



Streamlining CDSi Specification Updates Through Generative AI Innovation

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AGENDA

- Why Build an AI Chatbot?
- History of SmartUpdate HelperBot
- What is the SmartUpdate HelperBot?
- SmartUpdate in Action
- What's Next?



Why Build an AI Chatbot?



What Is the Problem?

- **Translating ACIP recommendations into CDSi resources is complex and time-consuming**
 - Clinical language must be converted into precise, structured logic
 - Updates span multiple interdependent documents
 - Some situations require clinical SME guidance
- **Current process is heavily manual**
 - Historical material can be cumbersome to reference
 - Clinical and CDSi SME turnover may create knowledge loss

Why an AI Chatbot?

- **Fast retrieval over many documents**
- **Reasoning over many possibilities quickly**
- **Provide wide-ranging suggestions, including edge-cases**
- **Capable of both Conceptual Search and Keyword Search**
 - No longer require specific keywords to return correct results
 - Can use Keyword Search for highly technical requests



Applications Beyond CDSi

Increase Information Discoverability

- Fast answers from dispersed knowledge sources
- Provide citations to original documentation for double-checking

Decrease knowledge loss from employee turnover

- Centralize knowledge in a searchable format
- Decrease friction for contributing knowledge to central repository
- Reduce reliance on individually-held knowledge

Increase efficiency in drafting documentation

- Generate first-drafts from existing documentation
- Eliminate the need to start from scratch
- Standardize tone, structure, and formatting across documentation



History of SmartUpdate HelperBot



History of SmartUpdate HelperBot, Our AI Chatbot



MIROW Proof-of-Concept

Tested AI handling technical terms
Explored limits and capabilities



Migration to EDAV

Learn & understand internal EDAV policies
Development of MIROW and HL7 bots within EDAV



Creation of HelperBot

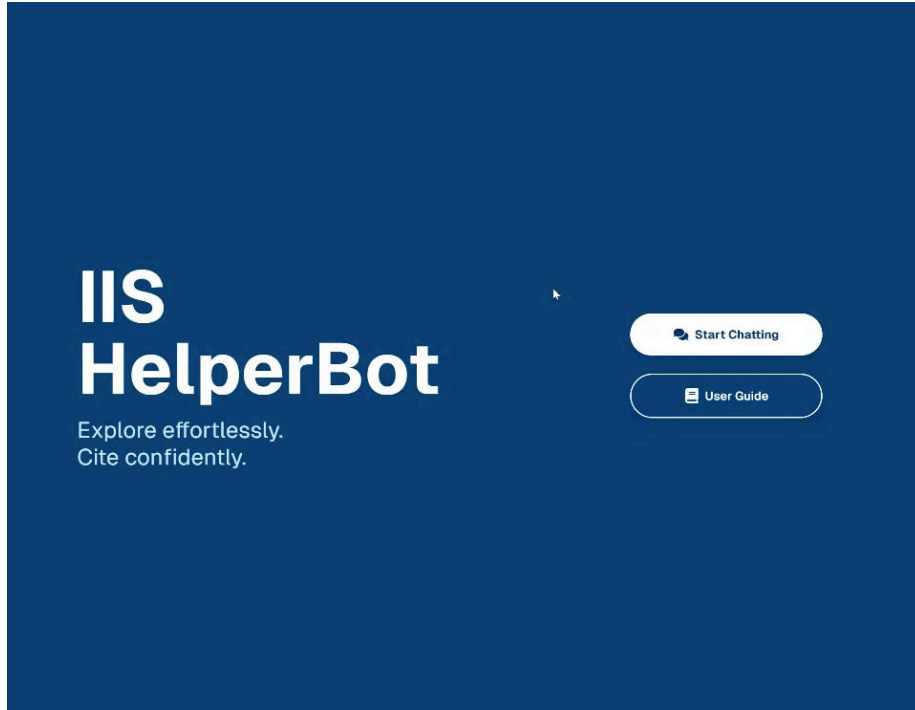
Close working relationship with HL7 Team
Feedback loop to provide fit-for-purpose Helperbot



Creation of CDSi SmartUpdate

CDSi team requirements gathering and process analysis
Prototyping building & pilot development

HL7 HelperBot, the predecessor to SmartUpdate



- Searches through documentation using Contextual and Key Word Search
- Used by HL7 team to search historical documentation while updating HL7 v2.5.1
- Emphasis on citations and referencing original documentation



HL7 HelperBot, the predecessor to SmartUpdate

The screenshot displays the HL7 HelperBot interface, which is divided into several sections:

- HelperBot Chat:** Located on the left, it shows a chat window with a search bar and a list of files in the h17-test knowledge base. A button at the top right says "Compare Profile Z32 with Profile Z34 in a table."
- Comparison Table:** A table comparing Profile Z32 and Profile Z34 based on the provided context. The table has three columns: Feature, Profile Z32, and Profile Z34.
- Citation Explorer:** A window on the right showing a PDF viewer. It displays a table from Chapter 6 of the HL7 V2.5.1 Implementation Guide, titled "Table 8-5 MSH Specification for Return Complete Immunization History Response". Below the table, there is a "Conformance Statement" section with several rules (IZ-12 to IZ-40).
- Citations:** A list of citations is shown below the comparison table, including references to various HL7 documents and standards.
- HelperBot Chat:** A chat input field at the bottom left with a "Send" button.

Table 8-5 MSH Specification for Return Complete Immunization History Response

SEQ	LEN	Data Type	Cardinality	Value set	ELEMENT NAME	Usage	Constraint
20	20	ID	[0..1]	0356	Alternate Character Set Handling Scheme	O	blank
21		EI	[1..*]		Message Profile Identifier	R	Z32^CDCPHNVS
22		XON	[0..1]		Sending Responsible Organization	RE	
23		XON			Receiving Responsible Organization	RE	

Conformance Statement:

- IZ-12: The MSH.1 (Field Separator) SHALL be valued "!"
- IZ-13: The MSH.2 (Encoding Characters) SHALL be valued "^^& "
- IZ-15: The MSH.12 (Version ID) SHALL be valued "2.5.1"
- IZ-59: MSH-9 (Message Type) SHALL contain the constant value "RSP^K11^RSP_K11"
- IZ-52: The value of MSH-16 (Application Acknowledgement) SHALL be "NE".
- IZ-53: The value of MSH-15 (Accept Acknowledgement) SHALL be "NI"
- IZ-40: One occurrence of MSH-21 (Message Profile Identifier) SHALL contain the constant value "Z32^CDCPHNVS"

Did HL7 HelperBot Succeed?

Metrics for Success	Outcome	Measurements
Accuracy of Answers	<ul style="list-style-type: none">•Reduced hallucinations through strict parameters•Improved coverage through hybrid search	Precision: 98% Coverage: 82% Declines to answer if uncertain
Speed of Answer Return	<ul style="list-style-type: none">•Much faster than manual search	10 sec – 5 mins answer return
Ability to Improve Process	<ul style="list-style-type: none">•Efficiently search through documents•Improved process of document updating•Features are easy to use and helpful	~45 mins of work done in ~10 mins 50% fewer clarifications

What is the SmartUpdate HelperBot?



SmartUpdate HelperBot

SmartUpdate is an extension of the Helperbot, built for the CDSi workflow

Goals:

- Help update documentation based on ACIP Recommendations
- Provide a wide array of suggestions to provide options for CDSi team

Helperbot Features	SmartUpdate Features
Document Search and Query	Ingestion of Recommendations and Historical Documentation
Document Citations	Analysis & suggestions for Documentation Updates
PDF Viewer	Downloadable outputs in Excel, Docx, and PDF



SmartUpdate HelperBot Input Page



Compare your antigen-specific XML files against new clinical guidance to generate actionable update recommendations



REQUIRED

XML Supporting Data

Antigen-specific supporting data files for analysis. Must be an XML file.

+ Click or drag to upload



ACIP Recommendations

Documents containing ACIP recommendations (PDF, Word, or TXT)

+ Click or drag to upload



Reference Documents

Additional context and reference materials (PDF, TXT, or Word)

+ Click or drag to upload

ADDITIONAL CONTEXT

Provide specific requirements, areas of focus, or any additional context for the analysis...



SmartUpdate HelperBot Output Sample

Analysis Complete

Your comprehensive analysis is ready for review

 New Analysis

Job ID: d402082a-e761-4cb6-b7e1-a399929d1acc

 COMPLETED

1

ANTIGENS ANALYZED



1

DOCUMENTS PROCESSED



ANALYSIS REPORTS



RSV

Source: rsv-original.xml



Executive Summary

This section lists each new ACIP recommendation with a brief description of what updates to make in supporting data, the current state of the supporting data, and available implementation strategies.

- Recommendation 1: Age Expansion Update — Update the "1-dose 60+ years Shared Clinical Decision Making series" to reflect the new age expansion for RSV vaccination to include all adults aged 75 years and older.
 - Current State: Currently, RSV vaccination for adults aged 60+ is handled under the "1-dose 60+ years Shared Clinical Decision Making series" with no specific age range defined.
- Recommendation 2: Dosing Update — Update the "1-dose 60+ years Shared Clinical Decision Making series" to include a new risk-based indication for adults aged 60-74 years at increased risk for severe RSV disease.
 - Current State: Currently, the "1-dose 60+ years Shared Clinical Decision Making series" does not specify risk-based indications for adults aged 60-74 years, and the age range is not defined in the supporting data.
- Recommendation 3: Dosing Update — Update the RSV vaccine series to exclude individuals who have already received an RSV vaccine dose, reflecting a single-dose lifetime approach.

SmartUpdate HelperBot Output Sample Excel

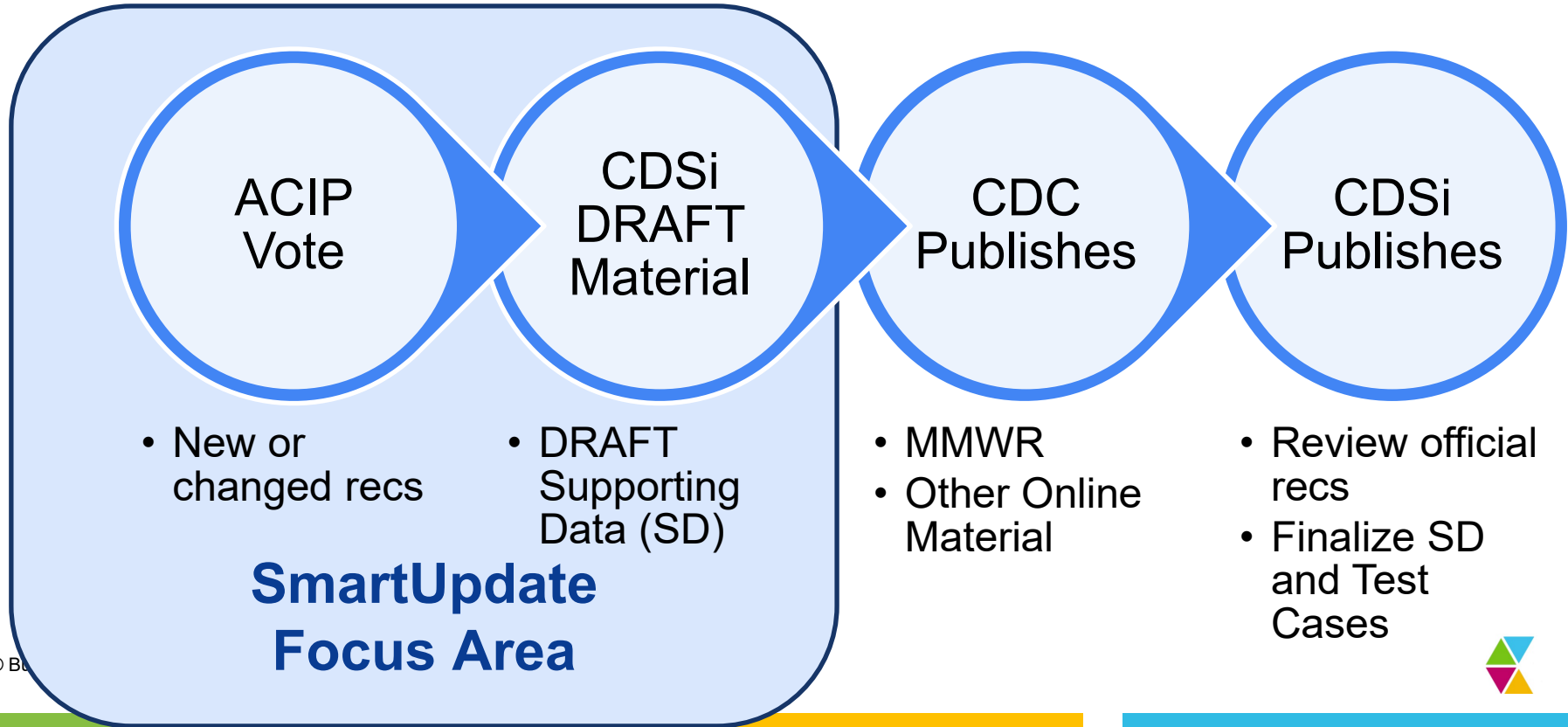
ACIP_Recommendation_Number	ACIP_Recommendation_Title	Strategy_Name	Strategy_Approach	Sheet_Name
1	Age Expansion Update	Age-Specific Series Update	Create a new series specifically for adults aged 75 years and older to reflc 1-dose 60+ years	Shared Clinical Decisi
1	Age Expansion Update	Age-Specific Series Update	Create a new series specifically for adults aged 75 years and older to reflc 1-dose 60+ years	Shared Clinical Decisi
1	Age Expansion Update	Age-Specific Series Update	Create a new series specifically for adults aged 75 years and older to reflc 1-dose 60+ years	Shared Clinical Decisi
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "Indications	
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "Indications	
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "Indications	
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "Indications	
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "1-dose 60+ years	Shared Clinical Decisi
2	Dosing Update	Add Risk-Based Indication for 60-74 Years	Introduce a new risk-based indication for adults aged 60-74 years in the "1-dose 60+ years	Shared Clinical Decisi
3	Dosing Update	Implement Conditional Skip for Previously Vaccinated Individuals	Introduce a conditional skip logic to the RSV vaccine series that checks for 1-dose: RSV	
3	Dosing Update	Implement Conditional Skip for Previously Vaccinated Individuals	Introduce a conditional skip logic to the RSV vaccine series that checks for 1-dose: RSV	Shared Clinical Decisi
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose: RSV	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose: RSV	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose: RSV	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose: RSV	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk under 20 months	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk under 20 months	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk under 20 months	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk Pregnant 1-dose	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk Pregnant 1-dose	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal Risk Pregnant 1-dose	
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose 60+ years	Shared Clinical Decisi
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose 60+ years	Shared Clinical Decisi
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose 60+ years	Shared Clinical Decisi
4	**Inclusion of New Vaccine Product**: The guidance now...	Add "mResvia by Moderna" as a Preferable Vaccine	Integrate "mResvia by Moderna" into the existing RSV series as a preferal 1-dose 60+ years	Shared Clinical Decisi
5	**Implementation Timeline**: The recommendations are set to...	Effective Date Addition	Add the effective date of June 26, 2024, to the "Change History" sheet to Change History	
6	Risk-Based Guidance	High-Risk Population Indication Update	Add new indications to the "Indications" sheet to activate the Risk series Indications	
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SmartUpdate in Action



