

NURSING CLINICAL PRACTICE IN MECHANICAL CIRCULATORY SUPPORT: SEARCH FOR EVIDENCE

Prática clínica do enfermeiro em assistência circulatória mecânica: busca de evidências
La práctica clínica de enfermería en soporte circulatorio mecánico: búsqueda de pruebas

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ABSTRACT: Objective: To analyze the scientific literature regarding the clinical practice of nurses in patients using mechanical circulatory support. **Method:** Integrative literature review was conducted from the databases of SciELO, Cochrane Library, PubMed, and LILACS, from April to August 2014. **Results:** Although there is a progress in the research on this topic, there are only few studies, of which eight articles were selected. Three articles point out the need of the nurses to detain knowledge about mechanical circulatory support for an effective and good service. Two articles approached the nursing care in patients using device. Three studies reported complications because of the use of intra-aortic balloon pump and showed that complications can be minimized through training and periodic clinical assessment of the nurse. **Conclusion:** There are only few articles that focused on nursing care; therefore, there is a need to further explore this theme to subsidize the practice based on scientific evidence.

Keywords: Nursing. Heart failure. Heart-assist devices. Assisted circulation.

RESUMO: Objetivo: Analisar na literatura científica a prática clínica do enfermeiro ao paciente em uso de assistência circulatória mecânica. **Método:** Revisão integrativa da literatura realizada nas bases de dados SciELO, Cochrane Library, PubMed e LILACS, de abril a agosto de 2014. **Resultados:** Embora haja avanço em pesquisas sobre o tema, ainda há poucos estudos, haja vista oito artigos selecionados. Três artigos apontam para a necessidade do enfermeiro deter o conhecimento sobre assistência circulatória mecânica, para uma assistência eficiente e com qualidade. Dois artigos trouxeram a assistência de enfermagem a pacientes em uso de dispositivos. Três relataram complicações devido ao uso do balão intra-aórtico e mostraram que as complicações podem ser minimizadas a partir da capacitação e da avaliação clínica periódica do enfermeiro. **Conclusão:** Há poucos estudos direcionados à assistência de enfermagem, havendo a necessidade de maior exploração do tema para subsidiar a prática baseada em evidências científicas.

Palavras-chave: Enfermagem. Insuficiência cardíaca. Coração auxiliar. Circulação assistida.

RESUMEN: Objetivo: Analizar en la literatura científica la práctica clínica de las enfermeras a los pacientes utilizándose del soporte circulatorio mecánico. **Método:** Revisión integradora de la literatura conducida en las bases de datos SciELO, *Cochrane Library*, PubMed y LILACS, desde abril hasta agosto de 2014. **Resultados:** Aunque hay avances en la investigación sobre el tema, hay pocos estudios, con solo ocho artículos seleccionados. Tres artículos apuntan a la necesidad de las enfermeras detener los conocimientos sobre soporte circulatorio mecánico para el servicio eficiente y de calidad. Dos artículos presentaron la atención de la enfermería a los pacientes que utilizan dispositivos. Tres estudios informaron complicaciones por la utilización de balón intra-aórtico y mostraron que las complicaciones pueden reducirse al mínimo basándose en la formación y la evaluación clínica periódica de la enfermera. **Conclusión:** Hay pocos estudios con foco en la atención de la enfermería, y una necesidad de una mayor exploración del tema, para subsidiar la práctica basada en evidencias científicas.

Palabras clave: Enfermería. Insuficiencia cardíaca. Corazón auxiliar. Circulación asistida.

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INTRODUCTION

Recognized by its high rate of morbidity and mortality, heart failure (HF) is a clinical syndrome in which there is a functional or structural change of the heart that results in a dysfunction in the ejection or accommodation of blood within physiological pressure values¹.

This syndrome has a high incidence and prevalence worldwide, thus resulting in two million cases every year with decrease in quality of life². It has been estimated that 1 to 2% of the population presents HF in developed countries; and in Europe, in about ten million people, this diagnosis is associated with ventricle dysfunction^{1,2}.

