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EuroSCORE and mortality in coronary artery bypass graft surgery at Pernambuco Cardiologic Emergency Medical Services [Pronto Socorro Cardiológico de Pernambuco]

EuroSCORE e mortalidade em cirurgia de revascularização miocárdica no Pronto Socorro Cardiológico de Pernambuco

Michel Pompeu Barros de Oliveira SÁ[1], Evelyn Figueira SOARES[2], Cecília Andrade SANTOS[3], Omar Jacobina FIGUEIREDO[3], Renato Oliveira Albuquerque LIMA[3], Rodrigo Renda ESCOBAR[4], Frederico Pires Vasconcelos SILVA[5], Ricardo de Carvalho LIMA[6]

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Abstract

Objective: **The aim of this study is to evaluate the applicability of EuroSCORE in patients undergoing coronary artery bypass graft (CABG) surgery at the Division of Cardiovascular Surgery of Pernambuco Cardiologic Emergency Medical Services - PROCAPE.**

Methods: **A retrospective study involving 500 patients operated between May 2007 and April 2010. The registers contained all the information used to calculate the EuroSCORE. The outcome of interest was death. Univariate analysis and multivariate analysis by backward logistic regression were applied to assess the association between each variable in the EuroSCORE and deaths. The following parameters were calculated: sensitivity, specificity, positive predictive value, and negative predictive value. The power of concordance between the predicted mortality by the EuroSCORE and the observed mortality was measured using the Kappa coefficient. The accuracy of the model was evaluated by the ROC (receiver operating characteristic) curve.**

Results: **The incidence of death was 13%. In multivariate analysis, nine variables remained independent predictors of death: chronic obstructive pulmonary disease, creatinine >2,3mg/dL, active endocarditis, preoperative critical state, unstable angina, ejection fraction 30% to 50%, acute myocardial infarction < 90 days, emergency surgery and additional surgery. The score had a sensitivity of 88.4%, specificity of 79.3%, positive predictive value of 40.7%, negative predictive value of 97.7% and 80.6% concordance. The accuracy measured by the area under the ROC curve was 0.892 (95% CI 0.862-0.922).**

1. Undergraduate Student; Postgradute Health Science Programme; Faculty of Medical Sciences, University of Pernambuco - FCM/UPE; Former intern; Division of Cardiovascular Surgery; Pernambuco Cardiologic Emergency Medical Services – PROCAPE.
2. Undergrate Medical Student; Faculty of Medical Sciences, University of Pernambuco - FCM/UPE; Scientific Initiation Scholarship; University of Pernambuco Strengthening Academic Program.
3. Undergraduate Student; Faculty of Medical Sciences, University of Pernambuco - FCM/UPE.
4. Graduated from the Faculty of Medical Sciences, University of Pernambuco - FCM/UPE in Medicine; Resident physician; Division of Cardiovascular Surgery; Pernambuco Cardiologic Emergency Medical Services – PROCAPE.
5. Professor of Cardiothoracic Surgery; Faculty of Medical Sciences, University of Pernambuco - FCM/UPE; Cardiovascular Surgeon; Division of Cardiovascular Surgery; Pernambuco Cardiologic Emergency Medical Services – PROCAPE.
6. Doctor Degree from UNIFESP in Cardiovascular Surgery. Full Professor Titular; Cardiothoracic Surgery; Faculty of Medical Sciences, University of Pernambuco - FCM/UPE (Head of the Division of Cardiovascular Surgery; Pernambuco Cardiologic Emergency Medical Services – PROCAPE.

This study was carried out at Division of Cardiovascular Surgery; Pernambuco Cardiogologic Emergency Medical Services – PROCAPE. University of Pernambuco – UPE, Recife, PE, Brazil.

Correspondence address:
Michel Pompeu Barros de Oliveira Sá. Av. Eng. