Use of the Immunization Calculation Engine (ICE) for Immunization Forecasting

41st VistA Community Meeting

September 8, 2023

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Immunization Calculation Engine (ICE)

Immunization Calculation Engine

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About ICE

The Immunization Calculation Engine (ICE) open source software supports immunization evaluation and forecasting in alignment with Advisory Committee on Immunization Practices (ACIP) recommendations.

Digital Public Goods Alliance

HLN Consulting

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Original ICE collaborators

- New York City Citywide Immunization Registry
- HLN Consulting, LLC
- Alabama Dept of Public Health
- OpenCDS Team
  - Software platform and toolkit
  - Open source
  - Standards-based
  - Web Service interface
  - Collaborative project: Dr. Kensaku Kawamoto at University of Utah

HLN Consulting

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ICE software and documentation is freely available

- Documentation, executable software, and source code is publicly accessible
- Standard, permissive open-source license (LGPL v3)

ICE Wiki:
https://cdsframework.atlassian.net/wiki/spaces/ICE/overview

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ICE easily integrates with health IT systems

- Designed for integration and use with any system that contains immunization data
- Standards-based architecture and APIs
- Variety of deployment options
- Used in public health, clinical, and research settings

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ICE supports routine immunizations across the lifespan

- Addresses routine child, adolescent, and adult immunizations in alignment with ACIP recommendations
- Supports a default immunization schedule with evaluation and forecasting for 17 vaccine groups

- COVID-19
- DTP
- H1N1
- Hepatitis A
- Hepatitis B
- Hib
- HPV
- Influenza
- Meningococcal ACWY
- Meningococcal B
- MMR
- Orthopoxvirus
- Pneumococcal
- Polio
- Rotavirus
- Varicella
- Zoster

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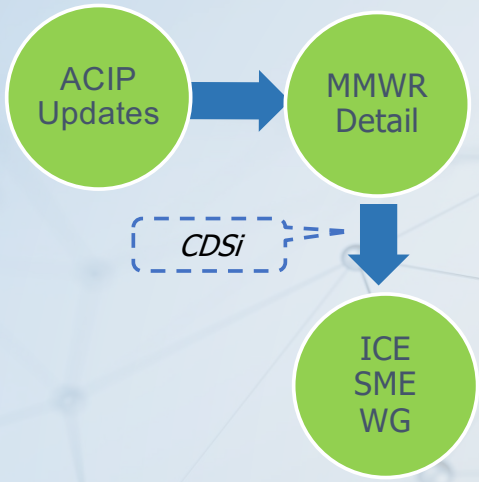
ICE adapts to changing recommendations



ICE is rigorously tested, with over 3,750 automated test cases

ICE DEVELOPMENT & TESTING

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"ICE Client" Application is a free test tool to try ICE

- Browser-based app: http://cds.hln.com/iceweb/
- Simple user interface for creating/submitting sample patient data and seeing ICE response/results
- Uses instance of ICE service hosted by HLN
- Shows vMR-formatted version of sample patient data from user, formatted by client app
- Shows raw vMR-formatted output, returned by hosted ICE instance

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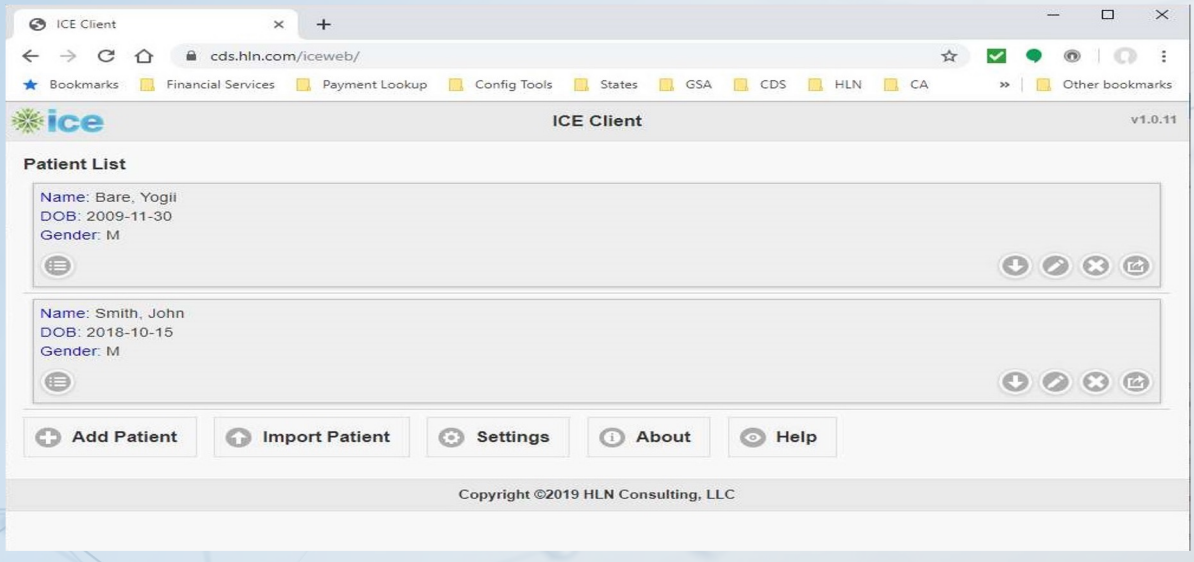
ICE Client - Patient list



