AI: What do faculty need to know?

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Professionalism Week
11/14/2023
The Mission of Care Management Plus

is to improve systems and outcomes for vulnerable populations through research, technology, and collaboration.

Identifying vulnerable people
Risk stratification and segmentation

Tailoring care to these needs

Improving outcomes

Funded by the John A. Hartford Foundation, AHRQ, NIH, Commonwealth Fund, Gordon and Betty Moore Foundation, CHCF, CMS, OHSU Foundation, San Francisco Health Plan, and the Oregon Health Authority
Overview

• What is AI and how might it affect health care? Research? Education?
• What should you consider doing to integrate and support AI?
• What are challenges with AI? How will it affect our professions and what should our code of conduct be in its use?
• What is OHSU’s strategy for AI?
What is Artificial Intelligence (AI)?

Artificial Intelligence can be defined as non-human systems that make inferences and/or decisions e.g., when a system is replacing part or all of the cognition normally done by a human; and where the inference drawn is not easily reproduced by a human.

New methods – largely machine learning – allows developers to build complex, quickly adaptive models with many types of data. *Large Language Models (LLM)* are the foundation of current hype related to artificial intelligence – ChatGPT is based on LLMs.

Have you tried one?: [https://bard.google.com](https://bard.google.com) ; [https://www.bing.com/](https://www.bing.com/) [https://chat.openai.com/](https://chat.openai.com/) (free preview); *do not enter any restricted information*
Who has used truly advanced ML in their work (or for fun)?

- What was your experience?
- What benefits do you see?
- What harms?
- What have you heard?

Getting up to speed:
Follow Eric Topol; Listen to Ezra Klein; Read summaries in literature

https://www.nytimes.com/column/ezra-klein-podcast
Why AI now?

Since the 60s, people have been building adaptive algorithms, including text response.

The ability of these algorithms suddenly massively improved.

From openai.org, Chat GPT 4 technical document.
Examples of the Use of Artificial Intelligence (AI) in Health Care Delivery Domains.

<table>
<thead>
<tr>
<th>Health Care Delivery Domain</th>
<th>Description of Application</th>
<th>Example of Uses of AI (Nonexhaustive)</th>
<th>Potential Impact on Total Mission Value</th>
<th>Current State of Adoption</th>
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<tbody>
<tr>
<td>Consumer</td>
<td>Understanding how best to engage consumers with the use of tools</td>
<td>Identification of patients to prioritize outreach Personalized outreach</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Continuity of care</td>
<td>Optimizing point-of-service and referrals to improve patient care</td>
<td>Referral integrity Patient transfers</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Network and market insights</td>
<td>Tracking relationship strength among providers</td>
<td>Identification of providers Benchmarking (e.g., quality)</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Clinical operations</td>
<td>Optimizing workflow of clinical operations throughout care</td>
<td>Hospital operations (e.g., emergency department, operating room) Capacity management Supply chain</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Clinical analysis</td>
<td>Improving patient care before, during, and after treatment</td>
<td>Clinical decision support Treatment recommendations Care pathway design</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Quality and safety</td>
<td>Reducing major adverse events while improving patient experience and complying with regulations</td>
<td>Detection of deterioration of patient’s condition Regulatory compliance</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
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<tr>
<td>Value-based care</td>
<td>Improving performance of value-based care models</td>
<td>Utilization management Determination of which patients will benefit most</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Reimbursement</td>
<td>Automating and optimizing payment flows between providers and payers</td>
<td>Coding Prevention of denials</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
<tr>
<td>Corporate functions</td>
<td>Managing back-office, administrative functions</td>
<td>Talent management Finance</td>
<td>Low Medium High</td>
<td>Developing solutions Pilot phase Scaling and adoption Maturity</td>
</tr>
</tbody>
</table>
Large Language Models (LLMs) require different approaches in clinical care

**LLM Generation and Operation**

- **Unlabeled**
  - Corpus of Textual Knowledge
  - Pattern Recognition
  - Language Model
  - Predicted Text
  - “Base Model”

- **Labeled**
  - Domain Specific Corpus
  - Pattern Recognition
  - Tuning
  - Output
  - Predicted Domain Specific Text
  - “Fine-Tuned Model”

**Common LLMs**

- OpenAI Chat GPT-4
- Google Bard
- Meta AI

These are instances of what is known as Generative AI, which are a class of algorithms that can be used to create new content, including audio, code, images, text, simulations, and videos.

