



Newborn Screening for CCHD

The First Six Months of Data Reporting in Michigan
Using Multiple Electronic Options

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Michigan CCHD Screening History

- June 1, 2012
 - HRSA Grant for CCHD Demonstration Program
 1. Increase the number of Michigan newborns screened for CCHD using a validated screening protocol
 2. Develop state infrastructure for collection of CCHD screening data through electronic health information exchange to enable effective public health follow-up, quality assurance and evaluation
- April 1, 2014
 - Mandated screening of all Michigan newborns
 - Electronic reporting of results to the state NBS program
 - Requiring individual-level data

Required data elements

- Pulse Oximetry Screening
 - Baby's Demographics
 - NBS kit number*
 - Date and times
 - Hand and Foot saturation
 - Difference
 - Outcome
 - OR Reason screening was not done



*kit number is vital for linking to blood spot card

Additional follow-up data elements

- **Clinical Exam**
 - Date/time
 - Findings
- **Echocardiogram**
 - Date/location
 - Findings
- **Case Report**
 - Antenatal ultrasound?
 - How CCHD was first suspected?
 - Surgery date/hospital
 - Catheterization
 - Diagnosis

Electronic Reporting Options

1. PerkinElmer's eReports
 - Individual baby results entered and submitted through web-based module
2. Batch file reporting from EHR system and uploaded to secure state FTP site
3. Direct HL7 messaging via Michigan Health Information Network (MiHIN)

I. PerkinElmer's eReports

- Access via Michigan Single-sign-on application
- Customized for pulse oximetry
- Real-time reporting
- Data entry by clinical staff
- Data accessible to MDCH follow-up staff

eReports Data Entry Screen



- . Home
- . Specimen Search
- . Submitter Search
- . Pulse Ox
- . Forms
- . Administration
- . Logout

Pulse Ox

[Click for Help](#)

Baby's First Name	<input type="text"/>	Mother's First Name	<input type="text"/>
Baby's Last Name	<input type="text"/>	Mother's Last Name	<input type="text"/>
Medical Record Number	<input type="text"/>	Newborn Screening Kit Number	<input type="text"/>
Date of Birth (mm/dd/yyyy)	<input type="text"/>	Birth Hospital Name	<input type="text" value="v"/>
Pulse Ox 1		Multiple Birth Order	<input type="text" value="v"/>
Date (mm/dd/yyyy)	<input type="text"/>	Perfusion Index Foot	<input type="text"/>
Time (HH:MM)	<input type="text"/>	Perfusion Index Right Hand	<input type="text"/>
Foot Sat%	<input type="text"/>	Pulse Ox Not Completed	<input type="text" value="v"/>
Right Hand Sat %	<input type="text"/>	Other	<input type="text"/>
Difference	<input type="text"/>		
Outcome	<input type="text" value="v"/>		
Pulse Ox 2		Perfusion Index Foot	<input type="text"/>
Date (mm/dd/yyyy)	<input type="text"/>	Perfusion Index Right Hand	<input type="text"/>
Time (HH:MM)	<input type="text"/>	Pulse Ox Not Completed	<input type="text" value="v"/>
Foot Sat%	<input type="text"/>	Other	<input type="text"/>
Right Hand Sat %	<input type="text"/>		
Difference	<input type="text"/>		
Outcome	<input type="text" value="v"/>		
Pulse Ox 3		Perfusion Index Foot	<input type="text"/>
Date (mm/dd/yyyy)	<input type="text"/>	Perfusion Index Right Hand	<input type="text"/>
Time (HH:MM)	<input type="text"/>	Pulse Ox Not Completed	<input type="text" value="v"/>
Foot Sat%	<input type="text"/>		
Right Hand Sat %	<input type="text"/>		
Difference	<input type="text"/>		

Internal Use Only

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2. FTP through DEG

- Data submission to a file transfer protocol (FTP) site through Data Exchange Gateway (DEG)
- Hospital prepares batch file with required data elements extracted from EHR
 - Delimited text file (txt) or comma separated values text file (csv)
 - Alternatively, may hand enter data into Excel spreadsheet
- Obtain user authorizations
- Upload to secure state FTP server
- File downloaded to eReports pulse oximetry holding table, then merged with NBS blood spot card information
- Submission: daily to weekly

