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Supplemental information

Federated machine learning in healthcare:

A systematic review on clinical applications

and technical architecture

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Supplementary Table 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement, related to systematic review search process in Figure 2

The PRISMA guidelines(1) was used for the reporting of this systematic review and meta-analysis. The 27-item checklist is as follows:

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	3-4
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	5-6
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5-6
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	7
Eligibility criteria	5-6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	8-9
Information sources	5-6	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	7-9
Search	5-6	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	7-8
Study selection	5-7	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	7-9

Data collection process	6-7	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	8-9
Data items	6-7	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	7-10
Risk of bias in individual studies	8	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	-
Summary measures	8	State the principal summary measures (e.g., risk ratio, difference in means).	-
Synthesis of results	8	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	-
Risk of bias across studies	13	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	-
Additional analyses	13	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	10
RESULTS			
Study selection	9	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	11
Study characteristics	9	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	11
Risk of bias within studies	9-10	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	-
Results of individual studies	9-10	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	11-12
Synthesis of results	9-12	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	-
Risk of bias across studies	9-10	Present results of any assessment of risk of bias across studies (see Item 15).	-
Additional analysis	11-12	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	-
DISCUSSION			

Summary of evidence	12-13	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	14-16
Limitations	13-14	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	15-16
Conclusions	16-17	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	14-19
FUNDING			
Funding	18	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	21

Supplementary Table 2: Electronic Database Search Strategy, related to the systematic review search process in Figure 2

Advanced search options:

Database	**Search Term**
PubMed/ Medline	(Federated Learning[Title/Abstract]) OR (Decentralised machine learning[Title/Abstract])
Embase	Federated learning [Title/abstract] AND (health or medical) [All fields]
IEEEXplore	(Federated learning OR decentralised machine learning) AND (healthcare OR medical)
ScienceDirect	Title/Abstract/Author-specified keywords (Federated learning) AND Any field: (health OR medical)
SpringerLink	"Federated learning" AND (health OR medical)
ArXiv	Federated learning [Abstract] AND (health OR medical) [All fields]
Scopus	ABS-Title-Key (Federated learning) OR all text (health Or medical)
Web of Science	Federated learning (abstract) and Health or Medical (All fields)
CINAHL	Federated learning OR Decentralised machine learning [All fields]
Google Scholar	(Federated learning) OR Decentralised machine learning AND (health OR medical)
ACM Digital Library	[Title: federated learning] AND [Abstract: health or medicine or medical]