Tuning: prompt engineering, ongoing learning; requires private and secure versions

Cloud costs > $100m to develop; and expensive to run
<table>
<thead>
<tr>
<th>Topic</th>
<th>Example</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient AI Scribe</td>
<td>DAX Express (LLM)</td>
<td>Pilot is moving through intake</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Hey Epic” – not yet available</td>
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<tr>
<td></td>
<td>Epic/Microsoft (LLM)</td>
<td></td>
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<tr>
<td>Autocomposing Patient Messages</td>
<td>Epic/Microsoft (LLM)</td>
<td>Available – no current plan</td>
</tr>
<tr>
<td>Clinical care and efficiency</td>
<td>Radiology</td>
<td>Reviewing Vendors</td>
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<td></td>
<td>Digital Pathology</td>
<td>Piloting</td>
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<tr>
<td>Clinical analysis</td>
<td>Translational efforts from research</td>
<td>Ecosystem required</td>
</tr>
<tr>
<td>Administrative</td>
<td>Revenue cycle optimization / coding</td>
<td>Nym, Codametrix</td>
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<tr>
<td></td>
<td>optimization (LLM)</td>
<td></td>
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<tr>
<td>Education</td>
<td>Literature synthesis</td>
<td>?</td>
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<td></td>
<td>Report summarization</td>
<td>?</td>
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<tr>
<td></td>
<td>Essay generation</td>
<td>NOT ALLOWED</td>
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<tr>
<td>Research efficiency</td>
<td>StarCoder (LLM)</td>
<td>?</td>
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<td></td>
<td>Trial recruitment matching</td>
<td>Evaluating</td>
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A harried, frustrated physician looking at a computer screen.

Generative AI use cases – Ambient AI Scribes

68 yo female with mild hypercalcemia and moderate hypoalbuminemia. Her past medical history includes hypertension, insomnia, chronic venous insufficiency, osteoarthritis, cholecystectomy, dyslipidemia, and rosacea.

1. Primary hyperparathyroidism: This is the most likely cause of mild hypercalcemia in this patient, given her age and gender. Primary hyperparathyroidism is more common in postmenopausal women and can lead to elevated calcium levels due to increased parathyroid hormone (PTH) secretion from one or more parathyroid glands. The PTH acts on bones, kidneys, and intestines to increase serum calcium levels. Additionally, patients with primary hyperparathyroidism may have a history of osteoporosis or kidney stones, which could be related to her osteoarthritis and hypertension.

2. Malignancy-related hypercalcemia: Although less likely than primary hyperparathyroidism, malignancies such as breast cancer, lung cancer, or multiple myeloma can cause hypercalcemia through various mechanisms like bone metastasis, production of PTH-related protein, or excessive cytokine release. Given the patient's age and gender, it would be important to consider these possibilities and perform appropriate diagnostic tests.

3. Vitamin D intoxication: Excessive vitamin D intake or overproduction of active vitamin D metabolites can lead to hypercalcemia. However, this diagnosis is less likely because it usually presents with severe hypercalcemia rather than mild. It is still worth considering if the patient has been taking high doses of vitamin D supplements or has a history of granulomatous diseases that might increase endogenous vitamin D production.

4. Thiourea diuretic use: Thiourea diuretics are commonly used for treating hypertension and can cause mild hypercalcemia by increasing renal tubular reabsorption of calcium. Since the patient has a history of hypertension, it is possible that she is taking thiourea diuretics, making this a potential cause of her hypercalcemia.

5. Familial hypercalcemic hyperparathyroidism (FHH): FHH is a rare genetic disorder characterized by lifelong mild hypercalcemia, relative hypercalciuria, and normal or mildly elevated PTH levels. Although less likely due to its rarity, it should be considered in the differential diagnosis if other more common causes are ruled out.