In Brazil, around 6.4 million subjects have an HF condition, which was the main cause of hospitalization in patients aged above 60 years and the third cause of hospitalizations in the Brazilian Unified Health System (SUS, acronym in Portuguese) in the year of 2007³. Hospitalization costs because of HF result in 60% of the total cost of treatment for this syndrome³.

Ventricle remodeling (structural, biochemical, molecular, and cellular changes)^{4,6} happens throughout the years, which can be made reversible by using devices of mechanical circulatory support (MCS) that provide a reverse remodeling⁷.

The use of such devices was proven to be efficient, when compared with the clinical treatment, in a prospective and randomized study named Rematch⁸. This investigation was carried out in 129 patients, who were submitted to the left ventricle support device, and who presented HF without indication for heart transplantation or refused to undergo the procedure. As a result, a better evolution in the patients using the device, that is, destination therapy, was observed, compared with those patients who underwent a clinical treatment exclusively.

When this circulatory support is used as a temporary support in a myocardium considered viable, it is referred as "bridge to recovery." However, if the myocardium is unrecoverable and heart transplantation is crucial, circulatory support is referred as "bridge to transplantation", and if heart transplantation is not indicated or the patient refuses to undergo the procedure, it is referred as "destination therapy"⁹.

This kind of treatment aims at reestablishing hemodynamics, improving symptoms by means of the increase of organ perfusion, preventing myocardial lesion, and improving patients' functional capacity^{10,11}.

Thus, the devices for HF treatment associated with ventricle dysfunction have been increasingly used as a bridge to heart transplantation in patients with myocardial failure,

besides being used in the myocardial readaptation, restoration of cardiac output, acute cardiomyopathy, acute myocardial infarction, postcardiotomy cardiogenic shock, infectious myocarditis, and transplantation rejection⁹. In most of the times, the patient who has undergone a heart surgery (myocardial revascularization, valve repair, corrective surgery, heart transplant) needs cardiopulmonary deviation using the extracorporeal circulation (CEC) machine. However, one of its complications is the difficulty in weaning off the CEC, the patient presents low cardiac output, intraoperative HF, and thus he or she needs to insert a MCS inside the operating room to improve the cardiac output⁹.

Therefore, perioperative nurses should seek technical and scientific improvement to guide their actions regarding the use of these devices, to provide more safety to the critical patient, and to improve the quality of the provided service, because implementation and removal of devices can be done inside the operating room.

The MCS devices can be classified in several ways, as seen in Chart 1^{8,9,11}.

HF is a public health issue and because of its clinical and epidemiological aspects, as well as the tendency of searching for alternatives to treat HF and preserve life, this study is necessary to subsidize a safe nursing care in the operating room, in the postanesthetic recovery, and in the intensive care unit, and, as a consequence, to reduce the probability of adverse effects.

OBJECTIVE

To analyze the scientific literature for nursing clinical practice while using the MCS in the patients.

Chart 1. Classification of devices of the mechanical circulatory support.

Classification according to	Device
Flow type:	
Counterpulsation	Intra-aortic balloon pump
Continuous	Roller, centrifuge, and axial
Pulsatile	Pneumatic and electric
Position in relation to the heart	Series or parallel
Assisted ventricle	Right, left, or biventricular
Grade of ventricle replacement	Total or partial
Position in relation to the patient	Para-corporeal or implantable
Period of permanence	<30 days – short duration 30 days to 1 year – medium duration >1 year – long duration

METHOD

This is an integrative review that followed the following steps: elaboration of the guiding question and objective for the integrative review; establishment of criteria to include and exclude studies (sampling); definition of information to be removed from the selected studies (study categorization); evaluation of the studies included in the integrative review; interpretation of results; and presentation of the results (knowledge synthesis)¹².

The guiding question used as basis for this integrative review was: What is the scientific production regarding the nursing clinical practice in patients using the MCS?

In the literature review, the Scientific Electronic Library Online (SciELO), Cochrane Library, *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) through the Health Virtual Library (BVS), and PubMed databases were consulted from the period of April 2014 to August 2014.

