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REVIEW

Cardiac prehabilitation Programs: indications, implications, challenges and future directions

Programas de prehabilitación cardíaca: indicaciones, implicaciones, desafíos y direcciones futuras

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ABSTRACT

Introduction: cardiac prehabilitation programs have emerged as effective multimodal strategies in preparing patients for elective cardiac surgeries. These programs aim to optimize the clinical condition of patients, especially the most vulnerable, reducing risks and improving postoperative outcomes.
Objective: to summarize cardiac prehabilitation programs, analyzing their main indications, clinical benefits, implementation challenges and prospects for future research.
Method: this is a critical narrative analysis based on a review of the current scientific literature on cardiac prehabilitation, focusing on studies that address program components, evidence of effectiveness and implications for clinical practice.
Results: cardiac prehabilitation programs include aerobic and strength training, respiratory muscle strengthening, nutritional support and psychobehavioral interventions. Evidence highlights significant improvements in functional capacity, reduced length of hospital stay, lower incidence of pulmonary complications and increased quality of life, especially among frail elderly patients and patients with comorbidities. Implementation requires careful planning and interdisciplinary action, with emphasis on the central role of nursing.
Conclusion: the integration of cardiac prehabilitation into perioperative protocols represents an opportunity to improve clinical outcomes and the efficiency of health care. Investments in team training, organizational structure and future research are essential to consolidate this approach in clinical practice.

Keywords: Preoperative Exercise; Thoracic Surgery; Exercise Therapy; Nutrition Programs; Information Motivation Behavioral Skills Model.

RESUMEN

Introducción: los programas de prehabilitación cardíaca han surgido como estrategias multimodales efectivas para preparar a los pacientes para cirugías cardíacas electivas. Estos programas tienen como objetivo optimizar la condición clínica de los pacientes, especialmente de los más vulnerables, reduciendo riesgos y mejorando los resultados postoperatorios.
Objetivo: realizar una síntesis sobre los programas de prehabilitación cardíaca, analizando sus principales indicaciones, beneficios clínicos, desafíos de implementación y perspectivas para futuras investigaciones.
Método: se trata de un análisis narrativo crítico basado en una revisión de la literatura científica actual sobre prehabilitación cardíaca, centrándose en estudios que abordan los componentes del programa, la evidencia de efectividad y las implicaciones para la práctica clínica.
Resultados: los programas de prehabilitación cardíaca incluyen entrenamiento aeróbico y de fuerza, fortalecimiento de los músculos respiratorios, apoyo nutricional e intervenciones psicoconductuales. La evidencia destaca mejoras significativas en la capacidad funcional, reducción de la duración de la estancia hospitalaria, menor incidencia de complicaciones pulmonares y mayor calidad de vida, especialmente entre ancianos frágiles y pacientes con comorbilidades. Su implementación requiere una planificación cuidadosa y una acción interdisciplinaria, con énfasis en el papel central de la Enfermería.
Conclusión: la integración de la prehabilitación cardíaca en los protocolos perioperatorios representa una oportunidad

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para mejorar los resultados clínicos y la eficiencia de la atención médica. Las inversiones en formación de equipos, estructura organizativa e investigación futura son esenciales para consolidar este enfoque en la práctica clínica.

Palabras clave: Ejercicio Preoperatorio; Cirugía Torácica; Terapia por Ejercicio; Programas de Nutrición; Modelo de Habilidades de Información Motivación Comportamiento.

INTRODUCTION

The care provided to people undergoing cardiac surgery has become progressively more complex, largely due to the ageing of the population and the increased prevalence of comorbidities, states of frailty and psychosocial problems associated with cardiovascular diseases.[1] In this context, it is imperative to develop strategies to better prepare patients for the perioperative period, in order to minimize the risk of complications and promote a faster and more effective recovery, with nurses being key professionals in the implementation of these interventions.[1,2,3]

Traditionally, cardiac and pulmonary rehabilitation programs have focused on post-event intervention, with a focus on functional recovery after acute episodes such as acute myocardial infarction, stroke or after invasive procedures such as coronary artery bypass grafting or percutaneous coronary intervention.[2,4] However, in recent decades, the concept of prehabilitation has gained prominence, which aims to enhance functional capacity and optimize the risk profile before elective surgery, particularly in the cardiac context.[2]

