Written Testimony
Of
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Good morning, and thank you Chairs McMorris Rogers and Guthrie, Ranking Members Pallone and Eshoo, and members of the subcommittee for the opportunity to speak with you today about our experience at UC San Diego Health using machine learning and artificial intelligence (AI) models to improve healthcare delivery. I am a practicing physician, board certified in pediatrics and clinical informatics, and have the privilege of serving as the Chief Medical Officer, Chief Digital Officer, and Associate Dean at UC San Diego Health. At our institution, we have been carefully evaluating and implementing machine learning and AI models to enhance quality and patient safety for over 5 years, and believe our experience can be helpful as the committee considers the implications of AI on healthcare.

As a leader at the intersection of care delivery and technology, it has been disappointing to see so little progress in patient safety over the last two decades, with a recent study demonstrating that one in four patients admitted to the hospital continue to experience an adverse event, many of which are preventable.[1] Healthcare delivery organizations are complex sociotechnical systems, and these new AI tools may be key to finally bending the patient safety curve in a better direction.[2]

One instructive example of our use of this technology at UC San Diego Health arose early in the pandemic. Because Marine Corps Air Station Miramar served as one of the two sites for evacuation of

[1] Bates DW, Levine DM, Salmasian H, et al. The Safety of Inpatient Health Care. *N Engl J Med*. 2023;388(2):142-153. https://www.nejm.org/doi/full/10.1056/NEJMsa2206117

[2] Classen DC, Longhurst C, Thomas EJ. Bending the patient safety curve: how much can AI help?. *NPJ Digit Med*. 2023;6(1):2. Published 2023 Jan 4. https://www.nature.com/articles/s41746-022-00731-5

ex-patriates from Wuhan, we hospitalized some of the first COVID patients in the country in February 2020.[3] This early experience led us to broadly deploy an imaging AI tool to help identify COVID pneumonia on chest x-rays months before widespread testing became available.[4] We published the results of our outcomes evaluation which showed this tool impacted clinical decision making for 1 in 5 of our emergency department patients over the course of the summer of 2020.[5] However, after processing over 60,000 chest x-rays, we turned the AI tool off at the end of 2020 because it was no longer useful to our clinicians when testing became ubiquitous, demonstrating the importance of ongoing monitoring to ensure that AI tools continue to be both safe and effective. This study was recently cited in a review of all research studies about AI and COVID, which found our study was 1 of just 4 out of over 9000 which actually studied clinical outcomes.[6] This demonstrates another key point which is the huge gap between creation of algorithms and actual implementation and measurement to benefit patients.

A second instructive example comes from our use of AI to support earlier identification and treatment of a blood infection called sepsis. In 2021, a Michigan study received widespread attention for demonstrating poor predictive ability of a proprietary model developed by an electronic health record (EHR) vendor.[7] Instead of using a vendor model, UCSD chose to develop a bespoke tool with our local data that was trained to tell users "I don't know" when predictive confidence is low, and was

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[3] Segar S, Bouland D, Torriani F, et al. Flight of the COVID-19 patient: experience with a Wuhan evacuee: a case report. *J Med Case Rep*. 2020;14(1):66. Published 2020 Jun 11. https://pubmed.ncbi.nlm.nih.gov/32527327/

[4] Artificial Intelligence Enables Rapid COVID-19 Lung Imaging Analysis at UC San Diego Health, April 7, 2020. https://health.ucsd.edu/news/press-releases/2020-04-07-artificial-intelligence-enables-rapid-covid-19-lung-imaging-analysis/

[5] Carlile M, Hurt B, Hsiao A, Hogarth M, Longhurst CA, Dameff C. Deployment of artificial intelligence for radiographic diagnosis of COVID-19 pneumonia in the emergency department. *J Am Coll Emerg Physicians Open*. 2020;1(6):1459-1464. Published 2020 Nov 5. https://onlinelibrary.wiley.com/doi/full/10.1002/emp2.12297

[6] Ahmadi Marzaleh M, Peyravi M, Mousavi S, Sarpourian F, Seyedi M, Shalyari N. Artificial Intelligence Functionalities During the COVID-19 Pandemic. *Disaster Med Public Health Prep*. Published 2023 Feb 27. https://pubmed.ncbi.nlm.nih.gov/36847255/

