Agentic rule creation for automatic report generation

ARCi - AI assistant for clinical rule creation

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Background

Every patient exam produces a clinical report, and writing it manually is a burden for clinicians. For an echocardiography report, the clinician gathers the measurements and decides on a diagnosis using criteria that differ by age, sex, or body size. Because this work repeats for every exam, it adds cognitive load that can put the accuracy of the report at risk.

Automatic report generation aims to reduce this effort. It applies clinical rules that turn the exam measurements into report content.

The problem

The value of automatic report generation rests on clinical rules, and each hospital may adopt different rules depending on its local regulations and clinical guidelines. Each hospital also uses its own terminology, so a rule written for one hospital does not transfer to another.

Creating a single rule requires close collaboration between two experts. The field engineer gathers the hospital's clinical specification and is responsible for clinical correctness, while a software developer translates it into an executable rule in Clinical Quality Language (CQL) and is responsible for technical soundness. This reliance on developers makes rule creation slow and expensive. Field engineers need an accessible way to create correct rules on their own.

The solution

- ARCi is an AI-agent-based application that enables field engineers to author CQL rules themselves.
- The field engineer gives the clinical specification, and AI agents, orchestrated by LangGraph, use hospital-specific context to iteratively write, compile, and test the CQL rule.
- The field engineer stays in control and can steer the agents, verify the output, and approve every rule before it is published.

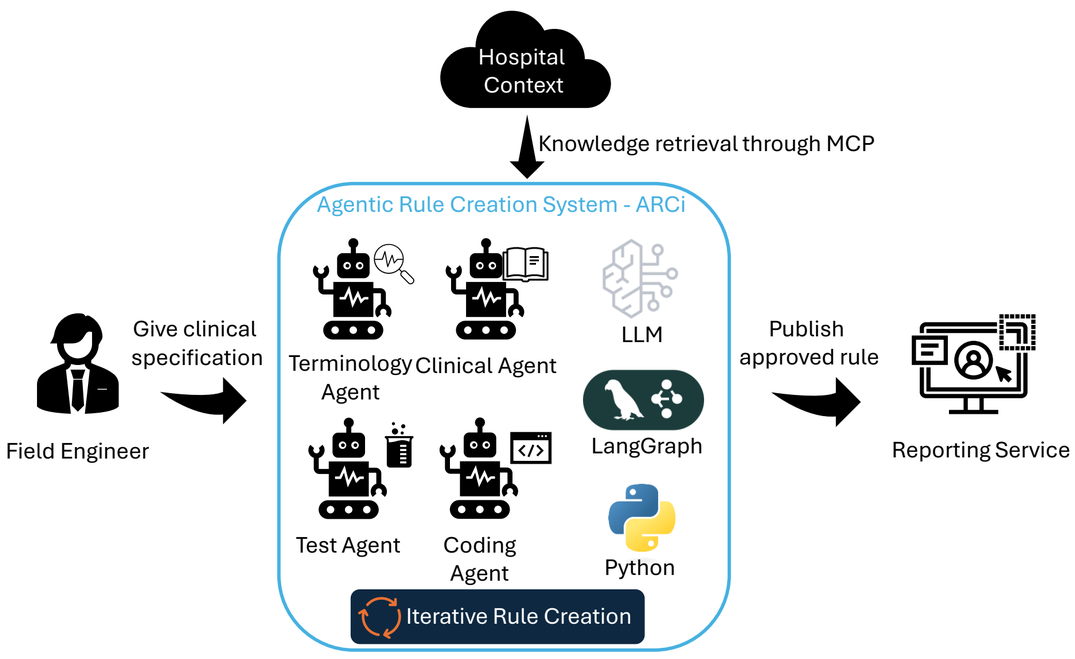
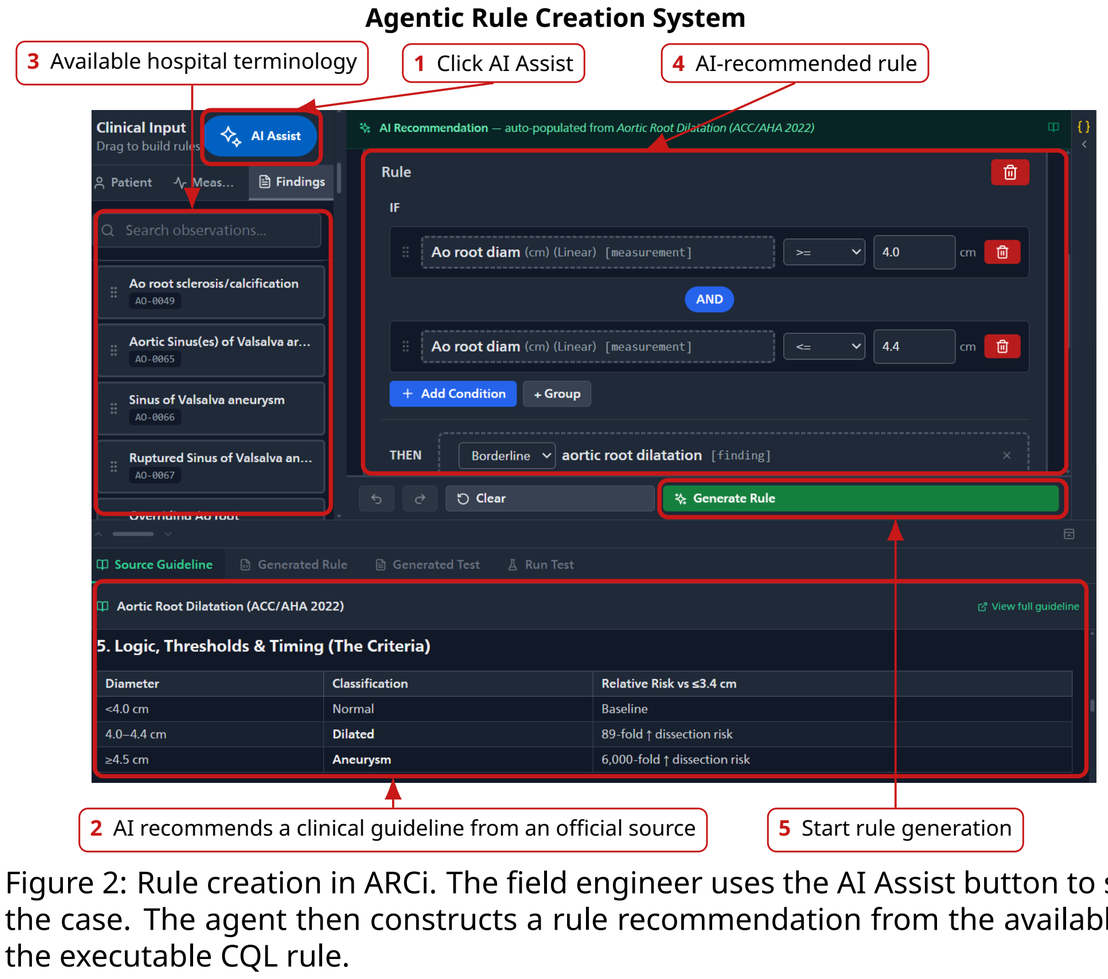


