EHR / IIS Interoperability Benefits and Barriers: Immunization Practice Perspectives

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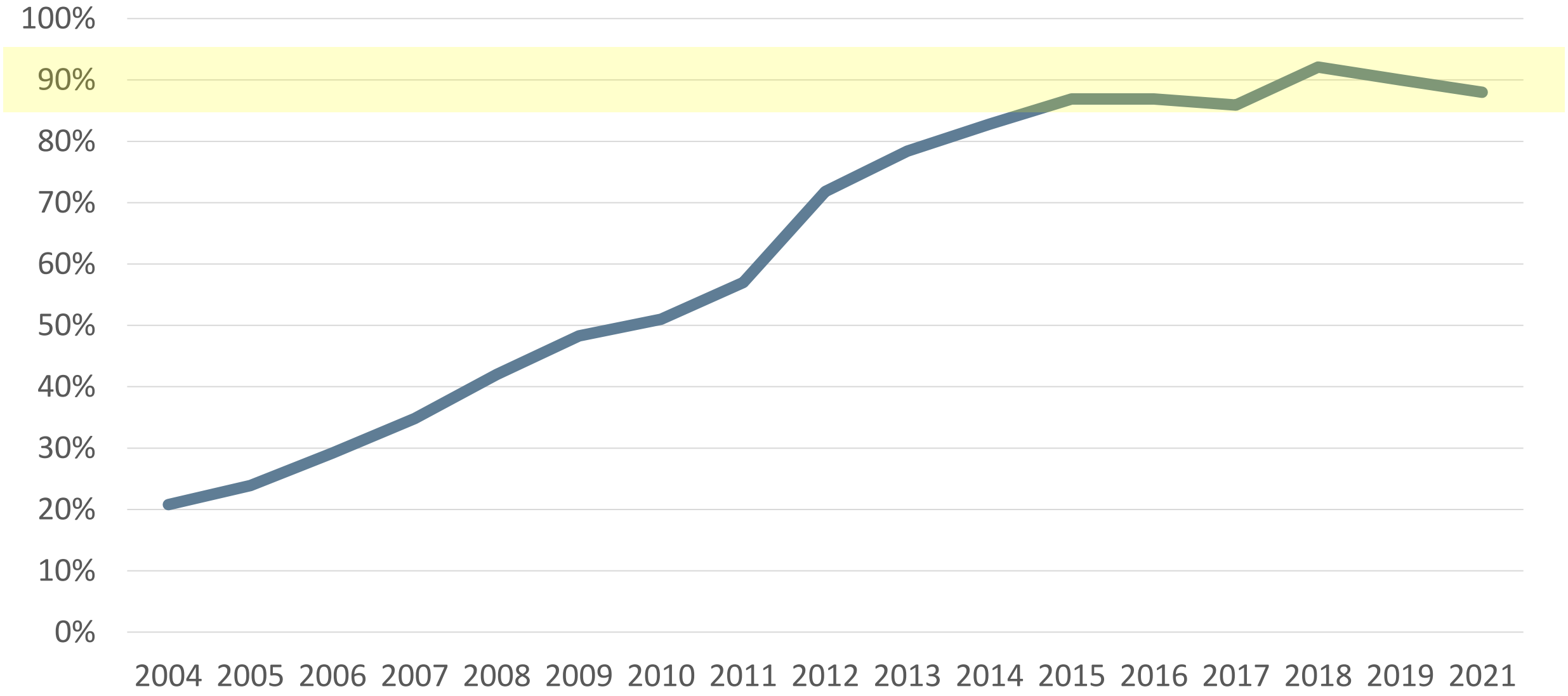
EHR / IIS Interoperability

- HITECH Act (2009) – incentivized EHR adoption
- EHRs adopted HL7 standards
- Practices adopted interoperability due to incentives


