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Summary of the best evidence for the management of kinesiophobia in patients after cardiac surgery

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Abstract

Background This study aimed to systematically search for relevant evidence on the management of kinesiophobia in patients after cardiac surgery both home and abroad. The evidence was evaluated and integrated to provide reference for clinical practice.

Methods According to the '6S' evidence pyramid model, evidence related to managing kinesiophobia in patients after cardiac surgery were systematically searched from relevant domestic and foreign guideline websites and professional association websites and databases from the date of their establishment to December 31, 2024. The quality of the literature was evaluated by two master's students who had completed their professional training and assessment at the Evidence-based Nursing Center of Fudan University. These students also extracted and summarised the pertinent evidence that met the literature quality evaluation standards.

Results Sixteen studies were included, including two guidelines, three expert consensus, six systematic reviews, two meta-analyses, and threerandomizedcontrolled trials. A total of 20 pieces of evidence were formed in seven aspects: management principles, exercise guidance, pain management, psychological intervention, health education, social support, and follow-up management.

Conclusions The comprehensive evidence summarised in this study for managing kinesiophobia in patients after cardiac surgery can provide resources for clinical translation. These insights can inform the development of kinesiophobia management plans to support the rapid recovery of patients after major surgery.

Trial registration This study was registered at the Center for Evidence-Based Nursing of Fudan University (registration number ES20245486).

Clinical trial number This study was registered at the Center for Evidence-Based Nursing of Fudan University (registration number ES20245486).This study is a summary of the best evidence and does not involve clinical trials and, therefore, no Clinical trial number.

Keywords Postoperative cardiac surgery, Kinesiophobia, Rehabilitation, Summary of the evidence

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Background

Cardiovascular disease (CVD) is a major global public health challenge [1], with its incidence and mortality rates steadily rising alongside the ageing population and increased prevalence of unhealthy lifestyles [2]. Although most patients with CVD can be treated pharmacologically to control disease progression, some with severe disease require surgery to re-revascularize blood vessels and improve cardiac function [3]. Of the more than 1.5 million patients who undergo cardiac surgery annually worldwide, 280,000 are in China [4]. Cardiac rehabilitation determines the prognostic outcomes of patients who undergo cardiac surgery. In particular, rehabilitation with 'exercise' as the core should be initiated as early as possible for eligible patients [5]. Active participation in exercise increases the left ventricular ejection fraction, reduces the risk of adverse cardiac events, and reduces the readmission rate while improving mental health and postoperative quality of life [6]. However, cardiac surgery is more invasive, and most postoperative patients are skeptical about the safety of exercise, exhibiting resistance, avoidance, or even a strong sense of fear, resulting in a decrease in their participation rate and adherence to exercise [7], the phenomenon known as kinesiophobia.

Kinesiophobia refers to 'an irrational and excessive fear of physical activity due to increased sensitivity to pain and fear that secondary injury from activity will be detrimental to recovery' [8]. We previously reported that the incidence of kinesiophobia in patients after cardiac surgery could reach 82.57%. If left uncorrected, long-term avoidance of rehabilitation exercises can result in muscle atrophy, deterioration of cardiovascular health, and an increased economic burden on families and society [9]. To date, most research on kinesiophobia has focused on orthopaedic patients and individuals with chronic pain, while its management after cardiac surgery remains in the early stage of exploration. The lack of targeted recommendations has led to inconsistent management strategies in clinical practice, hindering effective guidance for medical staff [7]. The current study comprehensively reviews the existing evidence on postoperative kinesiophobia following cardiac surgery at home and abroad. The relevant information is integrated to compile the optimal reference for formulating standardised postoperative kinesiophobia management measures for cardiac surgery. This study has been registered in the Center for Evidence-Based Nursing of Fudan University (registration number: ES20245486).

Methods

Establishment of a research team

The research team comprised two master's degree nursing students, one clinical nurse specialist, one cardiac surgeon, and one psychologist. The two master's degree students performed study retrieval, quality assessment, and data extraction and grading. The clinical nurse specialist, cardiac surgeon, and psychologist performed quality control measures. The team members received professional training and assessment from the Centre for Evidence-Based Nursing at Fudan University and demonstrated a strong ability to read and evaluate literature in English and Chinese.