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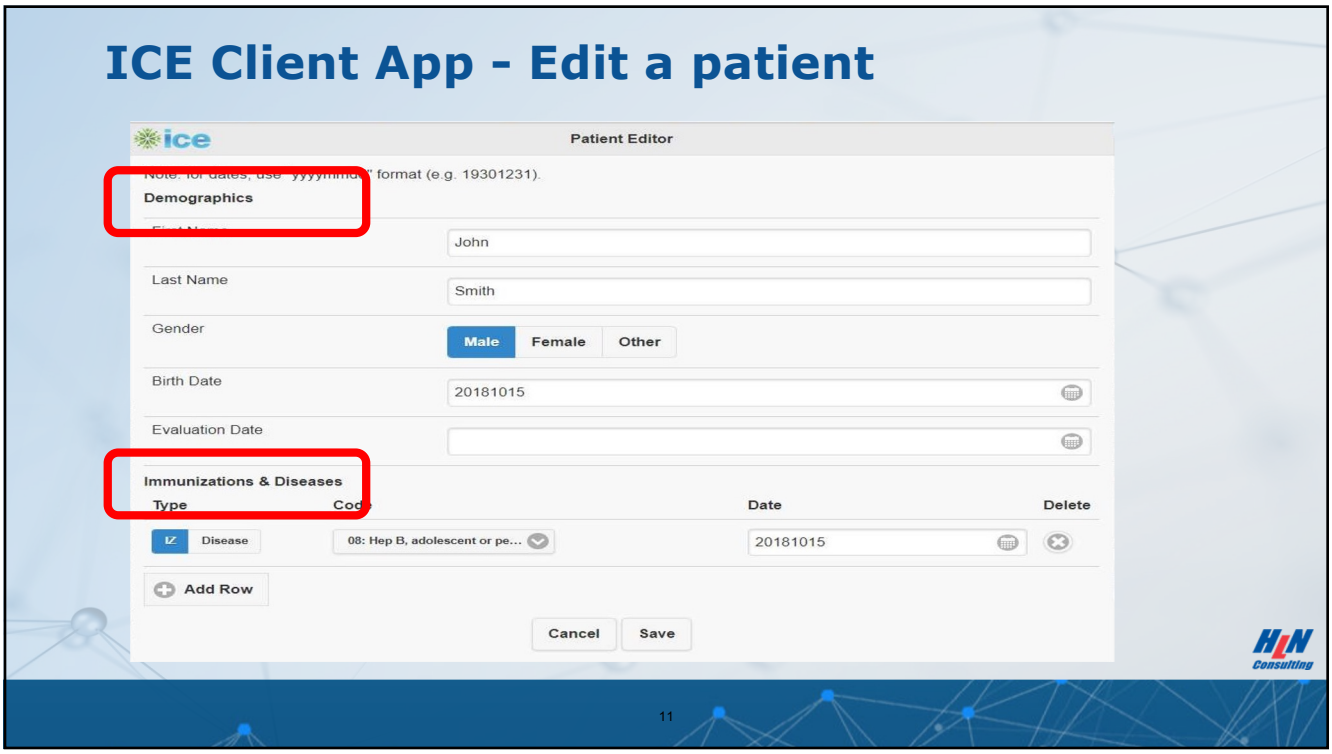
ICE Client App - Edit a patient



