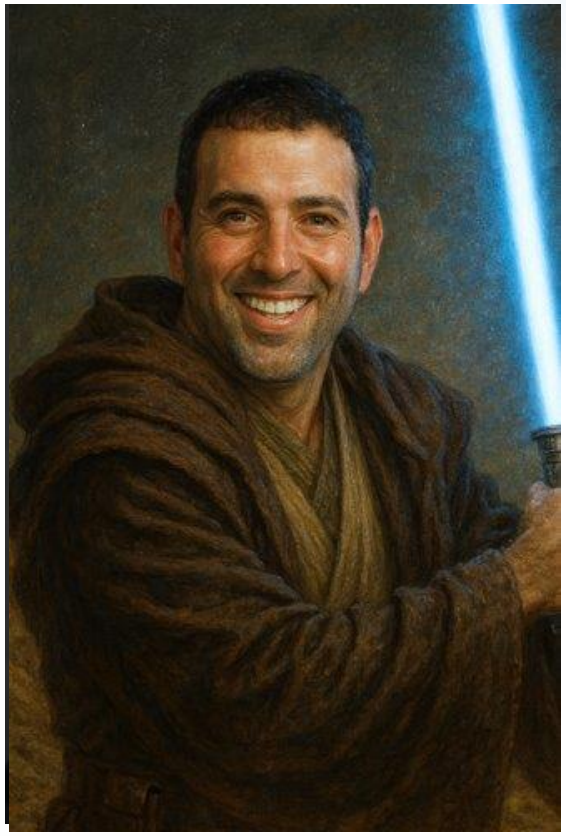
Artificial Intelligence in Medicine: Present and Future

Dr. Jonathan Kaufmann, D.O.
Chief Health Information Officer

Dr. Kaufmann Introduction Slide

- Background – Who is Dr. Kaufmann -
- Journey to Medicine –
- Dr. Kaufmann's AI Why -



Agenda

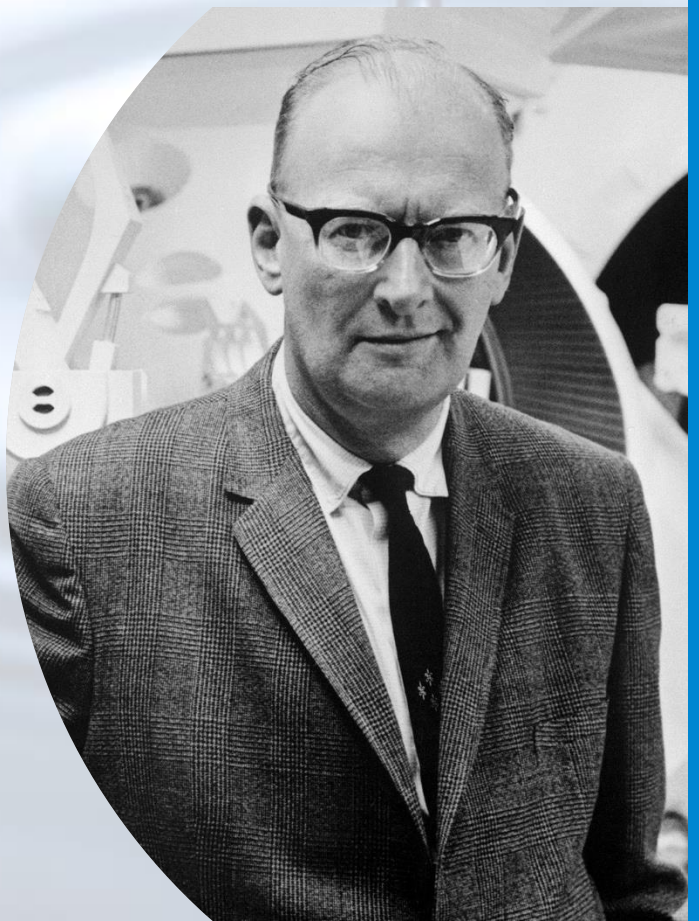
1. Introduction to AI
2. AI in Diagnostics
3. AI in Medical Imaging
4. Administrative AI in Healthcare
5. Ethical and Legal Considerations
6. Future Trends and Q&A

What uses of AI are there in Medicine?

What is Artificial Intelligence?

"Any sufficiently advanced technology is indistinguishable from magic."

Arthur C Clarke



It's not magic. It's math

Dr. John Lee, MD
HIMSS 2024

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Key Terms in Artificial Intelligence (AI)?

Artificial intelligence

The **simulation** of human intelligence by machines, enabling them to perform tasks that typically require human cognition.

Machine Learning and Deep Learning

AI includes machine learning and deep learning techniques, which allow systems to learn from data, identify patterns, and improve performance over time without explicit programming.

Natural Language Processing (NLP)

NLP is a key component of AI that enables machines to understand, interpret, and generate human language, facilitating communication and analysis of medical texts and conversations.

Large language model (LLM)

AI that uses deep learning and large datasets to understand, summarize, generate, and translate human language.

When was the first use of Artificial Intelligence in Medicine?

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Key Dates in Artificial Intelligence (AI)?

1972

First medical AI system at Stanford. Recommended antibiotics for infections using “if–then” rules.

1990s

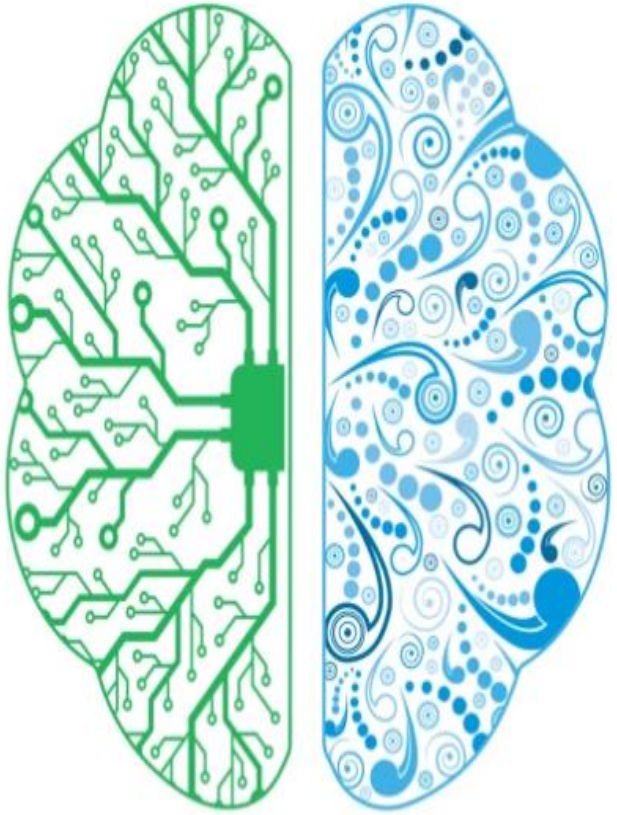
Hospitals began using AI to flag drug interactions and support doctors with guidelines.