Question identification

The evidence-based question establishment tool PIPOST [10] of the Center for Evidence-Based Nursing of Fudan University was used to form evidence-based practice questions: (1) P (population), the target population for evidence application comprised patients aged ≥ 18 years after cardiac surgery (type of surgery: coronary artery bypass grafting, heart valve replacement, heart transplantation, cardiac macrovascular surgery under general anaesthesia, cardiopulmonary bypass, etc.); (2) I (intervention), measures related to reducing the incidence of degree of kinesiophobia in patients after cardiac surgery; (3) P (professional), the personnel who apply the interventions, including cardiac surgeons, rehabilitation therapists, psychotherapists, postoperative cardiac surgery patients, caregivers, etc.; (4) O (outcome), the degree of kinesiophobia, motor self-efficacy, etc.; (5) S (setting), where the evidence is applied, including the intensive care unit, cardiac surgery ward, rehabilitation ward, home, etc.; (6) T (type of evidence), resources, including guidelines, clinical decisions, expert consensus, systematic reviews, meta-analyses, and original studies.

Search resources and strategies

Following the '6S' evidence pyramid model [11], searches were performed from top to bottom: (1) clinical decision support systems: BMJ Best Practice, UpToDate and Australian Joanna Briggs Institute (JBI) Healthcare Database,; (2) clinical practice guideline websites: National Guideline Clearinghouse (NGC), Scottish Intercollegiate Guidelines Network (SIGN), New Zealand Guidelines Group (NZGG), Guidelines International Network (GIN), and Medical Pulse; (3) Professional association websites: American College of Cardiology (ACC), European Society of Cardiology (ESC), European Association for Cardio-Thoracic Surgery (EACTS), American Thoracic Society (ATS), British Thoracic Society (BTS), French Society for Anaesthesia and Intensive Care (FSCIC), Anaesthesia and Intensive Care (SFAR), and Chinese Nursing Association; (4) comprehensive databases: PubMed, Embase, CINAHL, Web of Science, China National Knowledge Infrastructure(CNKI), Wanfang Database, China Biomedical Literature Database. The English search terms were 'Cardiac Surgical Procedures', 'Heart Surgical Procedure', 'cardiac cardiovascular

surgery', 'coronary artery bypass', 'valve surgery', 'valve replacement', 'kinesiophobia', 'fear of movement', 'pain-related activity avoidance', 'movement fear', 'movement phobia'. The searches were conducted by two Master's degree students, with a limited search timeframe of 31 December 2024. Figure 1 presents an example of the search strategy used in PubMed.

Literature inclusion and exclusion criteria

Literature inclusion criteria: (1) conducted on postoperative cardiac surgery patients; (2) content related to the management of postoperative cardiac surgery kinesiophobia; and (3) study was a guideline, best practice, expert consensus, systematic evaluation, meta-analysis, or original research. Literature exclusion criteria: (1) incomplete information or inaccessible full text; (2) brief version or guideline interpretation; (3) duplicated study; (4) systematic evaluation of proposals, reviews, or conferences; (5) written in languages other than Chinese or English; (6) did not pass the quality assessment grading (Grade C).

Two Master's students independently executed literature screening based on the inclusion and exclusion criteria. During the initial screening stage, literature not aligned with the study topic was screened by quickly skimming the titles and abstracts of studies; the remaining literature was subsequently read in its entirety to evaluate whether it met the inclusion criteria. During the screening process, if a disagreement arose between the two students, it was discussed with a third member of the research team until a consensus was reached.

Literature quality evaluation

Several literature quality evaluation criteria were applied. (1) Clinical decisions and evidence summaries: Sources from authoritative databases such as UpToDate, was traced, and the quality was evaluated according to the type of literature [12]. (2) Guidelines: The 2017 version of the Appraisal of Guidelines for Research and Evaluation II (AGREE II) [13] was applied to evaluate the quality of the included guidelines; the evaluation tool comprised 23 entries in 6 domains, with each entry scored on a 1–7 scale (with 1 representing strongly disagree and 7 representing strongly agree); the recommendation level was determined based on the results of each domain score (Grade A: all six domains with standardised scores ≥ 60%, Grade B: some domains < 60% and more than three domains ≥ 30%; Grade C: three domains < 30%; Grade C was not recommended). (3) Systematic evaluation and meta-analysis: the 2016 version of the Australian JBI Centre for Evidence-Based Health Care Systematic served as the quality assessment tool [14]. (4) Expert consensus: Quality assessment was performed using the 2016 edition of the Australian JBI Centre for Evidence-Based Health Care evaluation criteria for expert consensus [15]. (5)randomizedcontrolled trials: quality evaluation was performed using the Cochrane risk-of-bias tool [16]. Two master's students independently evaluated the trials

