MSR227

Zoom Out: Simplifying Complex Health Economic Model Structure Through Artificial Intelligence

Shilpi Swami, MSc, *Hanan Irfan, MSc, Tushar Srivastava, MSc.*
ConnectHEOR, London, UK.
Email: shilpi.swami@connectheor.com

BACKGROUND

- Health economic (HE) models for chronic and progressive diseases often become **highly complex**, making them difficult to interpret, validate, and communicate[1]
- This **complexity limits accessibility** for non-technical stakeholders such as market access and payer teams.
- Advances in **artificial intelligence (AI) and hybrid intelligence framework (AI+ human-in-the-loop (HITL))** offer opportunities to simplify model structures for interpretation, validation and communication while maintaining **clinical and economic fidelity**.[2]

OBJECTIVES

- To explore how **AI-driven hybrid intelligence** can **simplify HE model** structures without losing decision or clinical integrity.
- To apply **context engineering, GraphRAG, and structured reasoning** in redesigning existing HE models across multiple therapeutic areas.[3,4]
- To evaluate whether AI-supported simplification improves **transparency, validation, and stakeholder comprehension**.

METHODOLOGY

1. Knowledge Engineering
Built an AI-powered workflow combining context engineering, GraphRAG and structured reasoning.

2. Schema and Ontology Design
A canonical HE modeling schema was defined to standardize how model entities - health states, transitions, parameters, and outcomes are represented. This schema was extended with domain ontologies and linked to the RAG layer

3. Model Ingestion and Structuring
Model inputs and reference documents were ingested and structured through automated parsing and human curation. Each source was converted into a machine-interpretable format with metadata tagging, entity extraction, and dependency mapping

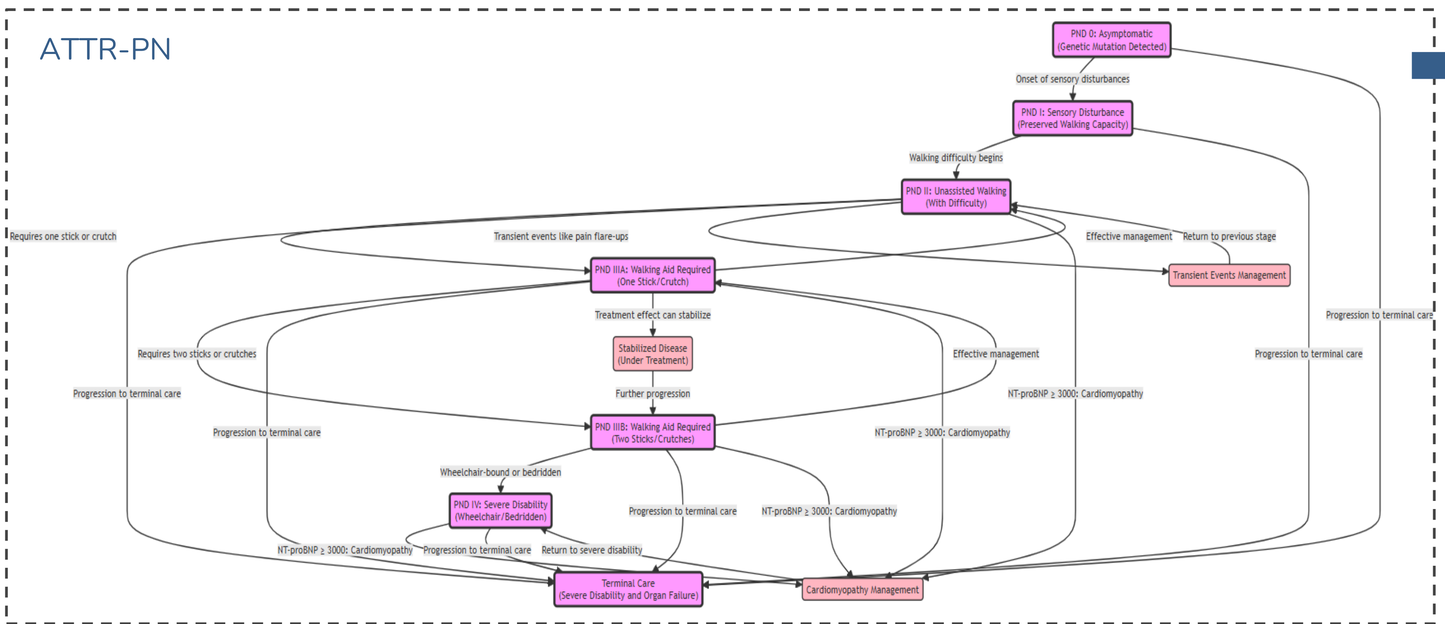
4. Output Generation
The AI agent, leveraging the RAG-trained HE knowledge base, generated draft disease concepts, model structures, and assumption frameworks.