2011

IBM Watson tested to help Oncology (cancer) Doctors with treatment recommendations

Generative vs Predicative

Exhibit 3 - The Complementary Nature of Predictive AI and GenAI



Predictive AI

Predictive algorithms that, among other things, can assign probabilities, categorize outcomes, and support decisions

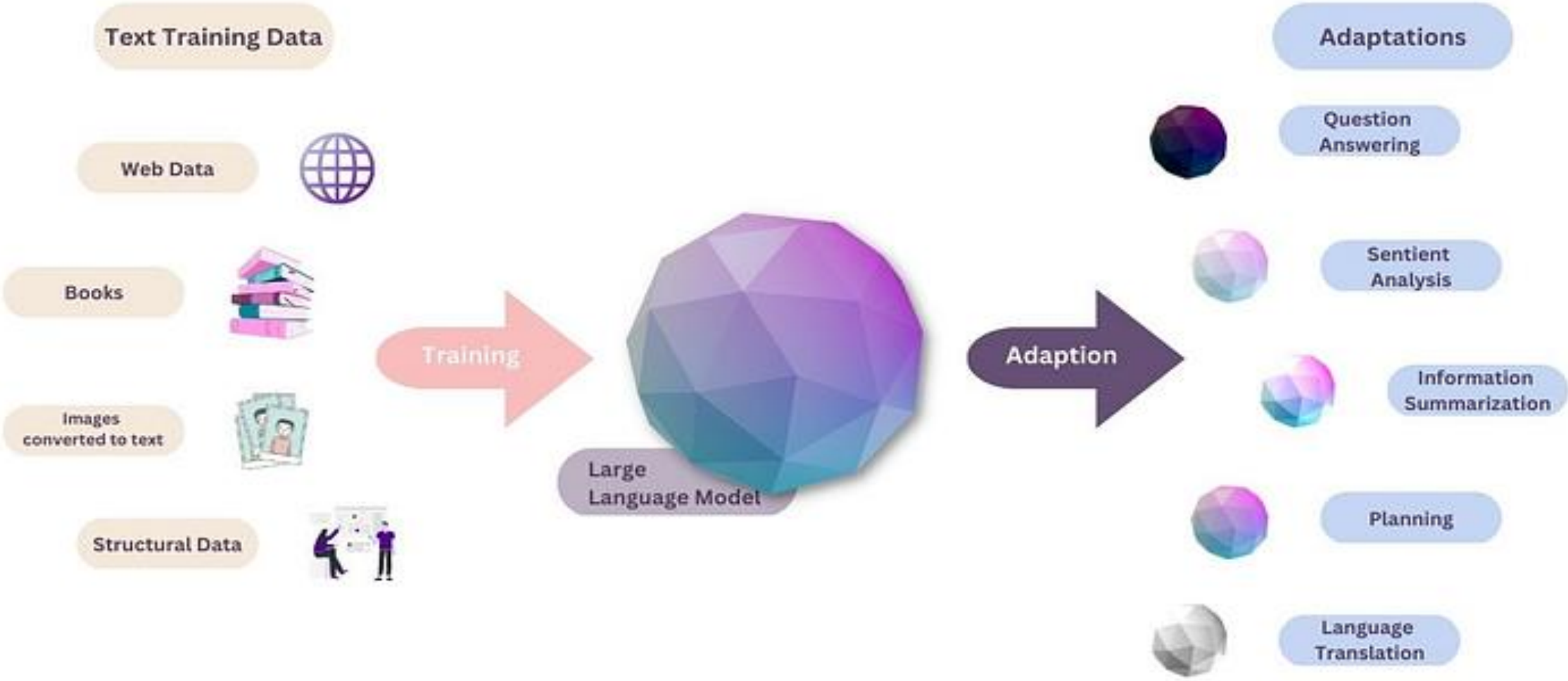
Generative AI

Generative algorithms that, among other things, can create text or images of human-level quality in response to prompts or requests for synthesis

Source: BCG analysis.

It's not magic. It's more math, faster

Large Language Models (LLMs)



AI in Everyday Life

Smart Assistants

E-commerce Enhancements

Autonomous Vehicles

Educational Tools

Financial Insights

Disruptive Technology

"Disruptive technology is innovative inventions or evolved current technology that changes the way society behaves, thinks, or interacts.

It also changes the way businesses or industries operate."

- Clara Piloto
Director of Global Programs, Director of Digital Plus Programs
MIT Professional Education

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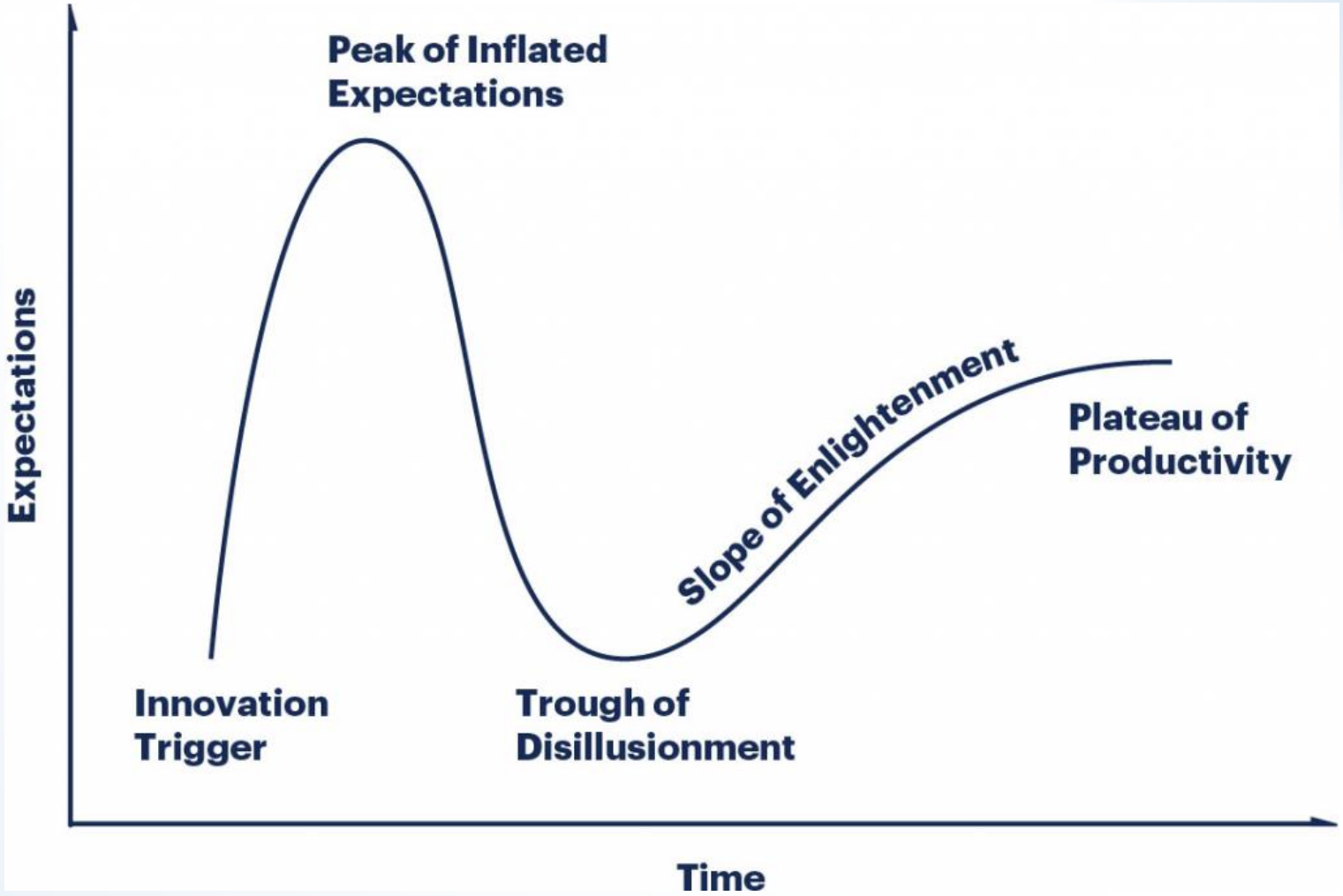
The Flatiron Building on 5th Avenue in NYC 1905

The Flatiron Building on 5th Avenue in NYC 1925

The Gartner “Hype Cycle”



A Solution Waiting for a Problem

What is AI in Medicine?

Improve Accuracy

AI enhances diagnostic precision by analyzing vast amounts of medical data to detect patterns that may be missed by humans, leading to more accurate diagnoses.

Save Time

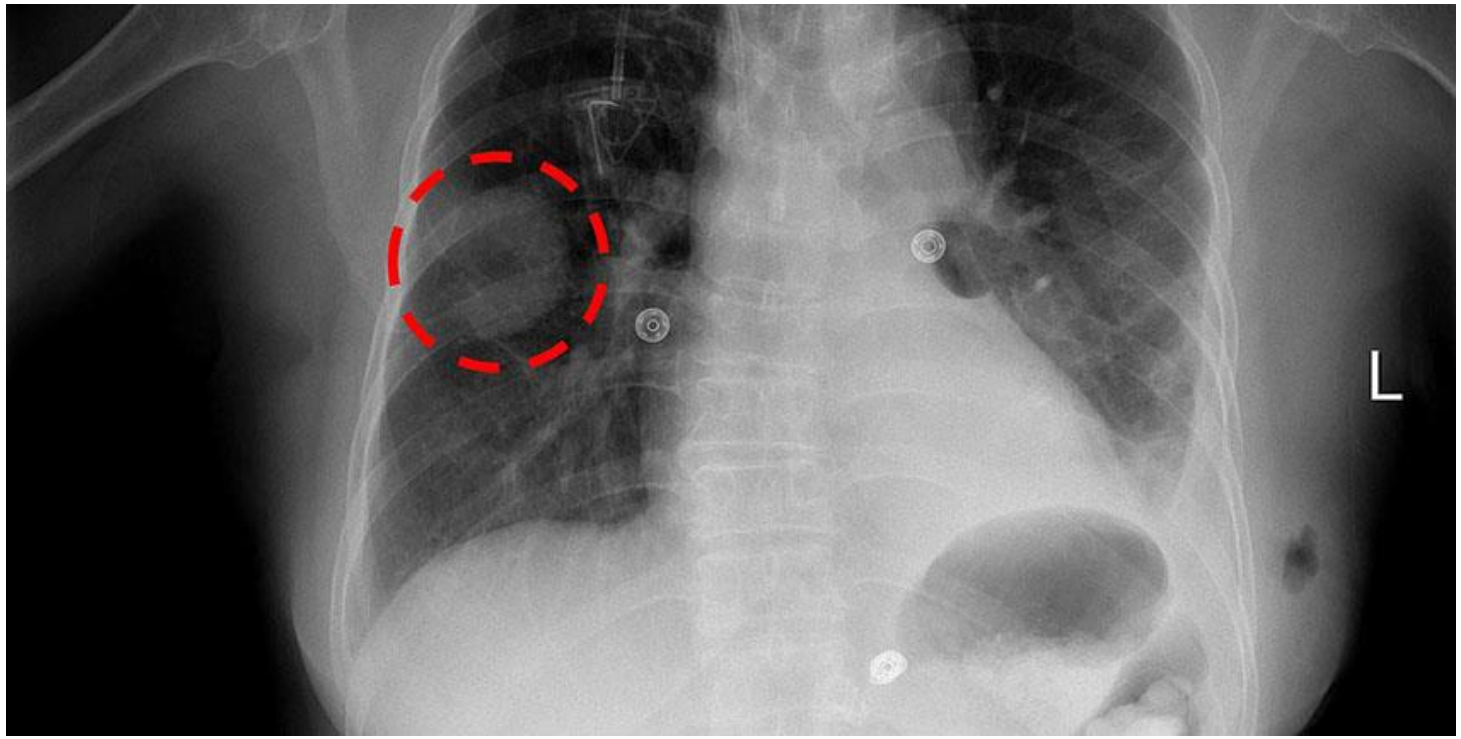
AI automates repetitive and time-consuming tasks, allowing medical professionals to focus more on patient care while reducing the time needed for data analysis and documentation.