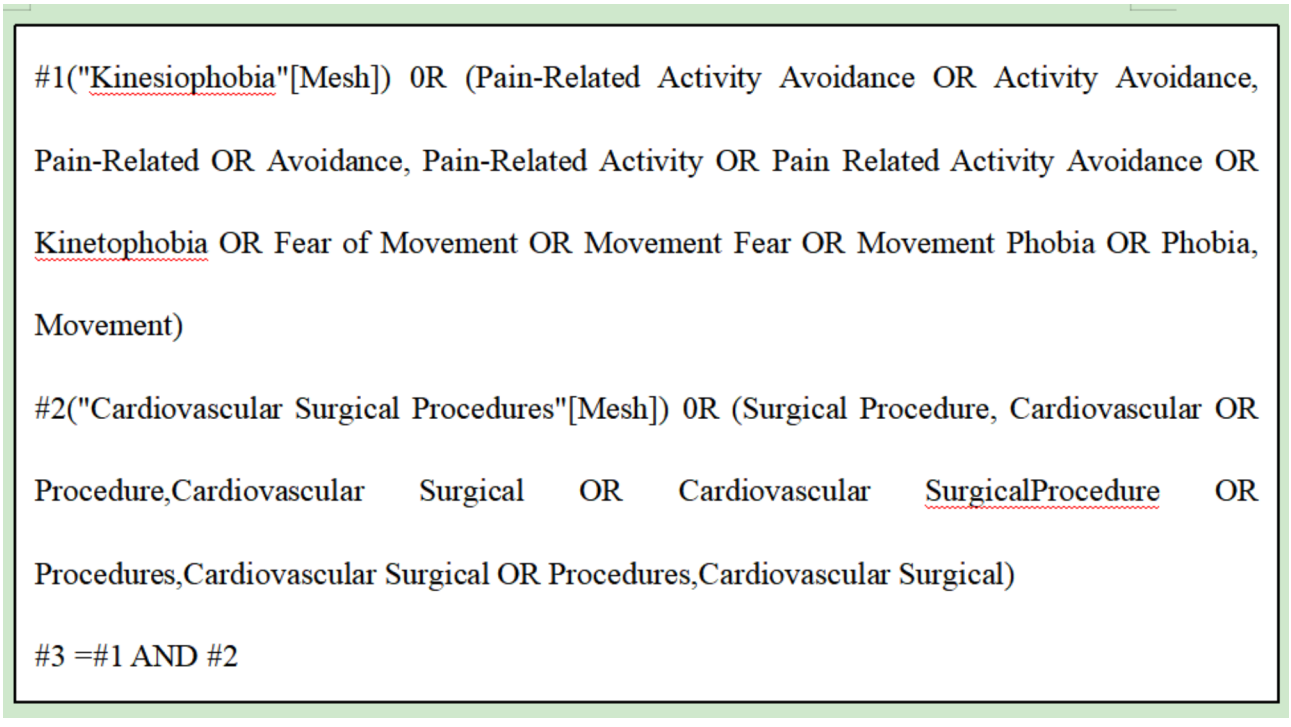

Fig. 1 PubMed retrieval strategy

according to the quality evaluation criteria for each type of literature. In instances of disagreement during the evaluation process, the members of the research team would adjudicate.

Summary and grading evidence

Two master's students read each article to categorise and summarise the evidence related to each topic and to identify the themes in the research. Any disagreements were resolved through discussion by the research team. If there were any conflicts about the conclusions drawn from diferent sources of evidence, this study followed the principle of evidence priority, high-quality evidence priority, and the latest published authoritative literature priority.After the evidence were aggregated, the evidence level of the original literature was determined using the Australian JBI Centre for Evidence-Based Health Care's Evidence Pre-grading and Recommended Levels of Evidence System (2014 version) [17]. Levels of evidence were categorised as 1–5 based on the design category of the included studies, with level 1 being the highest and level 5 being the lowest. Evidence was categorised into level A (strong recommendation) and level B (weak recommendation) based on the Feasibility, Appropriateness, Meaningfulness and Effectiveness (FAME) structure of JBI.If the contents of several different types of literature were aggregated into one piece of evidence, the highest level of the literature was taken as the level of that piece of evidence.

