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From: Will Falk
To: Healthcare AI Watchers
Re: CONDUCTOR NEEDED FOR HEALTHCARE'S GROWING AI ORCHESTRA

Artificial intelligence is rapidly transforming how clinicians make decisions, replacing traditional search and reference tools. Global health internet search volumes are down by 30 percent since June of 2024, according to *The Economist*.

"AI clinical decision support" is not one thing – it spans evidence-based copilots, data-driven prognostic tools, and specialty-specific systems, each with distinct risks and regulatory needs. Understanding these categories, and the circumstances under which AI complements or substitutes for human judgment is essential.

Many resident physicians and younger attendings now use some type of AI tool instead of internet search or online textbooks. Medical students and the more senior attending physicians are following suit.

To explain the many differences in purpose, data, and regulation among the AI clinical decision support tools, I identify several types of tools in use today and dimensions that modify these tool types. The first distinction is between best practice and past practice.

Best practice systems rely on published, normative knowledge; "What does the literature recommend?" Examples: The general tools such as OpenEvidence and Doximity/Pathway, and specialty specific tools like Perlis et al. for bipolar depression and HandRAG for hand surgery. These best practice tools are typically free of patient health information and often function as complements, not substitutes, for clinical judgment.

The general systems are being adopted quickly by millions of clinicians as a better alternative to find reference information than either internet search or base AI platforms like Gemini or ChatGPT. Still, those non-clinical systems also appear to have millions of users, including physicians, so "peeking at the Gemini answer," as one MD put it recently, remains a common practice and a legitimate substitute to internet search.

Specialty retrieval-augmented generation (RAG) AI tools, on the other hand are tuned to a domain, disease, or specialty. These enable best-practice personalization by specialty, department, or training program. Imagine a medical resident being able to review all their supervisors' past publications and a curated list of relevant articles and guidelines. Early days, but you can see the potential.

Past practice systems answer "What has worked (here) for this kind of patient?" They rely on large, curated datasets, which are often electronic health record-based, and increasingly include images, voice, and device signals.

These systems are often based on legacy datasets collected for another purpose and can face high costs for converting to usable formats. Privacy issues must be carefully controlled in these models and because Canadian healthcare's past does not reflect many values we now hold, equity is also a concern because values are implicit in the data and hard to address.

Then there are general-purpose data oceans: Huge datasets that enable **many-to-many mapping**, population queries, and clinical decision support nudges. Epic's **CoMET** pulls from about 300 million de-identified patients to support analytics and queries. In Canada, **GEMINI** has more than 35 hospital members, data from 2.4 million admissions, and is now linked with Institute for Clinical Evaluative Sciences data and is expanding beyond Ontario. But near-term individual clinical decision support impact may be limited. Population CDS insights and discoveries are a very different use case than bedside or ambulatory care CDS.

And there an ever-growing number of specialty systems across conditions. Many integrate population features and peer benchmarking. They often require condition-specific data, custom structure, and pre-resolved consent. One example is the British **AutoPrognosis 2.0** that provides modular risk modeling tailored to specialties and boasts dozens of projects and webinars. Every specialty will likely have several of these before consolidation begins.

And then there are other dimensions of the AI ecosystem.

Some platforms answer questions, typically from a licensed professional who remains responsible for interpretation. These "pull" systems are part of the general migration from internet search to AI search. Other platforms "push" their interventions, interrupting to make recommendations or issue alerts.

AI models are often shaped by existing rules: Standard operating procedures, formularies, local pathways, and insurance requirements. Tools like **FirstHx** support structured history collection. These deterministic overlays are very useful but should be explicit, auditable, and separable.

This multiplicity of platforms and approaches means that a "model of models" is likely to emerge in which expert systems are orchestrated with human guidance. An early example is Microsoft's new **MAI-DxO**, which coordinates multiple specialized agents and has improved diagnostic accuracy on **NEJM-CPC** benchmark cases compared to single models.

A clinical metaphor: A team of AI medical 'residents' is supervised by a Chief Resident Orchestrator (also AI) who aggregates inputs from multiple "residents" (best-evidence, past-practice, specialty-specific, societal determinants of health, formulary, finance, etc.), reports disagreements, and supports auditability.

Teams are modular by specialty and can include social determinants agents, formulary/insurance agents, and more. Accountability sits at the Chief Resident level, reporting to the attending physician.

Where disagreements exist, the causes can be surfaced and reviewed. This will allow better transparency, governance, and clinician oversight.

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