Help Doctors Make Better Decisions

AI tools provide evidence-based insights and recommendations, assisting doctors in making more informed and personalized clinical decisions.

AI as a Diagnostic Tool

- Radiology
  - Xrays
  - CT scan
    - Stroke
  - Mammograms
- Triage
  - Red dot system



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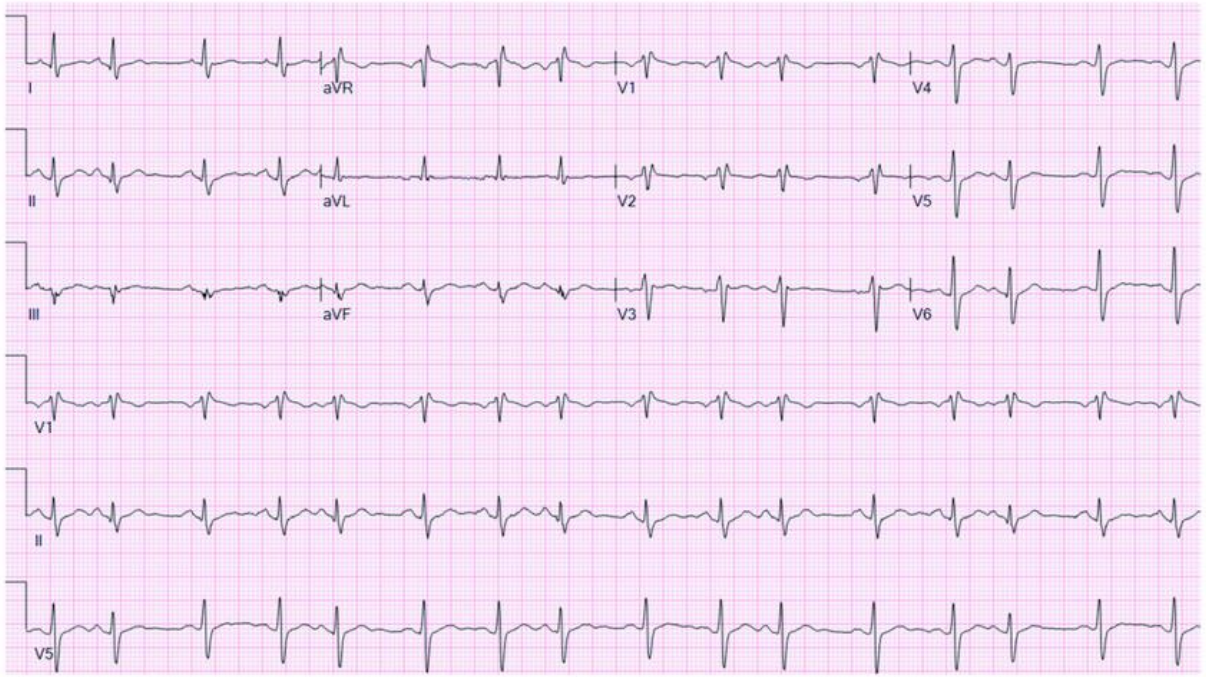
AI as a Diagnostic Tool

- Cardiology
- EKG analysis



Computer-Generated Interpretation

- Sinus rhythm with marked sinus arrhythmia
- Incomplete right bundle branch block
- Nonspecific T wave abnormality
- Prolonged QT

AI-ECG Interpretation

- Sinus rhythm
- Premature atrial complexes
- Incomplete right bundle branch block

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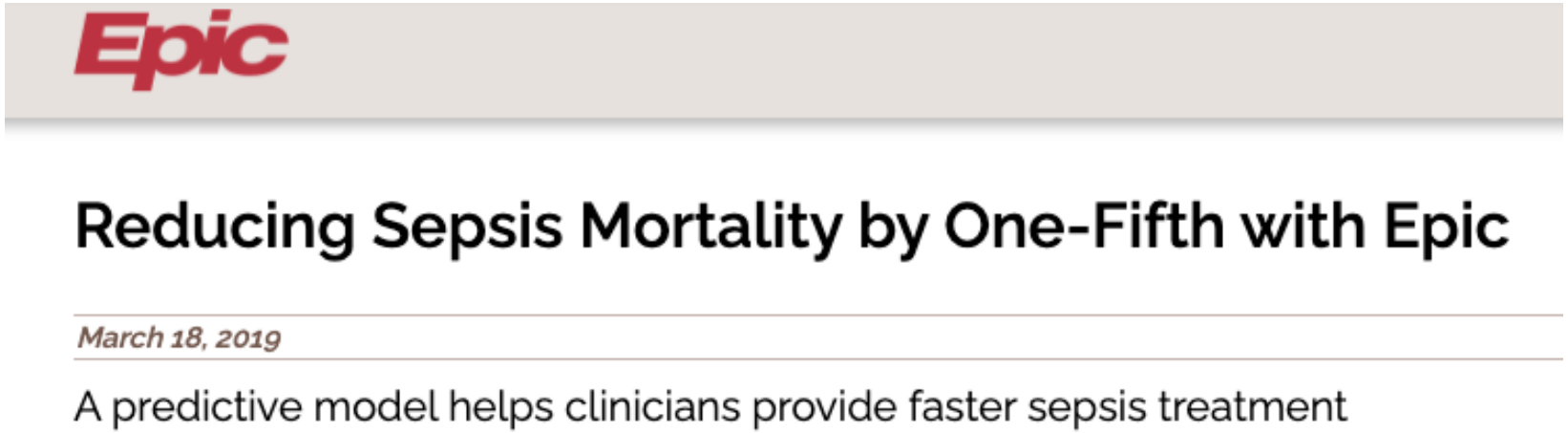
AI as a Diagnostic Tool

- Sepsis – infection causing significant sickness
  - AI model can look at 150+ variables in real time
  - Human models look at 5-10



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Trends

Future Trends in Diagnostics

Collaboration Between AI and Doctors

- AI supports doctors by analyzing complex data rapidly.
- Combining human expertise with AI precision improves diagnostic accuracy.
- Doctors validate AI findings, ensuring patient safety and ethical care.
- AI tools provide decision support, not replacement.

Personalized Medicine Using AI Insights

- AI analyzes patient-specific data for tailored treatments.
- Predictive analytics help anticipate disease progression and outcomes.
- Personalized diagnostics improve treatment effectiveness and patient care.
- AI enables continuous monitoring and adjustment of therapies.