Prehabilitation is based on the premise that better physical, nutritional and psycho-behavioral preparation of the patient not only allows for greater tolerance to the aggression of surgery, but also for better clinical results in the post-operative period.[3] This concept is thus based on the evidence that patients with greater prior functionality have lower complication rates, faster recovery and better quality of life after surgery.[1,3,4,5]

It is a multimodal intervention, integrating components such as aerobic and strength training, respiratory muscle training, lifestyle modification, control of chronic pathologies (such as diabetes), sleep hygiene and psychoeducation.[1,2,3] These components must be adapted to the individual needs of each patient, based on a comprehensive and interdisciplinary assessment. Recent studies, including systematic reviews and meta-analyses, have shown that cardiac prehabilitation programs are associated with significant improvements in functional capacity, reduced extubation time, lower incidence of pulmonary complications, shorter hospital stays and increased quality of life.[3, 4, 5]

This intervention, when structured in a multimodal and personalized way, proves to be particularly effective in vulnerable populations, such as the elderly, frail people or those with multiple comorbidities. Its implementation requires a coordinated interdisciplinary approach, involving professionals from the fields of nursing, medicine, nutrition, physiotherapy, psychology and social work, among others. [1,3,4,5]

Given that this is an emerging topic, it is important to summarize the knowledge on cardiac prehabilitation. This article aims to summarize cardiac prehabilitation programs, analyzing their main indications, clinical benefits, implementation challenges and prospects for future research.

METHOD

This is a critical narrative analysis based on a search in EBSCO Host, in the CINAHL® Plus, MEDLINE® databases, with the terms (prehabilitation OR prehab OR pre-operative rehabilitation OR peri-operative rehabilitation) AND (interventions OR strategies OR best practices) and articles that addressed cardiac prehabilitation were included, focusing on the program components, evidence of effectiveness and implications for clinical practice.

DEVELOPMENT

After analyzing the articles obtained from the research, we sought to synthesize the following topics: indications and limitations of cardiac prehabilitation; program components, with emphasis on exercise, nutrition and psychobehavioral components. Finally, we conclude with implications for practice and future directions in research.

Prehabilitation programs and their indications and limitations

The multimodal nature of prehabilitation programs, which integrate nutrition, physical exercise and psychobehavioral support components, requires rigorous interdisciplinary planning, involving various health professionals in their design and implementation.[1,3] This complexity can make it impossible to apply these programs in all clinical contexts, particularly in emergency surgical situations. In addition, patients with acute and decompensated cardiovascular, respiratory or metabolic pathology are often excluded from prehabilitation, due to the potential risks associated with exposure to intense physical exertion.[3]

Despite these limitations, the existing data is consistent in showing that prehabilitation programs are particularly beneficial in vulnerable populations, such as the elderly, patients with marked frailty or comorbidities.[1,3] Frailty, as a geriatric syndrome associated with a global physiological decline, is associated with a five times higher risk of serious complications after cardiac surgery, and is also a robust predictor of morbidity and mortality in the first year after surgery.[6]

Reduced functional capacity and physical deconditioning, often observed in the pre- and post-operative period, have a substantial negative impact on the clinical evolution of patients undergoing cardiac surgery, contributing to increased morbidity and mortality and prolonged hospital stays.[1,3,5]

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Eligibility criteria for prehabilitation often include patients with an indication for non-urgent cardiac or valvular surgery, namely those with New York Heart Association Class III syndromes, scheduled for their first coronary bypass surgery at least 10 weeks in advance and an ejection fraction of more than 40 %.[1,3,5]

Prehabilitation can be carried out in a hospital or home setting. The hospital environment offers greater control and professional supervision, as well as access to specialized equipment. On the other hand, home-based programs boost patient compliance and satisfaction, promoting convenience and eliminating constraints associated with transportation.[1]

