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Use of 50-M Walk Test as a Tool to Assess Phase-1 Cardiovascular Rehabilitation after Acute Coronary Syndrome

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Abstract

Introduction: In 2009, Dias and colls made a contribution to this field by applying the first functional 50-M Walk Test (50MWT) in the Coronary Intensive care Unit (CICU), being able to direct the exercise prescription as well as evaluate the response to a cardiovascular rehabilitation program during hospitalization. As the Cardiovascular Rehabilitation Program 1 (CVR1) does not yet recommend the 50 MWT in CVR1 due to safety measures and cardiovascular repercussion on the program, the inclusion of this tool is necessary as it concerns a population at risk. Objective: Compare the functional response and cardiovascular 50 MWT in patients with ACS who underwent CVR1.

Methodology: Single-arm clinical trial, conducted with ACS patients admitted to the CICU of a private Hospital in Salvador - Brazil, from 24 to 48 hours post-event. The inclusion criteria consisted ACS patients with medical permission to walk, and had not been submitted to acute surgical treatments, aged ≥ 18 years who were oriented in time and space. Exclusion criteria included patients with orthopaedic problems, neurological sequelae and the inability to walk independently.

Results: A total of 66 patients were gathered to compare the response to tests before CVR1 and at the time of discharge; data of systolic arterial pressure (SBP), heart rate (HR), perceived exertion rate by the Borg Scale (BS), time and speed of walking were evaluated. Measurements were obtained in the supine, seated and orthostatic positions, at the end of the walk, after 5 minutes rest, and walking duration. Statistical significance for SBP, in the time of walking and BS was observed ($p \le 0.05$). HR presented no statistical significance; predominance was shown in the absence of adverse effects in 89.4% of patients.

Conclusion: This sample proved that patients who underwent CVR1 program presented an impact on functional capacity interpreted by an increase in walking speed, perceived exertion rate decreased and better blood pressure control during hospital discharge. Furthermore, 50 MWT might safely be applied as a tool before beginning CVR1, and as a method of assessing cardiovascular repercussion in the hospital phase after the program.

Keywords: Acute coronary syndrome; Rehabilitation; Motor activity; Gait; Effort test

Introduction

The acute coronary syndrome (ACS) is included among the cardiovascular diseases (CVDs) and comprises a condition that involves acute myocardial infarction (AMI) and unstable angina (AU) [1]. These correspond around 50% of male deaths with the projections made for the year 2020; CVDs will remain the leading cause of mortality and functional incapacity [2].

The therapeutic arsenal for these diseases consists of medications, surgery and cardiovascular rehabilitation [3,4]. The latter therapy comprises four phases: phase Cardiovascular Rehabilitation 1 (CVR1), initiated in a hospital environment, this first phase is the preparatory time for the following phases (II, III e IV) [5].

The prescription of bed rest for post-event patients hospitalized in the ICU, previously carried out, is an influential factor in the reduction of physical and cardiovascular capacity. As CVR1 is applied irrespective of the functional capacity of patients, with exercises being prescribed in accordance with the patient's clinical stability and severity, this rehabilitation program described in the literature does not discuss the influence of cardio-circulatory variables on the functional capacity of patients with ACS undergoing cardiovascular rehabilitation at the hospital stage [6].

Gait is a complex ability, as it requires several controls of the posture and limb in order to produce dislocation of the body. It is known that with aging, the speed of gait tends to decrease due to physiological changes that occur, such as, reduction in muscle strength, increase in thoracic kyphosis and greater trunk flexion. Some authors have considered this reduction as a compensatory strategy of the body to generate greater stability, since there is a change in the center of gravity [7].

In 2009, Dias et al. made a contribution to this field by applying the first functional 50 m walk test (50MWT) in the coronary intensive care unit (CICU) in acute myocardial infarction patients after a period of 24 h, proving this method as safe and able to evaluate the cardiovascular stress after ACS. However, with this context, a gap was found in the literature regarding the functional evaluation of the population still in CICU. Thus, the inclusion of this test is necessary, because it is a population at risk. The evaluated variables were driving speed, perceived exertion rate and cardio-circulatory response. This study aims to compare the functional response and cardiovascular 50 MWT in patients with ACS who underwent CVR1 [8].