Diagnostics

AI Training

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AI as a Diagnostic Tool - bias

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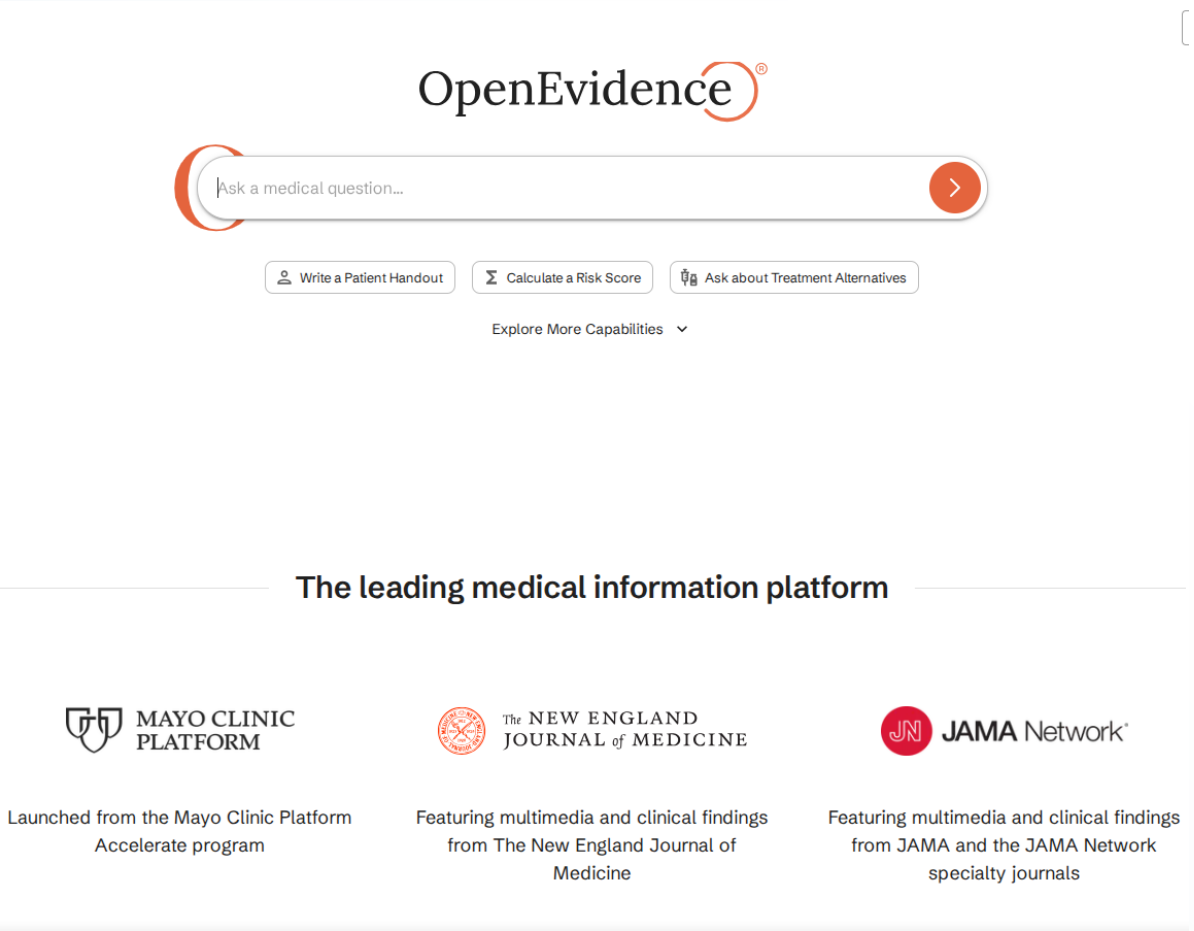
Treatment

AI for Treatment Recommendations



- AI examines detailed patient records including medical history, test results, and genetic information.
- It tailors treatment plans based on individual patient data, enhancing personalization.
- AI helps doctors select the most effective therapies and medication dosages.
- This personalized approach improves treatment outcomes and patient safety.
- AI's recommendations support clinical decisions but require human oversight for final approval.

Diagnosis

Pros and Cons of AI Diagnosis Tools

PROS

•Speed: AI tools analyze data rapidly, accelerating diagnosis times.

•Accuracy: AI often improves diagnostic accuracy by detecting patterns humans might miss.

•Consistency: AI provides consistent analysis without fatigue, reducing human errors.

CONS

•Bias: AI systems can inherit biases present in training data, leading to unfair outcomes.

•Lack of Empathy: AI cannot replicate human empathy, which is crucial in patient care.

