



Artificial Intelligence

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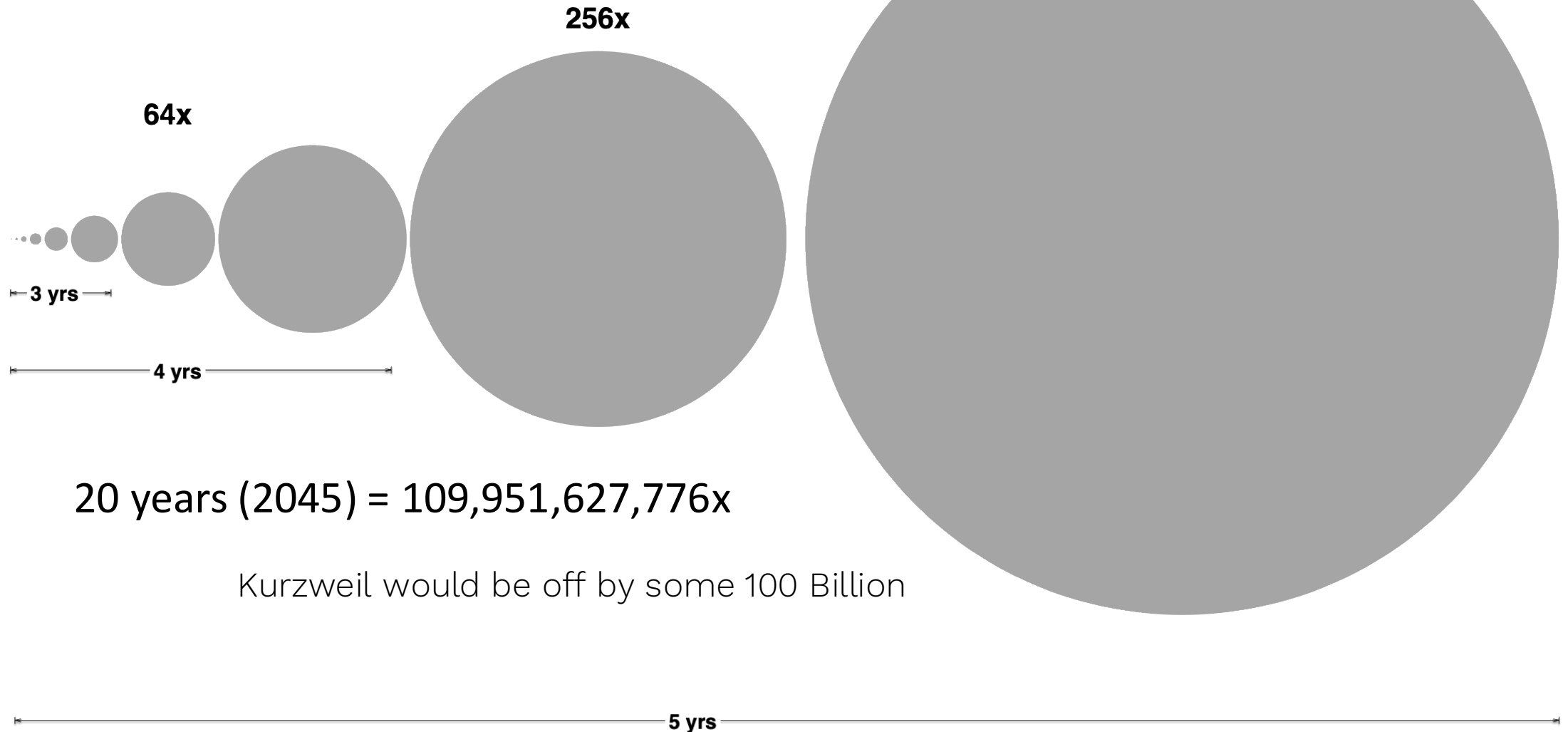


AI Advancement

“Artificial intelligence will reach human levels by around 2029. Follow that out further to, say, 2045, we will have multiplied the intelligence, the human biological machine intelligence of our civilization a billion-fold.”

