251)	IHC (251)	MtnStar (251)
Patient Record Number	PID-3-1	PID-3-1	PID-3-1	PID-3-1	PID-3-1
Baby/Patient Last Name	PID-5-1	PID-5-1	PID-5-1	PID-5-1	PID-5-1
Baby/Patient First Name	PID-5-2	PID-5-2	PID-5-2	PID-5-2	PID-5-2
Baby/Patient Middle Name	PID-5-3	PID-5-3	PID-5-3	PID-5-3	PID-5-3
Baby/Patient DOB	PID-7-1	PID-7-1	PID-7-1	PID-7-1	PID-7-1
Baby/Patient Sex	PID-8-1	PID-8-1	PID-8-1	PID-8-1	PID-8-1
Contact Last Name				NK1-2-1	NK1-2-1
Contact First Name				NK1-2-2	NK1-2-2
Contact DOB					
Contact/Patient Zip	PID-11-5	PID-11-5	PID-11-5	PID-11-5	PID-11-5
Contact/Patient Phone	PID-13-5&6	PID-13-5&6	PID-13-5&6	PID-13-5&6	PID-13-5&6
Date and Time Sample Collected	OBR-7-1	OBR-7-1	OBR-7-1	OBR-7-1	OBR-7-1
Date and Time Helper Field 1			SPM-17-1		
Type (Saliva,Urine,Blood)	OBR-4	OBR-4	SPM-4	SPM-4	OBX-3
Type Helper Field 1	OBX-3	OBX-3		OBR-4	
Type Helper Field 2					
Ordering/Testing Facility Name	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1
Birth Facility (will not overwrite on matches)	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1
Result (Detected,Not Detected,Equivocal)	OBX-5	OBX-5	OBX-5	OBX-5 (Number)	OBX-5
Result Data Type Check Field	OBX-2	OBX-2	OBX-2	OBX-2	OBX-2
Result Helper Field 1	OBX-7-1	OBR-12			
Result Helper Field 2	NTE-2-3??				
Result Helper Field 3	NTE-8-3??				
Result Note					
Ordering physician	OBR-16-??&??	ORC-12	OBR-16-???	ORC-12	ORC-12
Sending Lab	MSH-4	MSH-4	MSH-4	MSH-4	MSH-4

Lab Field Use Differences

HiTrack Field VV Source >>	LabCorp (231)	ARUP (231)	Quest Diag (251)	IHC (251)	MtnStar (251)
Patient Record Number	PID-3-1	PID-3-1	PID-3-1	PID-3-1	PID-3-1
Baby/Patient Last Name	PID-5-1	PID-5-1	PID-5-1	PID-5-1	PID-5-1
Baby/Patient First Name	PID-5-2	PID-5-2	PID-5-2	PID-5-2	PID-5-2
Baby/Patient Middle Name	PID-5-3	PID-5-3	PID-5-3	PID-5-3	PID-5-3
Baby/Patient DOB	PID-7-1	PID-7-1	PID-7-1	PID-7-1	PID-7-1
Baby/Patient Sex	PID-8-1	PID-8-1	PID-8-1	PID-8-1	PID-8-1
Contact Last Name				NK1-2-1	NK1-2-1
Contact First Name				NK1-2-2	NK1-2-2
Contact DOB					
Contact/Patient Zip	PID-11-5	PID-11-5	PID-11-5	PID-11-5	PID-11-5
Contact/Patient Phone	PID-13-5&6	PID-13-5&6	PID-13-5&6	PID-13-5&6	PID-13-5&6
Date and Time Sample Collected	OBR-7-1	OBR-7-1	OBR-7-1	OBR-7-1	OBR-7-1
Date and Time Helper Field 1			SPM-17-1		
Type (Saliva,Urine,Blood)	OBR-4	OBR-4	SPM-4	SPM-4	OBX-3
Type Helper Field 1	OBX-3	OBX-3		OBR-4	
Type Helper Field 2					
Ordering/Testing Facility Name	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1
Birth Facility (will not overwrite on matches)	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1	ORC-21-1
Result (Detected,Not Detected,Equivocal)	OBX-5	OBX-5	OBX-5	OBX-5 (Number)	OBX-5
Result Data Type Check Field	OBX-2	OBX-2	OBX-2	OBX-2	OBX-2
Result Helper Field 1	OBX-7-1	OBR-12			
Result Helper Field 2	NTE-2-3??				
Result Helper Field 3	NTE-8-3??				
Result Note					
Ordering physician	OBR-16-??&??	ORC-12	OBR-16-???	ORC-12	ORC-12
Sending Lab	MSH-4	MSH-4	MSH-4	MSH-4	MSH-4

Lab Result Output - Results as Text

	OBR-4	OBR-8	OBR-9	OBR-10	OBR-11	OBR-12
07323	^^LN^51813^CMV QNT^L					
07323	^^LN^0051813^Cytomegalovirus DNA Quantitation by PCR^L					
02131	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
0525	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
03150	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
01505	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
01459	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
00389	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
01431	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
01433	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
01470	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
00843	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L		1 CE	5000-5^Cy	1	^^^^Not Detected^L
03327	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L					
09057	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L					
03926	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L					
04894	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L					
01991	^^LN^0060040^Cytomegalovirus by Qualitative PCR^L					