5. Expert Validation
Subject matter experts reviewed AI-generated outputs at each iteration to ensure clinical validity, methodological rigor, and alignment with real-world decision contexts.

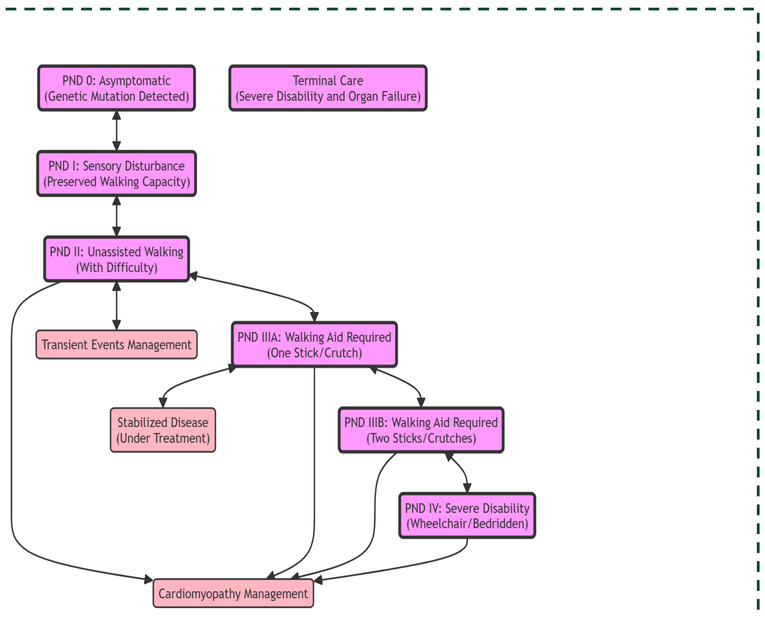
RESULTS: The AI workflow to deconstruct detailed models was applied to Transthyretin amyloid polyneuropathy (ATTR-PN) and Alzheimer's disease.

