ORIGINAL MANUSCRIPT

Influence of Early Ambulation in Postoperative Hospitalization Following Cardiac Surgery

André Luiz Lisboa Cordeiro[1], Thiago Araújo de Melo[2], Alina Ávila[3], Mateus Souza Esquivel[4], André Raimundo França Guimarães[1], Daniel Lago Borges[5]

[1]*Instituto Nobre de Cardiologia/Santa Casa de Misericórdia – Unidade de Terapia Intensiva – Feira de Santana, BA – Brazil*
[2]*Universidade Salvador – Hospital Aliança – Unidade de Terapia Intensiva – Salvador, BA – Brazil*
[3]*Faculdade Nobre de Feira de Santana – Feira de Santana, BA – Brazil*
[4]*Grupo de Pesquisa em Fisioterapia Cardiovascular – Salvador, BA – Brazil*
[5]*Universidade Federal do Maranhão – Hospital Universitário – Unidade de Terapia Intensiva – São Luís, MA – Brazil*

Abstract

Background: Despite the technological advances aimed to extend the quality of life of patients undergoing cardiac surgery, such procedure is still deemed a highly complex intervention. Early ambulation is an alternative to improve lung capacity, cardiovascular fitness and increased functional performance.
Objective: Assess the impact of early ambulation on the length of stay in intensive care unit (ICU) and in hospital, for patients undergoing cardiac surgery.
Methods: Cross-sectional study of 49 patients undergoing cardiac surgery and admitted to the ICU from October 2014 to April 2015. Patients were stratified into two groups: with and without early ambulation. Early ambulation is the act of walking up to the third day of ICU admission. Statistical analysis performed to check for changes in the length of stay in ICU and in hospital between the two groups of ambulation.
Results: The study observed 49 patients (55.1% men) with mean age of 55.2±13.9 years, admitted to the ICU due to cardiac surgery carried out during the study period. No statistical correlation was found between early ambulation and the length of stay in cardiac ICU (3.0±1.5 days vs. 2.8±1.1 days, p=0.819) and in hospital (5.4±3.3 days vs. 5.3±2.6 days, p=0.903).
Conclusion: Early ambulation is not related to a shorter length of stay in ICU or in hospital.

Keywords: Early ambulation; Intensive care unit; Cardiac surgery; Physiotherapy; Intensive care

Introduction

Heart disease has one of the highest mortality rates in the world. According to DATASUS[1], in January 2014 Brazil reported a mortality rate of 10.20% related to acute myocardial infarction (AMI) and heart failure (HF) on an emergency basis. From January to June 2008, 10,652 coronary artery bypass grafting and/or valve replacement surgeries were held in Brazil[1]. Despite the technological advances aimed to extend the quality of life of patients undergoing cardiac surgery, such a highly complex procedure favors the emergence of peripheral and lung function changes[2].

Among the most common respiratory complications are atelectasis, pneumonia, pleural effusion, pulmonary edema, pulmonary embolism, phrenic nerve injury, pneumothorax, acute respiratory failure and prolonged mechanical ventilation[3]. Some factors can influence the onset of pulmonary disorders, such as prior pulmonary disease, presence of cardiopulmonary bypass (CPB), general anesthesia, pleural drains, and duration of mechanical ventilation[2,3].

Oliveira et al.[4] reported that reduced cardiorespiratory capacity is negatively influenced by postoperative

Corresponding author: André Luiz Lisboa Cordeiro
Rua Japão, 94 – Caseb – 44052-022 – Feira de Santana, BA – Brazil
E-mail: andrelisboacordeiro@gmail.com

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ABBREVIATIONS AND ACRONYMS

- *AMI – acute myocardial infarction*
- *AVR – aortic valve replacement*
- *CABG – coronary artery bypass grafting*
- *CPB – cardiopulmonary bypass*
- *CS – cardiac surgery*
- *HF – heart failure*
- *ICU – intensive care unit*
- *MVR – mitral valve replacement*
- *PO – postoperative*

physical inactivity associated with prolonged bed rest, that generates loss of muscle strength and physical fitness. Therefore, the physiotherapist is key in the pre- and postoperative phases, acting preventively to minimize and reverse these complications[3,5].

According to Brawnwald et al.[6], in the absence of complications the patient should not remain restricted to bed, but try some exercises, such as stationary gait training, sedestation in chair, and early ambulation.

Early ambulation is encouraged up to the third postoperative day (PO) of the cardiac surgery (CS) still in the intensive care environment, thus contributing as adjunctive therapy for prophylaxis of pulmonary and circulatory complications[5]. Morris et al.[7] have shown that early mobilization protocol is feasible, safe and does not increase costs, contributing directly to the reduced length of stay in hospital, although this outcome has been little investigated in PO of CS[3,4].

Therefore, the aim of this study was to assess the impact of early ambulation on the length of stay in intensive care unit (ICU) and in hospital, for patients undergoing cardiac surgery.

Methods

Cross-sectional study carried out in the city of Feira de Santana, state of Bahia, from October 2014 to April 2015. The study population consisted of patients aged >18 years, of both genders, undergoing cardiac surgery (coronary artery bypass grafting, aortic and/or mitral valve replacement, atrial septal defect correction) and admitted to the ICU.

Patients with angina; dyspnea at rest; pallor with sweating; acute arrhythmia; gait dysfunction prior to hospital admission; temporary or permanent cognitive impairment; and those without medical clearance for the procedure were excluded from the study. Such exclusion criteria were established since they are elements that contraindicate ambulation.

The study was approved by the Committee for Ethics in Research of Faculdade Nobre in Feira de Santana, state of Bahia, under No. 796 580. All patients signed the Informed Consent Form.

The study population was stratified in groups (with and without ambulation) by daily screening carried out by an independent examiner, considering all patients undergoing cardiac surgery according to the application of predefined inclusion and exclusion criteria. All patients were monitored to check their length of stay in cardiac ICU and in hospital. No researcher influenced the decision on patient's ambulation. Such decision was exclusive to the physiotherapist and the medical staff.

The reasons for contraindication to ambulation and maintenance of bed restriction for the group without ambulation were recorded. Patients undergoing ambulation were monitored one minute before walking and one minute after walking in respect of: heart rate; respiratory rate; systolic, diastolic and mean blood pressure; oxygen peripheral saturation. The multiparameter monitor Dixtal DX 2010 (Dixtal Biomédica Ind. Com. Ltda, Manaus, Brazil) was used in this procedure. The physiotherapist interrupted ambulation in the event of adverse effects, e.g. desaturation, restlessness, dizziness, paleness and sweating, reporting the occurrence to the physician on duty. These adverse effects were registered in the medical record of patients, hence available to researchers.

The patients remained in the ICU until reaching clinical and hemodynamic stability, and were discharged after a joint decision between the staff on duty and the physician on day shift of the unit. The length of stay as from PO was registered at hospital discharge, excluding the pre-operative period.

The Shapiro-Wilk test was applied to identify the normality of groups under study. Quantitative variables were expressed as mean±standard deviation, and their differences verified by the Student t test or Mann-Whitney test. Qualitative variables were expressed as proportions, and their differences tested by Fisher's exact test. The results were considered statistically significant at $p<0.05$.

Results

The study observed 49 patients (55.1% men) with mean age of 55.2±13.9 years, admitted to the ICU of Instituto Nobre de Cardiologia/Santa Casa de Misericórdia em Feira de Santana, BA - Brazil. Table 1 shows the patients' characteristics.

No relevant difference was observed between the two groups of patients — with and without ambulation — against the length of stay in ICU (3.0±1.5 days vs. 2.8±1.1 days, p=0.819) (Figure 1) and in hospital (5.4±3.3 days vs. 5.3±2.6 days, p=0.903) (Figure 2).

The most common cause for restriction to ambulation was related to clinical reasons presented by the physician on duty: changes in clinical laboratory examinations or ECG at rest: 14 (41.1%) patients; use of vasoactive medications in high flow (above 2 mg/kg): 18 (52.9%) patients; insufficient time for this approach: 2 (6.0%) patients. It is worth highlighting the absence of any adverse event among patients undergoing ambulation.

It is believed that the increased possibility for the lack of correlation between ambulation and the length of stay in ICU and in hospital has been given by the quantitative difference in the distribution of the population under study, between the group with ambulation (n=15) and the group without ambulation (n=34).

