Immunization Calculation Engine (ICE)
an Open Source Clinical Decision Support System
for Integration with Health Information Systems

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OpenCDS

- Software platform and toolkit for developers implementing CDS services
- Open source
- Standards-based
- Web Service interface
- Collaborative project, led by Dr. Kensaku Kawamoto at University of Utah

www.opencds.org
Sample ICE Deployment
ICE Collaborators

- New York City Citywide Immunization Registry
- HLN Consulting, LLC
- Alabama Department of Public Health
- OpenCDS Team
- Veterans Health Administration
- Pfizer
ICE Roadmap

- Evaluate Pneumococcal Conjugate and Polysaccharide vaccines as a single vaccine group
- Updates to Polio Schedule
- Updates to Flu schedule
- Support for Meningococcal B (new!)
- Support for HALO factors (health, age, lifestyle, occupation)
- Support Past Due Date
Deployments of ICE

- National EHR – eClinicalWorks (December 2013)
- National PHR – CareDox (November 2014)
- Denver Public Health (July 2016)
- Veteran’s Administration (on VA Test server since July 2016)
- New York City IIS (Scheduled for Summer 2017)
- New Jersey IIS (In the process of scheduling... )
Learn More About ICE Through...

- ICE Wiki (cdsframework.org)
- HLN’s ICE Webpage (www.hln.com/ice)
- Executable software distribution
- Source code
- HLN-hosted test instance
- Software Demonstrations
Immunization Calculation Engine

An immunization decision support system that:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Achievement</th>
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<tr>
<td>Supports routinely administered vaccine groups</td>
<td>• Supports 14 vaccine groups from birth through adulthood</td>
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<td>Promotes clinical best practices</td>
<td>• Follows ACIP recommendations</td>
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<td>• Informed by CDC’s CDSi project</td>
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<td>Adapts to changing requirements</td>
<td>• Rule editing GUI tool for non-technical SMEs</td>
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<td></td>
<td>• Automated testing tool w/ 2,400 test cases</td>
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<tr>
<td>Easily integrates with IIS and other health systems</td>
<td>• Standards-based, web service interface</td>
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<td></td>
<td>• Variety of deployment options</td>
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<tr>
<td>Freely available</td>
<td>• Standard open-source license</td>
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<td>• Downloadable from public website</td>
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Contact Us for More Information

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Software Architecture

- ICE/OpenCDS
  - Servlet Container (Java EE 6 or 7 compliant)
  - JBoss Drools (rule engine/database)
  - HL7 Decision Support Service “DSS” (web service interface)
  - HL7 Virtual Medical Record “vMR” (data model)

- CAT
  - Application Server (Java EE 6 compliant)
  - JavaServer Faces (GUI)
  - Enterprise JavaBeans (business logic)
  - JDBC compliant database
Inputs to ICE

- Patient parameters
  - Date of birth
  - Gender
  - Immunization history (vaccine and admin date)
  - Disease immunity

- Situational parameters
  - Immunization schedule identifier
  - Date of evaluation
Outputs from ICE

- Evaluation of each dose
  - Evaluation = Valid, Invalid, or Accepted
  - Invalid Reason(s), for each Invalid dose
- Recommendation for each vaccine group
  - Recommendation = Recommended, Future recommended, Conditional, or Not recommended
  - Earliest recommended due date
  - Reason
Easy to Adopt and Integrate With

- Open source (GNU LGPL v3)
- Java-based system runs on a wide variety of server platforms
- Can be deployed in a variety of ways
- Standards-based Web Service interface
- Public wiki – binary releases, source code, implementation guide, immunization rules