—Ray Kurzweil (2017)

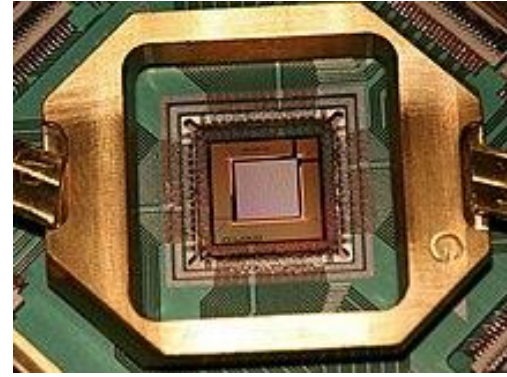
AI is Doubling Every 6 Months (or faster)



Quantum Computing is Likely to Transform Medicine

- Strength is simulation
- In the future, we will see quantum computers that will be able to simulate
 - Protein folding and interactions
 - Simulate chemical systems
 - Simulating entire biological systems
 - Simulate the human brain
- They will also be able to generate synthetic data for classical AI

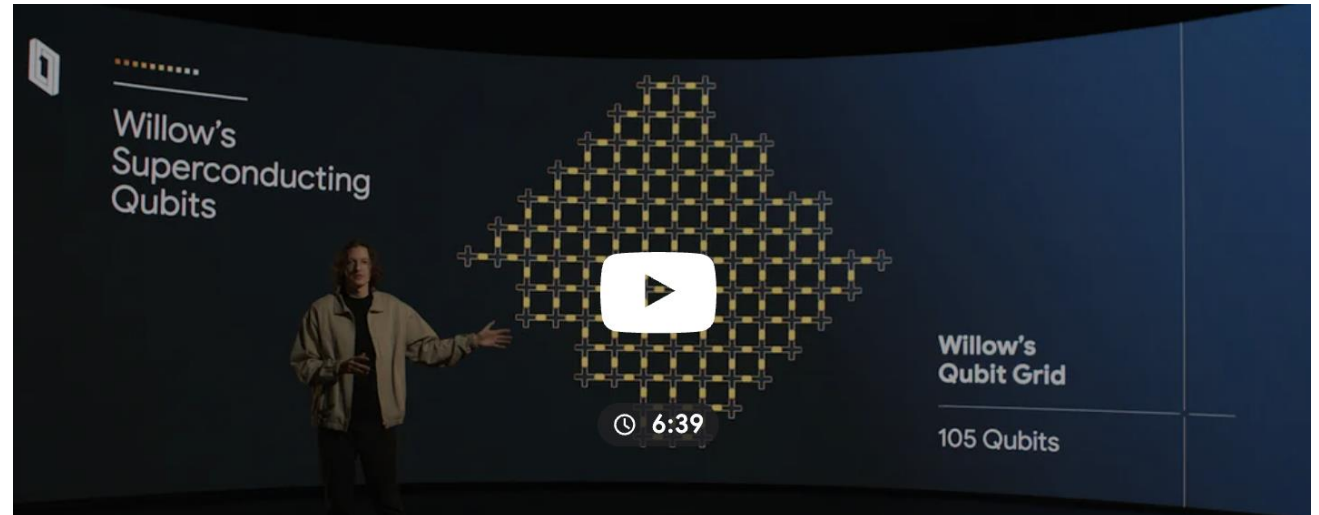
Dwave – 1000 qubits



Microsoft Majorana 1



Google Willow



“Willow’s prowess was its ability to solve a computation in under five minutes—a task that would take the world’s fastest supercomputer an incomprehensible 10 septillion years.”











“Artificial intelligence will fundamentally transform primary care. The question is when and how.

—Steven E. Waldren (2019)

2025 Addendum: “ with or without quantum computing but probably with”

ORIGINAL ARTICLE

Does AI-Powered Clinical Documentation Enhance Clinician Efficiency? A Longitudinal Study

Tsai-Ling Liu , Ph.D.,¹ Timothy C. Hetherington , M.S.,^{1,2} Ajay Dharod , M.D.,^{3,4,5,6,7} Tracey Carroll , M.B.A.,⁸ Richa Bundy , M.P.H.,³ Hieu Nguyen , M.S.,¹ Henry E. Bundy , Ph.D.,¹ McKenzie Isreal , M.P.H.,¹ Andrew McWilliams , M.D., M.P.H.,^{2,9} and Jeffrey A. Cleveland , M.D.¹⁰

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ORIGINAL RESEARCH

Using Primary Health Care Electronic Medical Records to Predict Hospitalizations, Emergency Department Visits, and Mortality: A Systematic Review

Rebecca Johnson, BSc, Thomas Chang, BHSc, Rahim Moineddin, PhD, Tara Upshaw, BSc, MHSc, Noah Crampton, MD, CCFP, MSc, Emma Wallace, MB, BAO, BcH, PhD, MICGP, and Andrew D. Pinto, MD, CCFP, FRCPC, MSc