Results

Literature search results and basic characteristics

A total of 1278 documents were retrieved and imported into NoteExpress 4.0 literature management software, and 372 duplicates were excluded after data cleaning. Subsequently, 845 documents were excluded after screening the titles and abstracts, and an additional 45 were excluded after reading the full text and performing quality evaluation. Finally, 16 documents were included in the analysis (Fig. 2). The 16 articles included two guidelines [18, 19], three expert consensuses [20–22], six systematic evaluations [23–28], two meta-analyses [29, 30], and three randomizedcontrolled trials [31–33]. The basic characteristics of the included literature are presented in Table 1.

Literature quality assessment

Quality evaluation of clinical guidelines: Two clinical guidelines were included, with high overall quality (Table 2).

Quality assessment of expert consensus: Three expert consensus articles with high overall quality were included in this study (Table 3).

Quality assessment of systematic evaluations and meta-analyses: Six systematic evaluations and two meta-analyses were included in this study. The study designs were relatively complete (Table 4).

Quality assessment of randomized controlled trials: Three randomized controlled trials with high overall quality were included in this study (Table 5).

Summary and generation of evidence

By categorising and summarising content on the same themes, 20 pieces of evidence were compiled across seven areas: management principles, exercise instruction, pain management, psychological intervention, health education, social support, and follow-up management (Table 6).

Discussion

Identifying postoperative patients with kinesiophobia for timely multidisciplinary intervention

'Exercise' is the core of cardiac rehabilitation, yet only 9.7% of patients participate after cardiac surgery, and nearly 90% withdraw from exercise rehabilitation [34]. Therefore, identifying patients with kinesiophobia after cardiac surgery is critical for implementing proactive interventions to improve their exercise participation and adherence rates. The Tampa Scale for Kinesiophobia Heart(TSK-SV Heart), which quantifies a patient's fear of pain, is a widely used tool for measuring kinesiophobia in patients with CVD [35]. It should be employed to identify at-risk patients following cardiac surgery and to dynamically evaluate the effectiveness of the intervention effect. The occurrence and development of kinesiophobia in patients following cardiac surgery are influenced by various factors [9], including physiological, psychological, and social aspects and the joint collaboration of a multidisciplinary team can effectively integrate the expertise from multiple professional fields to ensure patients with kinesiophobia after cardiac surgery receive comprehensive and personalised treatment.Meanwhile, Rosa et al. [36] reported that multidisciplinary team care reduces the risk of postoperative complications and the total length of hospital stay in patients after cardiac surgery. Therefore, evidence suggests that a multidisciplinary team should be formed to work together to manage exercise fear in patients after cardiac surgery.In addition, gradually increasing activity intensity can significantly reduce the incidence of kinesiophobia [37], but the adaptability and tolerance of exercise in the early postoperative period vary among patients. Thus, while the evidence suggests starting with 5–10-minute sessions and gradually increasing exercise intensity, this should be strictly implemented based on the patient's clinical symptoms.