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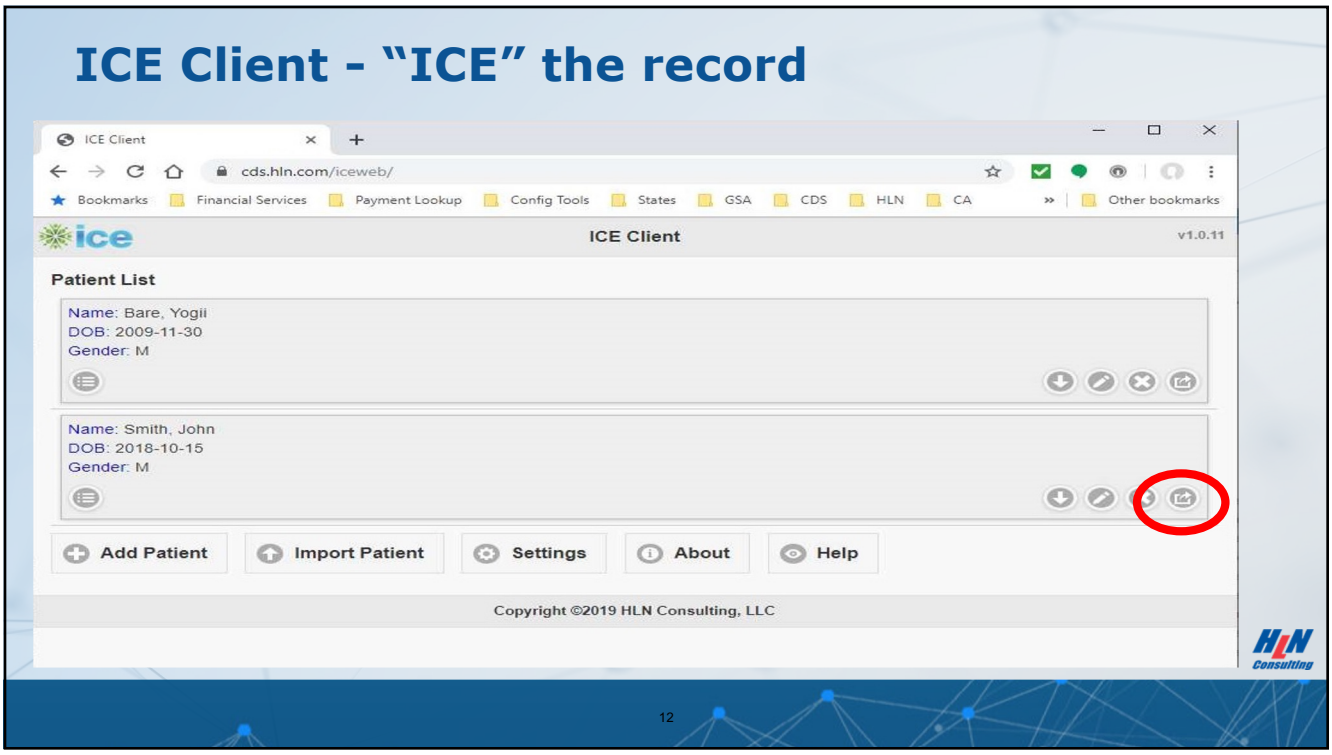
ICE Client - "ICE" the record



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ICE Client - Evaluation date, age at evaluation

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	

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ICE Client - Evaluation

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	

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ICE Client - Forecast

Name: John Smith
DOB: 2018-10-15
Gender: M
Evaluation Date: 2019-08-19
Age @Evaluation: 0y 10m 4d

Patient Output Grid - Click on the bulleted-list icons for additional details

Vaccine Group	Recommendations	Evaluations
Hep B	Recommendation Date: 2018-11-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-12 Status: RECOMMENDED Message: DUE_NOW Vaccine Group: Hep B	Date: 2018-10-15 Age: 0y 0m 0d Valid: true Vaccine: Hep B, adolescent or pediatric (08)
DTP	Recommendation Date: 2018-12-15 Overdue Date: 2019-02-11 Earliest Date: 2018-11-26 Status: RECOMMENDED Message: DUE_NOW Vaccine: DTaP NOS (107)	

