AI & Gen AI – Improving Healthcare Workflows

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References

Chen, R.J., Wang, J.J., Williamson, D.F.K., Chen, T.Y., Lipkova, J., Lu, M.Y., Sahai, S., Mahmood, F., 2023. Algorithmic fairness in artificial intelligence for medicine and healthcare. Nat Biomed Eng 7, 719–742. https://doi.org/10.1038/s41551-023-01056-8

Dhar, S., Shamir, L., 2021. Evaluation of the benchmark datasets for testing the efficacy of deep convolutional neural networks. Visual Informatics 5, 92–101. https://doi.org/10.1016/j.visinf.2021.10.001

Donzé, J., John, G., Genné, D., Mancinetti, M., Gouveia, A., Méan, M., Bütikofer, L., Aujesky, D., Schnipper, J., 2023. Effects of a Multimodal Transitional Care Intervention in Patients at High Risk of Readmission: The TARGET-READ Randomized Clinical Trial. JAMA Intern Med 183, 658–668. https://doi.org/10.1001/jamainternmed.2023.0791

Dorr, D.A., Adams, L., Embí, P., 2023. Harnessing the Promise of Artificial Intelligence Responsibly. JAMA 329, 1347–1348. https://doi.org/10.1001/jama.2023.2771

Embi, P.J., 2021. Algorithmovigilance-Advancing Methods to Analyze and Monitor Artificial Intelligence-Driven Health Care for Effectiveness and Equity. JAMA Netw Open 4, e214622. https://doi.org/10.1001/jamanetworkopen.2021.4622

Finlayson, S.G., Subbaswamy, A., Singh, K., Bowers, J., Kupke, A., Zittrain, J., Kohane, I.S., Saria, S., 2021. The Clinician and Dataset Shift in Artificial Intelligence. N Engl J Med 385, 283–286. https://doi.org/10.1056/NEJMc2104626

Han, R., Acosta, J.N., Shakeri, Z., Ioannidis, J., Topol, E., Rajpurkar, P., 2023. Randomized Controlled Trials Evaluating AI in Clinical Practice: A Scoping Evaluation. https://doi.org/10.1101/2023.09.12.23295381

Hassan, C., Spadaccini, M., Mori, Y., Foroutan, F., Facciorusso, A., Gkolfakis, P., Tziatzios, G., Triantafyllou, K., Antonelli, G., Khalaf, K., Rizkala, T., Vandvik, P.O., Fugazza, A., Rondonotti, E., Glissen-Brown, J.R., Kamba, S., Maida, M., Correale, L., Bhandari, P., Jover, R., Sharma, P., Rex, D.K., Repici, A., 2023. Real-Time Computer-Aided Detection of Colorectal Neoplasia During Colonoscopy : A Systematic Review and Meta-analysis. Ann Intern Med. https://doi.org/10.7326/M22-3678

Hersh, W., 2023. Physician and Medical Student Competence in AI Must Include Broader Competence in Clinical Informatics. Informatics Professor. URL

https://informaticsprofessor.blogspot.com/2023/09/physician-and-medical-student.html (accessed 9.15.23).

Liu, X., Rivera, S.C., Moher, D., Calvert, M.J., Denniston, A.K., SPIRIT-AI and CONSORT-AI Working Group, 2020. Reporting guidelines for clinical trial reports for interventions involving artificial intelligence: the CONSORT-AI Extension. BMJ 370, m3164. https://doi.org/10.1136/bmj.m3164

Mangas-Sanjuan, C., de-Castro, L., Cubiella, J., Díez-Redondo, P., Suárez, A., Pellisé, M., Fernández, N., Zarraquiños, S., Núñez-Rodríguez, H., Álvarez-García, V., Ortiz, O., Sala-Miquel, N., Zapater, P., Jover, R., CADILLAC study investigators*, 2023. Role of Artificial Intelligence in Colonoscopy Detection of Advanced Neoplasias : A Randomized Trial. Ann Intern Med. https://doi.org/10.7326/M22-2619

Obermeyer, Z., Nissan, R., Stern, M., Eaneff, S., Bembeneck, E.J., Mullainathan, S., 2021. Algorithmic Bias Playbook [WWW Document]. The University of Chicago Booth School of Business. URL https://www.chicagobooth.edu/research/center-for-applied-artificial-intelligence/research/algorithmic-bias/playbook (accessed 11.3.21).

