Supplementary Table 1: Critical Appraisal of Included Studies

Studies were assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools. Mixed-methods studies were assessed by the JBI Qualitative Studies checklist for qualitative components, and the JBI Quasi-Experimental Studies checklist for quantitative components.

Qualitative Checklist

Author (Year)	1	2	3	4	5	6	7	8	9	10
Barda (2020)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Bienefeld (2023)	Y	Y	Y	Y	Y	U	N	Y	Y	Y
Hwang (2022)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Matthiesen (2021)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Sivaraman (2023)	Y	Y	Y	Y	Y	U	Y	Y	Y	Y
Staes (2023)	Y	Y	Y	Y	Y	U	Y	Y	Y	Y
Xie (2020)	Y	Y	Y	U	Y	N	N	Y	Y	U

Quasi-experimental Checklist

Study	1	2	3	4	5	6	7	8	9
Bienefeld (2023)	Y	N	N/A	N	N	Y	Y	Y	Y
Chanda (2024)	Y	N	Y	N	Y	Y	Y	Y	Y
Chanda (2025)	Y	N	Y	N	Y	Y	Y	Y	Y
Famiglini (2024)	Y	Y	Y	Y	U	Y	Y	Y	Y
Hur (2025)	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hwang (2022)	Y	N	Y	Y	Y	Y	Y	U	Y
Jin (2024)	Y	N	Y	N	Y	Y	Y	Y	Y
Matthiesen (2021)	Y	N	Y	N	N	Y	Y	U	Y
Nagendran (2023)	Y	Y	Y	Y	N	Y	Y	Y	Y
Nagendran (2024)	Y	N	Y	Y	Y	Y	Y	U	Y
Nicolson (2025)	Y	N	Y	N	Y	Y	Y	U	Y
Panigutti (2022)	Y	Y	Y	Y	Y	Y	Y	U	Y
Rezaeian (2025)	Y	N	Y	N	Y	Y	Y	U	Y
Sivaraman (2023)	Y	Y	Y	Y	N	Y	Y	U	Y
Zhang (2021)	Y	Y	Y	Y	N	Y	Y	U	Y

RCT Checklist

Study	1	2	3	4	5	6	7	8	9	10	11	12	13
Jabbour (2023)	Y	Y	Y	U	U	Y	Y	Y	Y	Y	U	Y	Y
Jayakumar (2021)	Y	Y	Y	N	N	U	U	Y	Y	Y	Y	Y	Y

Supplementary Table 2: CDS Five Rights Rubric

CDS Five Right	Scope	Full Coverage	Partial Coverage	Minimal Coverage
Right Information	Content and purpose	Explicit evaluation of explanation content as an independent variable, with outcome data. This requires either: (1) Comparison ≥2 explanation types differing in informational content (e.g. technical vs. translated narrative, lower vs. higher-level features, simple vs. enriched uncertainty); or (2) Manipulation of specific informational elements.	Explanation content described in sufficient detail for extraction, but content is not manipulated as an independent variable. Includes comparison of explanation presence vs. absence with content held constant.	Explanation type identified but content, scope, or purpose not evaluated beyond study setup description.
Right Person	Stakeholder alignment and engagement	(1) Pre-specified or primary analysis of how participant characteristics (expertise, AI familiarity, role) moderate explanation effects; or (2) End-user involvement in co-design or structured feedback that changed explanation content, format, or the system evaluated.	Participant characteristics reported and user perceptions collected, but no formal moderation testing. Includes post-hoc subgroup analyses not pre-specified as study aims.	Stakeholder type identified only; no relevant user characteristics reported and no investigation of user-level variation in response to explanations.
Right Format	Type and presentation	(1) ≥2 formats compared with ≥1 objective and ≥1 subjective outcome; (2) single format vs. no-explanation control with ≥1 objective outcome + cognitive/utility data; (3) iterative co-design with multi-round evaluation and usability data	Specific format used with user perception outcomes reported, but no format comparison or link to objective decision-making outcomes. Includes presence vs. absence comparisons using subjective outcomes only.	Format described but not evaluated beyond study setup description.
Right Channel	Integration into existing systems	(1) Explanation evaluated within a real clinical system or realistic interface (e.g. embedded in EHR, deployed in live workflow, or delivered through a system used in routine care); or (2) Explicit experimental comparison of delivery channels (e.g. integrated vs. standalone, digital vs. paper) with outcome data.	Purpose-built interface simulating a clinical tool with domain-specific fidelity (e.g. interactive prototype with realistic clinical elements), reporting integration-level outcomes (usability in context, workflow compatibility, deployment feasibility, or integration preferences).	Explanations delivered via a generic or non-clinical platform (e.g. online survey, static images) with no assessment of clinical integration.
Right Point in Workflow	Timing and fit of explanation delivery	(1) Timing or sequence of explanation delivery manipulated as independent variable with outcome data; (2) evaluation in a real/near-real clinical pathway with workflow fit as a stated objective and ≥1 workflow outcome (time cost, task delegation, disruption, or consultation fit); (3) clinician-controlled explanation access where timing/initiation is a design variable.	Objective or subjective decision outcomes reported in the presence of fixed, researcher-controlled explanation delivery; no workflow-specific consequences measured.	Timing of explanation delivery described but no timing effects evaluated, no workflow consequences measured, and no actionability data beyond study setup.