Confidential paper
shredding & recycling
1 866 69 Shred

Office-based Physician Electronic Health Record Adoption, 2004 - 2021



Office of the National Coordinator for Health Information Technology. https://www.healthit.gov/data/quickstats/office-based-physician-electronic-health-record-adoption

Objectives

- Evaluate potential benefits and barriers of HL7 interoperability between EHRs and IIS at provider practices
- Focus on vaccination encounters and related functions, including:
  - immunization record keeping
  - decision support
  - administrative functions, e.g., inventory management and patient reminder / recall

Methods

- Evaluated the experiences of immunization providers using the Michigan Care Improvement Registry (MCIR)
- Interviewed 45 provider practices across Michigan, representing a range of:
  - medical specialties
  - geographic locations
  - patient population sizes

Practice Recruitment

- Designated in MCIR (2018) as active vaccination site
- Not a retail pharmacy or inpatient hospital unit
- Focused on practice types of interest:
  - family medicine
  - internal medicine
  - pediatrics
  - local health departments

Practice Recruitment

- Candidate practices identified statewide (n=1,892)
- Identified a diverse set of practice types and EHR/MCIR interoperability levels (n=111)
- Contacted via email to request participation; telephone follow up as necessary
- Identified key person(s) at each practice regarding vaccination workflow

Vaccination Workflow Model

Patient Information Collection

Collect or verify key patient information prior to vaccination encounter

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Vaccine Needs Assessment

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Inventory Management

Enter and balance inventory as decremented by doses administered

Interviewing Practices

- Developed interview guide to capture how each workflow step was accomplished, who performs tasks, and whether barriers exist
- Interviews conducted by telephone or Zoom
  - Phase 1: March 2019 – December 2019
  - Phase 2: September 2020 – December 2021
- Interviews typically <1 hour and were transcribed

Interviewing Practices

- Codebook developed to capture key interview themes (Phase 1) and adapted to reflect new topics (Phase 2)
- Themes were coded within each vaccination workflow category
- Results summarized

Results

Practice participation among candidate sites (n=111):

- Phase 1: 45 interviews completed
- Phase 2: 42 interviews completed

Practice Type

	Family Medicine	Pediatrics	Local Health Department	Internal Medicine
Phase 1 (n=45)	19 (42%)	18 (40%)	6 (13%)	2 (4%)
Phase 2 (n=42)	16 (38%)	18 (43%)	6 (14%)	2 (5%)

Results

- HL7 connectivity expanded among practices
- By the conclusion of the study, all practices had initiated at least unidirectional HL7 capability

HL7 Status

	Not HL7	Unidirectional	Bidirectional
Phase 1 (n=45)	4 (9%)	31 (69%)	10 (22%)
Phase 2 (n=42)	0 (0%)	26 (62%)	16 (38%)

Patient Information

Patient Information Collection

Collect or verify key patient information prior to vaccination encounter

- Nearly all (88%) practices updated patient information in the EHR
- Sometimes this is a paper-intensive process; 35% indicated use of paper forms
- Others report using a variety of electronic tools
- Updates transfer to MCIR for encounters where a vaccine is administered

Vaccine Needs Assessment

Vaccine Needs Assessment

Assess vaccination status and forecast which vaccines to be offered at encounter

- Completed before (63%) or day of appointment (37%)
- Nearly all practices (93%) consider MCIR as their primary source of vaccination data
- Most (83%) conduct dose reconciliation between their EHR and MCIR
- Majority (93%) print ‘MCIRs’ for each patient with upcoming appointments

STATE OF MICHIGAN
DEPARTMENT OF HEALTH AND HUMAN SERVICES
Official State of Michigan Immunization Record
333 S. Grand Avenue Lansing, MI USA 48909 www.Michigan.gov/MDHHS

MCIR ID#: 17170335980 **Patient ID#:**
Name: Michigander, Junior **Age:** 4 Years 3 Months **DOB:** 01/01/2019
As of: April 19, 2023
Provider: Assessment indicates that vaccinations are overdue and should be administered today if not medically contraindicated. This person is at high risk and should be tested for lead poisoning.

