Original Article

Myocardial revascularization surgery: hospitalization characteristics and changes related to hospitalization time

Cintia Koerich[1], Gabriela Marcellino de Melo Lanzoni[2], Giovana Dorneles Callegaro Higashi[3], Alacoque Lorenzini Erdmann[4], Betina Hörner Schlindwein Meirelles[5], Maria Aparecida Baggio[6]

[1] Nurse, Master in Nursing. Student of the Nursing Graduate Program at Universidade Federal de Santa Catarina, Doctoral level. Nurse at the Instituto de Cardiologia de Santa Catarina 2. São José, SC, Brazil. E-mail: cintia.koerich@gmail.com.

[2] Nurse, Ph.D. in Nursing. Adjunct Professor at Universidade Federal de Santa Catarina. Florianópolis, SC, Brazil. E-mail: gabimrc@gmail.com.

[3] Nurse, Ph.D. in Nursing. Substitute Professor at Universidade Federal de Santa Catarina. Florianópolis, SC, Brazil. E-mail: gio.enfermagem@gmail.com.

[4] Nurse, Ph.D. in Nursing. Full Professor at Universidade Federal de Santa Catarina. Florianópolis, SC, Brazil. E-mail: alacoque@newsite.com.br.

[5] Nurse, Ph.D. in Nursing. Associate Professor at Universidade Federal de Santa Catarina. Florianópolis, SC, Brazil. E-mail: betina.hsm@ufsc.br.

[6] Nurse, Ph.D. in Nursing. Professor at Universidade Estadual do Oeste do Paraná. Cascavel, PR, Brazil. E-mail: mariabaggio@yahoo.com.br.

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ABSTRACT

The study objective was to identify the hospitalization characteristics and changes presented by individuals submitted to Myocardial Revascularization Surgery and its association with hospitalization time for the surgery. We conducted a cross-sectional observational and epidemiological study, between March of 2013 and March of 2014, with 99 individuals submitted to Myocardial Revascularization Surgery. We verified chest pain and angina/thoracic pain pre-surgery and respiratory insufficiency, hypertermia, hypertension and arrythmias post-surgery as predictors for a longer hospital stay. The association between hospitalization characteristics and clinical changes with hospitalization time of individuals submitted to Myocardial Revascularization Surgery provides subsidies for nurses, all health professionals, and managers, to create early detection strategies for complications related to Myocardial Revascularization Surgery.

Descriptors: Length of Stay; Cardiovascular Diseases; Thoracic Surgery; Nursing Care; Health Managemen.

INTRODUCTION

Cardiovascular diseases (CVD) are estimated as the main cause of death and loss of quality of life related to disabilities in the world, and Coronary Artery Disease (CAD) is included in this group. Especially, Acute Myocardial Infarction (ACI) will be responsible for one death per minute in the next years[(1)]. CVDs are part of the circulatory system, and they are characterized as a non-communicable chronic disease[(2)]. In

Brazil, diseases of the circulatory system represented the third cause of hospitalization by the Unified Health System (SUS) in 2015, with 1,124,156 hospitalizations, being cardiac insufficiency the most frequent cause[3].

Hospital stay is needed according to the CAD severity and the advanced stage, which will require clinical or surgical treatment[4]. In cases when percutaneous coronary intervention is insufficient, the Myocardial Revascularization Surgery (MRS) has been regularly conducted in SUS, however, despite the great benefits reached, post-surgery complications are common, such as atelectasis, pneumonia, bronchospasm, respiratory insufficiency, within others[5].

The increase of MRS in SUS contributes for longer waiting time for the surgery, creating the complications and the worsening of the clinical case of individuals waiting for surgery[6]. It becomes important to know which complications presented by the patient during pre- and post- MRS are related to the hospitalization time, once extended periods tend to be directly related to patient's clinical changes, increasing the costs of cardiac surgery in SUS[7].

Thus, nurses and health professionals have an important role in the attention scenario to patients affected by cardiovascular disease, especially by coronary artery disease, due to the hemodynamic instability and potential disease related complications. It is indispensible to consider the reality experienced by these professionals for the planning of management actions for assistance to patients submitted to MRS. Nursing performance is noted by the responsible assistance practice, considering the most proximity to the patient during the surgical process[8], involving the surgical indication until after hospital discharge, including rehabilitation.

Therefore, the objective of our study is to identify the hospitalization characteristics and changes presented by patients submitted to Myocardial Revascularization Surgery, and its association with hospitalization time for surgery.

METHODS

We conducted a cross-sectional, observational and epidemiological study. The study scenario was a public hospital institution which is a cardiovascular reference in the South region of Brazil, located in Santa Catarina. The institution has 109 beds, being 79 at the medical-surgical intensive unit (IU), ten beds in the Intensive Care Unit (ICU), and 20 beds in the emergency room, where has semi-intensive and observation care.

All individuals hospitalized in the institution during March of 2013 until March of 2014 constituted the population. The inclusion criterion was to be hospitalized in the institution and to have had an MRS. We excluded patients with no favorable clinical conditions of answer the interview (due to disorientation and/or dyslalia), or those who died before the surgical procedure. In total, there were 110 admittances for MRS, and from those, 11 had exclusion criteria.

We presented the study objectives to participants, and those who agreeded to take part in the study signed the free and informed consent term. We contacted patients daily during their hospitalization time to

detect any changes in their health state. After patients gave us their permission, we collected information in their medical records about the diagnosis and clinical case that they might be unaware.

We collected data using a structured interview guide, which had the contribution of two professionals active in the institution for its creation: one physician and one nurse with field experience. At the moment of the interview, we entered the data into an electronic spreadsheet in the Microsoft Excel® program, and at the end, we exported the data to the SPSS Software, version 22.0 to conduct the statistical analysis.

For the descriptive analysis, we calculated frequencies and percentages for qualitative measures, and the means and standard deviations for the quantitative ones, considering the possible grouping and variables:

- **Hospitalization chracteristics:** Hospitalization period (Hospitalization time; Pre-surgery time; Post-surgery time) and Peri-operative elements (to have companion before surgery; period staying with the companion; to have companion after surgery; to have the surgery suspended; motivation for surgical suspension; to receive pre-surgical orientation; which professional provided guidance to the patient)
- **Clinical changes:** Symptoms presented during the pre-surgical period (anxiety; weakness; diziness; nausea/vomits; palpitations; chest pain; shortness of breath; fever); Complications during the pre-surgical period (angina/thoracic pain; hipertension; hypotension; tachycardia; bradicardia; arrythmias; tachypnea; bradipnea;dyspnea; stroke;hyperthermia); complications presented during the immediate-ICU post-surgery (kidney failure; respiratory failure; stroke; arrythtmias (atrial fibrillation - AF, total atrioventricular block -TAVB); trans-operatory acute myocardial infarction (AMI); bleeding/changes in blood cells; infections); Complications presented during the mediate-UI post-surgery (angina/thoracic pain; hypertension; hypotension; tachycardia; bradicardia; arrythmias; tachypnea; bradipnea; dyspnea; stroke; hyperthermia). Or symptoms referring to patient's complaints during the time researchers were following participants and, the complications registered by health professionals in the patient's medical record.

For attribute measures, we used the Fisher's Exact test and, for continuous measures, we used the Student's t-test or the non-parametric Kruskal-Wallis test when the t-test could not be used. About comparison tests, we considered outcome variables those referring to the category "Hospitalization Period", and as independent variables, those referring to the categories: peri-operatory elements, Symptoms presented during the pre-surgical period, Complications presented during the immediate-ICU post-surgery and Complications presented during the mediate-UI post-surgery.

For all statistical tests, we assumed the confidence level of 95% and a sampling error of 5%.

The Ethics in Research with Human Beings from Universidade Federal de Santa Catarina (CEPSH/UFSC) approved the study under the protocol number 120.184 in 2012, according to the Resolution n. 466/12 of the National Health Council.

RESULTS

Socio-demographic characteristics showed that 70.7% of participants were men, 61% were married, 53.5% were retired, and the mean age was 61.3 years (SD 8.5). In the descriptive analysis, the mean time of hospitalization was 40.3 (SD 19.4) days, while the mean pre-surgery time was 22.8 (SD16.1) days. The mean post-surgery time was 10.9 (SD 10.2) days.

Regarding the peri-operative elements, 14.1% (n=14) of participants had companions, from those, nine were there full-time. After the surgery, 59.5% (n=59) declared to have a companion, 47.5% (n=28) of those were accompanied by their children, 38.9% (n=23) by a spouse and, 13.5% (n=8) by others.

From the 99 participants, 12.1% (n=12) had their surgery suspended, but they were later submitted to MRS. Within the motives, 50% (n=6) had the surgery substituted by urgent surgery of another patient, 41.6% (n=5) due to lack of ICU bed and, 8.3% (n=1) by lack of blood reserve. Still, 47.4% (n=47) affirmed to have received pre-surgery guidance, 59.6% (n=28) from the multi-professional team, 31.9% (n=15) physician and, 8.5% (n=4) nurse.

Among the most frequent pre-surgery symptoms, 76.7% (n=76) of participants presented anxiety, 36.3% (n=36) chest pain and, 23.2% (n=23) shortness of breath. Other symptoms represented less than 10%. Regarding the pre-surgery complications, 40.4% (n=40) presented angina/thoracic pain, 17.1% (n=17) hypertension and, 15.1% (n=15) dyspnea). Other complications represented less than 10%.