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ICE Client - Debug mode

ICE Response Data:
{"100":{"groupName":"Hep B","evaluations":[{"id":"c311601b-50fd-5e61-cfad-d6eca5ffe3","substanceCode":"08","componentSubstanceCode":"08","administrationTime":"20181015","doseNu

Input VMR:
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns3:cdsInput xmlns:ns2="org.opencds.vmr.v1_0.schema.vmr" xmlns:ns3="org.opencds.vmr.v1_0.schema.cdsinput">

Output VMR:
<?xml version="1.0" encoding="UTF-8" standalone="yes"?><ns2:cdsOutput xmlns:ns2="org.opencds.vmr.v1_0.schema.cdsoutput" xmlns:ns3="org.opencds.vmr.v1_0.schema.vmr"

SOAP Request:
<?xml version="1.0" encoding="utf-8"?>
<S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope">

SOAP Response:
<soap:Envelope

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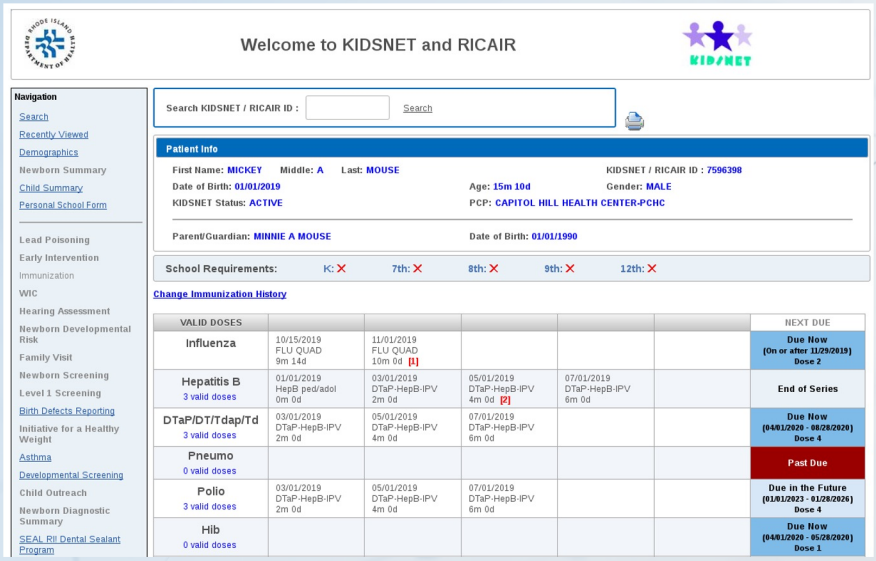
RI KIDSNET



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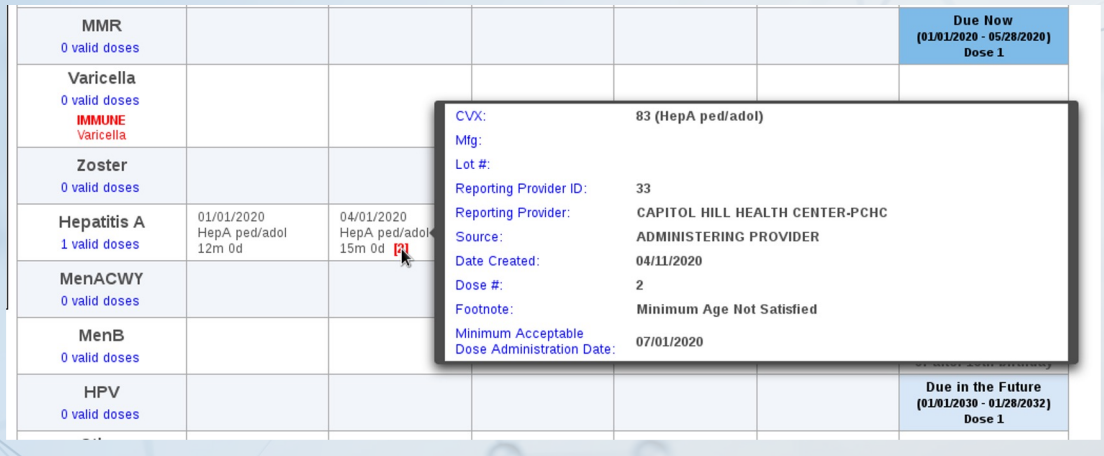
RI KIDSNET