Based on the Medical Subject Headings (MeSH), the keywords used were nursing, heart failure, heart-assist device, ventricle assist device, and based on the *Descritores em Ciências da Saúde* (DeCS): *insuficiência cardíaca, coração auxiliar, circulação assistida* (in Portuguese). The PubMed and Cochrane Library databases used the keywords according to MeSH. On the other hand, SciELO used them according to MeSH and DeCS. In both the cases, the Boolean operator “AND” was used, thus applying all the possible combinations among the keywords.

The inclusion criteria were original articles in Portuguese, English, and Spanish languages published in the period from 2005 to 2014; studies in humans, adults (older than 19 years old), and elderly; both genders; systematic reviews; controlled randomized studies, quasi-experimental outline studies; and studies that portrayed interventions, guidelines, or procedures of nursing interventions in MCS.

The exclusion criteria included articles that were not available for full reading, and dissertations and theses.

In the first step, a search was done in the databases and the studies that met the objectives of this study were chosen, based on reading the titles and abstracts.

A total of 1,413 studies were found: 900 from PubMed, 391 from Cochrane, 114 from LILACS, and 8 from SciELO. Of these, 742 were not available electronically and 62 were repeated. In addition, only few articles met the all inclusion criteria; therefore, only 13 of them were included: 5 from LILACS, 7 from PubMed, and 1 from SciELO. Of these, five were repeated, so only eight articles were included in this study.

After choosing and reading the articles, an adapted instrument¹³ of collection was used to gather the collected data

comprising the following items: identification data of the original article (title, country, language, year of publication, study institution, journal), study methodological characteristics (type, objective), evaluation of methodology, measured interventions, and results obtained.

Two independent reviewers analyzed the studies. When both reviewers disagreed about the inclusion of a study, a third nurse reviewer was requested to intervene. The reviewers were not blind.

A scientific evidence level by kind of study was used from the Oxford Center for Evidence-based Medicine (CEBM) to classify the articles¹⁴.

RESULTS

Eight articles were selected: two were published in 2013, two in 2012, one in 2011, two in 2009, and one in 2006. With regard to the publication location, two were from Brazil and six were from the United States. One study was published in the *AORN Journal*, one in the *AACN Advanced Critical Care*, one in the *Heart Lung*, three in the *Progress in Transplantation*, one in the *Revista Latino-Americana de Enfermagem*, and one in the *Acta Paulista de Enfermagem*.

All investigations had evidence level 5, which is a score for low scientific evidence.

To obtain a clearer analysis of the articles^{10,15-19} that met the inclusion criteria, Table 1 shows the chosen articles with their titles, name of authors, studied interventions, results, and conclusions.

DISCUSSION

Although there have been advances in the investigations regarding MCS, there are only few studies related to nursing, given the number of articles chosen for this integrative review.

Oppositely, studies^{10,15-19} point out the growing participation of nurses in the MCS care. A study¹⁶ emphasized the increasing presence of nurses in the MCS programs in the United States, which is in agreement with another study¹⁸ that pointed out the responsibilities, functions, and procedures performed by these professionals.

Among the eight selected studies, three studies (37.5%)^{15,17} point out the need of knowledge by the nurses on the used MCS to achieve good and faster results for both the patients and the multiprofessional team. It is worth mentioning that in one of the

Table 1. Synthesis of the selected articles for this integrative review.

