AI Isn't Replacing Doctors – *It's Making Their Prescriptions Smarter*

While AI doesn't diagnose or treat patients directly, database expert Dominik Tomicevic says its growing use, alongside graph technology, is transforming how healthcare systems deliver safer, more precise care.

According to the U.S. Centers for Disease Control, nearly 1 in 6 American adults now live with diabetes – 95% with lifestyle-related Type 2 – while globally, over 589 million people are affected. Preventing these numbers from rising is a top priority for health systems worldwide – because no one wants to see themselves or their loved ones facing a long-term, chronic condition if it can be avoided.

The urgency of doing so is reflected in the fact that the global diabetes drug market was valued at more than $88 billion in 2024.

Now, humanity may have a powerful new ally in this fight, built on silicon, in the shape of AI. But the real breakthrough isn't AI on its own; it's the way healthcare providers and researchers are combining all kinds of AI with advanced software tools, intelligent search, and graph technologies – especially knowledge graphs and graph algorithms – to focus AI's power where it matters most: tackling chronic disease.

Graph technology – designed from the ground up to store and navigate relationships between data points – is uniquely suited to uncovering hidden patterns and connections that enhance AI's capabilities. Unlike traditional databases that store data in isolated tables, knowledge graphs create a network of connected information, designed to capture real-world knowledge in a way that machines can understand and process.

In practice, these tools are starting to deliver context-rich, accurate insights that go far beyond what AI can achieve on its own.

The Challenge of Insulin Delivery for a Wide Class of Real-world Patients

One compelling example of innovation, based on a commitment to interrogating complex data in all its forms, comes from a tele-medicine start-up in Texas called Precina Health, which is using multiple forms of AI to optimise insulin treatment for patients who might struggle with more conventional clinical pathways.

Managing (in this cohort's case) Type 2, typically requires careful insulin use alongside ongoing lifestyle adjustments. But that's a tall order, especially for older adults living in rural parts of the Southern U.S., those managing on a low income, or anyone who either struggles with technology or doesn't really trust it. For many in this group, even accessing basic support via a smartphone or tablet can be a significant hurdle.

To better support these communities, Precina is leveraging technology to completely reimagine diabetes outpatient care. Working closely with direct healthcare providers, it's building highly responsive and personalised treatment pathways that combine daily support, continuous monitoring, help with medication adjustments, lifestyle coaching, and virtual consultations into a cohesive model of care that uses AI coaching to make each patient's individual life and needs the focus.

"We've deconstructed the traditional approach to managing Type 2 diabetes and instead built a model that's designed to work for every single patient," says Josiah Bryan, the company's Chief Technology Officer and lead AI researcher. "We're not just prescribing medicine or addressing behaviour in isolation; we're consciously taking a holistic view, factoring in everything to help each individual more effectively".[1]

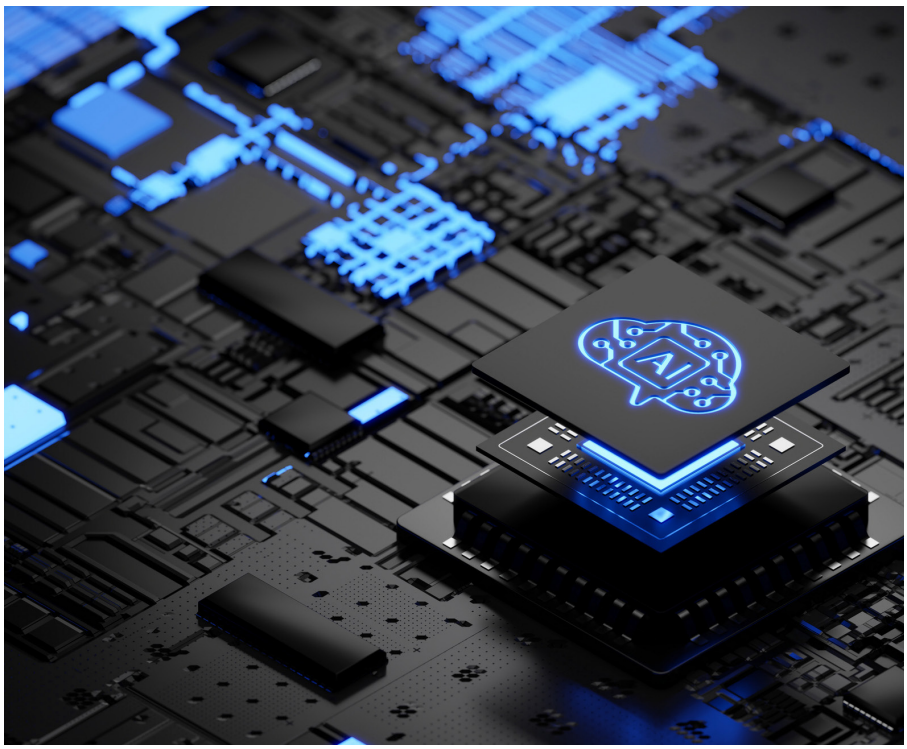
Using Machines to Ensure the Human Side of Patient Care

