

Notes and Takeaways from WMA Webinar: CURRENT AND FUTURE APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN MEDICINE

Overview

This webinar explored the current and emerging applications of Artificial Intelligence (AI) in medicine, including diagnostics, decision support, patient engagement, drug development, and data governance. The conversation also addressed regulatory and ethical considerations surrounding AI adoption in healthcare.

The session provided both a technical and strategic look at how AI is transforming clinical workflows, supporting physicians, and potentially redefining care delivery through automation, personalization, and augmentation of medical decision-making.

Current Medical Applications

1. Diagnostic Support and Accuracy

- AI systems can now emulate expert reasoning, such as that of a seasoned radiologist.
- FDA-approved AI tools are widely available to assist physicians in radiology, dermatology, and pathology, with proven gains in diagnostic accuracy when combined with human oversight.
- Example: In rheumatology, AI classified capillary images with performance nearly equal to expert rheumatologists.

2. Predictive Analytics and Clinical Decision Support

- AI models developed in Zurich predict clinical outcomes such as ICU delirium, lung function decline, and the need for medication adjustments in chronic conditions.
- LLMs (Large Language Models) like ChatGPT have demonstrated >90% accuracy on US medical licensing exam questions, surpassing average student performance.

3. Conversational Agents in Clinical Workflows

- AI-powered assistants can support physicians in creating radiology reports, translating text, and navigating imaging data, increasing efficiency and reducing screen time.
- Example: A radiologist assistant prototype allows interactive queries such as "show me pathology" or "write a report."

4. Operational and Logistical Applications

- AI tools help optimize workforce allocation (e.g., predicting nursing demand) and reduce no-show rates (e.g., MRI appointments), although human behavior remains a limiting factor.

5. Education and Support Tools for Physicians

- AI is being integrated into medical education curricula to support clinical reasoning, though only after traditional learning to ensure foundational knowledge is established.

Future Applications & Trends

1. Personalized and Precision Medicine

- AI enables personalized care by identifying patient cohorts with similar genetic or clinical profiles.
- Example: In oncology, AI helps match patients beyond standard treatment guidelines using data-driven similarity searches.

2. Drug Development and Discovery

- Tools like AlphaFold are revolutionizing protein structure prediction, expediting target identification in drug development.
- AI also assists in designing CRISPR-based gene editors tailored to individual mutations.

3. Closed-loop Systems and Medication Delivery

- AI-controlled drug delivery systems (e.g., for anesthesia or hypertension) have potential, though regulatory and trust barriers remain high.
Voice-based diagnostics (e.g., for schizophrenia) and wearable-guided medication

management are emerging.

4. Patient Engagement and Remote Monitoring

- AI-powered virtual assistants and chatbots offer triage, education, and behavioral nudges, though long-term engagement remains challenging.
- Embedded passive sensors may offer a solution for compliance without active user interaction.

5. Digital Twins and Future Care Models

- While digital twins are conceptually valuable, they are currently limited by data availability and system integration challenges.
- The future may include AI-guided care for low-risk pathways, with human oversight reserved for complex cases.

Key Quotes or Insights

- "We're trying to emulate expert thinking and put that into computers."
- "AI and physicians both make mistakes. Together, they can reduce them."
- "We expect AI to be unbiased, but we forget that humans are biased too."
- "AI will support, not replace physicians—especially by taking over simpler, repetitive tasks."
- "Patients are gaining access to expert-level knowledge through AI—this changes everything."
- "Trust and transparency are critical. Physicians must know when AI is being used and why."

Summary of Takeaways

- **AI Augments, Not Replaces:** AI excels at supporting physicians in diagnostics, documentation, and decision-making but does not eliminate the need for human judgment.
- **LLMs Show Promise:** Tools like ChatGPT achieve high accuracy on medical exams and can support clinical reasoning if properly validated.
- **Workload Relief:** Automation of repetitive tasks improves efficiency and may help address workforce shortages and burnout.
- **Precision Medicine at Scale:** AI facilitates personalized treatment by analyzing large patient datasets and predicting outcomes.
- **Operational Value:** AI improves hospital efficiency through tools for staffing, scheduling, and predictive logistics.
- **Behavioral Engagement Remains a Challenge:** AI tools are less effective for long-term behavior change and must be designed for seamless integration into daily life.
- **Digital Ethics and Trust:** Transparency, bias mitigation, and human oversight are key to ethical AI deployment.
- **Cybersecurity and Data Privacy:** Strong safeguards, anonymization, and secure platforms are essential, especially when using external cloud services.
- **Digital Twins and Closed-loop Systems:** These are on the horizon but require significant advances in data quality and regulatory clarity.
- **AI in Education:** Integrating AI into curricula must be balanced to preserve critical thinking skills and clinical reasoning.

Q&A from the Webinar:

Question:

Do LLMs have the capacity of quantifying the degree of certainty in the answers they give?

Answer:

Yes, certain methods and semantic-embedding techniques enable LLMs to estimate confidence scores by analyzing response variation or semantic coherence, helping identify unreliable answers. These techniques are being refined to improve trust and interpretability in medical contexts.

Question:

Will AlphaFold and new models help find cures for genetic diseases like Alpha-1 antitrypsin deficiency?

Answer:

Yes, models like AlphaFold and AlphaMissense are advancing the identification of pathogenic mutations, while CRISPR-based methods have shown potential in correcting DNA mutations in alpha-1 antitrypsin deficiency, accelerating the development of curative therapies.

Question:

Could future models trained on AI notes instead of physician notes eliminate bias?

Answer:

Unclear based on available sources. While AI-generated notes might reduce individual human biases, they risk reproducing and amplifying systemic biases unless rigorously audited and corrected during training.

Question:

Will understanding AI's "black box" improve diagnostic learning?

Answer:

Yes, interpretable AI approaches like semantic uncertainty quantification can provide insights into reasoning patterns, potentially enhancing clinician learning and diagnostic decision-making frameworks.

Question:

How can AI integration address LMIC-specific medical challenges?

Answer:

AI in LMICs must be adapted for limited resources, using low-compute models, mobile-first tools, and localized datasets to improve diagnostics and access. Shared benefits include better triaging and telemedicine support, but infrastructure gaps remain a key barrier.

Question:

What hidden biases affect AI fairness in medicine?

Answer:

Biases can stem from non-representative training data, clinician labeling errors, and failure to

include social determinants of health. WMA can help by promoting global standards for AI fairness, transparent auditing, and equity-centered model development.

Question:

Do health insurers use AI to override physicians and deny coverage?

Answer:

Yes, AI tools are increasingly used by insurers for prior authorization, with reports indicating denial rates significantly higher than manual reviews and lawsuits alleging AI-led systematic coverage denials.