Methodology

It involved a single arm clinical trial (self-paired) to study patients diagnosed with ACS, treated with or without angioplasty, hospitalized in a private hospital in Salvador-BA, Brazil. Inclusion criteria included patients diagnosed with ACS, with medical permission to walk, and had not been submitted to surgical myocardial revascularization, over the age of 18 years, who were oriented in time and space. Exclusion criteria included individuals who continued to present symptoms of myocardial ischemia, HR>100 bpm, RF>28 ipm, SpO_2<92%, SBP<100 or>160 mmHg, DBP>100 mmHg; who had neurological and orthopedic dysfunctions, cognitive deficit and were incapable of walking independently [9].

Sample calculation was carried out based on an outcome variable, the HR as a continuous variable, qualitative, could serve as an indicator for assessing patient's functional response [10]. Standard deviation of HR during exercise: the estimate variation was from 70 to 100 bpm (considering that many of these patients used BB) and the value of SD=¼ of this variation (30÷4= ± 7.5 bpm). Standardized amplitude of the interval=total amplitude of the interval (4) ± SD (7.5)=0.53. N=minimum number of 62 patients.

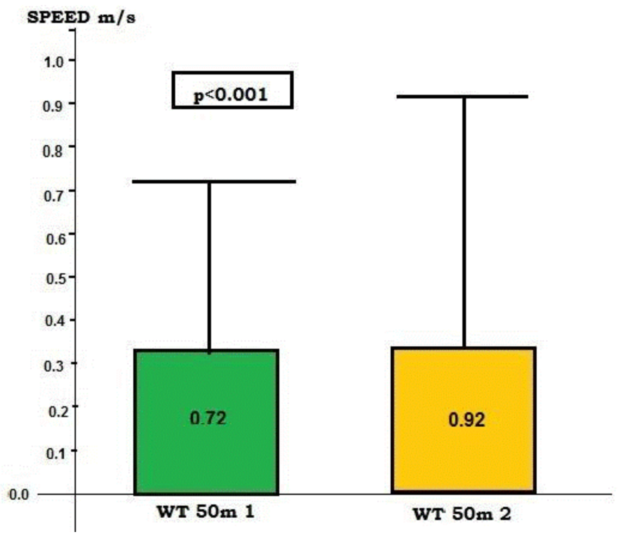

Figure 1: The difference in the variable gait speed between 1st and 2nd 50MWT before and after CVR1 in 66 patients with ACS. SSA-Ba, 2013.

The initial rehabilitation process (CVR1) was the first time 50MWT was utilized with the purpose of evaluating patient's safety under gravitational and physical stress (early mobilization), consequently, the gradual physical exercise protocol of CVR1 was applied (increased walks from 50 to 50 m) and at the time of discharge this corresponded as the second time 50MWT was applied, with the purpose of assessing the cardiovascular repercussion after the CVR1 program.

The physiological response to 50MWT was monitored during two phases: the first phase, denominated as gravitational stress while seated and in orthostasis; the second stage, denominated as physical stress. The test was applied following medical approval. The evaluation protocol consisted of all patients being submitted to a clinical assessment, with a standard record chart being filled out with anthropometric and clinical data; Questioning concerning orientation in regards to time and space and the actual presence of precordial discomfort, dizziness, dyspnea and gait dysfunction; Physical Exam: Arterial pressure measurement (AP); heart rate (HR), peripheral oxygen saturation (SpO_2); all patients were wearing a hospital gown.

Arterial pressure was measured according to the VII Brazilian Arterial Hypertension Guidelines [11] using an Omron®, Automatic Blood Pressure Monitor, model HEM-705CP. During the AP measurement, the patient was asked not to speak. Heart rate (HR) was measured with a Polar Electro Ou® heart rate monitor; to measure peripheral oxygen saturation (SpO_2) a BCi Moriya 101® Hand-Held Pulse Oximeter was used, and the body mass index (BMI) was calculated by the following formula: BMI=Weight in Kg/height in m^2, using an anthropometric scale 2096 PP®.

Gait velocity in this study was calculated from a fixed distance of 50 m based on the 2009 test description, and walking time was monitored through the timer (described in methodology). These variables were transformed into walking speed using the distance formula in meters divided by time in seconds; it is justified by the speed of a body given by the ratio between the displacements of the same at any given time [12].

During the 50MWT process, the physiological parameters were monitored in the following positions: dorsal recumbent position at zero degrees; seated on the bed with legs pendant, in orthostasis (1st phase); after 3 minutes in orthostasis, after the test and in the recovery phase (2nd phase). The parameters were monitored after 60 seconds rest, except when remaining in orthostasis after 3 minutes and in the recovery phase after 5 min [13,14]. All data were recorded on the monitoring chart.