Figure 1: ARCi overview. Specialized AI agents find the guideline, map hospital terminology, write the CQL, and test it in a loop.



AI agents write, compile, and test the CQL

Executable Clinical Rule (CQL)

```
define "Result":
  if ISCVMeasurements.Exists('Ao root diam') then
    if ISCVMeasurements.Value('Ao root diam') < 4.0 then Tuple{
      cards: {},
      systemActions: {
        ISCVFindings.CreateFindingAction('cardiac:00',
          '60132_AO-0047', 'The aortic root is normal size.')
      }
    }
    else if ISCVMeasurements.Value('Ao root diam') >= 4.0
        and ISCVMeasurements.Value('Ao root diam') <= 4.4 then Tuple{
      cards: {},
      systemActions: {
        ISCVFindings.CreateFindingWithOneModifierAction('cardiac:00',
          '60132_AO-0048', '_ aortic root dilatation.', 1, 'Borderline')
      }
    }
    else if ISCVMeasurements.Value('Ao root diam') >= 4.5 then Tuple{
      cards: {},
      systemActions: {
        ISCVFindings.CreateFindingWithOneModifierAction('cardiac:00',
          '60132_AO-0048', '_ aortic root dilatation.', 4, 'Severe')
      }
    }
    else null
  else null
```

Figure 2: Rule creation in ARCi. The field engineer uses the AI Assist button to start the AI flow, in which the AI agent recommends a specific guideline for the case. The agent then constructs a rule recommendation from the available hospital terminology, after which rule generation can start and produce the executable CQL rule.

Implementation

- The UI is built in TypeScript with React and Express.
- The ARCi Agents run in Python with LangGraph, using Claude Sonnet 4.5 and Haiku 4.5 on AWS Bedrock.
- Three Model Context Protocol (MCP) servers provide guidelines, terminology, and CQL compilation (Firely, C#/.NET).

Results and impact

- **6× faster**, **30× cheaper** than estimated manual rule creation.
- **Technically validated** and **hospital-specific** rules.
- **Can make** automatic reporting **scalable** for hospitals.
- **Supports faster and more accurate** clinical reports.

ARCi helps improve patient care.