Regarding the most frequent complications during the immediate post-surgical period (ICU), 21.2% (n=21) presented bleeding/changes in blood cells, 17.1% (n=17) arrythmias AF/TAVB). Regarding pulmonary complications, 21.2% had bronchospasm and atelectasis (23.2%; n=23), besides pneumonia/bronchopneumonia (2.0%;n=2) and dyspnea (12.1%; n=12), other complications represented less than 10%.

In the comparative analysis, for pooled hospitalization characteristics, the variables from the category “peri-operative elements” did not present a significant difference for the variables of the category “hospitalization period” ($p>0.05$).

From the pooled Clinical changes, in the category “Symptoms presented during pre-surgical period, the variable chest pain ($p=0.013$) presented significant difference for the variable Hospitalization time from the category “Hospitalization period”, as well as, the variable angina/thoracic pain ($p=0.024$), from the category “Complications presented during pre-surgical period”. In both cases, the hospitalization time was longer. All other variables from the categories cited above did not present a significant difference related to variables of the category “hospitalization period”.

Regarding the categories “Hospitalization period” and “Complications presented during the immediate post-surgery period (ICU)”, the variable respiratory insufficiency presented significant difference for the variable post-surgery time ($p=0.017$) and hospitalization time ($p=0.039$). All other variables of the category “Complications presented during the immediate post-surgery period (ICU)” did not present significant difference in relation to variables of the category “hospitalization period”.

Regarding the categories "Hospitalization period" and "Complications presented during the mediate post-surgery (IU)", the variables arrythmias (p=0.047) and hyperthermia (p=0.006) presented significant difference for the variable hospitalization time. The variables hypertension (p=0.048) and arrythmia (p=0.001) presented significant difference for the variable post-surgery time. All other variables of the category "Complications presented during the mediate post-surgery (IU)" did not present significant difference in relation to variables of the category "hospitalization time".

About the variables composing the grouping of Clinical changes, Table 1 presents only the predicting ones for longer hospitalization time or longer post-surgery time, among individuals submitted to MRS.

Table 1: Comparison of clinical changes and hospitalization period with 99 patients submitted to Myocardial Revascularization Surgery, Santa Catarina, Brazil, 2014.

Variables	Time of hospitalization (days)	
	Mean/SD	p-value
Pre-surgery symptom: Chest pain		
With	47.1(22.6)	0.013
Without	36.5 (16.3)	
Pre-surgery complication: Angina/thoracic pain		
With	46.1(22.1)	0.024
Without	36.4 (16.5)	
Immediate post-surgery complication (ICU): Respiratory insufficiency		
With	56.1(27.9)	0.038
Without	38.4 (17.3)	
Mediate post-surgery complication (IU): Arrythmia		
With	59.2(23.6)	0.047
Without	39.3 (18.8)	
Mediate post-surgery complication (IU): Hyperthermia		
With	73.0 (21.9)	0.006
Without	39.0 (18.2)	
Variables	**Post-surgery time**	
	Mean/SD	**p-value**
Immediate post-surgery complication (ICU): Respiratory insufficiency		
With	23.9 (23.6)	0.017
Without	9.3 (5.5)	
Mediate post-surgery complication (IU): Hypertension		
With	14.6 (8.6)	0.048
Without	10.6 (10.3)	
Mediate post-surgery complication (IU): Arrythmia		
With	30.2(24.5)	0.001
Without	9.9 (8.0)	

Statistical tests: Student's t-test or Kruskal-Wallis non-parametric test.

DISCUSSION

The mean hospitalization time in our study was 40.3 (SD 19.4) days, corroborating with a study conducted at the same institution in 2011, which tried to trace the clinical-epidemiological and surgical profile of patients submitted to MRS, with a median of 35.5 days[6]. The mean post-surgery time was 10.9 days (SD 10.2), three times higher than the finding of a study conducted in the Rio Grande do Sul, which the mean post-surgery hospitalization time was 3.77 (SD 3.53) days[9].

In relation to the mean post-surgery time, a study conducted in Oman, an Arabic country located on the southeast coast of the Arabic Penninsula, 30.5% of patients submitted to heart surgery in a large reference hospital, between 2009 and 2013, had their post-surgery time extended ((≥ 11 days), and the main determinant was the number of complications[10].

Other investigations bring the mean hospitalization time for MRS between three to 11 days and, they associate the low hospital stay to the reduction of complications and risks related to the hospitalization[11-12], influencing the availability of beds[11].

