Revista da
ASSOCIAÇÃO MÉDICA BRASILEIRA
www.ramb.org.br

Original article

Evaluation of the length of hospital stay in cases of coronary artery bypass graft by payer☆

Gilmara Silveira da Silva[a,*], *Alexandre Gonçalves de Sousa*[a], *Douglas Soares*[b], *Flávia Cortez Colósimo*[a], *Raquel Ferrari Piotto*[a]

[a]*Learning and Research Center of Hospital Beneficência Portuguesa de São Paulo, São Paulo, SP, Brazil*
[b]*School of Philosophy, Letters and Human Sciences, Universidade de São Paulo (USP), São Paulo, SP, Brazil*

ARTICLE INFO

Article history:
Received 20 September 2012
Accepted 16 December 2012

Keywords:
Length of hospital stay
Coronary artery bypass graft
Payer
Brazilian Unified Health System
Health plans

A B S T R A C T

Objective: The length of hospital stay (LOS) allows for the evaluation of the efficiency of a given hospital facility, as well as providing a basis for measuring the number of hospital beds required to provide assistance to the population in a specific area.
Methods: A retrospective survey was conducted on a database of 3,010 patients submitted to coronary artery bypass graft (CABG) from July, 2009 to July, 2010.
Results: Among 2,840 patients that met the inclusion criteria, 92.1% had their surgery paid by the Brazilian Unified Health System (Sistema Único de Saúde - SUS) and 7.9% by health plans or themselves (non-SUS). 70.2% were male, the average age was 61.9 years old, and the average risk score (EuroScore) was 2.9%. The SUS and the non-SUS groups did not differ regarding the waiting time for surgery (WTS) (2.59± 3.10 *vs.* 3.02 ± 3.70 days for SUS and non-SUS respectively; $p = 0.790$), but did differ with respect to the length of stay in intensive care unit (2.17 ± 3.84 *vs.* 2.52 ± 2.72 days for SUS and non-SUS respectively; $p < 0.001$), the postoperative period (8.34 ± 10.32 *vs.* 9.19 ± 6.97 days for SUS and non-SUS respectively; $p < 0.001$), and the total LOS (10.93 ± 11.08 *vs.* 12.21 ± 8.20 days for SUS and non-SUS respectively; $p < 0.001$). The non-SUS group had more events of non-elective surgery ($p = 0.002$) and surgery without cardiopulmonary bypass ($p = 0.012$). The groups did not differ regarding the associated valve procedure ($p = 0.057$) nor other non-valve procedures ($p = 0.053$), but they did differ with respect to associated non-cardiac procedures ($p = 0.017$). ICU readmission ($p = 0.636$) and postoperative complications rates were similar in both groups ($p = 0.055$).
Conclusion: The Non-SUS group showed longer LOS compared to the SUS group.

☆Study conducted at the Learning and Research Center of Hospital Beneficência Portuguesa de São Paulo, São Paulo, SP, Brazil.
Corresponding author at: Rua Maestro Cardim, 769, Bela Vista, São Paulo, SP, 01323-900, Brazil.
E-mail: gilmara_silveira@yahoo.com.br; gilmarasilveira@uol.com.br (G.S. Silva).

2255-4823/$ – see front matter

Avaliação do tempo de permanência hospitalar em cirurgia de revascularização miocárdica segundo a fonte pagadora

Palavras-chave:
Tempo de permanência hospitalar
Tempo de internação hospitalar
Cirurgia de revascularização do miocárdio
Fonte pagadora
Sistema Único de Saúde
Convênios de saúde