To evaluate the perceived exertion rate, the modified Borg scale (BS) was used [15]. Following explanation to patients, the scale was applied at the beginning and at the end of the walk. The patients were instructed not to exceed level four (slightly tiring), as it was the maximum safety limit for physical activity in this phase. The 50 m walk was followed-up by the physical therapist recording the data (HR_{max} and SpO_{2min}), and no verbal encouragement was given in regards to the rhythm and speed of the walk. The patient himself/herself limited his/her rhythm. At the end of the walk, the physiological parameters and level of the Borg Scale were recorded.

The following independent variables were evaluated: hypertension, diabetes mellitus, body mass index (BMI), smoking, physical activity, ACS classification, use of vasodilation and beta-blocker medication. The dependent variables were: SBP; HR; BS and walk duration. The database, descriptive analysis and analytical were performed in the Statistical Package for the Social Sciences program (SPSS), version 14.0 for Windows. The Kolmogorov-Smirnov test was applied to analyze normality [16].

The results were presented through tables and figures, the categorical variables expressed in frequency values, such as sex, ACS classification, type of treatment, risk predictors and the time of 50MWT application after hospitalization. Analysis of continuous variables, all of which showed normal distribution, was expressed in mean and standard deviation (X ± SD). The chi-square test was used to compare the categorical variables. The Student paired T test was used to compare the mean of cardiocirculatory variables, perceived exertion rate and gait speed in two different moments - first and second 50MWT. The significance level assumed 5%.

The Research Ethics Committee of the Bahiana School of Medicine and Public Health, Protocol No. 170/2011 approved this study. The data of this study are primary, collected and used only for the effectiveness of this study's purpose, with patients free from any harm, particularly in regards to secrecy and confidentiality. Patients signed an informed consent and could withdraw their consent at any time, without any damage to them.

Acute Coronary Syndrome	n (%)
Acute Myocardial Infarction	42 (63.3)
Unstable Angina	24 (36.4)
Treatment	
Doctor	44 (66.7)
Angioplasty	22 (33.3)
Associated Risk factors	
Sedentar sm	38 (57.6)
0besity/Overweight	38 (57.6)
Hypertension	45 (68.2)
Male Sex	45 (68.2)
Dyslipidemia	47 (71.2)
Smoking	4 (6.1)
Diabetes mellitus	10 (152)
Application WT50m	Mean (± SO)
Time after admission WT50m	1.67 (± 0.84)
Time of hospitalization	5.41 (± 2.44)

Table 1: Clinical characteristics and application of 50MWT in 66 patients with ACS before and after CVR1. SSA-Ba. 2013.

Results

The sample gathered a total of 66 patients. Demographic data showed the final sample with the mean age of 59.92 ± 12.37 years, with male sex being predominant, 45 male patients (68.2%). Table 1 presents the clinical data of the population, corresponding to ACS 42 [63.3%] with AMI - 26 [39.4%] STEMI and 16 [24.2%] NSTEMI and 24 [36.7%] with UA, of these 44 [66.7%] treated with clinical care and 22 [33.3%] with angioplasty.

Between the associated risk factors, the most frequent were: dyslipidemia 47 [71.2%], hypertension 45 [68.2%], male sex 45 [68.2%], overweight/obesity 38 [57.6%], sedentarism 38 [57.6%], diabetes 10 [15.2%] and smoking 4 [6.1%]. In regards to the anthropometric data, the mean weight was 76.99 (± 15.34) and mean height 1.68 (± 0.09). The BMI (kg/m^2) ranged between 19.17 and 36.57 kg/m^2 with high mean values (26.95 ± 3.94), in the eutrophic 24 (42.4%), overweight 21 (31.8%) and obese 17 (25.8%) range of patients. The first 50MWT was applied 1.67 (± 0.84) a day after hospital admission, the CICU had statistical significance of $p<0.001$. The mean length of stay in hospital was 5.41 (± 2.44) days, with predominance of application between 24 h [33 (50%)]-48 h [26 (39.4%)].

Table 2 displays the behavior of physiological variables in the Gravitational Stress phase (Phase 1) and during the second time (after CVR1). When compared, the response of the first and second test showed a decline in systolic arterial pressure (SBP) even though the behavior of HR presented discrete variability in response to gravitational and physical stress, with variability in dorsal recumbent position Δ:0.74. As this was a high-risk population, patients were beta-blocked (51 [77.3%]) to the use of Tridil and anti-hypertensive medication 41 (62.1%), respectively.