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Known ICE users*

- Physician's Computer Company (piloting, 2023)
- Docket PHR (2022)
- Office Practicum (2022)
- WebChart (2020)
- empower systems (2020)
- athenaPractice EHR (2020)
- Indian Health Service – RPMS EHR (2020)
- AZOVA Vaxigo Clinical System (2020)
- GE Centricity/Health 1 Technologies EHR (2018)
- New York-Presbyterian Hospital/Columbia University Medical Center (2017)
- CareDox PHR (2014)
- eClinicalWorks EHR (2013)
- CDC WIR IIS Software Replacement (when released – 2022)
- Massachusetts Department of Public Health – IIS (2021)
- Virginia Department of Health – Web Vision Public Health EHR (2020)
- New York City Department of Health and Mental Hygiene – Citywide Immunization Registry (2020, in phases)
- Vermont Department of Health – IIS (2020)
- Rhode Island Department of Health – IIS (2020)
- Michigan Department of Health and Human Services – IIS (2018, in phases)
- New Jersey Department of Health – IIS (2018)

*To the best of our knowledge

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ICE resources

- HLN ICE Webpage www.hln.com/ice
- ICE Wiki https://cdsframework.atlassian.net/wiki/spaces/ICE/overview
  - Subscribe to ICE Announcements https://docs.google.com/forms/d/e/1FAIpQLSeeeOLj7arRnJUl4vBtJZsCDKOcP-76vlL0PP-KduGglxJdWQ/viewform
  - ICE Immunization Schedule cdsframework.atlassian.net/wiki/spaces/ICE/pages/14352468/Default+Immunization+Schedule
  - Executable software distribution and source code cdsframework.atlassian.net/wiki/spaces/ICE/pages/18972704/Downloads
- Try ICE with the ICE Client App https://cdsframework.atlassian.net/wiki/spaces/ICE/pages/27820034/Try+ICE+by+Using+the+ICE+Client+App
- OpenHealthNews article www.openhealthnews.com/articles/2019/anatomy-public-health-open-source-project-hlns-immunization-calculation-engine-ice

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Indian Health Service
ICE Forecaster

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DIVISION OF INFORMATION TECHNOLOGY
PHARMACY INFORMATICS CONSULTANT
SEPTEMBER 8, 2023

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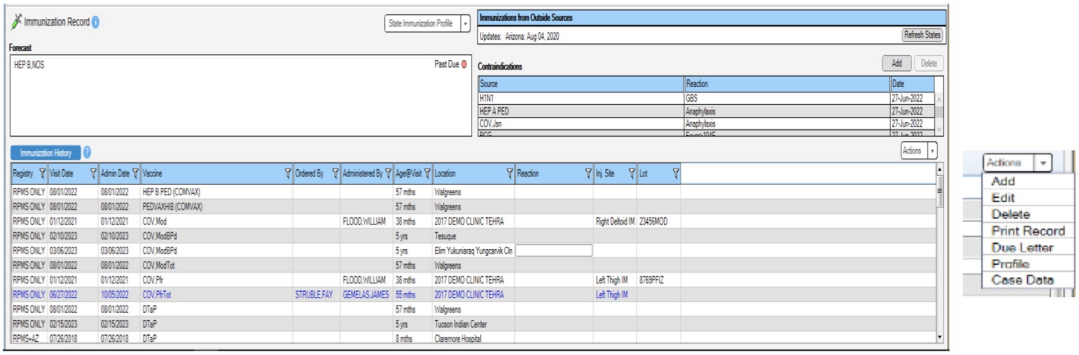
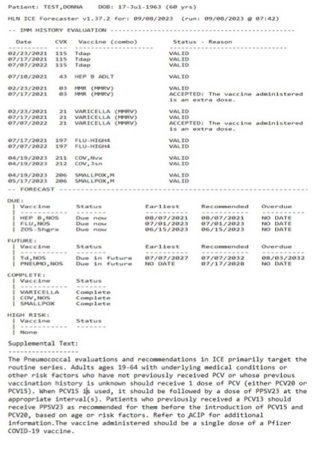
Immunization Component