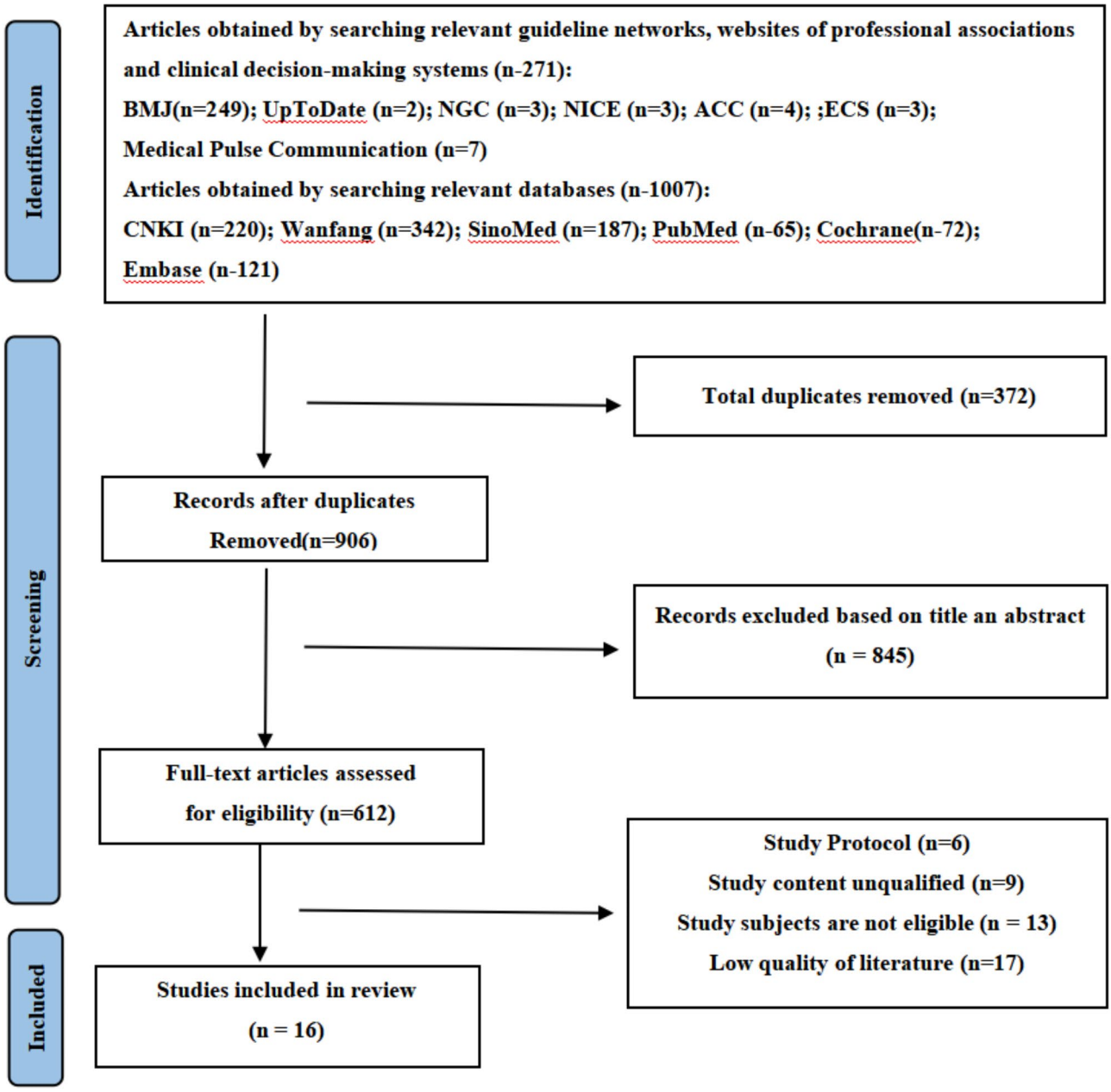

Fig. 2 Flow chart of literature screening

Improve pain control and promote exercise rehabilitation

The primary causes of kinesiophobia in postoperative cardiac patients are incisional pain and misconceptions regarding pain. In fact, over 50% of patients continue to experience pain in the incision area despite routine analgesia and are reluctant to engage in early rehabilitation exercises [38]. Pain assessment is the basis for implementing various pain management measures [39]. Therefore, the evidence suggests assessing resting and motor pain and implementing multimodal dynamic analgesia can assist patients in meeting their analgesic requirements for early postoperative activities. Although multimodal analgesia enables the simultaneous application of analgesic drugs and techniques with different mechanisms of action to enhance analgesia, reduce the use of a single drug, and decrease adverse drug reactions [40], this strategy has not been commonly reported in cardiac surgery, warranting more in-depth analyses [41]. Moreover, patients' misperceptions of pain can lead to incorrect coping behaviours [42]. Therefore, when applying pain management strategies, it is essential to offer education and counselling to patients and their caregivers. This helps them understand the objectives of analgesia and confront their pain experience, allowing them to