In regards to the time variable in the 50MWT before and after CVR1, T1 (Pre) showed a mean of 1.17 (± 0.58) and T2 (Post) 0.89 (± 0.67). Thus presenting statistical significance p:0.02. Statistical analysis was performed of all cardiocirculatory variables of the research in comparison to the risk factors, and clinical characteristics of the sample, no significance was made notable.

Information extracted from the data such as distance - an immutable variable in the 50MWT performance; when combined with the time of walking, led to obtain the walking speed, also denominated as gait speed. This is represented in Figure 1, in which statistical significance was obtained, $p<0.001$, with speed amplification from 0.72 m/s to 0.92 m/s when 50MWT 1 was compared with 50MWT 2.

The perceived exertion rate was assessed by the Borg Scale (0-10), which when compared to the beginning of the tests (T1 and T2) increased by 3.1% of the domain "no effort", from 1.6% of "very, very light"; with a decrease of 1.5% of "light" and 3.0% of the domain "moderate", no statistical significance was shown. While the end of T1 in relation to T2 repeats the variability for the domain "very, very light", with an increase of 9.1% "very mild" and decrease of 4.5% for "light" and "moderate", with statistical significance of p:0.03 after physical stress.

No adverse effects were observed in the majority of the sample 59 (89.4%), with seven (10.5%) patients presenting adverse effects. These were described as three (4.5%) patients with hypotension, three (4.5%) with hypertension and only one (1.5%) with tachycardia; this occurred when all patients assumed the orthostatic position.

Discussion

This study showed that 50MWT is a tool that assesses the impact of functional response after RCV1 program in patients with ACS. The variables that were statistically significant SBP, gait speed and the perception of respiratory effort, regardless of application time of the first walk test and the length of hospital stay. Though hospital stay was brief, adaptation to cardiovascular system was possible by a reduction of double product and improvement of physical performance represented by the increase in gait speed.

Variables								
	SBP (mmHg)				HR (bpm)			
Position	Pre	Post	Δ	value p	Pre	Post	Δ	value p
D. Recumbent	137.34 (± 20.06)	131.45 (± 19.04)	5.89	0.01	73.08 (± 11.59)	73.83 (± 11.62)	-0.74	0.56
Rest Phase	131.58 (± 21.86)	123.53 (± 17.83)	8.01	0.01	75.19 (± 11.84)	75.95 (± 12.31)	-0.75	0.15

Table 2: Physiological behavior variable SBP and HR in the gravitational stress and physical stress phase of the 50MWT before and after CVR1, in 66 patients with ACS. SSA-Ba, 2013.

In 2010, the 50MWT was considered the first functional test in the cardiology intensive care unit environment [7]. Until now, CVR1 patients were guided by programs pre-established by equivalent of metabolic consumption (METS) [8,15,17] , therefore they were programs that did not respect patients individuality and previous functional capacity. The 50 m test enables a secure, individual progression based not only on nosological diagnosis, but mainly on the functional response of the patient.

When pressure response to 50MWT was evaluated following a CVR1 program, better pressure control was observed when compared to the first test. This result was also observed by Frazao and collaborators [16]. Differently from SBP, heart rate showed no adaptive effect at the end of the test. This finding may be justified by the short time of exposure to exercise. Studies have demonstrated that the effect of bradycardia induced by exercise occurs after six weeks [17]. Another aspect to be analysed is the discrete variability when exposed to gravitational and physical stress. This response is associated with the submaximal characteristic of the test, and use of beta-blockers [18].

Gait speed and BS is variables representative of functional performance. The first cited, presented a significant increase when compared the 1st 50MWT with the 2nd 50MWT. The time of walking before CVR1 was the average of one to two minutes recommended by the literature [19] for the first walk after a coronary event, whereas the time of the second walk was shown to be even lower than the mean, which points towards optimization for capacity and gait speed.

The result found in BS was shown to be a reflection of both physiological and functional changes; they are intimately associated with the clinical changes that influence quality of life. Gait speed is influenced according to the general health status, anthropometric, physical, psychological and social data, and may be used as a marker of physiological reserve in elderly individuals and a prognostic factor in falling possibilities, frailty, and institutionalization of death in geriatric patients [7,20]. These results described in this study together with BS present themselves as a reflex to physiological and functional changes, as well as being associated with influential clinical changes in quality of life.