ICE Forecasting in EHR/RPMS



```
Patient: TEST,DONNA    DOB: 17-Jul-1963 (60 yrs)
HLN ICE Forecaster v1.37.2 for: 09/08/2023  (run: 09/08/2023 @ 07:42)
-- IMM HISTORY EVALUATION ----------------------------------------------
  Date       CVX  Vaccine (combo)          Status - Reason
  ---------- ---  --------------------     ------------------------------
02/23/2021   115  Tdap                     VALID
07/17/2021   115  Tdap                     VALID
07/07/2022   115  Tdap                     VALID

07/10/2021    43  HEP B ADLT               VALID

02/23/2021    03  MMR (MMRV)               VALID
07/17/2021    03  MMR (MMRV)               ACCEPTED: The vaccine administered
                                           is an extra dose.

02/23/2021    21  VARICELLA (MMRV)         VALID
07/17/2021    21  VARICELLA (MMRV)         VALID
07/07/2022    21  VARICELLA (MMRV)         ACCEPTED: The vaccine administered
                                           is an extra dose.

07/17/2021   197  FLU-HIGH4                VALID
07/07/2022   197  FLU-HIGH4                VALID

04/19/2023   211  COV,Nvx                  VALID
04/19/2023   212  COV,Jan                  VALID

04/19/2023   206  SMALLPOX,M               VALID
05/17/2023   206  SMALLPOX,M               VALID
-- FORECAST ----------------------------------------------------------
DUE:
  | Vaccine       Status          Earliest     Recommended   Overdue
  | ------------  --------------  ----------   ----------    ----------
  | HEP B,NOS     Due now         08/07/2021   08/07/2021    NO DATE
  | FLU,NOS       Due now         07/01/2023   07/01/2023    NO DATE
  | ZOS-Shgrx     Due now         05/15/2023   05/15/2023    NO DATE

FUTURE:
  | Vaccine       Status          Earliest     Recommended   Overdue
  | ------------  --------------  ----------   ----------    ----------
  | Td,NOS        Due in future   07/07/2027   07/07/2032    08/03/2032
  | PNEUMO,NOS    Due in future   NO DATE      07/17/2028    NO DATE

COMPLETE:
  | Vaccine       Status
  | ------------  --------
  | VARICELLA     Complete
  | COV,NOS       Complete
  | SMALLPOX      Complete

HIGH RISK:
  | Vaccine       Status
  | ------------  -------
  | None

Supplemental Text:
------------------
The Pneumococcal evaluations and recommendations in ICE primarily target the
routine series. Adults ages 19-64 with underlying medical conditions or
other risk factors who have not previously received PCV or whose previous
vaccination history is unknown should receive 1 dose of PCV (either PCV20 or
PCV15). When PCV15 is used, it should be followed by a dose of PPSV23 at the
appropriate interval(s). Patients who previously received a PCV13 should
receive PPSV23 as recommended for them before the introduction of PCV15 and
PCV20, based on age or risk factors. Refer to ACIP for additional
information.The vaccine administered should be a single dose of a Pfizer
COVID-19 vaccine.
```

ICE Supplemental Text

HLN ICE Forecaster v1.37.2 for:

-- IMM HISTORY EVALUATION ----------

Date	CVX	Vaccine (combo)	Status - Reason

-- FORECAST ----------

HIGH RISK:

Vaccine	Status
None	

Supplemental Text:

The Pneumococcal evaluations and recommendations in ICE primarily target the routine series. Adults ages 19-64 with underlying medical conditions or other risk factors who have not previously received PCV or whose previous vaccination history is unknown should receive 1 dose of PCV (either PCV20 or PCV15). When PCV15 is used, it should be followed by a dose of PPSV23 at the appropriate interval(s). Patients who previously received a PCV13 should receive PPSV23 as recommended for them before the introduction of PCV15 and PCV20, based on age or risk factors. Refer to ACIP for additional information.The vaccine administered should be a single dose of a Pfizer COVID-19 vaccine.

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ICE Supplemental Text

HLN ICE Forecaster v1.37.2 for:

-- IMM HISTORY EVALUATION ----------

Date	CVX	Vaccine (combo)	Status - Reason
01/01/2022	218	COV,PfrPed	VALID
01/22/2022	218	COV,PfrPed	VALID
05/22/2022	301	COV,PfrBbP	VALID

Supplemental Text:

The timing of the administration of this shot does not follow the guidelines regarding the minimum interval of 5 months required for the 1st Booster Dose.

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Questions?

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