JOURNAL OF MEDICAL INTERNET RESEARCH

Radionova et al

Review

Impacts of Symptom Checkers for Laypersons' Self-diagnosis on Physicians in Primary Care: Scoping Review

Natalia Radionova¹, MA; Eylem Ög¹, MA; Anna-Jasmin Wetzel², MA; Monika A Rieger¹, Prof Dr; Christine Preiser^{1,3}, MA, Dr phil






Systematic Review

The Use of Artificial Intelligence for Skin Disease Diagnosis in Primary Care Settings: A Systematic Review

Anna Escalé-Besa^{1,2,3}, Josep Vidal-Alaball^{2,3,4,*} , Queralt Miró Catalina^{2,4} , Victor Hugo Garcia Gracia³, Francesc X. Marin-Gomez^{2,5}  and Aina Fuster-Casanovas^{4,6} 

Review

Artificial-Intelligence-Based Clinical Decision Support Systems in Primary Care: A Scoping Review of Current Clinical Implementations

Cesar A. Gomez-Cabello¹ , Sahar Borna¹ , Sophia Pressman¹ , Syed Ali Haider¹ , Clifton R. Haider² and Antonio J. Forte^{1,*} 

STUDY PROTOCOL

Open Access



The acceptability and effectiveness of artificial intelligence-based chatbot for hypertensive patients in community: protocol for a mixed-methods study

Ping Chen¹, Yi Li², Xuxi Zhang¹, Xinglin Feng^{3*} and Xinying Sun^{1*}

Building Capacity for Pragmatic Trials of Digital Technology in Primary Care

David R. Rushlow, MD; Thomas D. Thacher, MD; and Barbara A. Barry, PhD

Over 30
Primary Care
AI Journal
Articles in the
Last Year



How: Promise > Peril (External > Internal)

“External” Driven Peril.

- The same drivers that lead us to current EHRs are still in place
- Health care is still very profit-driven
- Congressional bill to allow AI to prescribe medication
- AI used to reinforce and prolong the current broken system

AI Being Used to Deny Prior Auths and Claims



Source: Claude.ai

Combating “External” Driven Peril.

- Federal Advocacy
 - Establishment of safeguards
 - Ensure liability is attached to medical-decision making
 - Promote the value of full primary care led by a physician (4C's)
- Health Plan Advocacy
 - Hold accountable for inappropriate AI use
 - Combat with practice-side AI
- AI Developers and Investors
 - Educate on the value and role of primary care and family physicians
 - Insist on family physician input in discovery, design, and deployment
- Positioning AAFP and its members as leaders on AI

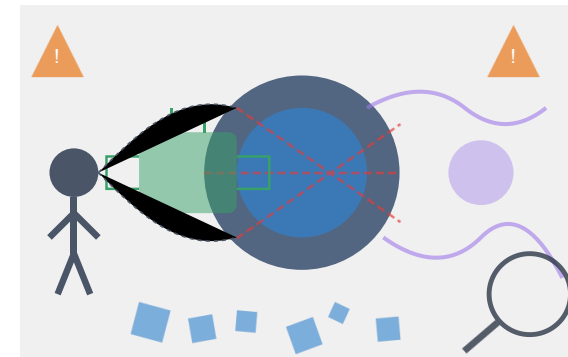


Source: ChatGPT

“Internal” Driven Peril.

- Bias and Lack of Diversity of Data
 - Place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, education, socioeconomic status, and social capital (PROGRESS-Plus)
- Hallucinations
- Lack of generalizability (esp. in clinical space)
- Automation Bias
- Lack of Explainability
- Data Privacy and Copyright

Can you create an abstract picture that represents the potential perils of AI (e.g., bias, hallucination, automation bias, etc.)?