Physical exercise

Physical exercise is widely recognized as one of the fundamental pillars of cardiac prehabilitation, playing a central role in preparing people for elective cardiac surgery. Its implementation aims to boost overall functional capacity, improve cardiovascular and respiratory efficiency, optimize metabolism and strengthen physical and psychological resilience prior to surgical intervention.[1,3,4,5]

Exercise programs are generally organized into three essential components: aerobic training, muscle strength training and inspiratory muscle training. Aerobic training, often carried out using treadmills, cycle ergometers or monitored walking, is prescribed in an individualized and progressive manner, with intensities between 50 % and 85 % of maximum functional capacity, adjusted according to the person's clinical response and the established therapeutic objectives.[1,3,4] On average, these programs last between two and eight weeks, with supervised sessions twice a week, which can last up to 90 minutes each.[1,3,4] Scientific evidence shows their positive effects on improving cardiorespiratory fitness, reducing the incidence of atrial fibrillation in the post-operative period, reducing the length of hospital stay and promoting a faster return to normal functionality.[4]

Muscle strength training is also of great importance in preventing the deconditioning associated with post-surgical immobilization, which is often exacerbated by the presence of devices such as chest drains, vascular accesses and invasive ventilation. Exercises adapted to the person's functional level are used, using elastic bands, light weights or the person's own body weight, such as wall push-ups, heel raises, sitting and standing movements, bicep push-ups, knee push-ups and tandem walking.[3,4] These practices help to improve balance, reduce the risk of falls, promote autonomy and increase general well-being. The literature points to a reduction in frailty and significant improvements in the distance covered in the six-minute walk test, as well as in functional capacity.[1,3,4,5]

Inspiratory muscle training focuses on strengthening the respiratory muscles, with the aim of preventing pulmonary complications such as atelectasis, pneumonia, pleural effusions, phrenic nerve damage and acute respiratory distress syndrome (ARDS), which are often associated with the postoperative period of heart surgery.[3,4,7] This training includes deep breathing exercises, forced expiration and the use of incentive spirometry or inspiratory resistance devices. It is an effective, safe, low-cost and feasible home-based intervention.[3,4,7] The benefits include a reduction in respiratory complications, the need for reintubation and the length of hospitalization.[3,4,7]

Adherence to exercise programs depends to a large extent on individual motivation, educational support and systematic monitoring by the health team. Setting realistic goals and personalizing routines are strategies that facilitate the person's active involvement in the process. In this context, the role of the nurse is crucial, not only in assessing functional capacity and monitoring response to the program, but also in promoting health literacy, educating people to perform exercises safely and building their confidence in the prehabilitation process.[3,4,7]

The effects of these programs can be assessed using indirect indicators such as the six-minute walk test, the Timed Up and Go test and quality of life questionnaires.[1,3,4,5] A systematic review and meta-analysis published in 2023 showed that exercise-based prehabilitation has a significant impact on improving functional capacity, reducing the length of hospital stay and reducing the risk of atrial fibrillation in people under the age of 65.[4]

Despite the widely documented benefits, many patients are still apprehensive about starting exercise programs in the preoperative period. However, the available evidence is clear as to their safety and effectiveness, especially when the programs are structured, monitored by interdisciplinary teams and person-centered.[3,4,5]

Diet and Nutrition

Nutrition plays a central role in cardiac prehabilitation, directly influencing the inflammatory response, energy metabolism and the ability to recover from surgery.[3,8,9] Nutritional status should be rigorously assessed, allowing us to identify situations of malnutrition, sarcopenia or obesity, all of which are associated with a higher risk of postoperative complications, infections, delayed healing and increased hospitalization time.[3,8,9]

Nutritional intervention should be personalized, including dietary advice, oral supplementation, correction of specific deficits and promotion of food literacy. Early coordination with a nutritionist is essential in cases of high nutritional risk.[10] The combination with physical exercise enhances the effects of prehabilitation, favoring lean mass gain, muscle strength and functional recovery.[3,10]

In the context of cardiac surgery, low body mass indexes are associated with higher mortality and complications, while a BMI between 30 and <40 kg/m² may have a protective effect.[11, 12] Severe obesity (BMI ≥40 kg/m²) is associated with sternal wound infection, renal failure and prolonged need for ventilation.[11, 12]