RESUMO

Objetivo: O indicador de Tempo de Permanência Hospitalar (TPH) permite avaliar a eficiência de uma determinada unidade hospitalar e serve como base para mensurar o número de leitos necessários para o atendimento da população de uma área específica.
Métodos: Levantamento retrospectivo de um banco de dados de 3010 pacientes submetidos à cirurgia de revascularização do miocárdio (CRM) de julho de 2009 a julho de 2010.
Resultados: Dos 2840 pacientes com critérios de inclusão, 92,1% tinham como fonte pagadora o Sistema Único de Saúde (SUS) e 7,9% eram de convênios e particulares (Não SUS); 70,2% eram do sexo masculino, a média de idade foi de 61,9 anos e a média do escore de risco (EuroSCORE) foi de 2,9%. Os grupos SUS e Não SUS não diferiram no tempo de espera pré-cirurgia (2,59 ± 3,10 dias *vs.* 3,02 ± 3,70 dias para os grupos SUS e não SUS, respectivamente; p = 0,790), mas diferiram nos tempos de terapia intensiva (2,17 ± 3,84 *vs.* 2,52 ± 2,72 dias para os grupos SUS e não SUS, respectivamente; p < 0,001), de pós-operatório (8,34 + 10,32 *vs.* 9,19 ± 6,97 dias para os grupos SUS e não SUS, respectivamente; p < 0,001) e de permanência hospitalar total (10,93 ± 11,08 *vs.* 12,21 ± 8,20 dias para os grupos SUS e não SUS, respectivamente; p < 0.001). O grupo Não SUS teve mais cirurgia não eletiva (p = 0,002) e mais cirurgia sem circulação extracorpórea (p = 0,012). Os grupos não diferiram em relação a procedimento valvar associado (p = 0,057) e a outros procedimentos não valvulares (p = 0,053), mas diferiram nos procedimentos não cardíacos associados (p = 0,017). As taxas de readmissão na UTI (p = 0,636) e de complicações pós-operatórias foram semelhantes entre os grupos (p = 0,055).
Conclusão: Os pacientes do grupo Não SUS tiveram tempos de permanência hospitalar maiores que o grupo SUS.

Introduction

Currently, there is a growing concern by health institutions, private or public, regarding better results in health assistance, which reflects a competitive system, where the increase in the volume of patients, reduction in the length of hospital stay (LOS), reduction in health care costs, and good results are regarded as guarantees of survival in the health market.[1]

LOS is one of the institutional quality indicators used to define the yield and productivity per hospital bed in each specialty. It is important to note its relevance to health care managers, as this indicator makes it possible to evaluate the efficiency of a certain facility, as well as its use as a basis for measuring the number of hospital beds required to provide assistance to the population in a specific area.[2,3] For patients submitted to coronary artery bypass grafting (CABG), LOS has substantially decreased in the last two decades.[4]

In Brazil, LOS is measured through the average length of stay (ALOS), which refers to the LOS and reflects factors that may increase the stay such as complexity, chronicity, and psychiatric treatments.[2] Studies have shown that possible differences in severity, intensity, and number of comorbidities, in addition to social factors, may be determinant for an increase in the LOS in patients of the Brazilian Unified Health System (Sistema Único de Saúde - SUS).[5-7] Conversely, factors such as LOS and cost restrictions by health plans and private patients and a differentiated attention by healthcare professionals may reduce the LOS in patients included in such categories.[8-10] Therefore, it is important to evaluate whether there is a difference in the LOS of SUS patients compared to health plans and private patients.

Thus, this study aimed to verify possible differences in the LOS of patients submitted to CABG, according to the hospital payer, whether SUS, health plans, or private.

Methods

This study is based on an electronic database, composed of 3,010 patients submitted to CABG at the Hospital Beneficência Portuguesa de São Paulo, who are 18 years old or older. The study was conducted from July 8, 2009 to July 26, 2010, including data from 70.0% of all CABGs performed at the hospital during this period.

For this study, a retrospective survey was conducted in this database. Patients were divided into two groups according to the payer. The SUS group was composed of patients from the SUS, in which the payer is the Brazilian government, and the non-SUS group encompassed patients whose treatment was paid by health plans, insurance companies, or private (in which the bill is the responsibility of the patient). 170 patients were excluded from the total database: 160 patients who died, seven patients who were not discharged from hospital until the end of this study (one-year follow-up), and three patients whose treatment was paid by the Associação Portuguesa de Beneficência (it was not possible to classify them as SUS or non-SUS). Therefore, the total sample comprised 2,840 patients.

Table 1 – Descriptive values of waiting time before surgery, intensive care unit, postoperative period, and total length of hospital stay by payer.