Source: Claude.ai



Source: ChatGPT

- Hallucinations
- Implicit bias
- Used to create convincing fake information



Created with: <https://replicate.com/stability-ai/stable-diffusion>

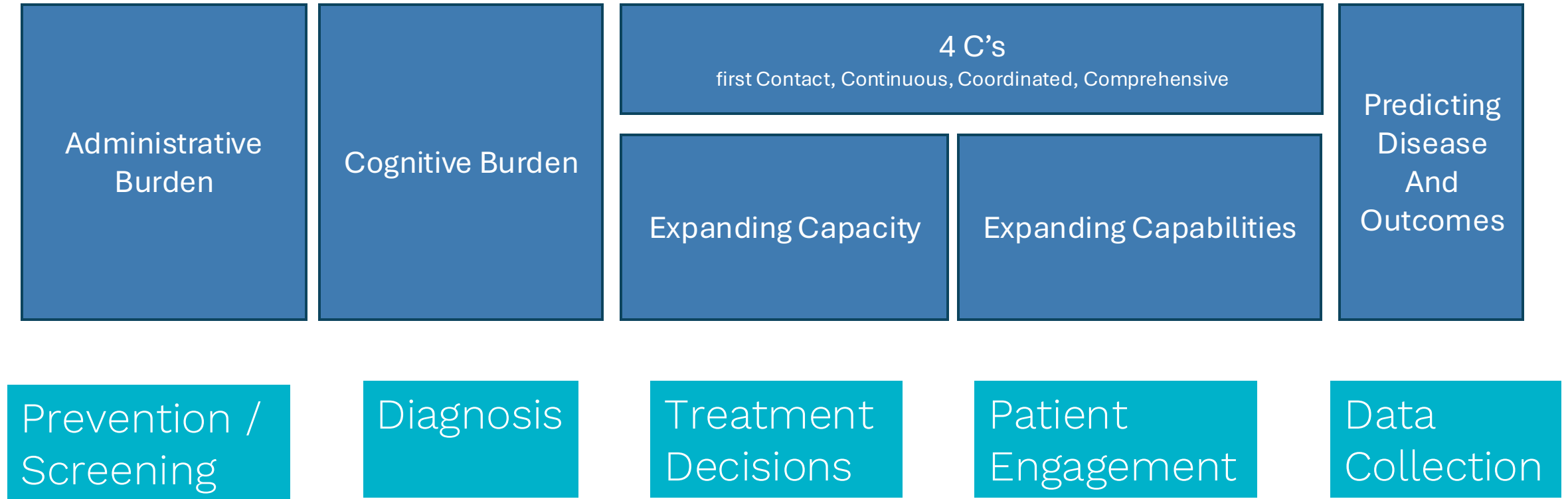
Risk-Based Framework: Borrow FDASIA

- Purpose of software product
- Intended user(s)
- Severity of [potential] injury
- Likelihood of hazardous situation arising
- Transparency
- Ability to mitigate harmful conditions
- Complexity of software
- Complexity of implementation
- Complexity of training
- Use as part of more comprehensive solution
- Network connectivity, standards, security



The Promise of AI

Opportunities for AI in Medicine

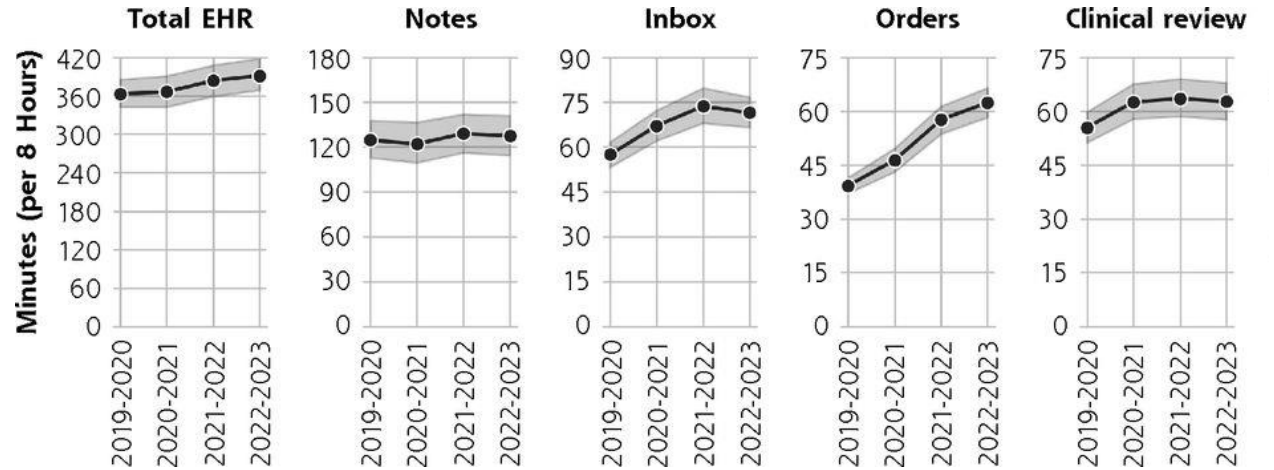


FDA has approved over 1,000 AI-enabled Software as a Medical Devices (SaMD)