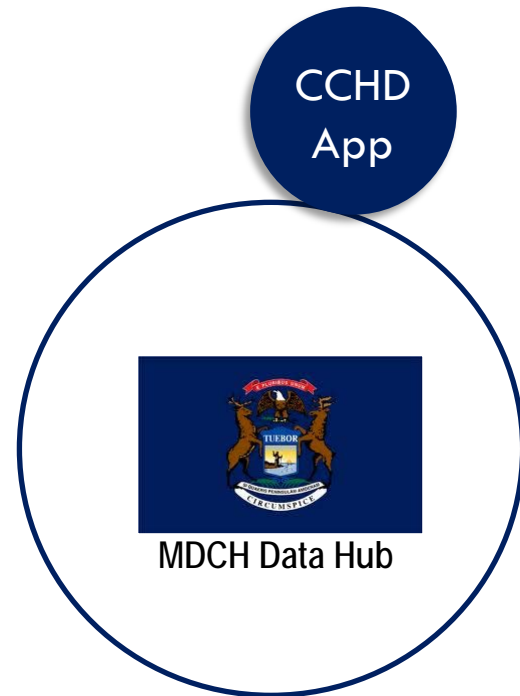
3. HL7 messaging

- Hospital builds CCHD reporting fields into EHR
- Messages sent nearly instantaneously from hospital EHR directly to MDCH using defined LOINC codes
- Data routed from Data Hub to Perkin Elmer eReports
- Implementation Guide developed – beginning pilot phase with hospitals

CCHD Reporting via HL7



HIE
(QOs, sub-state
HIEs)



Summary of Michigan Data Submission Methods

Method	Pro	Con	% of Hospitals
eReports	<ul style="list-style-type: none"> ✓ Lowest upfront cost for hospital ✓ Does not require modification to hospital EHR ✓ CCHD follow-up database links with existing NBS system 	<ul style="list-style-type: none"> ✓ Staff time to log in and submit individual baby data time consuming ✓ Moderate development cost at state level 	20
FTP	<ul style="list-style-type: none"> ✓ Does not require individual baby data entry ✓ Semi/automatic transmission of data file on multiple babies ✓ Minimal cost at state level 	<ul style="list-style-type: none"> ✓ Upfront cost to modify hospital EHR and/or develop batch file report ✓ Hospitals may choose to only submit once a week 	70
HL7	<ul style="list-style-type: none"> ✓ Nearly instantaneous transmission of individual baby data upon entry into EHR ✓ Minimal staff time ✓ Future transmission of NBS blood spot card data fields 	<ul style="list-style-type: none"> ✓ Upfront cost to modify hospital EHR and/or establish HL7 messaging ✓ Hospital must be a part of a substate HIE to connect to MiHIN ✓ Delayed start date; retroactive data submission back to April 1, 2014 ✓ Substantial development costs at state level 	10

CCHD Screening – First 6 months

- 68% of newborns from active CCHD reporting hospitals had pulse ox results reported that linked with their blood spot record
- MDCH goal = 90% of infants with a blood spot should have pulse ox results reported
 - 21 units out of 76 regular nursery units met this goal

CCHD Screening – First 6 months

34,248 newborns screened



Median age at first screen = 25 hours

34,089
pass

141
rescreen

18
fail

83
rescreened

58
No rescreen

4
failed
rescreen

36 – No rescreen
19 – Reported “Missed”
2 – ECHO
1 – discharge & PCP notified

22 Failed Screen Details

8 failures to follow Michigan algorithm

- “Failed” initial screen, rescreened and “passed”
- Screened while “in distress”

7 Errors in reporting

- Data entry errors

4 pending

- Referred for further follow-up
- No further information on these newborns

3 diagnosis

- Mild restrictive PDA
- Congenital pneumonia
- Pulmonary hypertension

Reasons Not Screened for CCHD

Reason	Number of MI Newborns
MISSED	332
Echocardiogram	82
Transfer	90
Refer for follow-up	3
Prenatal/Postnatal Diagnosis	38
Cardiac Distress	10
Parental Refusal	2
Death	9
Other	50
TOTAL	616



Challenges

- Variations from Michigan Algorithm
 - 314 newborns who passed 1st screen had rescreen
 - 9 newborns who passed 1st and 2nd screen had a 3rd screen
- Missed screens
 - Newborns discharged from hospital without screen, rescreen or documentation of screen
- Data quality issues
 - Data entry errors
 - Linking errors
 - CCHD reported but cannot link to blood spot screen
 - Missing kit number

Future Directions

- Educate hospital staff to improve data quality
- Calculate sensitivity and specificity
- Evaluate the current Michigan screening algorithm
- Implement electronic messaging for all NBS blood spot card demographics and results

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