AI CDSS: UX design and Implementation

AI-Clinical Decision Support Systems (AI-CDSS) are key to implementing AI into healthcare practice, as they inform key decisions in a clinical care pathway, from admission to discharge, which defines a patient's journey. AI-CDSSs work by running their algorithm's on data recorded into a patient-owned PHR by physicians (e.g. symptoms, signs, medical history, physical examinations, etc) and in combination with other inputs, such as investigations (e.g. imaging, histopathology, mobile health, etc). An AI-CDSS attributed to a physician then accesses the PHR to record its output into the patient's PHR.

However, the key attribute of AI-CDSSs in practice is the potential of their ability to navigate complexity, create shared understanding, and steer an open dialog between physicians and patients. AI-CDSSs must implement the use of eXplainable artificial intelligence (XAI) to enable interpretability and explainability, and to use a human-centered user experience (UX) design to deliver these systems through an interface to be used by physicians in practice [1]. An open-source library of UX designs that complement different XAI techniques for different types of algorithms (e.g. classification, imaging, time series) is required. Additionally, physicians have also shown differences in their preference for UX/XAI designs, and therefore providing a variety of UX designs for various clinical circumstances enables personalization for implementation [1]. XAI/UX designs are considered a public good for AI-CDSS developers, as this enables AI-CDSS developers to focus on developing the AI-CDSS itself. AI-CDSSs can therefore use an open-source UX interface standard that can be based on research and best practice. Additionally, this enables a more seamless transition from development to implementation, as a UX design that provides explainability and interpretability removes much of the necessity for regulation for these AI-CDSS systems to be integrated into clinical workflows [2]. These interfaces inform key decisions in a health care pathway (i.e., triage, diagnosis, treatment, prognosis, etc.) and the development of UX centrerd designs as a public good, allows AI-CDSS developers to train their algorithms and then more seamlessly integrate them into healthcare practice [2].

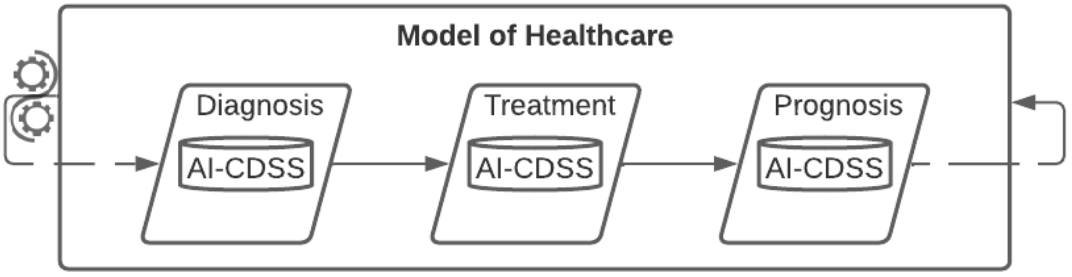

Figure 1. A 'Model of Healthcare' in a Clinical Care Pathway.

Physicians in other studies have also emphasized a need to gain an initial overall impression of an AI system (e.g., its limitations, medical point-of-view, idiosyncrasies, and overall objective) [1]. A *model* of healthcare practice is defined in this paper as the implementation of AI-CDSSs into clinical care pathways (e.g., triage, diagnosis, treatment selection, prognosis). In previous studies, clinicians have emphasized a need to gain an initial overall impression of an AI system (e.g., its limitations, medical point-of-view, idiosyncrasies, and overall objective) [3]. These systems can then be inserted into clinical care pathways by health professionals - as shown in Figure 6 - who can create their own unique models of health care practice. Physicians also consider the legal consequences of errors in decision-making, especially when managing complex clinical decisions, and navigating complexity in the provision of care has the potential to be well supported by such systems [2]. Physician-machine partnerships offer a method to support the complex decision-making found within healthcare (treatment selection, triage, diagnosis, prognosis). AI-Clinical Decision Support Systems (AI-CDSS) are key to implementing AI into healthcare practice, as they inform key decisions in a clinical care pathway, from

admission to discharge, which defines a patient's journey. However, the key attribute of AI-CDSSs in practice is the potential of their ability to navigate complexity, create shared understanding, and steer an open dialog between physicians and patients. AI-CDSSs must implement a human-centered user experience (UX) design to deliver the use of explainable artificial intelligence (XAI) to enable interpretability and explainability if these systems are to be used by physicians in practice [3].

An open-source library of UX designs that complement different XAI techniques for different types of algorithms (e.g. classification, imaging, time series) is required to bring about the use of AI tools by physicians in healthcare practice. Additionally, physicians have also shown differences in their preference for UX/XAI designs, and therefore providing a variety of UX designs for various clinical circumstances enables personalization for implementation [2]. UX designs can be are considered a public good for AI-CDSS developers, as this enables AI-CDSS developers to focus on developing the AI-CDSS itself. AI-CDSSs can therefore use an open-source UX interface standard which can be user-experience research for best practice. Additionally, this enables a more seamless transition from development to implementation, as a UX design that provides explainability and interpretability removes much of the necessity for regulation for these AI-CDSS systems to be integrated into clinical workflows [2]. These interfaces inform key decisions in a health care pathway (i.e., triage, diagnosis, treatment, prognosis, etc.), and the development of UX-centred designs (for example, as a public good), may allow AI-CDSS developers to train their algorithms and then more readily and seamlessly integrate them into healthcare practice [2].

[1] B. J. Evans and F. A. Pasquale, “Product Liability Suits for FDA-Regulated AI/ML Software.” Rochester, NY, Oct. 26, 2020. Accessed: Jun. 27, 2022. [Online]. Available: https://papers.ssrn.com/abstract=3719407

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[3] Beede, E. *et al.* (2020) “A human-centered evaluation of a deep learning system deployed in clinics for the detection of diabetic retinopathy,” *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* [Preprint]. Available at: https://doi.org/10.1145/3313831.3376718.