The Enhanced Recovery After Surgery Society guidelines recommend correcting nutritional deficits and glycemic control preoperatively, although there is still no specific protocol for nutritional optimization in cardiac surgery.[10] Only a few studies have integrated nutritional interventions into cardiac prehabilitation programs, with promising results in terms of function and reducing complications.[13, 14]

Despite the advances, the evidence on micronutrient supplementation remains inconclusive. Some trials report benefits with

antioxidant vitamins and minerals, but the results are not consensual, as demonstrated with intravenous iron supplementation.[15]

The nutritional component of prehabilitation is not limited to clinical intervention. The promotion of healthy eating behaviors, supported by educational actions and training strategies, is in line with the principles of community and public health, as it seeks to reduce inequalities in access to adequate nutrition and promote people's empowerment to make informed choices. This community focus reinforces the importance of linking clinical and community contexts, namely through support networks, outreach programs and public policies that value healthy eating as a structural determinant of cardiovascular health.[16]

Nurses, as privileged agents at the interface between clinical care and the community, play a fundamental role in monitoring nutritional status, signaling risk situations early on and liaising with other professionals to define adapted intervention plans.[16]

In addition to the physiological benefits, nutritional intervention should be seen as an opportunity to develop health literacy and motivation for change, establishing a bridge with the psychobehavioral dimension of prehabilitation, discussed in the following section.[1,3]

Psychobehavioral Component

The third pillar of the multimodal approach to prehabilitation lies in the psychobehavioral component, which aims to prepare the patient emotionally and behaviorally for the surgical process, promoting greater resilience, therapeutic adherence and active participation in care. This component includes interventions such as smoking cessation, anxiety and stress control, sleep management and optimizing family and social support.[1,3]

Smoking cessation is a priority, given its association with a high number of post-operative respiratory complications. Effective strategies include structured psychological support programs, monitoring by specialized professionals and, when necessary, nicotine or pharmacological replacement therapy.[3,17]

Managing preoperative anxiety has been shown to have a positive impact on pain perception, functional recovery and length of hospital stay. Successful interventions include preoperative education, relaxation sessions, cognitive-behavioral techniques, mindfulness and individual or group psychological support. Music therapy has also shown excellent effects in reducing preoperative anxiety, increasing motivation and participation in this type of program such as prehabilitation.[18] Programs that involve family members or close caregivers further enhance the emotional and motivational benefits.[3,19]

Promoting sleep hygiene is also a relevant area, given the association between sleep deprivation and worse surgical outcomes. Simple strategies, such as regulating bedtimes, reducing exposure to screens before bed and adopting calming routines, can be integrated into preoperative preparation.[1]

Health literacy is another crucial aspect. Informed patients feel safer, understand the therapeutic plan better and adhere more easily to the healthcare team's recommendations.[16] Clear, empathetic and culturally sensitive communication is therefore fundamental to the success of the psychobehavioral component of prehabilitation. In this process, the importance of the therapeutic relationship between the nurse and the patient stands out, marked by empathy, active listening and continuous emotional support, as facilitators of psychological adaptation and commitment to behavioral change.[3,16]

In short, integrating the emotional and behavioral dimension into surgical preparation contributes to a truly person-centered approach, favoring not only improved clinical outcomes, but also the patient's overall experience.[1,3]

Implications and future directions

The growing evidence on the clinical, functional and psychosocial benefits of prehabilitation fully justifies its systematic integration into perioperative care programs, particularly cardiac rehabilitation protocols. This integration must be structured and sustained, based on standardized protocols that can be adapted to the individual needs of patients and supported by an interdisciplinary, person-centred approach.[1,3]

The design and implementation of multimodal programs must include physical exercise components (aerobic, muscle strengthening and respiratory training), individualized nutritional intervention and psychobehavioral strategies aimed at sustained smoking cessation, body mass index control, anxiety management, improving sleep quality and promoting family involvement.[1,3]