Regarding hypoalbuminemia, there could be several contributing factors:
Use Cases for AMCs – Chatbot or MyChart responses

<table>
<thead>
<tr>
<th>Question and Evaluator Scores</th>
<th>Question about risk of going blind following bleach being splashed into an eye, resulting in irritated and dry eye.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• 100% preferred the chatbot&lt;br&gt;• 4.00 mean quality score (chatbot)&lt;br&gt;• 3.33 mean quality score (physician)&lt;br&gt;• 4.67 mean empathy score (chatbot)&lt;br&gt;• 2.33 mean empathy score (physician)</td>
</tr>
<tr>
<td>Physician Response</td>
<td>Sounds like you will be fine. You should flush the eye anytime you get a chemical or foreign body in the eye. You can also contact Poison Control 1-800-222-1222.</td>
</tr>
</tbody>
</table>
| ChatGPT Response             | I’m sorry to hear that you got bleach splashed in your eye. It’s important to rinse the eye as soon as possible after a chemical splash to remove as much of the chemical as possible and prevent further irritation or damage. If you have not already done so, you should rinse your eye with clean water or a saline solution as soon as possible. You can do this by holding your eye open and directing a gentle stream of water over your eye from the inner corner to the outer corner for at least 15 min. If you do not have access to water, you can use a saline solution or artificial tears to rinse the eye.  
If you are experiencing significant pain, redness, or vision changes, or if you are unable to rinse your eye properly, you should seek medical attention immediately. However, if your eye is just feeling irritated and dry, you may be able to treat it at home by using artificial tears or a lubricating eye ointment to keep the eye moist and comfortable.  
It is unlikely that you will go blind from getting bleach splashed in your eye, but it is important to take care of the eye and seek medical attention if necessary to prevent further irritation or damage. |
Use Cases for AMCs – is AI more empathetic than humans?
What is the risk/benefit and value?
How can we safely use this? Study it?
What are the ethical considerations?
What outcomes could it help us achieve?
Concerns and their validity

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10048148/
• 14 cases, each input into ChatGPT4 Plus 3 times (general system; not specifically trained for note generation)

• Assessed accuracy, consistency of results
Automation Bias in Mammography: Impact of AI on Reader Performance

- In a prospective study, 27 radiologists who interpreted 50 mammograms with AI assistance were affected by incorrect suggestions from the system.

- Inexperienced radiologists were more likely to follow the suggestions of the AI system when it incorrectly suggested a higher BI-RADS category compared with more experienced readers (mean bias, 4.0 ± 1.8 vs 1.2 ± 0.8).

Dratsch T and Chen X et al. Published Online: May 2, 2023
https://doi.org/10.1148/radiol.222176
22 significant machine learning models produced by industry in 2022 compared with 3 produced by academia

Need to reframe this to leverage our strengths
- Retraining and fine tuning models on local data
- Focus on application and guidance
- Translational R&D catalyst

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In Education

- Generative AI and multimodal AI models share a probabilistic base
- And are intended to support decision making through inference and tailored communication
- Changing teaching to understand Clinical Decision Support (CDS) and probabilities is crucial:
  - How different inputs affect results
  - How prior probability impacts interpretation, especially in rare cases
  - Bias identification
  - Communicating about the use of AI
- Learning HOW and WHEN to use the tools is important – and when you should NEVER use them

https://jamanetwork.com/journals/jama/fullarticle/2811219
Framework for AI adoption – example 1

• Concept-based (UC), a version of rights based
• Consequentialist
• Deontological
• Care ethics

1. Appropriateness: The potential benefits and risks of AI and the needs and priorities of those affected should be carefully evaluated to determine whether AI should be applied or prohibited.

2. Transparency: Individuals should be informed when AI-enabled tools are being used. The methods should be explainable, to the extent possible, and individuals should be able to understand AI-based outcomes, ways to challenge them, and meaningful remedies to address any harms caused.

3. Accuracy, Reliability, and Safety: AI-enabled tools should be effective, accurate, and reliable for the intended use and verifiably safe and secure throughout their lifetime.

4. Fairness and Non-Discrimination: AI-enabled tools should be assessed for bias and discrimination. Procedures should be put in place to proactively identify, mitigate, and remedy these harms.

5. Privacy and Security: AI-enabled tools should be designed in ways that maximize privacy and security of persons and personal data.

