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An Intelligent Graph-Based System for Automated Chronic Disease Management and Clinical Decision Support

Stanford researchers have developed an intelligent graph-based system that automates clinical decisions through evidence-based protocols for chronic disease management. The computational engine combines real-time patient monitoring with automated decision support to streamline provider workflows. This approach offers a practical solution for managing conditions like hypertension, diabetes, and heart failure, while reducing provider burden and improving patient outcomes.

Managing chronic diseases currently consumes $1.4 trillion in annual healthcare costs and represents a growing challenge as the U.S. population ages. While the number of patients with chronic conditions continues to rise, the availability of primary care physicians is declining, creating an unsustainable burden on the healthcare system. Current digital health solutions, while numerous, have shown limited success - for example, self-monitoring of blood pressure alone does not significantly improve patient outcomes. The combination of increasing patient needs, shrinking provider availability, and ineffective existing solutions indicates that new approaches focusing on provider workflow efficiency could offer a viable pathway to improved chronic disease management.

Initial implementation of the graph-based system demonstrated successful automation of chronic disease management through evidence-based treatment protocols. In a three-month pilot across academic and rural clinical settings, the system generated 178 prescription recommendations for 21 patients, with clinicians valuing the system's flexibility, deferral options, Electronic Health Record (EHR) integration, and transparent decision-making process. Importantly, testing showed

the system could accommodate diverse clinical settings and patient populations, suggesting broad applicability across various chronic conditions beyond hypertension.

Stage of Development:
Deployment at Stanford and other health centers

Applications

- Automated management of chronic diseases, starting with hypertension
- Clinical decision support across diverse healthcare settings
- Integration with existing EHR systems and workflows

Advantages

- Reduces provider workload through automated guideline-based recommendations
- Maintains complete transparency in decision-making process
- Scalable architecture applicable to multiple chronic conditions
- Single-click implementation of treatment changes and documentation
- The system is unique:
    - Supported by the American Heart Association
    - Guideline-based with input from Stanford medical experts

Publications

- • Funes Hernandez, M., Babakhanian, M., Chen, T. P., Sarraju, A., Seninger, C., Ravi, V., ... & Wang, P. J. (2024). Design and Implementation of an Electronic Health Record?Integrated Hypertension Management Application. Journal of the American Heart Association, 13(2), e030884.

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