	All	Group		p*
		SUS (n = 2617)	Non-SUS (n = 223)	
Waiting time before surgery (in days)				
Average ± SD	2.63 ± 3.15	2.59 ± 3.10	3.02 ± 3.70	
Median	1	1	1	0.790
(Minimum; maximum)	(0; 57)	(0; 57)	(0; 25)	
ICU (in days)				
Average ± SD	2.20 ± 3.77	2.17 ± 3.84	2.52 ± 2.72	
Median	1	1	2	< 0.001
(Minimum; maximum)	(1; 76)	(1; 76)	(1; 34)	
Postoperative period (in days)				
Average ± SD	8.41 ± 10.10	8.34 ± 10.32	9.19 ± 6.97	
Median	6	6	7	< 0.001
(Minimum; maximum)	(1; 211)	(1; 211)	(4; 71)	
Total (in days)				
Average ± SD	11.03 ± 10.89	10.93 ± 11.08	12.21 ± 8.20	
Median	8	8	10	< 0.001
(Minimum; maximum)	(5; 212)	(2; 212)	(5; 77)	

*Descriptive level of probability of the Mann-Whitney nonparametric test.
SD, standard deviation; SUS, Brazilian Unified Health System (Sistema Único de Saúde).

LOSs were assessed in terms of days: (1) total length of stay (TLOS), which is the period from admission until hospital discharge; (2) waiting time for surgery (WTS), which is the period from admission until the moment in which the patient is directed to the operating room to undergo CABG; (3) intensive care unit length of stay (ICULOS), which is the period in which the patient remains in the intensive care unit (ICU) after CABG (new admissions to the ICU were not taken into account); and (4) postoperative length of stay (PLOS), which is the period between the discharge from ICU and hospital discharge.

The following database variables were selected for this study: age, gender, hospital payer (SUS, health plans, or private), WTS, ICULOS, PLOS and TLOS (in days), EuroScore, surgery status (elective, urgent/emergency), cardiopulmonary bypass (CPB) support, procedures associated with the CABG (valve, cardiac, non-cardiac), ICU readmission, and existence of any postoperative complication.

Statistical analysis

Initially, all variables were descriptively analyzed. For quantitative variables, this analysis was performed by observing minimum and maximum values, and the calculation of averages, standard deviations, and medians. For qualitative variables, the absolute and relative frequencies were calculated.

Student's *t*-test was used to compare averages from both groups.[11] The Mann-Whitney nonparametric test was used[11] when the assumption of normality of data was rejected. The chi-squared test or Fisher's exact test were used to test the homogeneity among the proportions.[11]

The significance level used for the tests was set at 5%.

Results

The 2,840 patients evaluated were between 30 and 89 years old (average of 61.9 years), and 70.2% were male. Regarding the payer, 92.1% belonged to the SUS group and 7.9% to the non-SUS group.

The SUS and non-SUS groups did not show significant differences as to the WTS (2.59 ± 3.10 vs. 3,02 ± 3.70 days for SUS and non-SUS respectively; p = 0.790). However, the groups differed regarding ICULOS (2.17 ± 3.84 vs. 2.52 ± 2.72 days for SUS and non-SUS respectively; p < 0.001), PLOS (8.34 + 10.32 vs. 9.19 ± 6.97 days for SUS and non-SUS respectively; p < 0.001) and regarding the TLOS (10.93 ± 11.08 vs. 12.21 ± 8.20 days for SUS and non-SUS respectively ; p < 0.001) , as shown in Table 1. The TLOS in the non-SUS group is higher by more than one day in comparison with SUS patients. More occurrences of more-than-seven-day TLOS were also verified in the non-SUS group than in the SUS group (78.0% for non-SUS *vs*. 61.4% for SUS, p < 0.001).

Regarding preoperative characteristics, it was observed that the average age was not significantly different between the groups (61.8 ± 9.33 *vs*. 62.94 ± 10.39 for SUS and non-SUS respectively; p = 0.119). The number of women was greater in the SUS group than in the non-SUS group (30.6% *vs*. 20.6% [p = 0.002]).

The expected mortality, calculated by the average logistic EuroScore, ranged in the total sample from 0.88% to 34.75%, with an average of 2.88%, and it did not differ between the groups (2.81 ± 2.71 *vs*. 3.58 ± 4.02 for SUS and non-SUS respectively; p = 0.566). The EuroScore is a model of risk stratification in CABG initially validated in 128 centers of European countries, and subsequently in non-European populations. The risk

Table 2 – Descriptive results of preoperative, intraoperative, and postoperative variables, and their distribution between the groups.