Due to their proximity and holistic view of the person being cared for, nurses are particularly well placed to coordinate prehabilitation interventions, reinforcing patient empowerment and continuity of care. Their role is especially relevant in leading community programs, assessing perioperative risk, monitoring patient progress and coordinating the different professionals involved, becoming a structural link in the interdisciplinary team.[16]

To ensure the effectiveness of these interventions, it is necessary to adopt a differentiated approach according to the risk profile and characteristics of each patient. Thus, the prescription of exercises must comply with validated safety and efficacy criteria, smokers must benefit from structured smoking cessation programs that combine psychological, educational and pharmacological approaches, and patients with diabetes must be subject to strict preoperative glycemic control, coordinated with the medical and nutritional team.[1,3,5,10,17,19]

In addition, cases of malnutrition or excess weight require early and intensive nutritional interventions, using specialized advice and, whenever necessary, specific supplementation. These strategies help to optimize patients' nutritional and immune status, increasing their ability to recover and reducing post-operative risks.[3,8,9,10,11]

Implementing prehabilitation on a large scale also requires the development of institutional and public health policies that recognize its preventive and therapeutic value. The allocation of human and material resources, ongoing training for health teams and the creation of collaborative networks between hospital and community institutions are indispensable conditions for the sustained success of this approach.

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From a research point of view, more evidence is needed on the cost-effectiveness of prehabilitation, as well as its applicability in different age groups, socio-cultural contexts and clinical profiles. Standardizing eligibility criteria, intervention protocols and evaluation indicators will strengthen the external validity of studies and facilitate their translation into clinical practice.

In short, prehabilitation should be seen not just as preparation for surgery, but as an opportunity to transform the therapeutic path, promoting autonomy, empowerment and quality of life for people undergoing surgery. Its systematic integration into healthcare represents a paradigmatic evolution, in line with the principles of preventive medicine, patient safety and the humanization of care.

CONCLUSION

Cardiac prehabilitation programs represent an innovative approach, supported by scientific evidence, with significant potential to improve the clinical outcomes of patients undergoing elective cardiac surgery. By promoting the optimization of physical, nutritional and psychosocial condition prior to surgery, prehabilitation contributes to the reduction of post-operative complications, shorter hospital stays and improved quality of life for patients.

BIBLIOGRAPHICAL REFERENCES

1. McCann M, Stamp N, Ngui A, Litton E. Cardiac prehabilitation. J. Cardiothorac. Vasc. Anesth. 2019 Aug 1;33(8):2255-65. https://doi.org/10.1053/j.jvca.2019.01.023

2. Myers J, Niebauer J, Humphrey R. Prehabilitation coming of age: implications for cardiac and pulmonary rehabilitation. J. Cardiopulm. Rehabil. Prev. 2021 May 1;41(3):141-6. https://doi.org/10.1097/HCR.0000000000000574

3. Bargnes III V, Davidson S, Talbot L, Jin Z, Poppers J, Bergese SD. Start strong, finish strong: a review of prehabilitation in cardiac surgery. Life. 2024 Jun 29;14(7):832. https://doi.org/10.3390/life14070832

4. Steinmetz C, Bjarnason-Wehrens B, Walther T, Schaffland TF, Walther C. Efficacy of prehabilitation before cardiac surgery: a systematic review and meta-analysis. Am. J. Phys. Med. Rehabil. 2023 Apr 1;102(4):323-30. https://doi.org/10.1097/phm.0000000000002097

5. Yau DK, Underwood MJ, Joynt GM, Lee A. Effect of preparative rehabilitation on recovery after cardiac surgery: a systematic review. Ann. Phys. Rehabil. Med. 2021 Mar 1;64(2):101391. https://doi.org/10.1016/j.rehab.2020.03.014

6. Sepehri A, Beggs T, Hassan A, Rigatto C, Shaw-Daigle C, Tangri N, Arora RC. The impact of frailty on outcomes after cardiac surgery: a systematic review. J Thorac Cardiovasc Surg. 2014 Dec 1;148(6):3110-7. https://doi.org/10.1016/j.jtcvs.2014.07.087