Lab Result Output - Numeric Results

Data Type	Test Performed	OBX-4	Test Result	Units
OBX-2	OBX-3	OBX-4	OBX-5	OBX-5
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	5124-3^CMV IgG S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
SN	5126-8^CMV IgM S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
NM	5124-3^CMV IgG S	1	0.7	{EIA_index}^EIA index^UCUM^8995800
SN	5126-8^CMV IgM S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
NM	72494-8^CMV DNA	1	2.5	{Log_IU}/mL^log (base 10) internationa
SN	5126-8^CMV IgM S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
SN	5126-8^CMV IgM S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
NM	5124-3^CMV IgG S	1	0.7	{EIA_index}^EIA index^UCUM^8995800
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	5124-3^CMV IgG S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
SN	5126-8^CMV IgM S	1	<^0.2	{EIA_index}^EIA index^UCUM^8995800
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
NM	5124-3^CMV IgG S	1	7.5	{EIA_index}^EIA index^UCUM^8995800
NM	5124-3^CMV IgG S	1	4.7	{EIA_index}^EIA index^UCUM^8995800
NM	5126-8^CMV IgM S	1	1.8	{EIA_index}^EIA index^UCUM^8995800
NM	5126-8^CMV IgM S	1	1.5	{EIA_index}^EIA index^UCUM^8995800
NM	1742-6^ALT SerPI-c	1	1240	U/L^enzyme unit per liter^UCUM^319^
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa
SN	72494-8^CMV DNA	1	<^2.1	{Log_IU}/mL^log (base 10) internationa

Technical Research Phase

- Lab Messages have very sparse demographic information
 - Decided that matching for Labs had to be different than matching for hearing screening.
- Explored technology for making the lab data available to the HiTrack software
 - Mirth Connect Messages
 - Secure File transfer

Development Phase

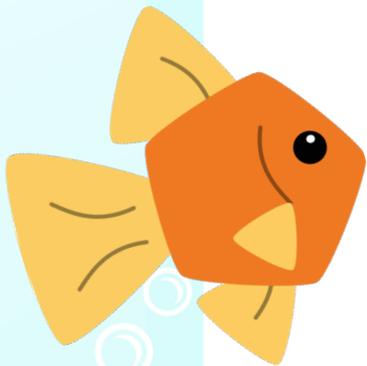
- Challenges
 - Official Facility List - the Facilities list reported by the labs is more comprehensive than what is needed for HiTrack.
 - Unstandardized HL7 Message Content
- Interactions with lab data IT (Informatics – Division of Disease Control and Prevention Utah)
 - Responsive IT support was essential
- Secure Email System enhanced development process
 - Enabled discussion about specific records and troubleshoot import problems.

Testing Phase

- Secure Database Copy
 - BAA / Data Privacy Agreement
 - Data destruction policy
- Compared automatically imported results to hand entered results
- Looked for Unmatched Records
 - Match Scores
 - Surprised by records that came in prior to hearing screening results

Implementation

- UDOH IT Support
- UDOH Shared Folder Installation
 - Lab team built auto-extract process
- HiTrack 5.0.2 Update



Automated Import

HiTrack
EHR Data Management System
james

Appointments Today Notifications James Facility

Pending Merge Data 4

Shimmer B 3/25/2019 12:00:00 AM [Baby]
Dollar Sandy 3/4/2019 12:00:00
Corral A 4/7/2019 12:00:00 AM [Baby]

Field	Incoming	Info
Phone Number		Waiting to be Merged
— ph number	435-7209999	
Contact Role		Waiting to be Merged
— contact role type	Other Contact	
Event		Waiting to be Merged
— event date	4/3/2019 4:49:00 PM	
— facility id		
— stage code	Laboratory Testing	
Test		Waiting to be Merged
— test date	4/3/2019 4:49:00 PM	
— result	Not Detected	
— screener id		
— test type	CMV - Urine	
-		

Waiting to be Merged

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Automated Import - Match Resolution

Pending Merge Data 4

⚡

Coral
Ralphie
4/7/2019
12:00:00

Dollar
Sandy
3/4/2019
12:00:00

Shimmer B
3/25/2019
12:00:00
AM [Baby]

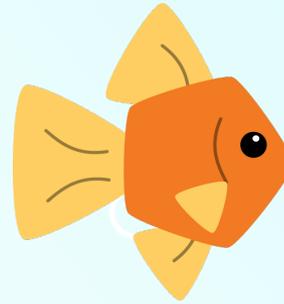
Combine With Corral Ralph 4/7/2019 12:00:00 AM Baby Last Name: Corral, Baby Medical ID: 21628126, 92.86 %

Field	Existing	Incoming	Use Incoming	Info
Baby Medical ID	21628126	R000216222	<input checked="" type="checkbox"/>	R000216222
Baby Last Name	Corral	Coral	<input type="checkbox"/>	Corral
Baby First Name	Ralph	Ralphie	<input type="checkbox"/>	Ralph
Baby DOB	4/7/2019 12:00:00 AM	4/7/2019 12:00:00 AM	<input type="checkbox"/>	4/7/2019 12:00:00 AM
Is Multiple Birth	N		<input type="checkbox"/>	N
Multiple Birth Code			<input type="checkbox"/>	
Birthing Facility	University Hospital UT		<input type="checkbox"/>	University Hospital UT
Gender	M	M	<input type="checkbox"/>	M
Baby Alternate ID			<input type="checkbox"/>	
Is Deceased	N	N	<input type="checkbox"/>	N
Birth Weight (grams)		4422	<input checked="" type="checkbox"/>	4422
ICU Days			<input type="checkbox"/>	
Gestational Age			<input type="checkbox"/>	
Nursery Level			<input type="checkbox"/>	
Current Location			<input type="checkbox"/>	

Attention Needed

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New Day-to-day Process



- Staffing Changes
 - Hospital data entry reduced
 - State staff
 - (fewer than 2 hours a week)
- UDOH efforts changed
 - Shift from data entry to import oversight efforts
 - More efficient
- Challenges
 - Unrecognized Doctor names
 - Not getting Saliva (Fall 2019)

Future Work

- More Labs
- Increased Automation with IT scripting

Questions?

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