Variables	Groups				p
	SUS (n = 2617)		Non-SUS (n = 223)		
	n	%	n	%	
Age (average ± SD)	61.8 ± 9.33		62.94 ± 10.39		0.119[a]
EuroScore (average ± SD)	2.81 ± 2.71		3.58 ± 4.02		0.566[b]
Male gender	1817	69.4	177	79.4	0.002[c]
Urgency/emergency	17	0.7	7	3.1	0.002[d]
Surgery without CPB	308	11.8	39	17.5	0.012[c]
Associated procedure					
Valve	97	3.7	14	6.3	0.057[d]
Cardiac	151	5.8	6	2.7	0.053[d]
Non-cardiac	15	0.6	5	2.2	0.017[c]
ICU readmission	174	6.7	13	5.8	0.636[c]
Complications	912	34.6	92	41.3	0.055[c]

CPB, cardiopulmonary bypass; ICU, intensive care unit; SD, standard deviation; SUS, Brazilian Unified Health System (Sistema Único de Saúde).
[a] Descriptive level of probability of the Student's t-test.
[b] Descriptive level of probability of the Mann-Whitney nonparametric test.
[c] Descriptive level of probability of the chi-squared test.
[d] Descriptive level of probability of the Fisher's exact test.

assessment contemplates the following clinical or surgical procedure-related variables: age, gender, chronic obstructive pulmonary disease (COPD), extracardiac arteriopathy, neurological dysfunction, previous cardiac surgery, serum creatinine value, active endocarditis, critical preoperative state, unstable angina, left ventricular ejection fraction, recent myocardial infarction, pulmonary hypertension, emergency surgery, other related surgeries, thoracic aorta surgery, and septal rupture after infarction.[12] The mean EuroScore was obtained in 1,237 patients (41%) presenting complete data for the calculation of such score, as shown in Table 2.

Regarding the intraoperative and postoperative characteristics, non-elective surgery was unusual, but occurred in a higher number in non-SUS patients (3.1% *vs.* 0.7% of SUS [p = 0.002]). Surgeries without CPB were significantly higher in the non-SUS patient group (17.5% of non-SUS *vs.* 11.8% of SUS [p = 0.012]). The groups did not differ with respect to an associated valve procedure (97 [3.75%] of SUS *vs.* 14 p[6.35%] of non-SUS [p = 0.057]) and to other cardiac procedures (non-valve) (151 [5.8%] of SUS *vs.* six [2.7%] of non-SUS [p = 0.053]), but they differed with respect to associated non-cardiac procedures (15 [0.6%] of SUS *vs.* five [2.2%] of non-SUS [p = 0.017]). There were not differences in terms of ICU readmissions (174 [6.7%] of SUS *vs.* 13 [5.8%] of non-SUS [p = 0.636]). The complication rate (all complications) was similar in both groups (912 [34.6%] of SUS *vs.* 92 [41.3%] of non-SUS [p = 0.055]), as shown in Table 2.

Discussion

The results of this study showed that the total LOS, ICULOS, and PLOS of patients submitted to CABG at the Hospital Beneficência Portuguesa in São Paulo were different between SUS and non-SUS groups. Only with respect to WTS was there no difference between the groups.

A study conducted in the city of Belo Horizonte, Brazil, showed similar TLOS, ICULOS, and PLOS in the SUS and the non-SUS groups, and a greater WTS in the SUS group.[5]

The average WTS in this study was 2.6 days, and meets the current institutional efforts in reducing the preoperative hospital stay. Some authors, by analyzing WTS costs of elective surgeries in public hospitals, verified that the efficiency in the management of health services could reduce this time, with consequent reduction in costs and increase in availability of hospital beds/day.[13]

The non-SUS group presented a longer ICULOS (2.5 days for non-SUS *vs.* 2.2 days for SUS; p < 0.001), which was below the average reported by a national study conducted in the 1990s (3.8 days).[14] In the United States, the average ICULOS after a CABG is 2 days.[15] A study conducted in Brazil focusing on minimally invasive CABG showed an average ICULOS of 18 hours.[16]

There was a significant difference in the average PLOS between the groups (8.3 days in the SUS group *vs.* 9.2 days in the non-SUS group [p < 0.001]). A study based on the US Society of Thoracic Surgeons' National Database with 496,797 isolated CABGs performed from January 1997 to January 2001 in 587 hospitals, considers as ideal a PLOS of less than five days.[15]

An early discharge (on day four of the postoperative period) protocol was used in a study with patients submitted to isolated CABG, aiming at evaluating the safety of the hospital discharge and reduced PLOS. Patients were divided into a group of regular discharge (control) and another group of early discharge. Before the study, PLOS was between 7.8 days. For patients in which the early discharge protocol was applied, the average PLOS was 4.7 days, while in the control group, it was 7.7 days (p < 0.0001). The reduction in PLOS resulted

Table 3 – Absolute and relative frequencies of length of hospital stay by payer.

