Applying Semantic Artificial Intelligence to Improve Data Retrieval and Analysis in Wound Care

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Background

Wound care services collect detailed structured measurements and narrative clinical notes during patient visits. Although this data is clinically valuable, extracting meaningful insights often requires predefined dashboards or specialist analytics support.

Traditional reporting tools depend on fixed queries and structured filters. These approaches may not align with how clinicians naturally frame questions about patient care, and variability in terminology and documentation can further limit flexibility.

Semantic artificial intelligence refers to artificial intelligence (AI) systems that interpret the meaning and clinical intent of language, rather than matching keywords alone. In this context, semantic AI recognizes concepts such as wound type, time frame, treatment, and outcome, and maps them to relevant data within the system.

We explored whether a semantic AI interface could serve as a conversational analytics layer within a wound care information system, allowing clinicians and service leaders to ask questions in plain language and receive clinically meaningful summaries.

Aim

To assess whether a semantic AI interface could enable natural language interrogation of wound care data and support clinically relevant insights across multidisciplinary teams.

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Method

A prototype semantic AI interface was layered onto an existing wound care information system containing realistic, de-identified patient and assessment data.

The system was designed to:

- Accept questions written in everyday clinical language
- Identify relevant clinical concepts (wound etiology, time period, treatment, outcome)
- Define appropriate patient groups
- Present results as clear visual summaries and structured text

Users could review how patient cohorts and time frames were selected.

Evaluation scenarios reflected common service-level questions including healing progress, delayed healing, documentation completeness, treatment comparison, and performance trends.

Results

In the evaluation environment, the interface successfully interpreted complex clinical and operational questions and returned results consistent with expected test cases.

The system was able to:

- Identify clinically relevant patient cohorts
- Apply time-based criteria (e.g. "last 30 days," "in 4 weeks")
- Source relevant wound and clinical notes data
- Highlight documentation gaps
- Generate visual outputs within seconds

The conversational format supported immediate follow-up questions, enabling iterative exploration rather than static reporting.

Example query

1. Ask

In plain language, describe your question. No forms or coding required.

2. Analyze

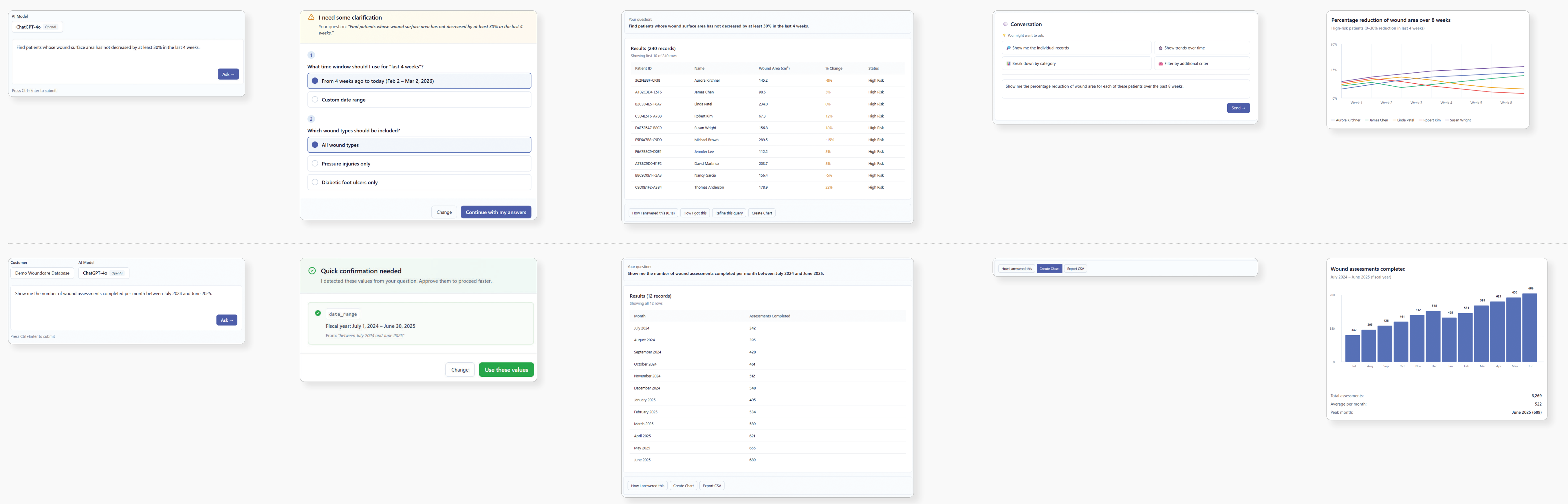
AI is used to translate clinical terminology and intent into a structure that can be queried in the database, so that relevant records from can be retrieved.

3. Act

To deliver visual insights and understand more, decide how you want the data presented. Ask follow-up questions immediately with ease.

4. Create Graphs

In one click, view a graph of the results data and download the file.



Representative Conversational Queries

The following examples reflect natural language questions that could be posed using the interface.

These examples demonstrate relevance across clinical, quality, operational, and finance domains.

Clinical Monitoring and Risk Identification

"Find me the trends on hospital acquired injuries obtained in the last 30 days."

"Create a list of all patients whose wound surface area has not decreased by at least 30% in 4 weeks."

"Find patients whose surface area or volume has increased 5% or more and has signs of infection."

Documentation and Compliance Review

"Identify all assessments where the 'Wound Grade' in the notes does not match the wound measurements."

"Find all instances where 'tunnelling depth' has not been recorded for a patient with tunnelling."

Performance and Service Evaluation

"Compare the 'Days-to-Heal' for wounds treated with [Brand A Dressing] vs. [Brand B Dressing]."

"Determine the percentage of pressure injuries that are hospital-acquired vs. present on admission."

"Assess the post admission infection rates, looking for commonalities."

Resource Utilization and Care Intensity

"What percentage of our patients require 'high-intensity' care (more than 2 visits per week)?"

"What is the 'Recurrence Rate' for patients six months after they are discharged as 'healed'."

Discussion

This evaluation demonstrates that semantic AI can make wound care data more accessible to multidisciplinary teams by interpreting clinical intent and reducing reliance on predefined reports.

Clinicians can explore healing progress and risk patterns using natural language. Quality teams can review documentation completeness. Service leaders can examine trends across facilities. Finance and administrative teams can explore workload and recurrence patterns.

The interface is intended to support clinical review and quality improvement discussions, not replace formal governance or established reporting processes.

Further evaluation in live service environments is required to assess workflow integration, adoption, and measurable impact.

Conclusion

A semantic AI interface integrated within a wound care information system enables clinicians and service leaders to ask questions in natural language and receive clinically interpretable summaries.

In this evaluation environment, the system successfully queried the database and provided results a clinician would expect for the questions evaluated.

Conversational access to wound care data may enhance clinical review, quality monitoring, and service planning. Real-world validation is ongoing.

Key Learnings

Semantic AI can interpret clinical intent rather than relying on keyword matching alone.

Natural language querying supports both patient-level and service-level review.

Understanding of how cohorts and metrics are selected is critical for clinical trust.

The approach has multidisciplinary relevance across clinical, quality, operational, and finance teams.

Implementation requires governance and workflow integration planning.

Semantic AI can find correlations/causation of wounds not improving and ways to improve wound care overall.

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