

Supplementary Materials

Seismic Vulnerability of Transportable Medical Equipment in Hospitals and the Need for Automated Safety Controls: A PRISMA-Based Systematic Review

Page and line numbers refer to the revised manuscript.

Table S1. PRISMA 2020 checklist.

Section and topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Title; Page 1, Lines 2–4
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract; Pages 1–2, Lines 27–55; Table S3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Section 1; Pages 2–3, Lines 60–116
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Section 1; Page 3, Lines 117–130
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Sections 2.3–2.4; Page 6, Lines 203–230; Section 2.8; Page 8, Lines 295–307
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.	Section 2.2; Page 5, Lines 156–162; Pages 5–6, Lines 183–201
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Section 2.2; Page 5, Lines 167–182; Table S2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review.	Section 2.5; Page 6, Lines 233–241
Data collection process	9	Specify the methods used to collect data from reports.	Section 2.6; Page 7, Lines 244–262
Data items	10a	List and define all outcomes for which data were sought.	Section 2.6; Page 7, Lines 244–262
	10b	List and define all other variables for which data were sought.	Section 2.6; Page 7, Lines 244–262
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies.	Section 2.7; Page 7, Lines 265–289; Pages 7–8, Lines 290–294
Effect measures	12	Specify for each outcome the effect measure(s) used in the synthesis or presentation of results.	Section 2.8 (direction of effect); Page 8, Lines 295–307
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis.	Section 2.8; Page 8, Lines 295–307
	13b	Describe any methods required to prepare the data for presentation or	Section 2.8; Page 8, Lines 295–307

		synthesis.	
	13c	Describe any methods used to tabulate or visually display results.	Section 2.8; Tables 1–5
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s).	Sections 2.1 and 2.8 (SWiM, vote counting); Page 8, Lines 295–307
	13e	Describe any methods used to explore possible causes of heterogeneity among study results.	Not applicable (no statistical synthesis); heterogeneity discussed in Section 4.4 and limitations, Pages 19–20, Lines 693–711
	13f	Describe any sensitivity analyses conducted.	Not applicable (no statistical synthesis)
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results.	Not formally assessed; addressed in limitations, Pages 19–20, Lines 693–711
Certainty assessment	15	Describe any methods used to assess certainty in the body of evidence.	Not performed (GRADE not applicable to engineering experiments); Pages 19–20, Lines 693–711
RESULTS			
Study selection	16a	Describe the results of the search and selection process, ideally using a flow diagram.	Section 3.1; Page 8, Lines 310–330; Figure 1 (Page 4)
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why.	Section 3.1; Page 8, Lines 310–330
Study characteristics	17	Cite each included study and present its characteristics.	Section 3.1; Table 2; Page 10, Lines 375–377
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Section 3.2; Table 1; Pages 8–9, Lines 333–345; Page 9, Lines 347–351
Results of individual studies	19	For all outcomes, present for each study summary statistics and/or an effect estimate.	Table 2; Table 3
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Sections 3.2 and 3.6; Page 12, Lines 404–422
	20b	Present results of all statistical syntheses conducted.	Not applicable; structured vote-counting synthesis in Table 3, Page 12, Lines 404–422
	20c	Present results of all investigations of possible causes of heterogeneity.	Not applicable
	20d	Present results of all sensitivity analyses conducted.	Not applicable
Reporting biases	21	Present assessments of risk of bias due to missing results.	Not assessed; see limitations, Pages 19–20, Lines 693–711
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence.	Not assessed; see limitations, Pages 19–20, Lines 693–711
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Sections 4.1–4.6; Pages 13–19, Lines 424–677
	23b	Discuss any limitations of the evidence included in the review.	Section 4.7; Pages 18–19, Lines 660–677; Pages 19–20, Lines 693–711
	23c	Discuss any limitations of the review processes used.	Section 4.7; Pages 19–20, Lines 693–711
	23d	Discuss implications of the results for practice, policy, and future research.	Sections 4.6 and 5; Page 18, Lines 628–658; Page 20, Lines

			716–743
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review or state that the review was not registered.	Section 2.1; Pages 3–4, Lines 133–144
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Section 2.1; Pages 3–4, Lines 133–144 (not registered)
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not applicable
Support	25	Describe sources of financial or non-financial support for the review.	Funding statement; Page 20, Line 755
Competing interests	26	Declare any competing interests of review authors.	Conflicts of Interest; Page 21, Line 762
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found.	Data Availability Statement; Page 21, Line 759; Tables S1–S2

From: Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71.