6. Human Values: AI-enabled tools should be developed and used in ways that support the ideals of human values, such as human agency and dignity, and respect for civil and human rights. Adherence to civil rights laws and human rights principles must be examined in consideration of AI-adoptions where rights could be violated.

7. Shared Benefit and Prosperity: AI-enabled tools should be inclusive and promote equitable benefits (e.g., social, economic, environmental) for all.

8. Accountability: The University of California should be held accountable for its development and use of AI systems in service provision in line with the above principles.
Framework – example 2

Coalition for Health AI

- USEFUL
  - Beneficial and needed

- Valid and Reliable
  - Implies reproducible, requires monitoring

- Testable (Verifiable)

- Usable

- Safe

- Accountable and Transparent

- Explainable and Interpretable

- Fair (managing bias)

- Secure and resilient

- Privacy addressed

https://www.coalitionforhealthai.org/papers/blueprint-for-trustworthy-ai_V1.0.pdf
Engagement in the AI conversation nationally

OHSU faculty involved in several efforts:
- National Academy of Medicine Code of Conduct
- Bridge2AI ethical AI generation

We are now in an exceptional time: algorithms driven by artificial intelligence (AI) and related approaches are seemingly ubiquitous, are heavily promoted, and hold great potential, but early implementations have demonstrated the potential for harm, failure to perform, and furtherance of inequity. The promise of AI is clear: algorithms can provide new insights that support better health for individuals and populations and improve systems, including
What might a Code of Conduct entail for health care professionals? What should you expect of us?

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<tr>
<th>Sustainable AI</th>
<th>Responsible local leadership</th>
<th>Social sustainability</th>
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<tr>
<td></td>
<td>AI Audit and Assessment*</td>
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<tr>
<td>Human-centric AI</td>
<td>Embedding humanness in AI agents to meet ethics of care requirements</td>
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<td></td>
<td>The role of health professionals in maintaining public trust</td>
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<tr>
<td></td>
<td>Developing appropriate AI technology through interdisciplinary collaboration^</td>
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<tr>
<td>Inclusive AI</td>
<td>Inclusive communication and involvement in AI governance^</td>
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<tr>
<td>Fair AI</td>
<td>Alleviating algorithmic and data bias</td>
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<td></td>
<td>Data representation and equality</td>
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<td></td>
<td>AI related health disparity in low resource settings^</td>
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<tr>
<th>Transparent AI</th>
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<tbody>
<tr>
<td>Safeguarding personal privacy</td>
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<tr>
<td>Explainability of AI-driven models and decisions</td>
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<tr>
<td>Addressing the loss of confidence on AI by policy, legislation and regulation</td>
</tr>
<tr>
<td>User empowerment^</td>
</tr>
<tr>
<td>Informed consent for data use</td>
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<thead>
<tr>
<th>Policy Considerations for the AI Accountability Ecosystem</th>
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<tbody>
<tr>
<td>Trade-offs among trustworthy AI goals*</td>
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<tr>
<td>Barriers to implementing accountability mechanisms*</td>
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<tr>
<td>Complex AI lifecycle and value chains*</td>
</tr>
<tr>
<td>Difficulties with standardization and measurement*</td>
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**OHSU Adoption of AI**

**Intake questions for AI (from Statement on AI)**

1. Is it NEEDED?
2. Is it USEFUL and SAFE?
3. Compliance with or evidence of exemption from all relevant regulatory bodies. FDA (most), CLIA (sometimes), ONC

4. A clear and evidence-based risk-benefit calculation with consideration for value.
6. Local validation and evaluation.
7. A feasible and sustainable implementation plan that includes monitoring for harms as well as benefit over time, which includes resources for ongoing algorithm vigilance.
8. A training and support plan to help all persons at OHSU, including patients, learners, and researchers, understand and use the tools effectively and safely.
9. What conflict of interests exist? – These need to be documented
Initial OHSU AI Governance Committee Stakeholders

- Research and Innovation
- Health Care
- Academics
- Health Equity
- IT including Privacy and Security, Business Intelligence and Advanced Analytics
- Enterprise Revenue
- Clinical Departments
- AI Researchers