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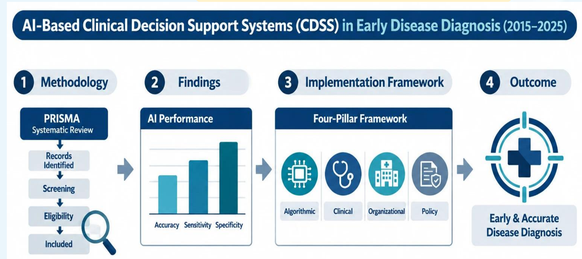


AI-Based Clinical Decision Support Systems (CDSS) in Early Disease Diagnosis: A Systematic Review

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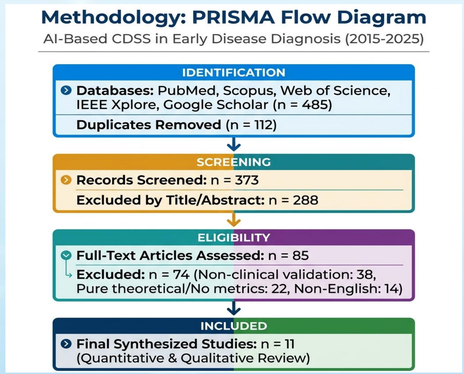
Backgrounds

The Challenge: The global healthcare landscape faces an exponential surge in medical data complexity. Traditional rule-based Clinical Decision Support Systems (CDSS) struggle to process unstructured data, hindering early and accurate diagnosis of chronic and acute diseases.

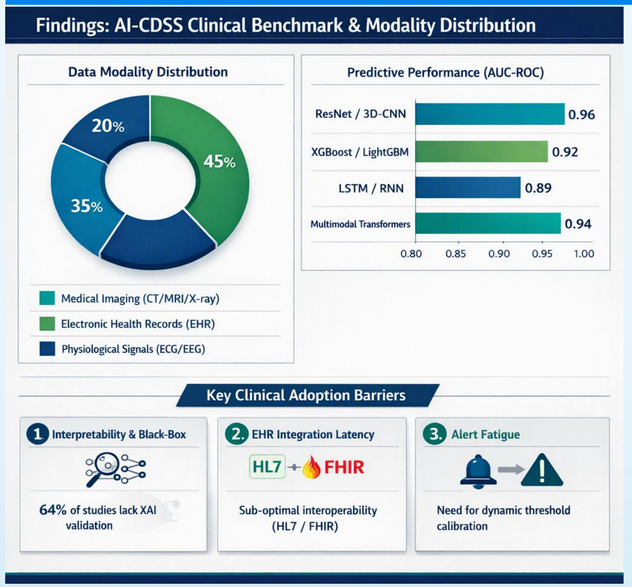
The AI Paradigm Shift: A transformation from reactive, rule-based algorithms to proactive, AI-driven CDSS is underway. Machine Learning (ML) and Deep Learning (DL) architectures (CNNs, RNNs, Transformers) now demonstrate superior capabilities in identifying subclinical biomarkers and predictive insights.

The Theory-Practice Gap: Despite high empirical accuracy in controlled research, significant bottlenecks impede frontline deployment.

Methods

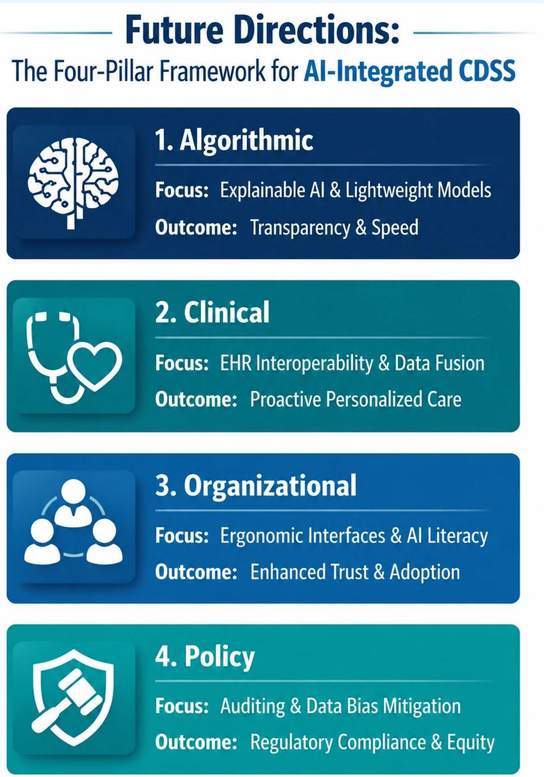


Findings



Primary Barriers to Bedside Translation:

1. **Explainability & Black-Box Nature:** Over **64%** of evaluated AI-CDSS lack rigorous Explainable AI (XAI) validation (e.g., SHAP, Grad-CAM), limiting clinician trust and diagnostic accountability.
2. **Interoperability & Data Silos:** Sub-optimal integration latency with legacy EHR systems through HL7/FHIR protocols impedes real-time point-of-care deployment.
3. **Alert Fatigue & Clinical Workflow:** Frequent false-positive alerts cause cognitive overload, highlighting an urgent need for adaptive risk-stratification thresholds.



Conclusion



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