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Abstract
With increasingly available healthcare data and advances in computational techniques, artificial intelligence (AI) approaches to clinical decision support (CDS) have re-emerged in the field of informatics. The impact of AI on CDS effectiveness is unknown. We systematically reviewed literature to characterize and evaluate the impacts of implemented AI-enabled CDS with respect to clinical outcomes to suggest best practices. AI-enabled CDS has enhanced the ability to assess morbidity, affect health-related quality of life, and prevent adverse events.

Introduction
Clinical Decision Support (CDS) applications vary widely, assisting clinicians with limited binary data from laboratory results and clinical metrics to recommending diagnoses and treatment, avoiding adverse events, and supporting adherence to clinical guidelines. Artificial intelligence (AI) can enhance CDS by identifying novel clinical trends and aggregating data from medical texts, laboratory studies, imaging data, patient portals, and electronic health records (EHRs). However, as types of CDS and applied AI expand, the impact of AI-enabled CDS is unknown. CDS design, partnerships with AI, and means of implementation vary across institutions and practices. Thus, we reviewed the literature to understand the effects of modern CDS with AI with respect to patient outcomes.

Methods
We conducted a systematic review of the literature to aggregate and contextualize the potential effects of AI-enabled CDS on providers and their patients. We searched four databases, PubMed, IEEE, Web of Science, and ACM Digital Library and mined reference lists. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)¹ model for independently screening and excluding studies. We included studies that fully implemented CDS which incorporates any type of AI into a clinical setting and evaluated the impact of these systems on clinical outcomes and the clinical process. We noted facilitators and barriers to effective development and implementation of such systems to guide best practices for reaching patients.

Results
The initial search identified 4456 manuscripts from four databases, where 436 described fully implemented AI-enabled CDS. Preliminary results indicated that an overwhelming number of AI models fail to have a structured, formal evaluation in a clinical environment. Evaluation was often limited by a lack of interoperability with and access to EHRs. Across departments, AI-enabled systems were demonstrably improving imaging interpretations, standardizing and mandating the usage of interoperable ontologies, intelligently managing physician workload, quickly developing more tailored, holistic treatment plans, and assessing adverse events and responses through smart reminder systems. Inefficient or incompatible EHRs, unstandardized evaluation guidelines, and clinician adoption served as barriers for effective use.

Conclusion
Preliminary findings from abstract screening in a systematic review of the implementation of AI-enabled CDS have identified trends in improving patient outcomes in diverse clinical domains. More research is necessary to fully characterize and evaluate the impact of AI-enabled CDS on broader healthcare contexts and clinician decision-making to identify best practices in implementation.

References

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