	Group				
	SUS (n = 2617)		Non-SUS (n = 223)		
Length of hospital stay	n	%	n	%	p*
More than seven days	1606	61.4	174	78.0	< 0.001

SUS, Brazilian Unified Health System (Sistema Único de Saúde).
*Descriptive level of probability of the chi-squared test.

in a significant reduction in costs; there was no increase in mortality within 30 days of postoperative period, and the incidence of nonfatal perioperative complications was similar in both groups. Regarding readmissions, the rate was 8.4% in the control group *versus* 3.8% in the early discharge group. The study concluded that the reduction in the elective PLOS to 4 days is safe and may be a way to reduce health care costs.[17]

The average LOS of all patients in this study (SUS and non-SUS) was 11 days (± 10.89), which shows a progressive decrease in comparison with previous studies. Data from 41,989 patients submitted to the CABG in the SUS between 1996 and 1998 at 131 hospitals located in 22 Brazilian states showed an average LOS of 14.5 days.[14] Another study, conducted between 2005 and 2007 with 63,529 SUS patients in 191 hospitals, showed an average LOS of 12 days, with no difference between low-surgical-volume (12.08 ± 5.52) and high-surgical-volume (12.5 ± 7.70) hospitals.[18] Studies that evaluated only revascularizations without cardiopulmonary bypass indicated a maximum LOS of five days[16] or average LOS of seven days.[19] In a study assessing the LOS of 66,587 patients submitted to CABG from 2007 to 2009 in ten European countries, the average LOS ranged from nine to 17 days.[20]

In the present study, TLOS longer than seven days occurred more frequently in the non-SUS group (78.0% for non-SUS *vs.* 61.4% for SUS [p < 0.001]), as shown in Table 3. Some authors regard as lengthy a TLOS higher than 12 days,[21] while others considerer that only TLOSs longer than 14 days[15] are lengthy.

With respect to preoperative, intraoperative, and postoperative characteristics, differences between the SUS and non-SUS groups regarding gender, urgent and emergency surgery, and surgery with CPB were observed. There was no significant difference between the SUS and non-SUS groups regarding age, EuroScore, ICU readmission, and evolution of any complication during the postoperative period.

The SUS group had significantly more women than the non-SUS group (p = 0.002), and also showed a reduced incidence of surgeries without CPB. Non-elective surgeries (urgent/emergency) occurred more in the non-SUS group (seven patients [3.1%] *vs.* 17 patients [0.7%], p = 0.002).

Significant differences were observed in the studied LOS; patients of the non-SUS group have longer ICULOS, PLOS, and TLOS. New studies are required to identify the reason for the differences in the LOSs between the study groups, and to assess whether this occurs in other health institutions.

A hypothesis for the higher LOSs observed in the non-SUS group is that health care plans and private patients are more conscious about their conditions and rights, directly interfering in hospital discharge, an act that is shared or consented by doctors. Another hypothesis is that the major requirement by the non-SUS group is based on reasons that are not an obstacle for the physician to extend his/her patients stay, in addition to the inattention of the controlling institutions that allow longer stays and, finally, that patients from other states need to be discharged in excellent clinical conditions, provided that they require long-distance transportation.

Although the PLOS observed in the present study was consistent with those observed in ten European countries,[20] it was above that reported in the USA, where the average was 6.9 days.[15] It is important that other studies are performed in order to evaluate whether the discharge of SUS patients is premature or if the discharge of health plan patients is overdue.