History of Vaccinations Given By Series

Vaccine Series	Date#1	Date#2	Date#3	Date#4	Date#5	Date#6	Date#7
DTP/DTaP/DT/Td/Tdap	03/02/2019	05/02/2019	07/02/2019				
Hib	03/02/2019	05/02/2019	01/01/2020				
Polio	03/02/2019	05/02/2019	07/02/2019				
MMR	01/01/2020						
Hepatitis B	01/01/2019	02/01/2019	07/02/2019				
Varicella	01/01/2020	03/01/2022	03/09/2022 *				
Hepatitis A	01/01/2020	07/01/2020					
Pneumococcal Conjugate	03/02/2019	05/02/2019	01/01/2020				

Immunizations Status and Shots Needed

Vaccine	Next Dose Due	Accelerated Due	Recommended	Overdue Date
DTaP	4	01/01/2023	01/01/2023	01/01/2023
Hib	Complete			
Polio	4	01/01/2023	01/01/2023	01/01/2024
MMR	2	04/06/2022	01/01/2023	01/01/2024
Hepatitis B	Complete			
Varicella	Complete			
Hepatitis A	Complete			
Seasonal Influenza	1	09/01/2022	09/01/2022	10/01/2022
Pneumococcal PCV13/PCV15	Complete			
COVID-19 (Pfizer/Moderna)	1	06/17/2022	06/17/2022	07/17/2022

Shots given Today

Vaccine Type	Date	Dose Qnty	Site	Mfg	Lot#	VIS Date	Signature

*** Invalid Dose**

Signature:_____ **Date:**_____/_____/_____

Dose Reconciliation

Vaccine Needs Assessment

Assess vaccination status and forecast which vaccines to be offered at encounter

- Bidirectional HL7 practices (38%) query doses from MCIR for review
- Other practices will typically review MCIR information from printed MCIRs
- Some practices noted difficulties due to the time-consuming nature of this task
- Most (93%) conduct reminder/recall which relies on similar information

Vaccine Administration

Vaccine Administration

Indicate vaccines to be given in the EHR and document as administered

- Majority (68%) indicate orders in their EHR for specific vaccines to be administered
- Most (71%) conduct some verification once orders are placed / finalized
- Vaccine refusals are typically recorded in EHR (74%) with some including signed refusal (45%)
- Some (26%) also manually enter refusals into MCIR

Data Transfer

Data Transfer

Transfer data on vaccine administered in MCIR

- Practices that adopted HL7 during the study (10%) no longer required keyboard entry
- EHRs typically send data to MCIR immediately following vaccination encounter (93%)
- Reviewing HL7 Transfer Reports was the method used by most sites (97%) for identifying errors
- Data entry errors were those most frequently noted (e.g., lot numbers, stock selection)

Inventory Management

Inventory Management

Enter and balance inventory as decremented by doses administered

- VFC stock is pre-entered into MCIR for VFC sites (88%)
- Most sites (93%) also track private stock in MCIR
- EHR/IIS interoperability does not include the vaccine stock, so double entry is required to track inventory in EHRs as well

Conclusions

- Practices rely heavily on both EHR and MCIR information throughout the vaccination workflow
- Most practices rely on MCIR as their primary vaccination history source and forecast of eligible doses at an encounter
- Practices continue to rely on paper-based systems for workflow, tracking, and verification processes
- HL7 connectivity can impact several key activities including vaccination assessment, data transfer, and consequently, inventory management

Implications

- Data quality impacts: timeliness, accuracy, completeness (e.g., lot numbers, CVX codes, etc.)
- The use of EHR vs. IIS for decision-making or targeted outreach hinges on accurate reconciliation of doses
- While there may be time savings to adopting HL7 interoperability, this change may require staff to implement and learn new workflow processes that can be time consuming
- Developing improved mechanisms for reconciling information from MCIR into EHRs may help alleviate burdens on staff time

Collaborators

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