

# Clinical Decision Support for Immunization (CDSi)



The federal Advisory Committee on Immunization Practices (ACIP) provides expert advice and guidance on the use of vaccines and related agents for the control of vaccine-preventable disease in the United States. ACIP recommendations include the age for vaccine administration, number of doses, dosing interval, special indications for at-risk individuals, and precautions and contraindications.

## The Challenge: Updating CDS Engines

As ACIP recommendations are published, evaluation and forecasting engines—known as Clinical Decision Support (CDS) engines—need to be updated to determine recommended immunizations for a patient and deliver those recommendations to the healthcare provider.

Translating the ACIP recommendations’ clinical language into technical logic that can be processed with CDS engines, however, is a time-consuming and complex process that occurs mostly independently within the different Health Information Systems (e.g., Immunization

Information Systems [IIS], Electronic Health Records [EHRs], and [HIS] Health Information Exchanges).

The outcome? CDS engine outputs that often vary and do not always match the expectations of clinical subject matter experts (SMEs)

## The Solution: Easing the Process of Updating CDS Engines

Funded by the Immunization Information System Support Branch at the Centers for Disease Control and Prevention (CDC), the Clinical Decision Support for Immunization (CDSi) project was established to harmonize CDS engine outputs by developing a technical framework and resources focusing on the following goals:

- Improving the process of updating CDS logic with new and/or changed ACIP recommendations
- Increasing the accuracy and consistency of immunization evaluation and forecasting
- Improving the ease of developing and maintaining immunization CDS products

### The CDSi project was executed in two phases:

	Objective	Panel
PHASE 1	Develop CDSi resources such as a Logic Specification, Supporting Data, and Test Cases for vaccine groups routinely recommended by ACIP for healthy children from birth through 18 years	SMEs and expert reviewers from the CDC Public Health Informatics and Technology Program Office, American Immunization Registry Association, Indian Health Service, EHR vendors, programs and vendors, and academic institutions
PHASE 2	Expand the project’s scope to include adult vaccines and special-risk indications	Phase 1 representatives as well as representatives from the Veterans Administration, American College of Physicians, and American Academy of Family Practitioners

## The Scope

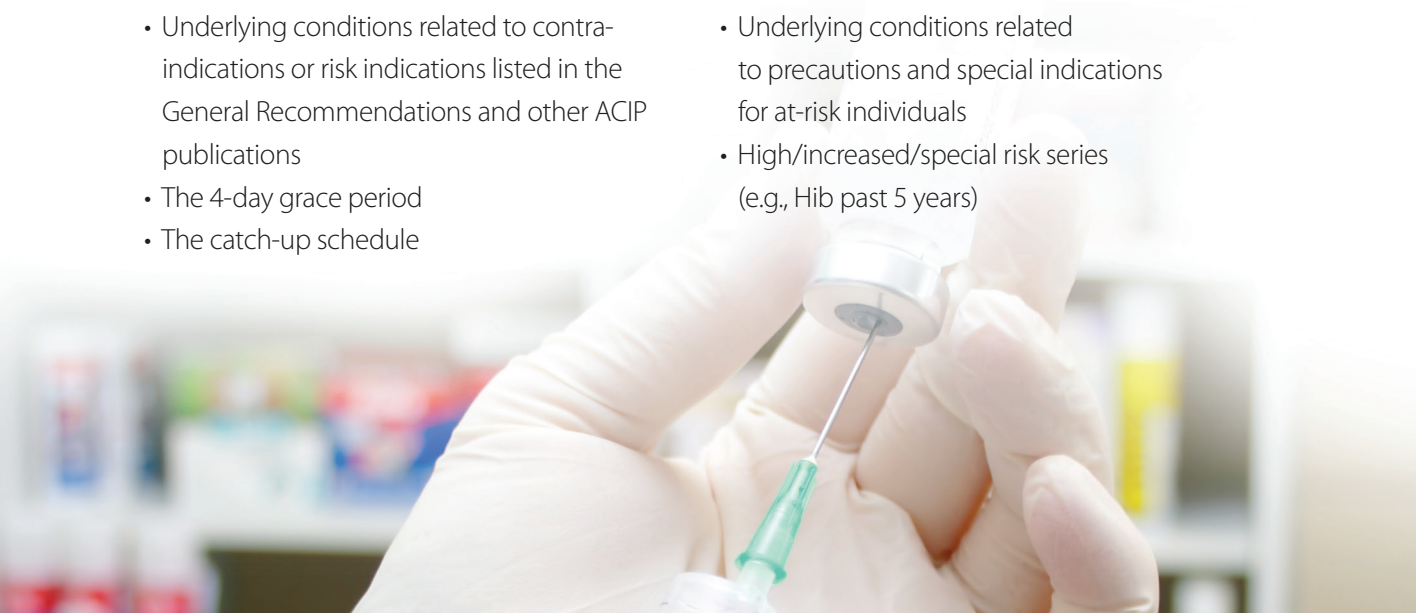
The target audience for the CDSi project includes business and/or technical implementers of immunization CDS engines. These implementers may support any system with an immunization evaluation and forecasting engine including but not limited to IIS and EHRs.