- Chart Review 27.6%
- Documentation 23.7%
- Inbox 23.7%
- Order Entry 12.1%
- Billing & Coding 3.9%

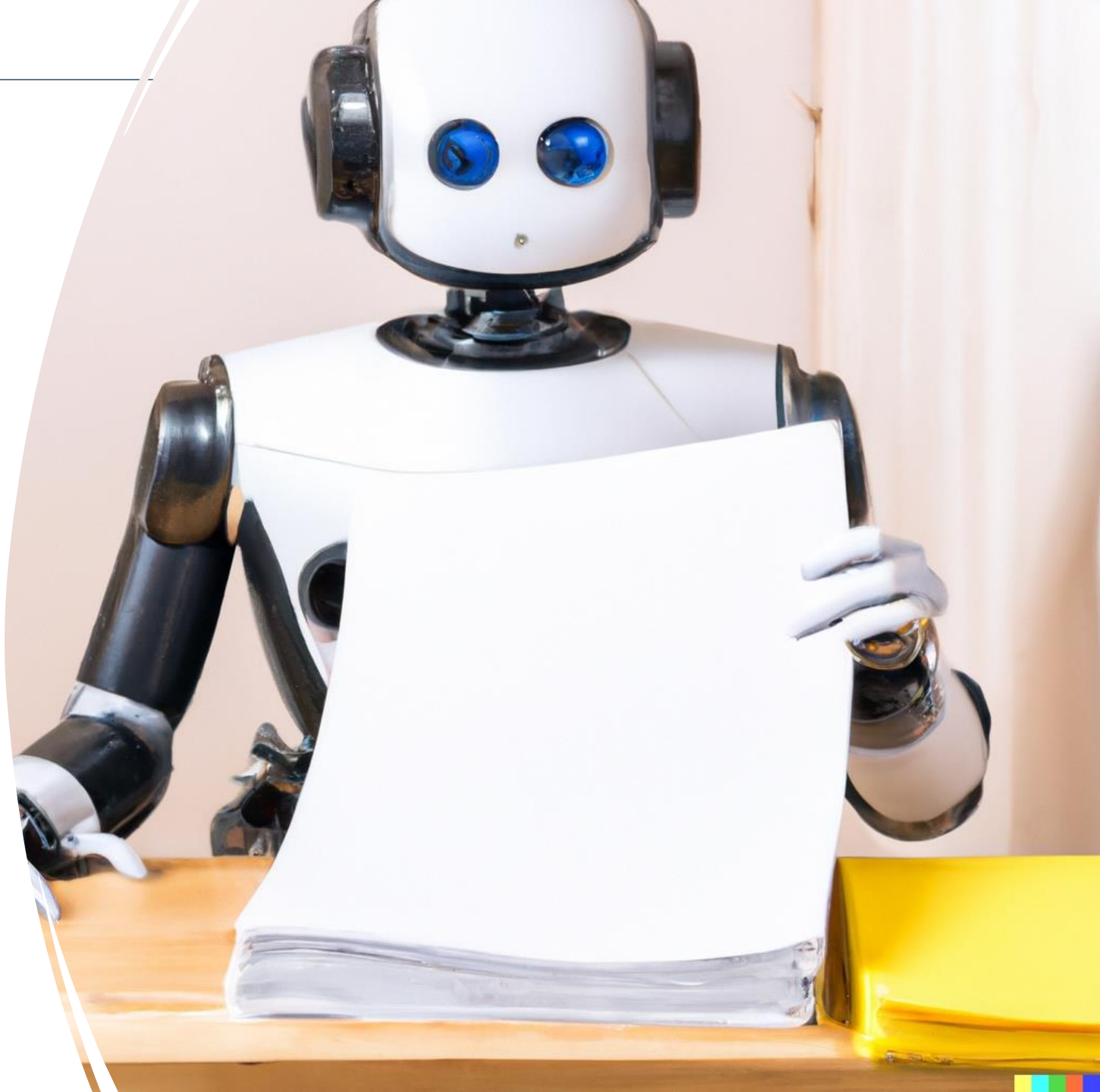
% of Time Spent



Source: Arndt BG, Micek MA, Rule A, Shafer CM, Baltus JJ, Sinsky CA. More Tethered to the EHR: EHR Workload Trends Among Academic Primary Care Physicians, 2019-2023. Ann Fam Med. 2024 Jan-Feb;22(1):12-18.