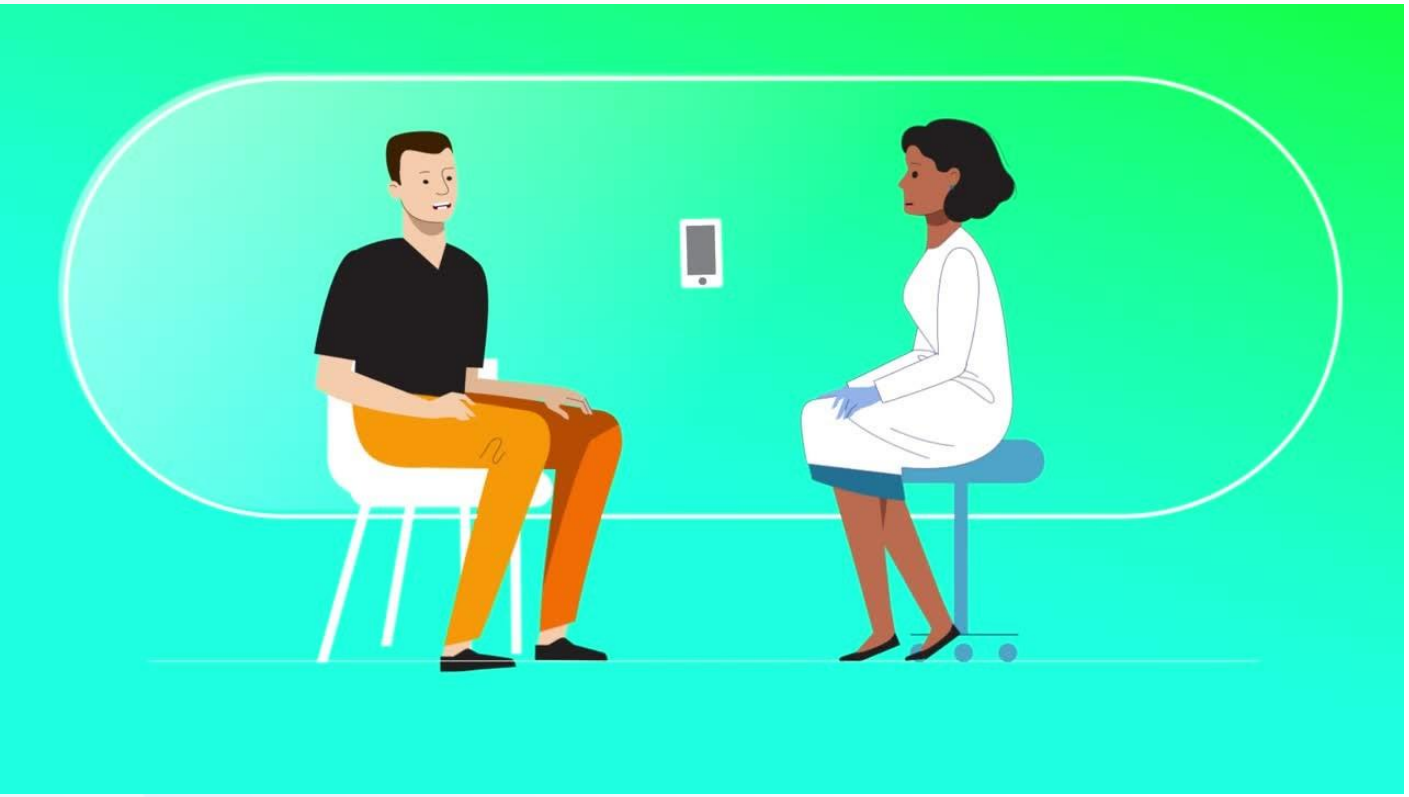
•Privacy Concerns: Use of sensitive medical data raises significant privacy and security issues.

Administrative Burden in Healthcare

Toll E. The Cost of Technology. JAMA. 2012;307(23):2497–2498. doi:10.1001/jama.2012.4946

- Doctors spend approximately 50% of their time on documentation tasks, reducing time available for patient care.
- The extensive administrative burden is a major factor contributing to physician burnout worldwide.
- Documentation includes recording patient visits, updating medical records, and completing insurance forms.
- It allows doctors to focus more on patient care and less on administrative tasks.

What is Ambient Voice Technology?



- AI listens passively during doctor-patient talks without interrupting the flow of conversation.
- It creates real-time documentation by transcribing and organizing spoken information automatically.
- This technology significantly reduces the time doctors spend on note-taking and documentation.
- It allows doctors to focus more on patient care and less on administrative tasks.

Example: Nuance DAX

Ambient AI in Clinics

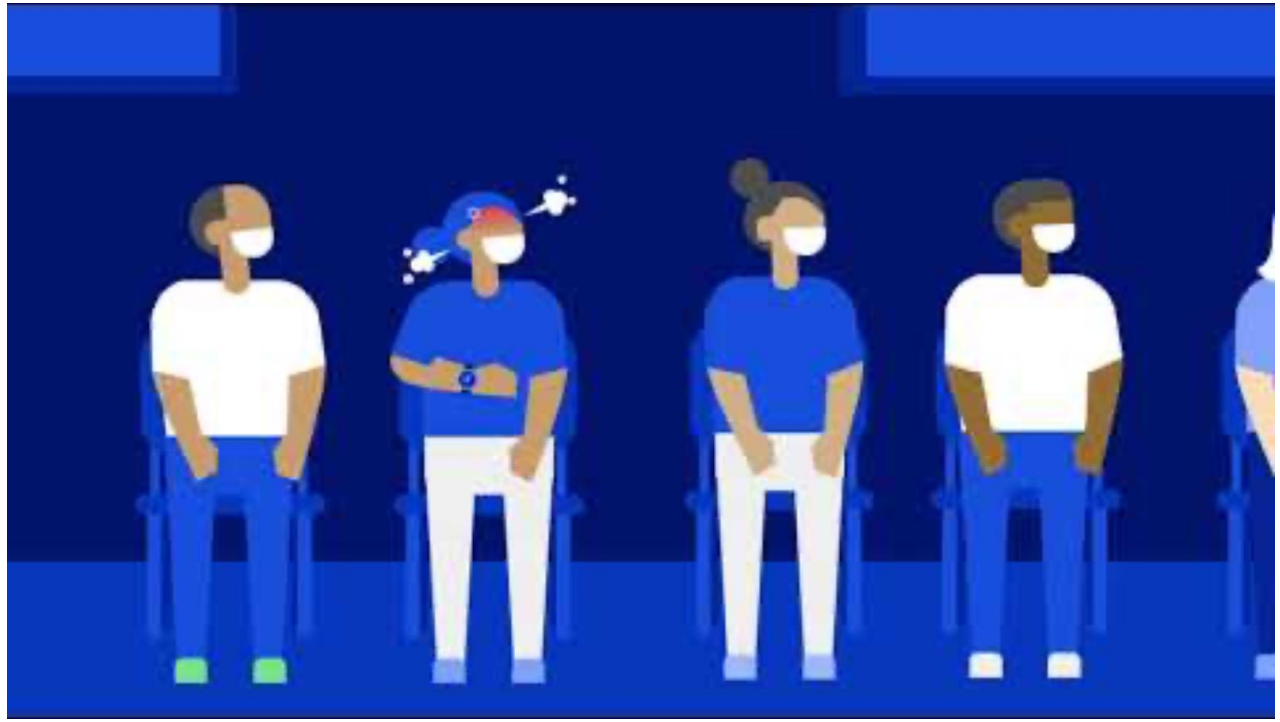
Nuance DAX employs ambient voice technology that listens during doctor-patient conversations to create real-time clinical documentation automatically.

Reducing Note-Taking Time

By automating the documentation process, Nuance DAX significantly cuts down the time doctors spend on writing notes, easing administrative burdens and reducing burnout.

AI Scheduling Assistants

- Automate appointment bookings and reminders to patients.
- Reduce administrative workload for clinic staff.
- Help optimize scheduling to minimize patient wait times.
- Improve clinic efficiency and patient satisfaction.
- Enable seamless communication between patients and healthcare providers.