Conclusion

Patients submitted to a CABG paid by health plans or with private resources presented longer TLOS, ICULOS, and PLOS than patients funded by the SUS. New studies are required to identify the reason for these differences and to assess whether this occurs in other health institutions.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. Borba VR, Lisboa TC. Teoria geral de administração hospitalar: estruturação e evolução do processo de gestão hospitalar. Rio de Janeiro: Qualitymark; 2006.
2. Brasil. Ministério da Saúde. Portaria n. 1.101 de 12 junho 2002. Parâmetros assistenciais do SUS. Available from: http://portal.saude.gov.br/portal/arquivos/pdf/portaria%20GM%201101%2002.pdf
3. Santos MCE, Jorge LT, Anção MS, Sigulem D. O indicador hospitalar média de permanência e sua aplicação no ambiente hospitalar. 2004. Available from: http://www.sbis.org.br/cbis9/arquivos/732.doc
4. Cowper PA, DeLong ER, Hannan EL, Muhlbaier LH, Lytle BL, Jones RH, et al. Is early too early? Effect of shorter stays after bypass surgery. Ann Thorac Surg. 2007;83(1):100-7.

5. Almeida FF, Barreto SM, Couto BRGM, Starling CEF. Fatores preditores da mortalidade hospitalar e de complicações perioperatórias graves em cirurgia de revascularização do miocárdio. Arq Bras Cardiol. 2003;80(1):41-50.
6. Travassos, C. Equidade e o Sistema Único de Saúde: uma contribuição para debate. Cad Saúde Pública. 1997;13(2):325-30.
7. Castro MSM, Travassos C, Carvalho MS. Fatores associados a internações hospitalares no Brasil. Ciênc Saúde Coletiva. 2002; 7(4):795-811.
8. Bittar OJNV. Produtividade em hospitais de acordo com alguns indicadores hospitalares. Rev Saúde Pública. 1996;30(1): 53-60.
9. Taraboulsi FA. Humanização: a grande conquista da hotelaria. In: Taraboulsi FA, editor. Administração e hotelaria hospitalar. 4ºed. São Paulo: Atlas; 2011. p. 17-29.
10. Boareto C. Humanização da assistência hospitalar: o dia-a-dia da prática dos serviços. Ciênc Saúde Coletiva. 2004;9(1):20-2.
11. Rosner B. Fundamentals of biostatistics. Boston: PWS Publishers; 1986.
12. Euro SCORE Logístico. Available from: http://www.euroscore.org/calculators
13. Reis MFFE. Permanência hospitalar pré-operatória e sua repercussão nos custos dos serviços de saúde. Divulg Saúde Debate. 2007;(38):35-47.
14. Noronha JC, Martins M, Travassos C, Campos MR, Mais P, Panezzuti R. Aplicação da mortalidade hospitalar após a realização de cirurgia de revascularização do miocárdio para monitoramento do cuidado hospitalar. Cad Saúde Pública. 2004;20(2):322-30.
15. Peterson ED, Coombs LP, Ferguson TB, Shroyer AL, DeLong ER, Grover FL, et al. Hospital variability in length of stay after coronary artery: results from the Society of Thoracic Surgeon's National Cardiac Database. Ann Thorac Surg. 2002; 74(2):464-73.
16. Braile DM, Leal JCF, Soares MJ, Godoi MF, Paiva O, Petrucci Junior O, et al. Revascularização do miocárdio com cirurgia minimamente invasiva (MIDCAB): resultados em 46 pacientes. Rev Bras Cir Cardiovascular. 1998;13(3):194-7.
17. Loubani M, Mediratta N, Hickey MS, Galiñanes M. Early discharge following coronary bypass surgery: is it safe? Eur J Cardiothorac Surg. 2000;18(1):22-6.
18. Piegas LS, Bittar OJNV, Haddad N. Cirurgia de revascularização miocárdica: resultados do Sistema Único de Saúde. Arq Bras Cardiol. 2009;93(5):555-60.
19. Lobo Filho JG, Dantas MCBR, Rolim JGV, Rocha JA, Oliveira FM, Ciarline C, et al. Cirurgia de revascularização completa do miocárdio sem circulação extracorpórea: uma realidade. Rev Bras Cir Cardiovasc. 1997;12(2):115-21.
20. Gaughan J, Kobel C, Linhart C, Mason A, Street A, Ward P, et al. Why do patients having coronary artery bypass grafts have different cost or length of stay? An analysis across 10 European countries. Healt Econ. 2012;21(Suppl. 2):77-88.
21. Toumpoulis IK, Anagnostopoulos CE, Swistel DG, DeRose Junior J. Does EuroSCORE predict length of stay and specific postoperative complications after cardiac surgery? Eur J Cardiothorac Surg. 2005;27(1):128-33.