Table 1 Basic characteristics of the included literature

Included literature	Year of publication	literature source	Document type	Literature Topics
Mertes [18]	2022	PubMed	Guide	Guidelines for rapid recovery after cardiac surgery under cardiopulmonary bypass or non-cardiopulmonary bypass
Schwaab [19]	2021	PubMed	Guide	Cardiac rehabilitation
Hansen [20]	2022	Medline	Expert consensus	Exercise intensity assessment and exercise prescribing for cardiac rehabilitation
Chinese Nursing Association [21]	2022	CNKI	Expert consensus	Cardiac rehabilitation care
National Center for Cardiovascular Diseases [22]	2020	WanFang	Expert consensus	Cardiac rehabilitation after coronary artery bypass grafting
Jia [23]	2024	PubMed	Systematic review	Kinesiophobia Evaluation Tool measures attributes in patients with cardiovascular disease
Jia [24]	2024	Pubmed	Systematic review	Kinesiophobia Evaluation Tool measures attributes in patients with cardiovascular disease
Costa [25]	2023	UpToDate	Systematic review	Exercise rehabilitation in patients after heart transplantation
Santiago [26]	2019	UpToDate	Systematic review	Interventions to promote patient utilization of cardiac rehabilitation
Nachiyunde [27]	2018	Cochrane Library	Systematic review	Efficacy of different analgesic modes on postoperative pain management and early mobilization in patients undergoing cardiac surgery
Rawstorn [28]	2016	PubMed	Systematic review	Teleguide cardiac rehabilitation for patients after cardiac surgery
Wang [29]	2022	PubMed	Meta-analysis	The effect of virtual reality on kinesiophobia
Carl [30]	2019	UpToDate	Meta-analysis	Effect of exposure therapy on kinesiophobia
Tigges [31]	2022	PubMed	Randomized controlled trials	Educational interventions to enhance adherence after heart transplantation
Jia [32]	2024	CNKI	Randomized controlled trials	Effect of cognitive-behavioral intervention on kinesiophobia in patients with coronary heart disease after stenting
Li [33]	2022	CNKI	Randomized controlled trials	Effect of dual-heart care model on kinesiophobia in patients with coronary heart disease stenting

Table 2 Results of guideline quality evaluation

Included literature	Percentage of standardization by domain						≥ 60% of the number of fields	≥ 30% of the number of fields	Recommended level
	Scope and Purpose	Participants	Rigor of formulation	Clarity of presentation	Usefulness of the guide	Editorial independence			
Mertes [18]	86.04	54.41	78.47	85.31	47.52	82.33	4	2	A
Schwaab [19]	76.78	65.89	63.64	86.41	39.38	98.67	6	5	B

Table 3 Results of expert consensus quality evaluation

Literature review items were included	Hansen [20]	Chinese Nursing Association [21]	National Center for Cardiovascular Diseases [22]
(1) Whether a clear source of point of view is presented?	Yes	Yes	Yes
(2) Whether the opinion comes from influential experts in the field?	Yes	Yes	Yes
(3) Whether the arguments presented are centered on the interests of the people involved in the study?	Yes	Yes	Yes
(4) Whether the stated conclusions are based on the results of the analysis?	Yes	Yes	Yes
(5) Whether other existing literature has been consulted and accurately indexed?	Yes	Yes	Yes
(6) Whether there are any inconsistencies between the points presented and previous literature?	Yes	No	Yes

Table 4 Quality evaluation results of systematic reviews and meta-analyses

Literature review items were included	Jia [23]	Liu [24]	Costa [25]	Santiago [26]	Nachiyunde [27]	Rawstorn [28]	Wang [29]	Carll [30]
(1) Whether the evidence-based questions raised are clear and unambiguous	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(2) Whether the literature inclusion criteria were appropriate for the evidence-based question	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(3) Whether the search strategy is appropriate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(4) Whether the database or resources of the searched literature are sufficient	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(5) Whether the quality evaluation criteria adopted are appropriate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(6) Whether the quality evaluation of the literature was completed independently by two or more reviewers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(7) Whether certain measures are taken to reduce errors when extracting data	Unclear	Unclear	Yes	Yes	Unclear	Yes	Unclear	Yes
(8) Whether the methods of pooling studies are appropriate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(9) Whether the likelihood of publication bias was assessed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(10) Whether the recommendations made for policy or practice are based on the results of the systematic review	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(11) Whether the proposed direction for further research is appropriate	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 Quality evaluation results of randomized controlled trials

Literature review items were included	Tigges [31]	Jia [32]	Li [33]
(1) Random sequence generation	Yes	Yes	Yes
(2) Assignment hidden	Unclear	Unclear	Unclear
(3) Implementation bias	Yes	Yes	Yes
(4)Measurement bias	Yes	Unclear	Unclear
(5) Follow-up bias	Yes	Yes	Yes
(6)Reporting bias,	Yes	Yes	Yes
(7) Other bias.	Yes	Yes	Yes

effectively manage their pain perception during exercise rehabilitation.