Previous studies have observed that 0.1 m/s reduction in gait speed (GS) increases the risk of falls in elderly by 7.0%; and if improvement in GS is maintained for one year it reduces the absolute risk of death in these individuals by 17.7%. As gait is a functional complex, the literature [20] has suggested gait speed to be the sixth most vital sign due to its immense reliability that translates in the individuality [21], reproduced in this study.

The perceived exertion rate was evaluated by means of the modified Borg scale, an important instrument for evaluating the intensity of an activity as this prescription variable is individualized, and is related to cardiorespiratory and neuromuscular capacity. In this population, it was observed that after CVR1, lower frequency occurred of the domains that reflected the test, leading to greater subjective tiredness ("Moderate" and "Slight") and amplification in reference to the three first domains of the Borg Scale. As for the study that described the test [8], the Borg scale was shown to be easy to apply, making it possible to evaluate the improvement in functional capacity. It is worth emphasizing that the perceived exertion rate was also influenced by psychological and not physiological factors only, thus making it difficult to define which variable was predominant [22].

In regards to cardiovascular risk factors associated in this population, no influence was demonstrated on the cardio-circulatory variables in response to the 1st and 2nd 50MWT. Nevertheless, it could be proved that in this sample there was no difference in the cardiovascular response to 50MWT according to the clinical classification. Although, the minimum age at which the coronary event occurred in this sample was lower than the estimated prevalence of ACD in adults over the age of 40 years [23], the demographic characteristics did not result in values differing from the cardiocirculatory variables when compared in isolated groups.

However the significant prevalence of 1°TC50m application period for 24-48 hours post coronary event, this result was more remarking that evidenced by Dias, 2009 [8], together with prevalence of hospital stay by seven days corroborating the average expected in the literature [24,25]. This sample is cautioned for a disease with a high cost to public health. This includes the direct costs in reference to medical interventions, and indirect costs, also known as social costs, which correspond to individual and family productivity loss, family members who have to provide care for the patient after event, as well as absenteeism and early mortality.

The adverse effects all succeeded on the assumption orthostasis and 1°TC50m followed the earlier study profile [8]. The minority of the patients analysed, revealed a condition of hypotension, hypertension and tachycardia, making it necessary to interrupt the test, but as soon as they were re-stabilized, the CVR1 was resumed. This effect occurred in spite of patients having performed active lower limb exercises and respiratory exercises [26,27]. In the second test, these adverse effects did not occur, suggesting that after the progressive walk, the autonomic responses of patients improved. The authors pointed as a study limitation the absence of a control group.

Based on the result of this study, it was observed that patients who were submitted to the CVR1 program presented improved functional capacity, reflected by the increase in gait speed, lower perceived exertion rate, and improved control of pressure on hospital discharge. Furthermore, the 50MWT was shown to be a safe tool capable of being used for evaluating and guiding the CVR1 program.