Plana, D., Shung, D.L., Grimshaw, A.A., Saraf, A., Sung, J.J.Y., Kann, B.H., 2022. Randomized Clinical Trials of Machine Learning Interventions in Health Care: A Systematic Review. JAMA Netw Open 5, e2233946. https://doi.org/10.1001/jamanetworkopen.2022.33946

Vaid, A., Sawant, A., Suarez-Farinas, M., Lee, J., Kaul, S., Kovatch, P., Freeman, R., Jiang, J., Jayaraman, P., Fayad, Z., Argulian, E., Lerakis, S., Charney, A.W., Wang, F., Levin, M., Glicksberg, B., Narula, J., Hofer, I., Singh, K., Nadkarni, G.N., 2023. Implications of the Use of Artificial Intelligence Predictive Models in Health Care Settings : A Simulation Study. Ann Intern Med. https://doi.org/10.7326/M23-0949

Youssef, A., Pencina, M., Thakur, A., Zhu, T., Clifton, D., Shah, N.H., 2023. External validation of AI models in health should be replaced with recurring local validation. Nat Med. https://doi.org/10.1038/s41591-023-02540-z

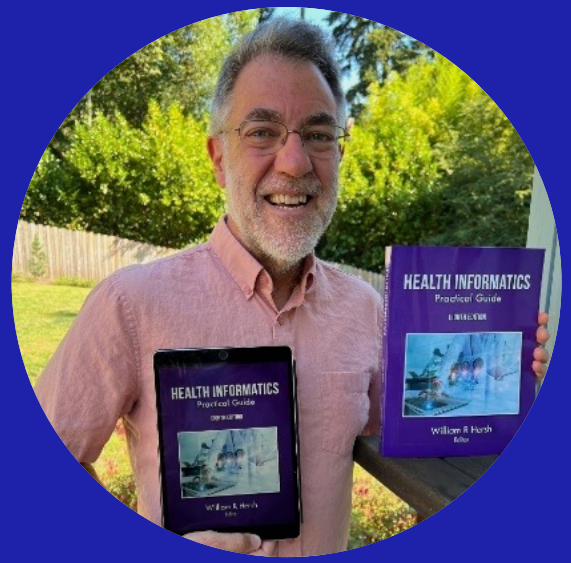
Zhou, Q., Chen, Z.-H., Cao, Y.-H., Peng, S., 2021. Clinical impact and quality of randomized controlled trials involving interventions evaluating artificial intelligence prediction tools: a systematic review. NPJ Digit Med 4, 154. https://doi.org/10.1038/s41746-021-00524-2

Impacts of New Technology in Healthcare

Presented by:

- HIMSS Oregon
- AWS
- Deloitte

AI & GenAI:
Improving Healthcare Workflows



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Translational AI

Overheard in a workshop on AI for innovative medical educators, circa 2022

“I hope that AI won’t be as awful as the EHR”

(Proceeded to lament about workflow and other challenges with the EHR)

What do we need for AI to not be as awful as the EHR and its workflow issues?

- **Translational AI**
  - Show us the evidence
  - Real-world implementation
- **Clinicians don't dislike technology, but they don't like technology that doesn't work or is too difficult to use efficiently**

How do we “show the evidence?”

- **Best evidence for any clinical intervention is through randomized controlled trials (RCTs) or systematic reviews of RCTs**
- **Although not as easy to carry out as RCTs of drugs or devices (and placebos), we must demonstrate benefit for patient outcomes and/or healthcare delivery improvement**
  - Additional issues for RCTs of AI (Liu, 2020)
- **As with drugs and devices, we need to move from ”basic science” to “clinical science” and “postmarket surveillance”**
  - Need “algorithmovigilance” (Embi, 2021)

What is the evidence so far?

- **Many, many papers published about models and simulated use (basic science)**
- **Very few RCTs demonstrating value from real-world use (clinical science)**
  - Search of PubMed reveals thousands of papers about models and simulated uses
  - Systematic reviews of RCTs show (Zhou, 2021; Plana, 2022; Han, 2023)
    - Much smaller numbers of RCTs – about 100, depending on how we count
    - 65-82% of RCT showed positive outcomes
    - Many RCTs showed aspects of "risk of bias"
- **Concerns about generalization beyond initial clinical settings**
  - Biased data and algorithms (Obermeyer, 2021: Dhar, 2021; Chen, 2023)
  - Data and algorithm drift (Finlayson, 2021; Vaid, 2023)

Learning from some specific examples

- **Computer-aided detection (CADe) of polyps in colonoscopy**
  - One of earliest and widest applications of AI
  - Systematic reviews show polyps missed by colonoscopists are discovered, but mostly small and clinically inconsequential (Hassan, 2023)
  - RCT of CADe found no increased detection of advanced neoplasias (Mangas-Sanjuan, 2023)
- **30-day hospital readmissions**
  - After implementation of CMS penalty, proliferation of highly accurate predictive models published
  - Recent RCT showed use of high-quality model and implementation of program around it did not reduce readmissions (Donzé, 2023)

What do we mean by “translational AI?”

- **Translational research historically concerned about “bench to bedside”**
- **But there are additional aspects to translational research**
  - T1 – from lab to clinical use
  - T2 – from clinical use in controlled settings to larger community
  - T3 – assessment of use in real world
- **How do we get there?**
  - From development to deployment and from models to data (Zhang, 2022)
  - Models validated locally and recurrently, as open as possible (Youssef, 2023)
  - Clinician competence and education (Hersh, 2023)
  - Responsible use of AI (Dorr, 2023)
  - Coalition for Health AI, including evaluation – https://www.coalitionforhealthai.org/