Source: Arndt BG, Beasley JW, Watkinson MD, et al. Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and Time-Motion Observations. Ann Fam Med. 2017;15(5):419-426.

What if you
could have an
assistant to
help you?



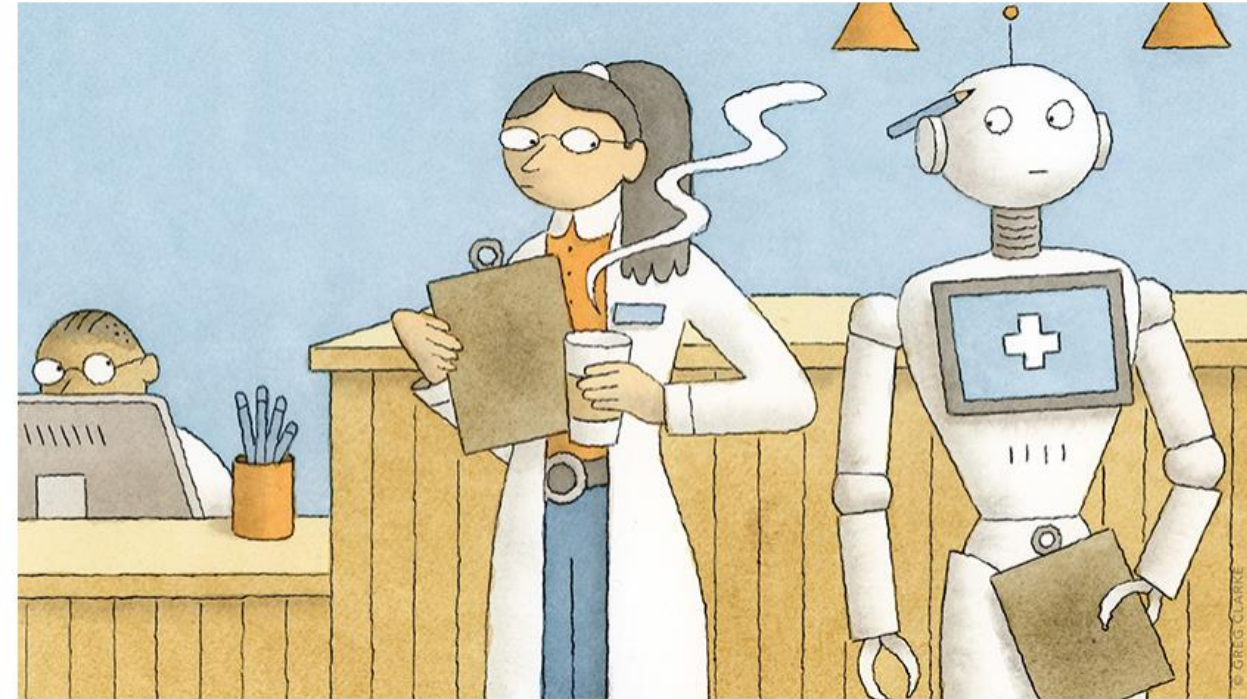
AI Assistants

- Administrative Burden
 - Generate Documentation
 - Suggest codes
- Cognitive Burden
 - Summarize charts
 - Ask questions of the chart (“Was there a colon cancer screening done?”)
 - Generate EHR Inbox message responses
- Expanding Capacity
 - Converse with patient to get history or educate
 - Generate patient education materials

Info on evaluations of some AI Assistants - <https://www.aafp.org/family-physician/practice-and-career/managing-your-practice/health-it/innovation-lab.html>

FPM Article

Waldren SE MD, MS. The Promise and Pitfalls of AI in Primary Care. Fam Pract Manag. 2024 Mar;31(2):27-31.



The Promise and Pitfalls of AI in Primary Care

Programs like ChatGPT can lessen administrative burden. But how do you get started — and can you trust them?

[VIEW ARTICLE](#)

Looking into the Future...

- Caveat – Amara’s Law
- AI will cause seismic changes
 - Promise
 - Peril
- AI will replace some tasks and hopefully many administrative tasks
- Human+AI is how most AI will be deployed in the near future
- Likely to have more “ChatGPT” like advancements (Deepseek, MANUS, quantum computing)



Created with: <https://replicate.com/stability-ai/stable-diffusion>

Takeaways

- AI will transform health care and care delivery
- AI does reduce burden today
- Still some unknowns
- If clinicians led, I believe there will be much more promise than peril

Questions?

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Thank you