The current scope of the project includes those vaccine groups routinely recommended by ACIP for healthy individuals from birth through age 65+ years, as well as those who have risk indications related to underlying medical conditions:

- Diphtheria, Tetanus, and Pertussis (DTaP, Tdap, Td)
- Hepatitis A
- Hepatitis B
- Haemophilus influenzae type B (Hib)
- Human papillomavirus (HPV)
- Influenza (Flu)
- Japanese Encephalitis
- Measles, Mumps, Rubella (MMR)
- Meningococcal ACWY conjugate vaccine (MCV)
- Meningococcal B
- Pneumococcal
- Poliomyelitis
- Rabies
- Rotavirus
- Typhoid
- Varicella
- Yellow Fever
- Zoster

Additional items in scope include:

- Current ACIP recommendations with clarifications
- Underlying conditions related to contraindications or risk indications listed in the General Recommendations and other ACIP publications
- The 4-day grace period
- The catch-up schedule
- Aged-based adult recommendations
- Travel vaccines
- Underlying conditions related to precautions and special indications for at-risk individuals
- High/increased/special risk series (e.g., Hib past 5 years)



## The Strategy

The complexity of the problem and the project goals influenced the design strategy. The guiding principles were to:

- Separate the complex problem into simpler, more focused parts: the data, the algorithm, and the framework that pulls the data and algorithm together
- Emphasize “universal” functionality across IIS implementations instead of more detailed, implementation-specific engineering requirements for local needs and technical environments.
- Utilize a variety of mechanisms (e.g., business rules, decision tables, process models, and a domain model) to document the specification, providing a concise, unambiguous, computable description of the functionality required.
- Develop a testing methodology that utilizes test cases and expected results to validate CDS algorithms against the Logic Specification.

The design strategy culminated in the creation of three resources: the Logic Specification, Supporting Data, and Test Cases.



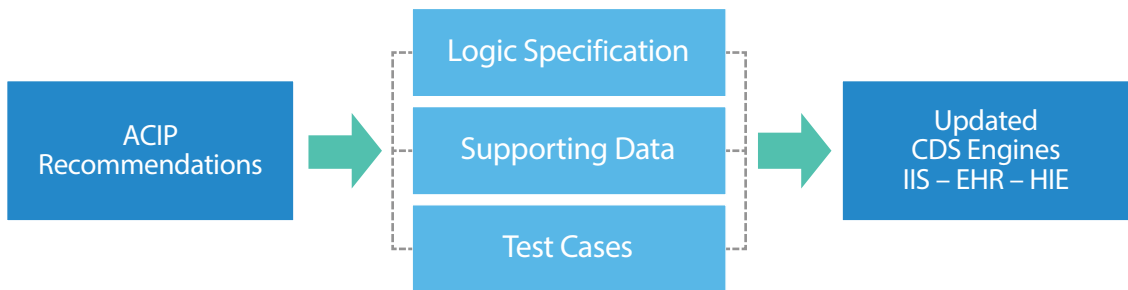
## The Resources

**Logic Specification** - Documents the logic for applying ACIP business rules to CDS engines required to evaluate and forecast based on a patient's immunization history and the Supporting Data

**Supporting Data** - Describes, by antigen, the attributes (e.g., minimum age, earliest recommended age, and preferable vaccine type) necessary and specific values (e.g., schedule-specific, antigen series-specific, and dose-specific) required to support evaluation and forecasting as described by the Logic Specification

**Test Cases** – Provide a representative set of scenarios and expected outcomes that can be processed against an immunization evaluation and forecasting engine to validate or test its algorithm against the Logic Specification and Supporting Data

## The CDSi resources translate clinical recommendations into technical information



## The complete suite of CDSi resources comprises:

Logic Specification	Supporting Data	Test Cases
<ul style="list-style-type: none"> <li>– Vocabulary</li> <li>– Business Rules</li> <li>– Decision Tables</li> <li>– Processing Definitions</li> <li>– Domain Model</li> </ul>	<ul style="list-style-type: none"> <li>– Excel Format</li> <li>– XML Format</li> <li>– Release Notes</li> </ul>	<ul style="list-style-type: none"> <li>– Excel Format</li> </ul>
<b>Training Materials</b>	<ul style="list-style-type: none"> <li>– Brochure</li> <li>– Quick Guides</li> </ul>	<ul style="list-style-type: none"> <li>– Practice Exercise</li> <li>– Quiz</li> </ul>
		<ul style="list-style-type: none"> <li>– Videos</li> </ul>



## The Result: Ensuring the Right Immunization at the Right Time

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The CDSi resources provide a single, authoritative, implementation-neutral foundation for developing and maintaining CDS engines to ensure patients receive “the right immunization at the right time.”

Using these CDSi resources:

- Makes it easier to develop and maintain immunization evaluation and forecasting products
- Ensures a patient’s immunization status is current, accurate, consistent, and readily available
- Increases the accuracy and consistency of immunization evaluation and forecasting
- Improves the timeliness of accommodating new and updated ACIP recommendations



## FAQs

### How are the CDSi resources being used?

Members of the IIS community are using the CDSi resources to support updates to their forecasting and evaluation engines and even build engines from scratch. Community members are also:

- Consulting the Supporting Data for clarification when rules are complex and clinical SME team members cannot agree
- Testing immunization forecasting algorithms against CDSi Test Cases to ensure their recommendations or evaluations align
- Referencing the Supporting Data as industry standards to help answer clients' questions about particular forecasts or recommendations

### What will happen when ACIP makes recommendation changes?

Each time ACIP updates its recommendations, a team designated to maintain the resources will make the appropriate updates. Subsequently, communications will be disseminated to make the HIS community aware of the changes

### How can I obtain support?

The CDSi resources and training materials can be found on the CDC's Immunization Information System Support Branch website at: [www.cdc.gov/vaccines/programs/iis/cdsi.html](http://www.cdc.gov/vaccines/programs/iis/cdsi.html)

You can also obtain support by emailing: [nipinfo@cdc.gov](mailto:nipinfo@cdc.gov)



## Contact Information

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