Supplementary Table 3: Inclusion and exclusion criteria

Theme	Inclusion Criteria	Exclusion Criteria
Publication type	• Peer-reviewed or conference-accepted full text • Pre-prints	• Reviews, meta-analyses, editorials, opinions, theses, commentaries • Conference abstracts without full text
Domain & Setting	• Clinical environments or realistic simulations • Applications in diagnosis, prognosis, treatment recommendation, or risk prediction	• Non-healthcare domains • Veterinary or non-human medical contexts • Laboratory-only experiments without clinical relevance
AI / XAI focus	• Explicit or implicit focus on XAI techniques, regardless of whether the term "XAI" is explicitly used • Evaluation of interpretability, trust, usability, and fairness • Comparison of multiple XAI in clinical decision-making • Description of XAI in a specific clinical decision or task	• No XAI implementation or evaluation, including studies in which AI predictions and explanations were manually authored by researchers to simulate AI system outputs* • AI for administrative tasks only • Purely theoretical or performance-focused
Stakeholder involvement	• Clinician and/or patient involvement in design or evaluation • Patient-facing explanations or shared decision-making contexts • Diverse healthcare professionals (doctors, nurses, radiologists, etc.)	• No end-user involvement • XAI tools without feedback or interaction • Developer or regulator-only perspectives • Studies in which end-user involvement was limited to post-hoc output rating or isolated perceptual measures, without linkage to specific explanation features or decision-making contexts. **
Data & Methodology	• Qualitative or quantitative data on clinician and/or patient perceptions of XAI metrics • Impact of XAI on decision-making accuracy or clinical workflow	• No empirical data on explainability • No outcome or impact assessment • Frameworks for XAI evaluation lacking empirical evidence

* Revised from protocol: criterion added to clarify fidelity of XAI and differentiate between explanations generated by an AI model versus a human researcher. [Date of revision: March 18, 2026]

** Revised from protocol: criterion added to clarify the minimum threshold for end-user engagement required for extraction within the Five Rights framework. [Date of revision: February 27, 2026]

Supplementary Note 1: database searches

PubMed search strategy

((("Artificial Intelligence"[Mesh] OR "Machine Learning"[Mesh] OR "Deep Learning"[Mesh] OR "Neural Networks, Computer"[Mesh] OR "Algorithms"[Mesh]) OR (AI[tiab] OR "Artificial intelligence"[tiab] OR "Machine learning"[tiab] OR "Deep learning"[tiab] OR "Neural network*"[tiab] OR "Large language model*"[tiab])) AND (("Explainable AI"[tiab] OR "XAI"[tiab] OR "Model Interpretability"[tiab] OR "Transparency"[tiab] OR "Black box"[tiab] OR "White box"[tiab] OR "Feature attribution"[tiab] OR "Saliency map*"[tiab] OR "SHAP"[tiab] OR "LIME"[tiab] OR counterfactual*[tiab] OR explainab*[tiab] OR interpretab*[tiab])) AND (("Decision Support Systems, Clinical"[Mesh] OR "Decision Making, Computer-Assisted"[Mesh]) OR ("Clinical decision support"[tiab] OR "CDS"[tiab] OR "CDSS"[tiab] OR "Clinical decision making"[tiab])) AND (("User-Centered Design"[Mesh] OR "User-Computer Interface"[Mesh] OR "Health Plan Implementation"[Mesh] OR "Attitude to Computers"[Mesh]) OR (Usability[tiab] OR "User study"[tiab] OR "Human factors"[tiab] OR "Workflow"[tiab] OR "Implementation"[tiab] OR "Trust"[tiab] OR "Cognitive load"[tiab] OR "Shared decision-making"[tiab] OR "Clinician*"[tiab]))) AND Humans[Mesh]

IEEE Xplore search strategy

(("Document Title":XAI OR "Document Title":Explainab* OR "Abstract":XAI OR "Abstract":Explainab*) AND ("Abstract":"machine learning" OR "Abstract":AI) AND ("All Metadata":"clinical decision support" OR "All Metadata":"decision support system") AND ("All Metadata":medical OR "All Metadata":clinical))