Table S2. PRISMA 2020 for Abstracts checklist.

Section and topic	Item #	Checklist item	Reported (Yes/No)
TITLE	1	Identify the report as a systematic review.	Yes (Title)
BACKGROUND – Objectives	2	Provide an explicit statement of the main objective(s) or question(s) the review addresses.	Yes
METHODS – Eligibility criteria	3	Specify the inclusion and exclusion criteria for the review.	Yes
METHODS – Information sources	4	Specify the information sources used to identify studies and the date when each was last searched.	Yes (databases and search period)
METHODS – Risk of bias	5	Specify the methods used to assess risk of bias in the included studies.	Yes (adapted nine-item engineering checklist)
METHODS – Synthesis of results	6	Specify the methods used to present and synthesise results.	Yes (narrative synthesis and structured tables following SWiM)
RESULTS – Included studies	7	Give the total number of included studies and participants and summarise relevant characteristics of studies.	Yes (six studies, five countries, experimental/numerical)
RESULTS – Synthesis of results	8	Present results for main outcomes, preferably indicating the number of included studies for each.	Yes
DISCUSSION – Limitations of evidence	9	Provide a brief summary of the limitations of the evidence included in the review.	Yes
DISCUSSION – Interpretation	10	Provide a general interpretation of the results and important implications.	Yes
OTHER – Funding	11	Specify the primary source of funding for the review.	Reported in the Funding statement (no external funding) because of the abstract word limit
OTHER – Registration	12	Provide the register name and registration number.	Not registered; stated in Section 2.1

Table S3. Full search strategies for each database (searched from 1 January 1990 to 31 December 2025; English language).

Database	Search string
PubMed	(earthquake*[tiab] OR seismic*[tiab]) AND (hospital*[tiab] OR "healthcare facilit*" [tiab] OR "health care facilit*" [tiab]) AND ("nonstructural component*" [tiab] OR "non-structural component*" [tiab] OR "medical equipment" [tiab] OR "medical device*" [tiab]) AND ("hospital functionality" [tiab] OR "operational continuity" [tiab] OR "seismic risk reduction" [tiab] OR mitigat* [tiab]) AND ("1990/01/01" [dp] : "2025/12/31" [dp]) AND English [la]
Scopus	TITLE-ABS-KEY((earthquake* OR seismic*) AND (hospital* OR "healthcare facilit*" OR "health care facilit*") AND ("nonstructural component*" OR "non-structural component*" OR "medical equipment" OR "medical device*") AND ("hospital functionality" OR "operational continuity" OR "seismic risk reduction" OR mitigat*)) AND PUBYEAR > 1989 AND PUBYEAR < 2026 AND (LIMIT-TO(LANGUAGE, "English"))
Web of Science Core Collection	TS=((earthquake* OR seismic*) AND (hospital* OR "healthcare facilit*" OR "health care facilit*") AND ("nonstructural component*" OR "non-structural component*" OR "medical equipment" OR "medical device*") AND ("hospital functionality" OR "operational continuity" OR "seismic risk reduction" OR mitigat*)); Publication years: 1990–2025; Language: English
EBSCO (Academic Search / CINAHL)	TI ((earthquake* OR seismic*) AND (hospital* OR "healthcare facilit*" OR "health care facilit*")) OR AB ((earthquake* OR seismic*) AND (hospital* OR "healthcare facilit*" OR "health care facilit*")) AND TI/AB ("nonstructural component*" OR "non-structural component*" OR "medical equipment" OR "medical device*") AND TI/AB ("hospital functionality" OR "operational continuity" OR "seismic risk reduction" OR mitigat*); Limiters: published 1990–2025; English
PsycINFO (EBSCOhost)	Same strategy as EBSCO, applied to TI and AB fields; Limiters: 1990–2025; English
Google Scholar	(earthquake OR seismic) hospital ("nonstructural components" OR "medical equipment" OR "medical devices") ("hospital functionality" OR "operational continuity" OR mitigation); custom range 1990–2025; first 200 results screened, sorted by relevance
Supplementary search (Scopus)	TITLE-ABS-KEY(seismic AND medical AND hospital); plus backward citation searching (reference lists of all included studies) and forward citation searching (Google Scholar "cited by")

Search period: 1 January 1990 to 31 December 2025.