Article title	Authors	Studied Interventions	Results	Conclusions
Gastrointestinal bleeding in patients with assist devices: what every cardiac nurse should know ¹⁰	Ballew CC, Surrat JF, Collins TL, Shah N	Possible causes, the group of diagnosis procedures, and treatments for gastrointestinal bleeding	Incidence of 13 to 44% of patients using ventricle support devices. Bleeding is present when using the continuous-flow device compared with the pulsatile one. Risk factor: advanced age. Treatment: cauterization, epinephrine injection, metal clips, bandages, or plasma use	The ventricle support devices are successful treatments at long term; however, there are some limitations for caregivers, patients, and family, as these patients, many times, have risk factors for bleeding.
Monitoring patients with continuous-flow ventricular assist devices outside of the intensive care unit: novel challenges to bedside nursing ¹⁵	O'Shea G, Teuteberg JJ, Severyn DA	Describe the function of continuous-flow devices and how they affect the function of monitoring options, and how to clinically assess to quickly identify those whose condition might deteriorate	Despite all the technological advances, the most important monitoring device is still the "bedstead nurse."	The condition of each patient should be assessed according to their clinical records, and data follow-up is an additional piece of information to analyze
Practice pattern and professional nurse practitioners in mechanical circulatory support programs in the United States: a survey report ¹⁶	Casida JM, Pastor J	Practice pattern and professional issues faced by nursing in the development of mechanical circulatory support programs in the United States	Most of the nurses were experts in heart surgery or intensive care, but not in transplant; 90% of the nurses were authorized to prescribe medications and procedures and 64% were authorized to provide hospital discharge; 96% of the nurses characterized it as a stressful work. Many of them pointed out lack of knowledge of evidence-based practice or guidelines. Only 2 of the 48 interviewed subjects mentioned being satisfied with such work.	Although the results are preliminary, data extended the existing information of this important group of nursing professionals, thus providing a script for future investigations and development of relevant policies for MCS programs in the United States
<i>Complicações do balão intra-aórtico em uma coorte de pacientes hospitalizados: implicações para a assistência de enfermagem</i> ¹⁷	Assis RBS, Azzolin K, Boaz M, Rabelo ER	Complications because of IAB use by relating them to permanence time, to the presence of risk factors/ comorbidity, and nursing records	The mean of permanence with the IAB was 28 hours; 25% of the patients presented vascular complications. The male gender presented more complications. The higher the number of hours with the IAB, the higher the number of complications. Only 68.3% of the medical records reported using catheters. Only 28.8% of them presented an evolution, thus describing the presence of device, and 26.9% reported patient's conditions after their discharge.	The most frequent complications were vascular-related ones. Patients with more than 37 hours using the device presented more complications. The occurrence of complications might be minimized through periodical clinical evaluation and lab monitoring.
A survey of nurses in the mechanical circulatory support programs in the United States ¹⁸	Casida JM, Ilacqua J	Role of nurses in mechanical circulatory support programs in the United States	A total of 63% of the registered nurses were not trained. More than 62% of their jobs were destined to direct care to the patients and their caregivers. Less than half of the participants needed to complete the basic or advance life support. A total of 71% of the nurses obtained their knowledge through informal means. The most common function in the job was care coordination. Both APN and RN work as educators in the entire health service; 96% of the RN sees an improvement in the patient's quality of life, whereas only 90% of the APN referred it.	Regardless of the nurses' level of autonomy in the clinical practice, they are consultants, educators, investigators, and leaders, besides coordinating patient care.

Continue...

Table 1. Continuation.

Article title	Authors	Studied Interventions	Results	Conclusions
<i>Validação de protocolo para assistência a pacientes com balão intra-aórtico</i> ¹⁹	Machado RC, Guerra GM, Branco JNR	Develop a care protocol for patients with IAB and to validate the content of this protocol	Thirty-six items were assessed, which were focused on the care of the patients using the IAB. In the end, a protocol with 22 items was developed approaching since the patient and family's education to the performance of the procedure and care until his/her discharge.	A protocol with 22 items was prepared with regard to care for the patients using IAB
Intra-aortic balloon pump therapy: a primer for perioperative nurses ²⁰	Tremper RS	Use of an intra-aortic balloon pump in the perioperative period	Shows indications, contraindications, and complications, perioperative use, manipulation and console setting, and physiology	Having knowledge about IAB allows nurses to anticipate the surgical staff needs and improve patients' results
Ventricular assist devices: what intensive care unit nurses need to know about postoperative management ²¹	O'Shea G	Strategies of nursing management in the postoperative period and the most important complications that critical care nurses need to know	Nurses should pay attention to monitoring, hemorrhage, right ventricle dysfunction, heart tamponing, cannula obstruction, dysrhythmias, secondary organic dysfunction, hemolysis, respiratory and neurological dysfunction, infection, mechanical failures, and thrombosis.	Indicates the need of knowledge by the nurses, and this device improves quality of life compared with drug therapy; however, it presents risks and complications

IAB: intra-aortic balloon; NAP: nurses of advanced practices; RN: registered nurses; MCS: mechanical circulatory support.

investigations¹⁸, 75% of the nurses working with the MCS program in the United States had been trained on device handling; however, most of the nurses learned about it through informal means (out of job). Studies showed that nurses should be trained regarding indications, benefits, risks, and possible complications associated with these therapeutics; thus, emphasizing as the care strategy the accurate physical examination^{16,17,19}.