Attaching importance to psychological intervention and improving patient education

Approximately 40% of postoperative cardiac surgery patients express negative emotions, such as anxiety and depression [43]. The greater the severity of anxiety and depression, the higher the likelihood of kinesiophobia. Furthermore, patients' psychological needs may evolve over time due to various environmental factors [39]. Therefore, the evidence suggests that medical staff to monitor these needs during the rehabilitation process and encourage communication with relatives, friends, doctors, and others when patients experience adverse emotions and actively seek psychological support. Health education is a critical aspect in managing Kinesiophobia in patients after cardiac surgery, as individuals with a greater understanding of CVD experience a lower incidence of Kinesiophobia [44]. In particular, accurate knowledge of the disease reduces patients' concerns about exercise and increases their confidence in participating in rehabilitation exercises. Postoperative cardiac surgery patients vary in their knowledge of exercise rehabilitation. Therefore, appropriate health education methods should be tailored to their learning needs to enhance their understanding, motivate participation, and improve rehabilitation outcomes [45]. The current evidence on health education is based primarily on previous systematic evaluations and expert consensus. Although it can be used to guide clinical practice, further high-quality original studies are needed to support clinical practice.

Provide social support and strengthen follow-up management

The level of social support is a risk factor for developing kinesiophobia in postoperative cardiac surgery patients. Medical staff, patient caregivers, and family members are the primary sources of social support, playing a crucial role in facilitating behavioural change in patients [46]. Thus, the evidence indicates that medical staff, patient caregivers, and patients should actively engage with one another. This interaction is essential to help patients articulate their needs and concerns regarding rehabilitation exercises. At the same time, involving patient caregivers in the decision-making process and supervision of rehabilitation can enhance patients' self-efficacy in exercising, ultimately aiding in the management of their kinesiophobia. A longitudinal study by Zhao et al. [47] on patients after coronary artery bypass grafting reported continued kinesiophobia three months post-surgery. Therefore, medical staff should continue to guide patients after discharge to encourage them to continue exercising through health education, text messages, etc [48].On the

Table 6 Summary of evidence for the management of fear of movement in patients after cardiac surgery