Table 1
Characteristics of the population under study by ambulation group

Variables	Ambulation		p
	Yes n (%)	No n (%)	
Gender			
Male	11 (73.3)	16 (47.1)	0.123[a]
Female	4 (26.7)	18 (52.9)	
Age (mean±SD) in years	53.7±14.0	58.0±13.8	0.319[b]
Type of surgery			
Coronary artery bypass grafting	10 (66.6)	26 (76.5)	
Valve surgery	4 (26.7)	7 (20.6)	0.617[a]
ASD correction	1 (6.7)	1 (2.9)	
CPB duration (minutes)	70.6±18.1	69.1±21.1	0.814[b]
MV duration (hours)	7.4±2.3	7.5±2.8	0.999[c]

ASD – atrial septal defect; CPB – cardiopulmonary bypass; MV – mechanical ventilation; SD – standard deviation
[a]Fisher's exact test; [b]Student t test; [c]Mann-Whitney test.

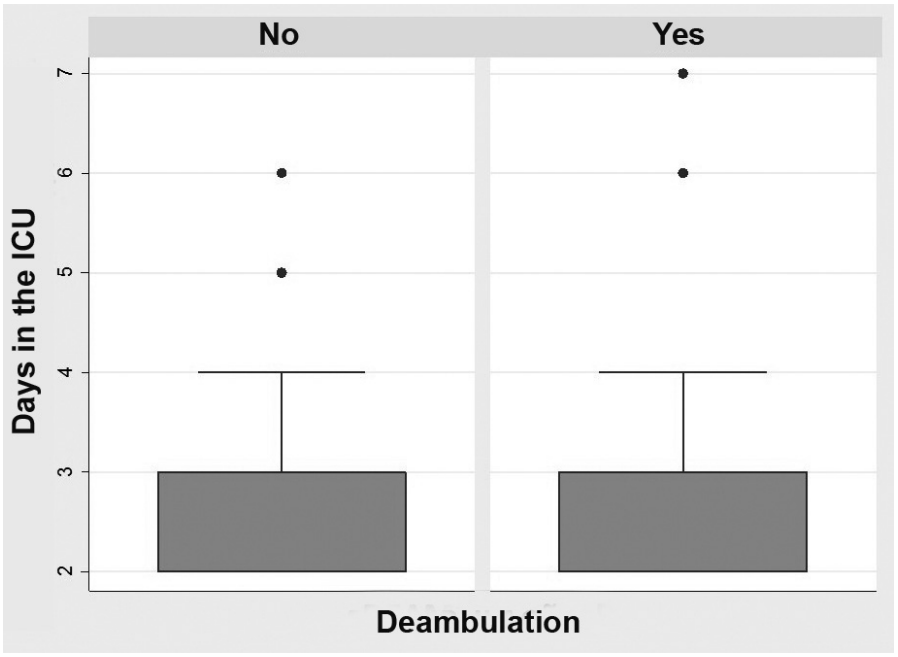

Figure 1
Average length of stay in ICU of groups studied: with and without ambulation (p=0.543). Mann-Whitney test.

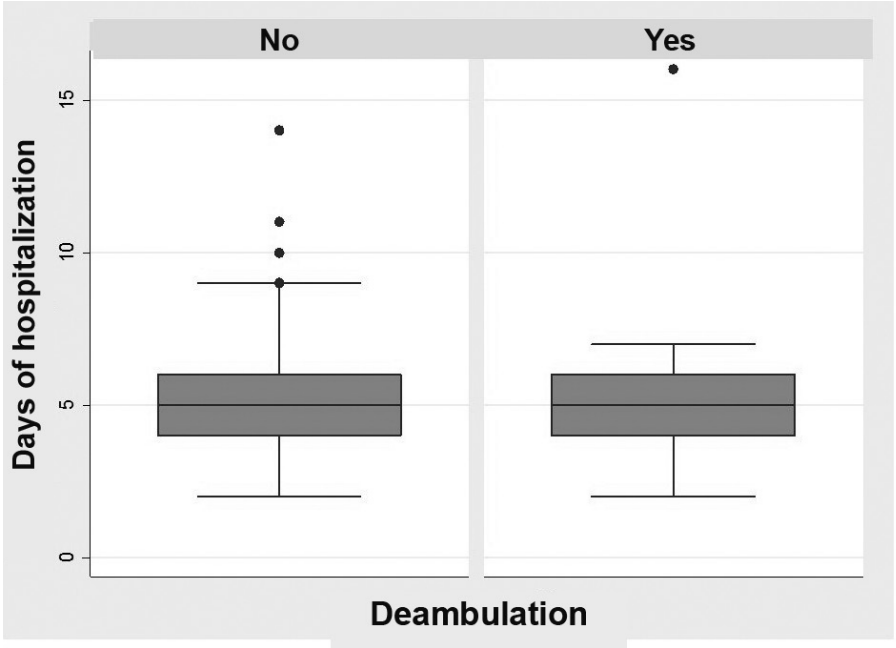

Figure 2
Average length of stay in hospital of groups studied: with and without ambulation (p=0.957). Mann-Whitney test.