Bryan is quick to clarify that at Precina, technology is central, but it's a catalyst for better outcomes, not the sole solution here. "I'm not legally allowed to practice medicine. And neither is my technology," he states. "When we say we're optimising insulin management, that doesn't mean the AI is doing some sort of linear regression or tweaking the prescription up and down; what we want is a way to manage the high-touch environment you need to get great progress with Type 2 over the long-term".[1]

In terms of patient care, the staff liaising and caring for patients remotely rely on a highly-responsive digital assistant called P3C—the Precina Provider-Patient CoPilot. This AI-powered system joins voice or video calls, offering real-time prompts and suggestions to the healthcare provider, helping guide the conversation and ensuring timely, personalised support for patients.

The role of P3C is not only to provide the latest evidence-based guidance but also to offer a personalised view of each patient's health journey, enabling more meaningful,





informed care in real time. One of the most striking examples of this AI-driven approach is how the system seeks information that goes beyond basic metrics, like daily step count. Instead, it consistently prompts providers to consider broader aspects of the patient's context – such as how they're feeling at home, whether they've had a difficult night, or even if their pet is doing well.

Complexity Hidden, but Patient Insight Clarified

These levels of dual medical and treatment pathway insight cannot be derived from a single data stream but can only be derived from a way to integrate a profound understanding of the condition with real-time knowledge of the individual.

Bryan and his team have achieved this through a complex but fully integrated stack of a relational database (MySQL), a custom Large Language Model based on GPT-4o mini that's been trained on a vast range of medical literature, a knowledge graph queried using Cypher, and the extensive use of modern techniques like vector search, as well as more classical approaches such as Monte Carlo tree search (MCTS) and other heuristic algorithms.

Sounds like a complex mix? Bryan says he needed all these different ways of working with data at scale, in real-time, and with nuanced inference capabilities to meet the demands placed on P3C by both his CEO and Chief Medical Officer. But what really makes it all tick like medical software clockwork, he says, is the extensive use of a knowledge graph as the central organising layer.

Central to all this is how his team has combined graphs with RAG (retrieval-augmented generation) to use an approach called GraphRAG. "When a provider and a patient chat in Google Meet," he says, "we have a plugin that extracts the audio, immediately transcribes it and in real-time is constantly extracting anything useful by performing a GraphRAG lookup.

"Importantly, that's against both the past things you've talked about with them as well as their medical file, but also thousands and thousands of pages of documentation that's all been indexed and sorted to give medical advice too.

"All that's implemented with graph technology to give a holistic view of where their patient is at in not just their medical journey but their emotional state".[1]

Is RAG the key that unlocks the AI medicine cabinet of the future?

What makes this approach particularly compelling for Bryan and others is how generative AI, when combined with the power of knowledge graphs and intelligent search across vast amounts of medical data, enhances the human aspects of care while simultaneously equipping caregivers with the most up-to-date and comprehensive medical insights.

Even more impressive, this is just one of the ways Precina is harnessing AI to assist patients. The company has also deployed a voice-driven AI assistant that can be accessed from any device – yes, even a rotary phone. This means it's been designed to support anyone who prefers minimal digital interaction, including older patients and those with conditions like Alzheimer's.

Put all of this together, and a clear picture emerges of how developers are increasingly turning to graph technology and approaches like GraphRAG to unlock the full potential of big medical data and AI. This isn't some distant, abstract vision; it's happening right now, in ways that are already making a tangible difference in patient care.

The ultimate question is: Can AI help us overcome the scourge of diabetes? Based on this compelling use case, there's every reason to believe it can at least make living with it – a reality many of us may need to plan for – a lot easier than it would otherwise have been.

RESOURCES

1. https://www.usnews.com/news/health-news/articles/2024-11-06/u-s-diabetes-rates-rise-to-nearly-1-in-6-adults
2. https://www.healthday.com/a-to-z-health/diabetes/type-2-diabetes-644147.html
3. https://www.fortunebusinessinsights.com/industry-reports/diabetes-drugs-market-100570

REFERENCES

1. https://youtu.be/jaWBFx-qDlI?si=JPJLrIZFcODsu0xm



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Dominik Tomicevic is the Founder and CEO of knowledge graph leader Memgraph. Today, Memgraph boasts an open-source community of 150,000 members and a portfolio of global 2000 customers, including NASA, Cedars-Sinai, and Capitec Bank. The company's mission is to deliver knowledge graphs with unprecedented integration and ease of use, setting a new benchmark for knowledge graph solutions. In 2017, Forbes recognised Dominik as one of the top 10 Technology CEOs to watch.