Theme of evidence	Content of evidence	Level of evidence	Level of recommendation
Management principles	1. The Tampa Scale for Kinesiophobia Heart(TSK-SV Heart) was used to identify patients with kinesiophobia and evaluate the management effect [23]	Level 1	A
	2. A multidisciplinary team of medical specialists, nurse specialists, psychologists, and rehabilitation physiotherapists worked together to reduce postoperative patient kinesiophobia [18, 19, 21, 22]	Level5	A
Exercise Guidance	3. A thorough assessment of the factors influencing the postoperative patient's kinesiophobia can help reduce kinesiophobia before developing an exercise rehabilitation program [24]	Level 1	B
	4. Encouraging patients to participate in exercise rehabilitation programs and goal development can avoid conflicting decision-making and reduce kinesiophobia [24, 25]	Level 1	A
	5. The exercise mode is selected according to the patient's values and preferences; the exercise intensity is adjusted according to the patient's exercise tolerance, starting from 5 to 10 min of exercise, and gradually increasing to reducing postoperative kinesiophobia [20, 25, 30]	Level 2	A
Pain Management	6. Health care providers screen for pain 30 min before pain-causing activities and administer predictive analgesia to reduce the degree of kinesiophobia [25, 27, 30]	Level 1	A
	7. Correcting postoperative patients' misperceptions of pain can help reduce their kinesophobia [22, 27]	Level5	A
	8. Dynamic analgesia using a multimodal analgesic approach is recommended; the analgesia intensity should try to meet the postoperative patient's requirements for early activity [27]	Level1	B
Psychological interventions	9. Dynamic monitoring of the postoperative patient's psychological state during exercise and timely provision of psychological interventions for individuals with kinesiophobia can alleviate kinesiophobia [21, 22]	Level5	A
	10. Gradual adjustment of exercise intensity, duration, and frequency to achieve gradual exposure and desensitization is beneficial to alleviate kinesiophobia [26, 30]	Level2	A
	11. Patients with postoperative kinesiophobia are encouraged to seek psychological support, share their feelings with relatives, friends, and health care providers to relieve emotional distress, and receive psychotherapy if necessary [31]	Level5	A
	12. Peer education or group exercise can be beneficial in reducing postoperative kinesiophobia [25]	Level 1	A
	13. Psychoeducational activities with immersive virtual reality to divert patients' attention can alleviate anxiety, depression, and fear after surgery [29, 30]	Level1	B
Social support	14. Respecting the patient's subjective feelings while treating the physical illness can help reduce postoperative kinesiophobia [32, 33]	Level 2	A
	15. Caregiver involvement in developing and supervising the patient's exercise plan can be beneficial in reducing kinesiophobia [33]	Level 2	A
Health education	16. Correcting the patient's misconception of movement can help reduce postoperative kinesiophobia [22, 27]	Level1	A
	17. Conducting health education in plain language and providing oral, written, and visual reminders is beneficial to reducing kinesiophobia [28, 30]	Level 1	A
	18. Health education should include the importance of exercise, the dangers of kinesiophobia, and information on exercise and emotion management skills [21, 22, 25, 31]	Level 5	A
Follow-up management	19. Using exercise logs, wearable devices, and mobile applications for feedback monitoring can help alleviate postoperative kinesiophobia [25, 28]	Level 5	B
	20. Remote telephone guidance and sending motivational text messages are beneficial to alleviate postoperative kinesiophobia [21, 28]	Level 5	A

one hand, by leveraging the advancement of digital health technologies, we can proactively create an online supervision and interactive platform to offer patients real-time exercise guidance, thereby enhancing the safety and effectiveness of home exercise. On the other hand, we can share patients' exercise experiences online to bolster the confidence of patients with kinesophobia.

Limitations of the study

Although this study summarises the recommendations and evidence related to kinesiophobia in postoperative cardiac surgery patients in strict accordance with evidence-based care, it includes only Chinese and English literature, which may have omitted high-quality findings in other languages. Given the variances in healthcare delivery systems, geographic economies, and cultural contexts across nations, healthcare professionals should thoroughly assess the clinical practice environment, analyse the factors that facilitate or impede healthcare

delivery, and judiciously apply evidence per the specific circumstances of their hospitals, the patient's propensity to engage in postoperative activities, and their medical conditions. Furthermore, a limitation of this study is that most of the included literature were expert consensuses and systematic evaluations, with few original studies. Therefore, future updates should include high-quality original studies to enhance the summary of evidence. Localised research should be enhanced in the future to formulate guidelines for the prevention and management of postoperative exercise kinesiophobia in patients undergoing cardiac surgery. These guidelines should be tailored to the specific circumstances of each country to facilitate the translation and application of evidence-based practices, thereby increasing the participation rate and adherence to exercise rehabilitation among cardiac surgery patients, ultimately improving their postoperative health outcomes.

Conclusions

This study summarises the most relevant evidence for managing kinesiophobia after cardiac surgery from seven aspects: management principles, exercise guidance, pain management, psychological intervention, health education, social support, and follow-up management. However, given that the development of kinesiophobia is a dynamic process, applying this evidence requires the full consideration of individual differences among patients, combined with the professional judgement of medical staff. In addition, it is essential to evaluate the conditions for translating evidence based on each patient's expectations, preferences, and values. This careful selection and application of evidence aims to make the management of kinesiophobia in postoperative cardiac surgery patients more effective and standardised, ultimately reducing the incidence of kinesiophobia in this population.

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Author contributions
(Zhi Zeng) is responsible for the design, literature acquisition and thesis writing of his works. (Li Wan, Jianying Zheng) contributed to the data analysis and interpretation of the paper. (Yuqi Shen and Huaili Luo) were involved in the literature acquisition and screening, and (Mei He) supervised the compilation of and Revision of the manuscript. All authors read and approved the final manuscript.

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Data availability
Data is provided within the manuscript or supplementary information files.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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