Discussion

Regarding sociodemographic findings, male patients was prevalent in the population under study. The study by Borges et al.[8] analyzed the profile of patients undergoing coronary artery bypass graft surgery (CABG) and found that 71.0% of the sample consisted of elderly males aged >60 years. This finding was also reported by Kaufman et al.[9], who observed that 67.3% of male patients, mean age 61.2±10.3 years, undergoing coronary artery bypass grafting surgeries. Therefore, this study is in agreement with other researches[9-11] in relation to age (>50 years), gender (male patients), and the emergence of cardiac conditions requiring surgical approach.

As for the type of surgery, the most performed was coronary artery bypass grafting (73.5%), followed by valve surgeries (22.4%), and atrial septal defect correction (4.1%). Previous studies also observed a higher prevalence of CABG surgery, as in the study by Carneiro et al.[12], which analyzed the degree of respiratory muscle strength in a sample of 20 patients, in which 45.0% of interventions were CABG, 35.0% of MVR, and 20.0% AVR.

In this study, early ambulation did not seem to influence the length of stay in cardiac intensive care unit or in hospital. Despite such conclusion, it is worth noting that postoperative early ambulation is safe in selected patients, since there were no adverse events in this study and in others[13,14]. In the study by Bailey et al.[15], with 103 patients admitted to the ICU, it was found that 762 ambulation activities occurred, with reports of only four adverse situations, such as orthostatic hypotension and an episode of hypertension.

Cordeiro et al.[16] showed significant hemodynamic changes after ambulation, but without adverse effects in patients who walked in the third or fourth following the surgery.

It is known that prolonged hospital stay or excessive bed rest can lead to a decrease in protein synthesis, decreased muscle strength[17,18], and as for cardiac patients, the orthostatic intolerance and reduced cardiac output may worsen physical fitness[13].

With regard to functional decline provided by surgical approach, especially in the elderly, Monteleone et al.[14] evaluated the ability to walk after undergoing cardiothoracic surgery, in which all patients were able to walk prior to hospitalization. The authors observed a functional limitation in the postoperative early stage characterized by the loss of ability to walk in some patients. For this reason, early mobilization should be stimulated in selected patients to prevent future adverse outcomes with respect to the functional status of patients, besides preventing clinical complications.

Contrary to this study, Dantas et al.[19] found increased peripheral muscle strength in the group undergoing early mobilization protocol. This same group presented reduced length of stay in ICU and in hospital. Other authors show that, besides increasing the ability to walk, implementing a mobilization protocol can reduce hospital length of stay, however, they did not report the time of ambulation[4,20,21]. Soares et al.[22], in a longitudinal and retrospective study, found that patients withdrawn prematurely from the hospital bed tend to have lower mortality rates and are also able to restore functional limitations earlier.

Ota et al.[23], working with 108 early mobilized patients, verified an increased hospital discharge rate and improved functional capacity in patients without neurological impairment. The mobilization protocol included passive and active exercises for extremities and deep breathing exercises. It is noteworthy that, despite the positive effect related to a shorter hospital stay, an actual comparison with this study is unfeasible due to lack of ambulation in the protocol abovementioned, and the fact that these patients were on mechanical ventilation.

It is also important to detail some limitations of this study: (1) to the detriment of the nature of the epidemiological study, the population covered is small, limiting the extent of findings to other populations; (2) the quantitative difference in the number of patients in each group — with and without ambulation — may have inferred in the absence of statistical correlation between the length of stay in ICU and in hospital, and the early ambulation.

These limitations were due to the lack of a culture that encourages early ambulation in the unit studied, and only a small number of patients walk still in the ICU.

While such restrictions cannot account for a possible relationship between length of stay and early ambulation following cardiac surgery, based on this and other

studies developed, it can be said that ambulation seems to be a safe intervention, well tolerated in this population. Nevertheless, it requires further studies to evaluate its relationship with the length of stay in ICU and in hospital.

Conclusion

The early ambulation neither has influenced the length of stay in ICU nor in hospital. For evaluating such outcome, new researches with more representative populations should be encouraged.

Potential Conflicts of Interest
No relevant potential conflicts of interest.

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This study had no external funding sources.

Academic Association
This study is not associated to any graduate programs.

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