CDSi Workflow following ACIP Vote



CDSi Pilot work – 2024 RSV Recommendation

Removed

- 60+ Shared Clinical Decision Making (SCDM)

New

- 60-74 risk-based recommendation
- 75+ routine recommendation
- Approved mResvia vaccine for use

Same

- 1 lifetime dose regardless of age or reason received



CDSi and SmartUpdate Process

- August RSV MMWR
- Pre-August RSV Supporting Data
- SmartUpdate Report
- Post-August RSV Supporting Data
- Analysis Findings
- Team Input/Prioritization



Round 1 Findings and Improvements

Analysis Findings

- 21 Suggestions
 - 6 roughly aligned
 - 11 did not align
 - 3 were not needed
 - 1 unclear suggestion
- Missed Suggestions
 - Identified enough to warrant improvements

Algorithm

Improvements

- Incorporated Logic Specification
- Incorporated Schedule Level Supporting Data



Round 2



Round 2 Findings and Improvements

Analysis Findings

- 37 Suggestions
 - 21 roughly aligned
 - 10 did not align
 - 4 were not needed
 - 2 unclear suggestion
- Missed Suggestions
 - Identified more than round 1!

Algorithm

Improvements

- Upgraded to 5.1 ChatGPT
 - Adds Reasoning
- Added “Ground Facts”



Round 3



Round 3 Findings and Improvements

Analysis Findings

- 408 Suggestions
 - Removal of “60+ SCDM”
 - Creation of 2 new series
 - Details were hard to follow
 - Wires crossed on series
 - Additions to deleted series
 - Hallucinations
 - “No Change” suggestions
- Missed Suggestions
 - Hard to quantify

Algorithm

Improvements

- Resolving a “too many cooks in the kitchen” problem



Summary of Current Status



Successes

- Algorithm iteration is quick
- Forward progress can be seen
- Human in the loop

Challenges

- Unclear how far away we are from a successful/usable tool
- With a human in the loop unclear if this is a time saver
- Workflow challenge (e.g., published recs come too late)

Next Steps

- Explore a shift in tool usage to address workflow challenge



Next Steps

ACIP
Vote

- New or changed recs

**SmartUpdate
Focus Area**

CDSi
DRAFT
Material

- DRAFT Supporting Data (SD)

CDC
Publishes

- MMWR
- Other Online Material

**Quality Assurance
Focus Area**

CDSi
Publishes

- Finalize SD and Test Cases



THANK YOU

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