Detailed

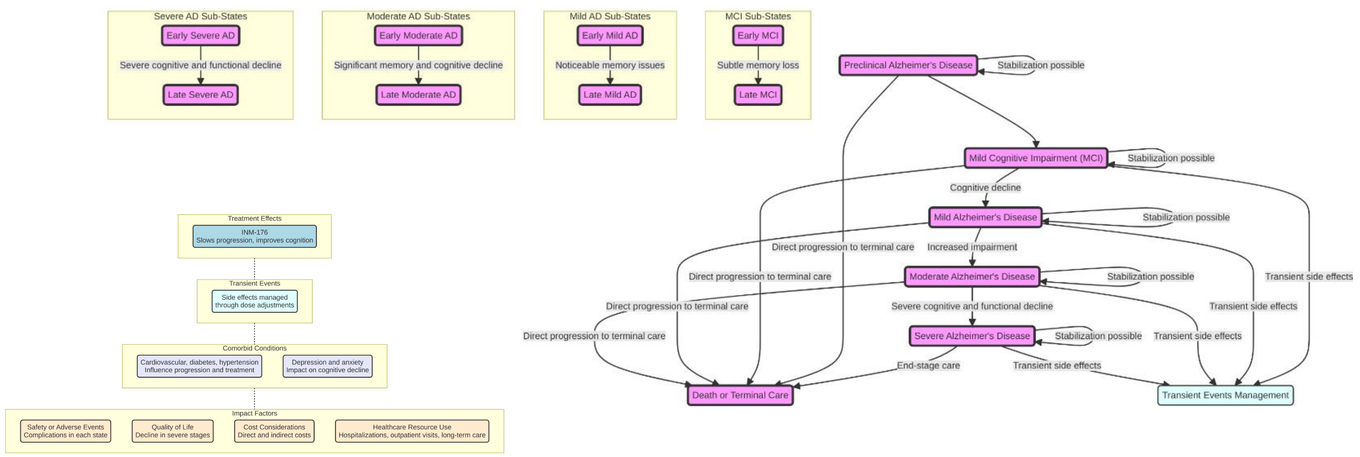
ATTR-PN

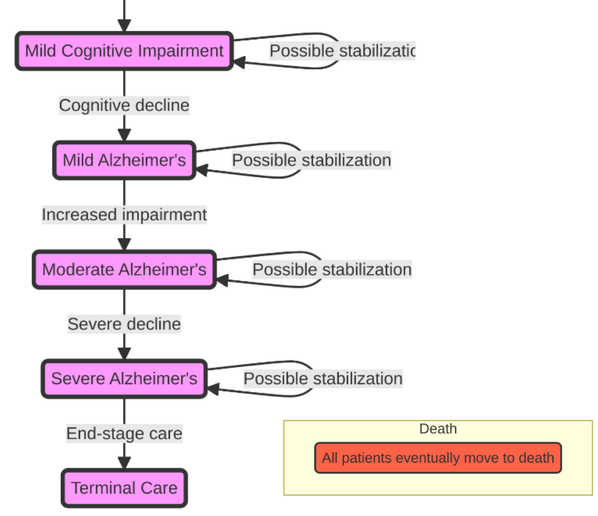


Simplified



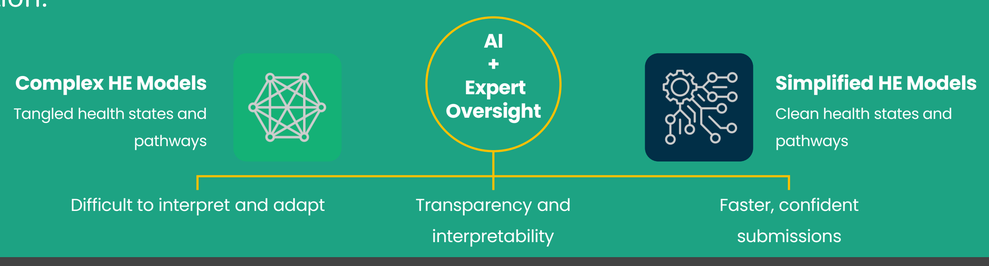
Alzheimer





CONCLUSION

- **AI + HITL:** Simplifies HE models across therapeutic areas through combined AI and human validation.
- **Intelligent Simplification:** GraphRAG and context-engineering reduce complexity while preserving disease and treatment fidelity.
- **Enhanced Usability:** Improves model transparency and communication for technical and non-technical stakeholders.
- **Support for HTA:** Enables faster, confident submissions with potential for scalable HEOR integration.



> AI, when combined with expert oversight, can intelligently simplify complex health economic model structure, making them more transparent, usable, and decision-ready.

REFERENCES

1. Drummond, MF., 2025
2. Srivastava, T., 2025
3. Mesko, B., 2025
4. Mei, L., 2025

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