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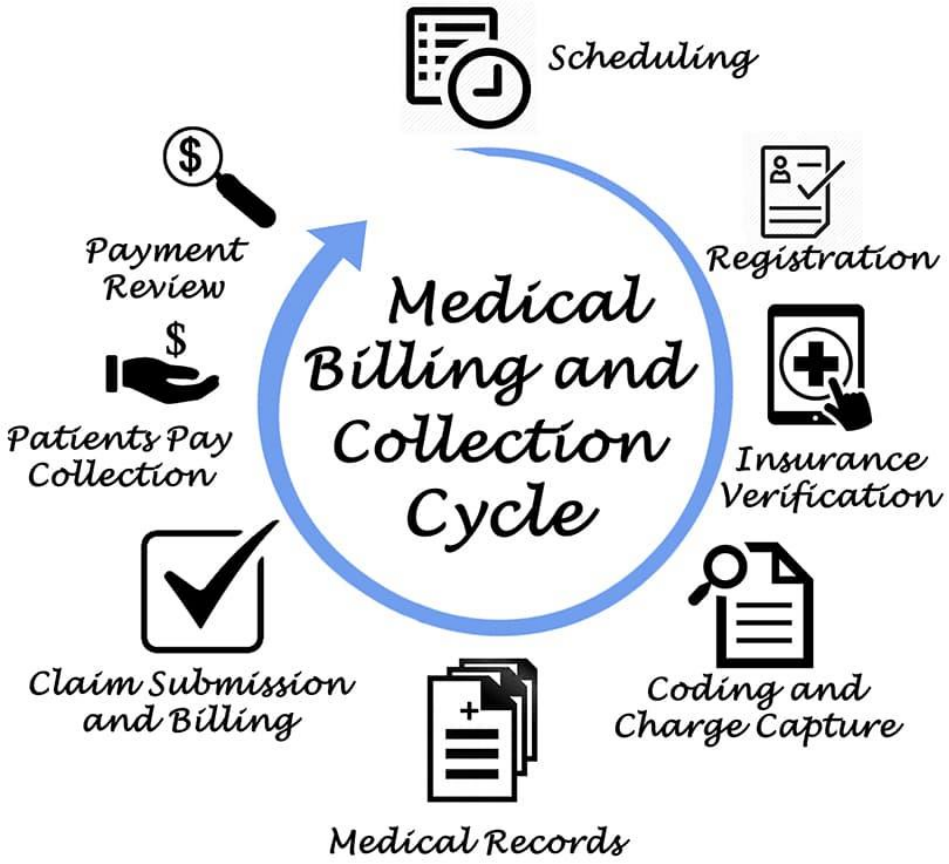
AI in Billing and Coding

- AI automates the billing process, reducing manual entry errors.
- Improves accuracy in coding for insurance and reimbursement claims.
- Speeds up billing cycles, leading to faster revenue collection.
- Helps healthcare providers reduce administrative costs.
- Increases overall revenue by minimizing claim denials and errors.



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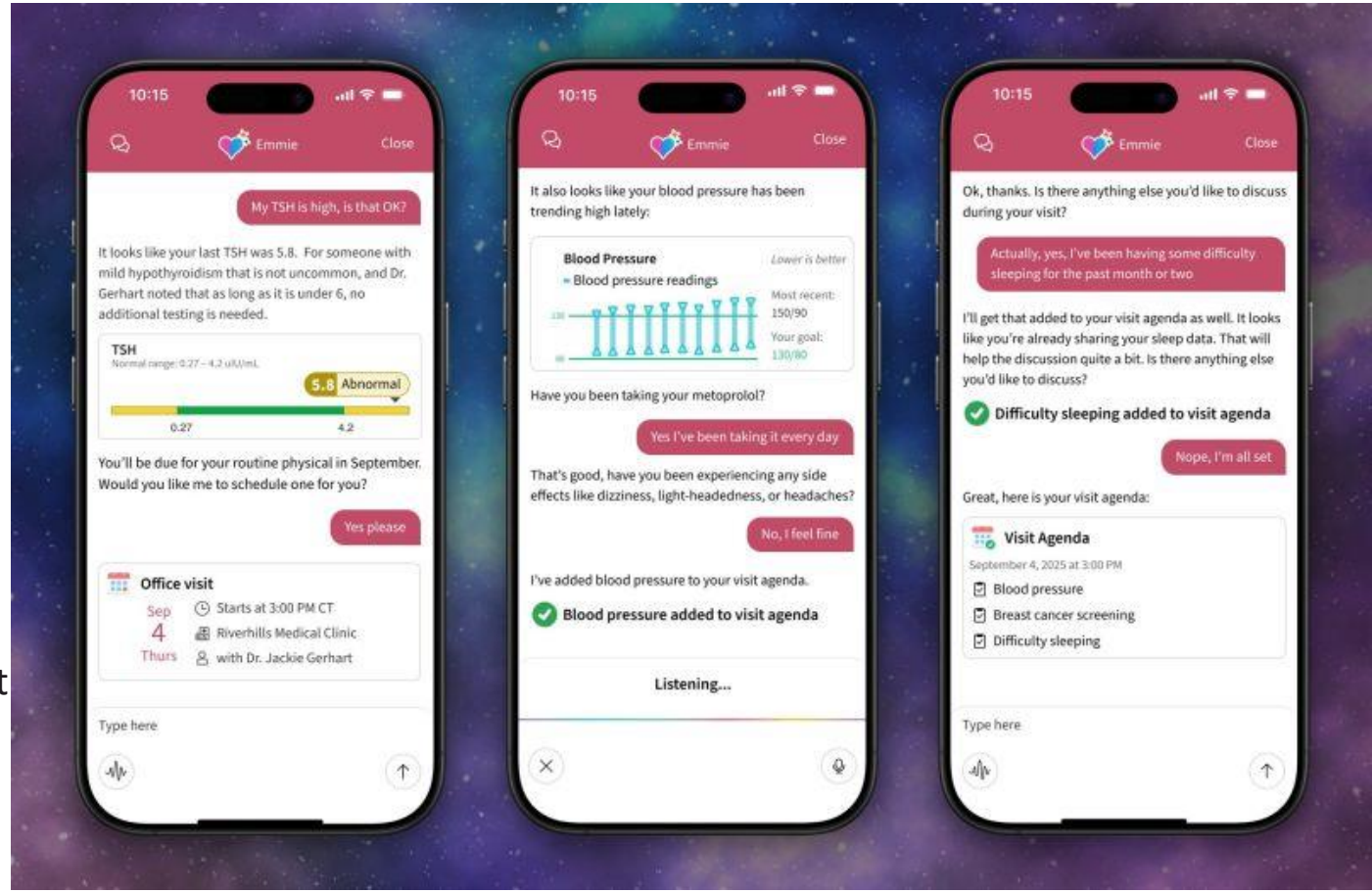
Patient Portals with AI

- AI-powered patient portals provide quick answers to patient questions, improving accessibility to healthcare information.
- These portals send medication reminders to help patients adhere to their prescribed treatments.
- By automating routine communication, AI enables healthcare providers to focus more on patient care.
- Patient portals with AI support better health management and increase patient engagement in their care journey.