Embase search strategy

('artificial intelligence'/exp OR 'machine learning'/exp OR 'deep learning'/exp OR 'neural network'/exp OR 'artificial intelligence':ti,ab OR 'machine learning':ti,ab OR 'deep learning':ti,ab OR 'neural network*':ti,ab) AND ('explainable artificial intelligence'/exp OR 'explainable ai':ti,ab OR 'xai':ti,ab OR 'model interpretability':ti,ab OR 'feature attribution':ti,ab OR 'saliency map*':ti,ab OR 'shap':ti,ab OR 'lime':ti,ab OR 'counterfactual explanation*':ti,ab OR explainab*:ti,ab OR interpretab*:ti,ab) AND ('clinical decision support system'/exp OR 'medical decision making'/exp OR 'clinical decision support':ti,ab OR 'cds':ti,ab OR 'cdss':ti,ab OR 'clinical decision making':ti,ab) AND ('user centered design'/exp OR 'human computer interaction'/exp OR 'implementation science'/exp OR 'usability':ti,ab OR 'user study':ti,ab OR 'human factors':ti,ab OR 'workflow':ti,ab OR 'trust':ti,ab OR 'clinician*':ti,ab OR 'physician*':ti,ab) AND 'human'/de

ACM Digital Library search strategy

(Title:("explainable AI" OR XAI OR explainab* OR interpretab* OR "model interpretability") OR Abstract:("explainable AI" OR XAI OR explainab* OR interpretab* OR "model interpretability")) AND (Title:("decision support" OR "clinical decision support" OR CDSS OR CDS) OR Abstract:("decision support" OR "clinical decision support" OR CDSS OR CDS)) AND (AI OR "artificial intelligence" OR "machine learning" OR "deep learning") AND (clinical OR medical OR healthcare OR patient OR clinician OR physician)

Scopus search strategy

TITLE-ABS-KEY (("artificial intelligence" OR "machine learning" OR "deep learning" OR "neural network*" OR "AI" OR "ML") AND ("explainable AI" OR "XAI" OR "model interpretability" OR "feature attribution" OR "saliency map*" OR "SHAP" OR "LIME" OR "counterfactual explanation*" OR explainab* OR interpretab*) AND ("clinical decision support" OR "CDS" OR "CDSS" OR "clinical decision making") AND ("usability" OR "user study" OR "human factors" OR "workflow" OR "implementation" OR "trust" OR "clinician*" OR "physician*" OR "user-centered design"))

ArXiv search strategy

arXiv advanced search (https://arxiv.org/search/advanced): abstract field only, no category or date filter applied. "AI" AND "decision" AND "explain" AND "clinical"

Supplementary Table 4: PRISMA Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Background Par. 1-6
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Background Par. 6
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Methods: eligibility criteria
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Methods: Information sources and search strategy
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary Note 1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Methods: Study selection
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Methods: Data extraction and analysis
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Methods: Data extraction and analysis
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Methods: Data extraction and analysis; Table 1
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methods: Quality appraisal; Supplementary Table 1
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Methods: Synthesis
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Methods: Synthesis
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	N/A – no missing summary statistics or data conversions required
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Methods: Synthesis
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Methods: Synthesis
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Methods: Synthesis
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Methods: Synthesis
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Methods: Quality appraisal
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Methods: Quality appraisal
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Results: Study selection and characteristics; Figure 6
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Figure 6: PRISMA flow diagram;

Supplementary Table 4: PRISMA Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
			Discussion: Par. 8
Study characteristics	17	Cite each included study and present its characteristics.	Results: Study selection and characteristics; Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Results: Study selection and characteristics; Discussion: Par. 8; Supplementary Table 1
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Results: Themes 1-3; Table 1; Figures 3-5
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Results: Themes 1-3
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A – no meta-analysis conducted
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Results: Theme 3
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Results: Study selection and characteristics
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Discussion: Par. 8
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A – narrative synthesis
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Discussion: all sub-sections
	23b	Discuss any limitations of the evidence included in the review.	Discussion: Par. 8
	23c	Discuss any limitations of the review processes used.	Discussion: Par. 8
	23d	Discuss implications of the results for practice, policy, and future research.	Discussion: Par. 9-10
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Methods: OSF Registration
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Methods: OSF Registration
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Methods: Eligibility criteria; Methods: Information sources and search strategy; Supplementary Table 3
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Acknowledgements
Competing interests	26	Declare any competing interests of review authors.	Competing Interests
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Data and availability