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References

1. dos Santos FL, de Araújo TL (2003) Having an infarction: the meanings of the disease from the patient's perspective. Rev Lat Am Enfermagem 11: 742-748.
2. Avezum A, Piegas LS, Pereira JC (2005) Risk factors associated with acute myocardial infarction in the São Paulo metropolitan region: a developed region in a developing country. Arq Bras Cardiol 84: 206-213.
3. Lessa I (2003) Medical care and deaths due to coronary artery disease in Brazil, 1980-1999. Arq Bras Cardiol 81: 336-342, 329-35.
4. Stewart KJ, Badenhop D, Brubaker PH, Ketevian SJ, King M (2003) Cardiac rehabilitation following percutaneous revascularization, heart transplant, heart valve surgery, and for chronic heart failure. Chest 123: 2104-2111.
5. Cortez AA, Ferraz A, Nóbrega ACL, Brunetto AF, Herdy AH, et al. (2006) Diretriz de reabilitação cardiopulmonar e metabólica: aspectos práticos e responsabilidades. Arquivos Brasileiros de Cardiologia 86: 74-82.
6. Serrano C, Rocha e Silva M (2010) A review of cardiopulmonary research in Brazilian medical journals: clinical, surgical and epidemiological data. Clinics (Sao Paulo) 65: 441-445.
7. Abreu SSE, Caldas CP (2008) Velocidade de marcha, equilibrio e idade: Um estudo correlacional entre idosas praticantes e idosas não praticantes de um programa de exercícios terapêuticos. Revista Brasileira de Fisioterapia 12: 324-330.
8. Dias CMCC, Maiato ACCA, Baqueiro KMM, Fiqueredo AMF, Rosa FW, et al. (2009) Resposta circulatória à caminhada de 50 m na unidade coronariana, na síndrome coronariana aguda. Arquivo Brasileiro Cardiologia 92: 132-142.
9. [No authors listed] (1997) [I National Consensus of Cardiovascular Rehabilitation]. Arq Bras Cardiol 69: 267-291.
10. Hulley SB, Cummings SR, Browner WS (2003) Delineando a pesquisa clínica: uma abordagem epidemiológica. Artmed, Brasil, Porto Alegre.
11. Sociedade Brasileira de Cardiologia; Sociedade Brasileira de Hipertensão; Sociedade Brasileira de Nefrologia (2010) [VI Brazilian Guidelines on Hypertension]. Arq Bras Cardiol 95: 1-51.
12. Heneine IF (2005) Biofísica Básica. Atheneu, Brasil, São Paulo.
13. Netea RT, Smits P, Lenders JW, Thien T (1998) Does it matter whether blood pressure measurements are taken with subjects sitting or supine? J Hypertens 16: 263-268.
14. Miranda H, Simão R, Lemos A, Dantas BHA, Baptista LA, et al. (2005) Análise da frequência cardíaca, pressão arterial e duplo-produto em diferentes posições corporais nos exercícios resistidos. Revista Brasileira de Medicina no Esporte 11: 295-298.
15. Iserin L, Chua TP, Chambers J, Coats AJ, Somerville J (1997) Dyspnoea and exercise intolerance during cardiopulmonary exercise testing in patients with univentricular heart: the effects of chronic hypoxaemia and Fontan procedure. Eurpean Heart Journal 18: 1350-1356.
16. Costa MFL, Petto J, Gomes VA, Esquivel MS, Oliveira FTO, et al. (2015) Efeitos dos exercícios funcionais e neuromusculares no tempo de internação e controle pressórico de pacientes hospitalizados. Arquivos Brasileiros de Ciências da Saúde 40: 33-37.
17. Almeida MB, Araújo CGS (2003) Efeitos do treinamento aeróbico sobre a freqüência cardíaca. Revista Brasileira de Medicina em Esporte 9: 104-112.
18. Polito MD, Farinatti PTV (2003) Respostas de freqüência cardíaca, pressão arterial e duplo produto ao exercício contra-resistente: uma revisão da literatura. Revista Portuguesa de Ciências do Desporto 3: 79-91.
19. National Heart Foundation of Australia, Australia Cardiac Rehabilitation Association (2004) Recommended framework for cardiac rehabilitation.
20. Novaes RD, Miranda AS, Dourado VZ (2011) Usual gait speed assessment in middle-aged and elderly Brazilian subjects. Rev Bras Fisioter 15: 117-122.
21. Sancho AG, Bacelar SC, Cader AS, Caldeira JB, Pereira CCL, et al. (2011) A Significância da Avaliação Intra-Hospitalar da Capacidade Funcional na Síndrome Coronariana Aguda. Revista Brasileira de Cardiologia 24: 282-290.
22. Dias CM, Macedo LB, Gomes LT, de Oliveira PL, Albuquerque IV, et al. (2014) Quality of life of patients after an acute coronary event: hospital discharge. J Clin Med Res 6: 362-368.
23. Teich V and Araujo D (2011) Estimativa de Custo da Síndrome Coronariana Aguda no Brasil. Revista Brasileira Cardiologia 24: 85-94.
24. Kostis WJ, Demissie K, Marcella SW, Shao YH, Wilson AC, et al. (2007) Weekend versus weekday admission and mortality from myocardial infarction. N Engl J Med 356: 1099-1109.
25. Takada JY, Roza LC, Ramos RB, Avakian SD, Ramires JA, et al. (2012) Emergency service admission time and in-hospital mortality in acute coronary syndrome. Arq Bras Cardiol 98: 104-110.
26. No authors listed (2002) II Guidelines on Ergometric Tests of the Brazilian Society of Cardiology. Arq Bras Cardiol 78 Suppl 2: 1-17.
27. Dias MSD and Dias CMCC (2011) Resposta Cardiovascular ao Teste de Caminhada de 50M em Pacientes com Infarto Agudo do Miocárdico e Angina Instável. Revista Pesquisa em Fisioterapia (RPF) 1.