7. Wang J, Li H, Yan W, Xue N, Yin J, Yin S. Prehabilitation Interventions for Cardiac Surgery to Prevent Postoperative Pulmonary Complications: Systematic Review and Meta-Analysis. Iran. J. Public Health. 2024 Oct;53(10):2167. https://doi.org/10.18502/ijph.v53i10.16683

8. Damluji AA, Alfaraidhy M, AlHajri N, Rohant NN, Kumar M, Al Malouf C, Bahrainy S, Ji Kwak M, Batchelor WB, Forman DE, Rich MW. Sarcopenia and cardiovascular diseases. Circulation. 2023 May 16;147(20):1534-53. https://doi.org/10.1161/CIRCULATIONAHA.123.064071

9. He N, Zhang Y, Zhang L, Zhang S, Ye H. Relationship between sarcopenia and cardiovascular diseases in the elderly: an overview. Front. Cardiovasc. Med. 2021 Dec 9;8:743710. https://doi.org/10.3389/fcvm.2021.743710

10. Engelman DT, Ali WB, Williams JB, Perrault LP, Reddy VS, Arora RC, Roselli EE, Khoynezhad A, Gerdisch M, Levy JH, Lobdell K. Guidelines for perioperative care in cardiac surgery: enhanced recovery after surgery society recommendations. JAMA surg. 2019 Aug 1;154(8):755-66. https://doi.org/10.1001/jamasurg.2019.1153

11. Ding CY, Qi WH, An YJ, et al. The effect of body mass index on short-term outcomes in patients undergoing off-pump coronary artery bypass grafting surgery: a retrospective study from a single cardiovascular center. J Cardiothorac Surg.2024;19:86. https://doi.org/10.1186/s13019-024-02586-1

12. Lv M, Gao F, Liu B, Pandey P, Feng Y, Wang Y, Zhang Y, Li Z. The effects of obesity on mortality following coronary artery bypass graft surgery: a retrospective study from a single center in China. Med Sci Monit. 2021 Apr 27;27:e929912. https://doi.org/10.12659/MSM.929912

13. Hartog J, Mousavi I, Dijkstra S, Fleer J, van der Woude LHV, van der Harst P, Mariani MA. Prehabilitation to prevent complications after cardiac surgery: a retrospective study with propensity score analysis. PLoS One. 2021 Jul 16;16(7):e0253459. https://doi.org/10.1371/journal.pone.0253459

14. Cheung HHT, Yau DKW, Chiu LCS, Wong MKH, Yeung SSY, Underwood MJ, Wong RHL, Joynt GM, Lee A. Effect of prehabilitation-related dietary protein intake on quality of recovery after elective cardiac surgery (DIETQoR) study: protocol of a randomised controlled trial. BMJ Open. 2023 Jul 20;13(7):e069528. https://doi.org/10.1136/bmjopen-2022-069528

15. Liu HM, Tang XS, Yu H, Yu H. The efficacy of intravenous iron for treatment of anemia before cardiac surgery: an updated systematic review and meta-analysis with trial sequential analysis. J Cardiothorac Surg. 2023 Jan 11;18(1):16. https://doi.org/10.1186/s13019-023-02119-2

16. Graça G, Nascimento MJ, Matias S, Sousa L, Mestre R, Valido S. Risk factors in epidemiology and the intervention of nurses specializing in community nursing. AG Salud. 2025;3:225. https://doi.org/10.62486/agsalud2025225

17. Califf RM, King BA. The need for a smoking cessation "care package". Jama. 2023 Jan 17;329(3):203-4. https://doi.org/10.1001/jama.2022.24398

18. Lu G, Jia R, Liang D, Yu J, Wu Z, Chen C. Effects of music therapy on anxiety: A meta-analysis of randomized controlled trials. Psychiatry Research. 2021 Oct;304:114137. https://doi.org/10.1016/j.psychres.2021.114137

19. Rouleau CR, Chirico D, Hauer T, Kidd W, Arena R, Aggarwal SG. An observational study examining utilization of prehabilitation and its association with postoperative cardiac rehabilitation participation and risk factors following coronary artery bypass grafting. Int. J. Cardiol. 2022 Sep 1;362:28-34. https://doi.org/10.1016/j.ijcard.2022.05.006

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