Agent-based Automated Analysis of ICD-10-CM Revisions

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OVERVIEW

ICD-10-CM is essential for standardized disease, symptom, and procedure classification in healthcare. Accurate adoption of annual updates is critical for clinical documentation, research, billing, and regulatory compliance.

Manual review of annual ICD-10-CM updates is resource-intensive and error-prone, risking claim denials and data quality degradation.

Our Objective: Develop and evaluate an automated, agent-based system to detect, classify, and query ICD-10-CM revisions.

METHOD

Our framework consisted of a backend change detection engine and a frontend conversational AI agent (see Figure 1).

The backend engine parses the hierarchical XML structure of both files (2025 and 2026 ICD-10-CM). It performs a recursive comparison to identify all discrepancies, classifying each change into one of eight predefined categories. The final list of detected changes is then exported to a structured CSV file.

The frontend is a conversational AI agent powered by the Qwen SLM. We equipped this agent with a custom tool that directly queries the CSV file generated by the backend.

The agent translates a user's natural language question into a programmatic tool call, retrieves the filtered data, and synthesizes the information into a coherent, human-readable response.

RESULTS

The change detection engine identified 555 unique revisions between the 2025 and 2026 ICD-10-CM indices. Notably, revisions to sub-terms (Added Child, Child Code Change) accounted for 433 changes (78% of the total), underscoring the granular nature of the annual updates.

The heuristic-driven approach successfully identified subtle but clinically relevant terminological updates, such as the correction of 'Pneumocystis jiroveci' to 'Pneumocystis jirovecii' (Figure 2).

Table 1: Frequency of Change Types

Change Type	Count
Term Update	2
Child Term Update	39
Removed Term	1
Added Term	22
Code Change	40
Removed Child	18
Added Child	227
Child Code Change	206

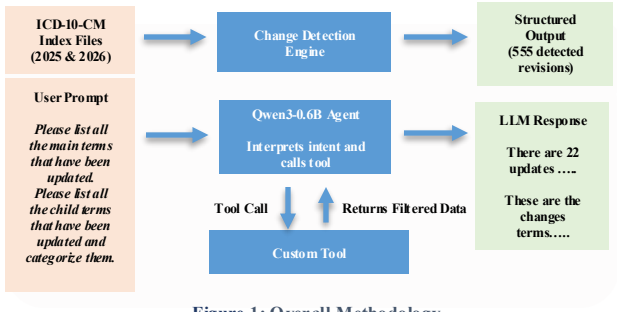

Figure 1: Overall Methodology

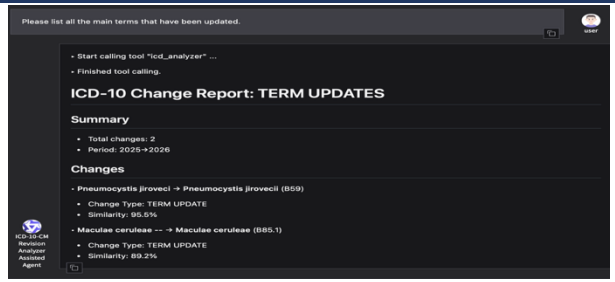

Figure 2: Screenshot of the agent showing term updates.

CONCLUSION & DISCUSSION

Our framework effectively integrates the precision of deterministic algorithms with the natural language capabilities of generative AI. This agent-based system can improve efficiency significantly when compared to manual review protocols. The time required to analyze annual updates is reduced, with a concurrent increase in the accuracy and reproducibility of the results.

Future work will expand the agent beyond revision tracking to full ICD-10-CM code intelligence. By integrating access to the ICD-10-CM Tabular List, the system could answer advanced clinical and administrative queries (e.g., Excludes notes for I10–I16, MCC status for E11.9), evolving into an interactive coding assistant rather than a change-detection tool.

This work presents a validated approach for the automated analysis of ICD-10-CM revisions. By delegating the complex comparison logic to a specialized tool, our system ensures data accuracy while leveraging LLMs for natural language interaction, offering a robust and scalable framework for managing critical standards in healthcare.

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