Two articles (25%) analyzed the nursing care in the patients using the ventricle support device^{10,15} and showed the challenges faced by nurses, especially when the continuous flow equipment is used, as it is not possible to measure the hemodynamic parameters through the traditional invasive methods. Thus, the professionals must be qualified to identify the complications of these devices — such as, gastrointestinal bleeding, which have not been found a cause yet. Therefore, the institution should provide resources, for example, the use of a Doppler ultrasound to check the blood pressure.

Three studies (37.5%)^{10,17,19} analyzed the use of an intra-aortic balloon pump (IAB) and showed that complications can be minimized with nurse's qualification and periodic clinical evaluation. A study¹⁹ pointed out that only 28.8% of the 104 medical records showed an evolution describing the use of IAB, and 26.9% reported, after device removal, the patient's conditions; thus, this lack of information in the records might be associated with the technical and administrative attributions, as well as with the number of patients to be cared. This is in agreement with one of the studies chosen for this integrative review¹⁶,

which explored the excessive attributions and responsibilities in this group of professionals. In addition, 96% of the nurses characterized the job as stressful and mentioned the lack of institutional support and lack of professional acknowledgment, as only 2 (4.16%) of the 48 interviewed nurses reported being satisfied with their occupation.

One of these studies emphasized the importance of the operating room nurses having basic knowledge about IAB, because they were in charge of solving problems of the device. It also described in details the activities conducted by the nurses in all stages of the procedure (preparation of material/equipment, implementation of device, and removal), as well as indications, contraindications, and complications of this complex therapy. Such complications might be a result from infections, limb ischemia, balloon rupture, bleedings, paraplegia, or abdominal pain caused by the occlusion of the mesenteric artery¹⁹.

Most of the complications seen in the studies presented in this review^{10,14,15,17} could be minimized or avoided using protocols, as they guide clinical procedures, flows, and conducts, thus increasing the probability of good results^{17,18}.

A study¹⁹ developed a care protocol for the patient using IAB, which is indicated for supporting or rehabilitating the coronary flow. This protocol aimed at decreasing the risk factors of the therapeutics and providing evidence for the nurse's clinical practice. A total of 22 items can be highlighted related to IAB patient's care, such as fulfillment of

the system transducer with heparin, skin antiseptics in the area where the device is inserted with chlorhexidine at 2%, patient in horizontal supine position after inserting the device with the limb restricted to avoid flexion and prevent flow obstruction and hematomas, periodical evaluation of the limb, manual compression of the place after device removal, and compressive dressing¹⁹. Thus, it provides subsidies so that the nurse can offer interventions aiming at a quality care to the critical patient.

The growing presence of critical patients in the operation center shows the need of nurses with technology skills to take care of these complex therapies, besides the magnitude of the responsibility of these professionals.

Thus, to obtain professional training, quality care, and, consequently, better results in the patients using MCS devices, we should focus our view on the nursing process systematization that allows developing methodologies for interdisciplinary care, thus guiding the nursing work process²².

CONCLUSION

There are only few studies that focused on nursing care; therefore, more exploration of this theme is necessary to subsidize scientific evidence-based practice. Only two studies provided notes on the nurse's clinical practice in MCS. The others emphasized the need of knowledge and the importance of updating it by the nurses to provide a quality care. Thus, most of the nurses who are involved in the MCS practice acquire their knowledge during their professional routine.

In addition, the article emphasizes that institutions need to work with care methodologies and protocols, because they are the most important achievements in the nursing care with the aim of obtaining more professional training, better quality care, optimization of work time, and institutional planning to provide resources for the professionals.

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