Despite not presenting significant difference for hospitalization time in this study, anxiety was a pre-surgical symptom reported by 76 (76.7%) of participants and, only 14 (14.1%) participants informed to have a companion during the pre-surgical period. Another study that tried to compare the intensity of anxiety symptoms in people during the pre-surgical period of a heart surgery confronted three groups; those who had their family welcoming them, those who had only the nurse and those who had no one. It was observed a reduction of anxiety symptoms being higher for the group having their family presence in comparison to the other two groups, suggesting that the family presence in the pre-surgery period can contribute to the reduction of anxiety symptoms before heart surgeries[13]. Anxiety can negatively reflect in the post-surgery recovery as it can result in physiological changes[14] being its reduction evident in patients who received pre-surgical orientations[15].

Angina/thoracic pain was the most frequent alteration during the MRS pre-surgical period. The presence of this change during pre-surgery was related to longer hospitalization time (p=0.0242). A study that analyzed the presence of unstable angina in patients before the MRS identified that these patients used more medications during hospitalization, monitoring with Swan-Ganz and the intra-aortic balloon support in comparison to those with no unstable angina, therefore needing longer hospitalization time[16].

Besides angina, hypertension appears as a frequent pre-surgical and mediate post-surgical change and, in the last case, it was statistically associated with longer post-surgical time (p=0.0487). A study conducted in the southeast of Brazil identified hypertension being directly related to injuries in vital organs of patients submitted to MRS, characterizing higher clinical gravity and, consequently, greater likelihood of worse outcomes[17].

The prolonged hospitalization time presented a statistical association with respiratory insufficiency during the immediate post-surgery time in the ICU (p=0.017) and in the mediate post-surgery period with the presence of arrhythmia (AF/TAVB) (p=0.047) and hyperthermia (p=0.006). Most frequent post-surgical complications in the ICU were bleeding and pulmonary complications. In the IU, pulmonary complications prevailed.

A study conducted in the southeast region of Brazil analyzed the MRS post-surgical complications and identified bleeding or low post-procedure output as the most frequent, occuring in 50% of cases; and in 60% of cases when patients died after MRS, they presented five or more post-surgery complications[18]. Another study assessed the main changes presented by elderly patients after MRS, being respiratory complications,

pneumonia, and re-intervention due to bleeding[19].

About respiratory insufficiency, patients submitted to MRS normally develop post-surgery pulmonary disfunction[12,19] with an important reduction of pulmonary volumes, impairments in the respiratory mechanics, decrease of pulmonary complacency and, increase of the respiratory work, which causes longer hospitalization time. In this case, respiratory physiotherapy can be an integral part of care management of the patient with cardiovascular disease, during the MRS pre- and post-surgery moments[5,20].

On the other hand, arrythmias are considered frequent post-surgical changes related to heart surgery, specially the atrial fibrillation[12,19]. In a study conducted in the South region of Brazil, post-surgery complications occurred in 48.3% of the sample, and atrial fibrillation was the most prevalent representing 20.7%, and the AF during the MRS post-surgery was directly related to the increase in hospitalization time ($p<0.001$) [21]. Another study pointed that 208 (8.15%) of patients presented atrioventricular block during the MRS post-surgery moment, needing temporary artificial cardiac stimulation and longer hospitalization time[22].

Hyperthermia is one of the main manifestations of an infectious scenario, and it is closely related to complications and death per septic shock after MRS. Complications in the respiratory system, like pneumonia and bronchopneumonia, for example, normally are infections that end up increasing the hospitalization time after MRS[23].

When analyzing clinical outcomes of patients submitted to cardiac surgery in the South of Brazil a study showed the importance of health professionals to know the main changes in post cardiac surgery. In special, nurses should recognize the risky characteristics of patients, so they can direct care to evidence that can harm the patient and, consequently, improve the nursing assistance[9].

Thus, the availability and the use of nursing systematic assistance (NSA) and, institutional protocols can be applied by nurses intended to detect early clinical changes in the patient with an indication or submitted to MRS. Therefore, optimizing the flow of these patients to surgery, decreasing their hospital stay and consequently, the costs for the health system. To know the main changes in these patients from proper tools facilitates such identification and it helps the nurse in their therapeutical decision and their planning for nursing assistance[24].

CONCLUSION

The results reveal the main characteristics of hospitalization and changes presented by individuals during their pre- and post- MRS surgery moments, being these: anxiety, chest pain, thoracic pain, angina, shortness of breath, dyspnea, hypertension, bleeding, pulmonary complications and, arrythmias. The pre-surgery variables: chest pain, thoracic pain and angina; and the post-surgery variables: respiratory insufficiency, hyperthermia, and arrythmia were associated with higher general hospitalization time. We also observed longer post-surgery time related to variables in the post-surgery: respiratory insufficiency, hypertension, and arrythmias.

Such fundings provide assets for the action of nurses, other health professionals, and managers, to create prevention and early detection strategies for changes related to CVD and MRS that can optimize the treatment and to reduce the hospitalization time, preventing worse outcomes and reducing the costs of the health system.

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