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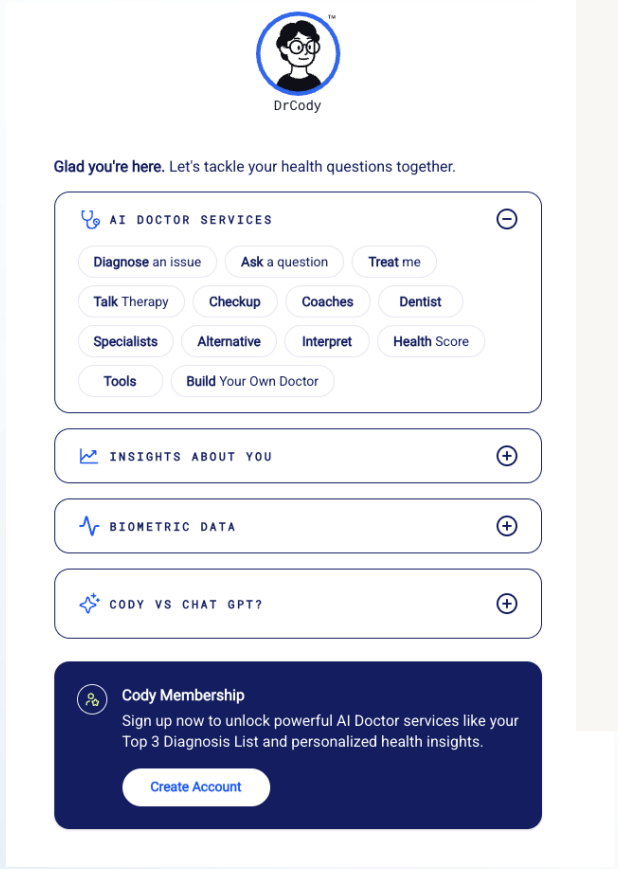
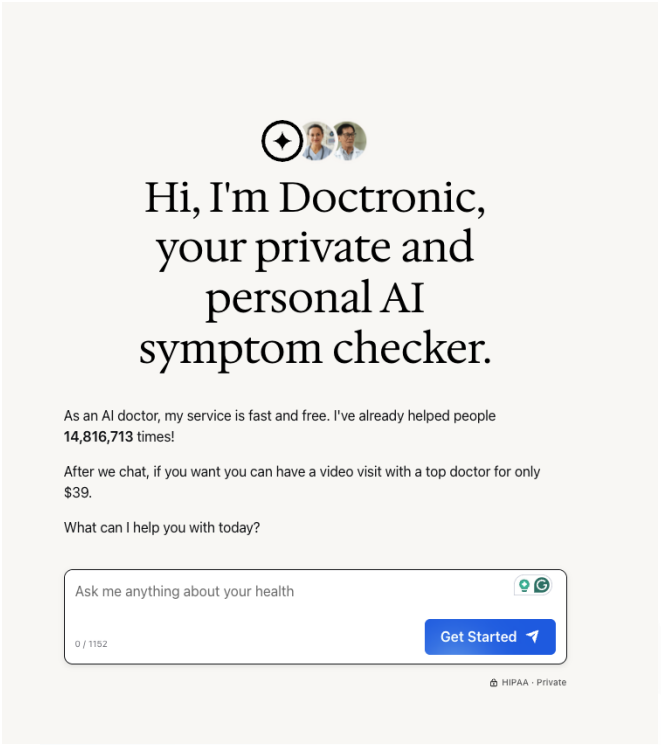
AI Applications

Chatbots in Medicine





Patient facing

- Used for triage to assess patient symptoms quickly and direct care.
- Support mental health by providing accessible therapeutic conversations.
- Assist with follow-ups to monitor patient progress and adherence.
- Improve access to care outside of traditional clinical hours.
- Reduce workload for healthcare professionals by handling routine inquiries.

Always discuss Doctronic output with a doctor. Doctronic is an AI doctor, not a licensed doctor, does not practice medicine, and does not provide medical advice or patient care. By using Doctronic, you agree to our Privacy Policy & Terms of Service. LegitScript certified.

Ethical Concerns

- Consent must be obtained for recordings during medical interactions to respect patient autonomy and privacy.
- HIPAA (Health Insurance Portability and Accountability Act) sets strict rules for protecting patient information in the US.
- Data privacy concerns arise because AI systems process sensitive health data, requiring robust safeguards against breaches.
- Patients and providers must be informed about how AI collects, stores, and uses medical data to ensure transparency and trust.
- Ethical AI use demands continuous oversight to prevent misuse and protect patient rights.

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Bias

AI learns from **past medical data**
If the data is **unfair or incomplete**, the AI can make **unfair/incorrect decisions**

Biggest Issues:
Missing voices: not enough diversity in data
Unequal treatment: worse care for some groups
Trust & safety: patients can be harmed if doctors rely too much on AI

Real Example:
An AI once predicted **Black patients were healthier than they were**—
just because historically **less money was spent** on their care.

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Ethical and Legal Considerations

Responsibility for AI Mistakes

- **Determining who is accountable when AI makes an error is critical.**
- **Legal frameworks are still evolving to address AI-related medical mistakes.**
- **Doctors, AI developers, and healthcare institutions share responsibility.**
- **Clear guidelines are needed to manage liability and patient safety.**

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Support

Artificial Intelligence is designed to support, not replace, healthcare professionals. By automating routine tasks and assisting with data analysis, AI allows doctors and nurses to focus more on direct patient interaction and care, improving overall healthcare delivery.

Our Commitment Runs Deep

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