[7] Wong A, Otles E, Donnelly JP, et al. External Validation of a Widely Implemented Proprietary Sepsis Prediction Model in Hospitalized Patients [published correction appears in JAMA Intern Med. 2021 Aug 1;181(8):1144]. *JAMA Intern Med*. 2021;181(8):1065-1070. https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2781307

implemented with significant redesign of processes and workflows in the clinical setting, such as notifying a central team and not just the treating clinicians.[8] The results have been associated with an increased likelihood of survivorship among patients with sepsis in our emergency department.[9] This case study highlights the importance of not only creating predictive algorithms, but ensuring these algorithms are transparent in their predictions to generate trust, and doing the hard work of integrating these into clinical workflows that impact meaningful outcomes in care quality.

A final example is our recent use of generative AI to help our busy clinicians answer patient messages, which have reached unprecedented levels with the rise in virtual care. UC San Diego authors published a study earlier this year showing that generative AI could draft responses to patient questions that were rated as high quality and sometimes more empathetic than the physician responses.[10] On the tail of these results, UC San Diego became one of the first sites in the nation to implement generative AI to help our clinicians respond to patient messages in our EHR.[11] Importantly, we chose to ensure full transparency with our patients by ensuring that every message has an addendum disclosing "this message was automatically generated and reviewed by your doctor." It is important to note that these messages cannot be sent to patients without a clinician review, and the preliminary results show that this has been well received by both our clinicians and our patients and may save time and cognitive burden. This case study illustrates the importance of both transparency and keeping a human in the loop at all times.

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[8] Shashikumar SP, Wardi G, Malhotra A, Nemati S. Artificial intelligence sepsis prediction algorithm learns to say "I don't know". *NPJ Digit Med*. 2021;4(1):134. Published 2021 Sep 9. https://www.nature.com/articles/s41746-021-00504-6

[9] Boussina A, Shashikumar SP, Malhotra A, et al. Impact of a Deep Learning Sepsis Prediction Model on Quality of Care and Survival. *NPJ Digit Med*. In press.

[10] Ayers JW, Poliak A, Dredze M, et al. Comparing Physician and Artificial Intelligence Chatbot Responses to Patient Questions Posted to a Public Social Media Forum. *JAMA Intern Med*. 2023;183(6):589-596. https://pubmed.ncbi.nlm.nih.gov/37115527

[11] Epic taps Microsoft to integrate generative AI into EHRs with Stanford, UC San Diego as early adopters. April 17, 2023. https://www.fiercehealthcare.com/health-tech/himss23-epic-taps-microsoft-integrate-generative-ai-ehrs-stanford-uc-san-diego-early

To summarize, as a health system engaged in the procurement, development, and use of large-scale machine learning models that can perform a wide variety of tasks, we commit to pursuing these technologies' benefits while mitigating their risks and protecting patient privacy. For almost 5 years, our health AI committee has been evaluating all machine learning models proposed for implementation from an ethical and health equity framework to ensure safety, security, and trust, which is well aligned with the model proposed by the Office of the National Coordinator for Health IT (ONC), to ensure fair, appropriate, valid, effective, and safe (FAVES) use of AI.[12] While some would advocate for a centralized regulatory body, our experience suggests that local audits, such as those performed as part of triennial hospital accreditation, could be more effective in ensuring alignment with these principles, as these models must be evaluated within the context of the care they support.

With the generous support of local philanthropists, our Joan & Irwin Jacobs Center for Health Innovation is in the process of establishing a mission control to manage the emerging AI use cases across our enterprise.[13] We see an opportunity for moving our industry forward, while we engage with Congress and the Administration to work together on responsible AI use. I hope UC San Diego Health's experience with implementing these tools leaves the subcommittee with a sense of the promise that artificial intelligence can bring to healthcare delivery. With thoughtful implementation and careful oversight to ensure equity, transparency and effectiveness, AI can be transformative for healthcare delivery, improving quality and patient safety, and reducing administrative burdens. I look forward to answering any additional questions that you have.

[12] Healthcare AI Principles at UC San Diego Health https://healthinnovation.ucsd.edu/our-principles

[13] A $22 million donation to UC San Diego Health will establish a mission control center to manage emerging AI. https://www.sandiegouniontribune.com/news/health/story/2023-05-05/ucsd-health-plans-home-for-cutting-edge-innovation-at-jacobs-medical-center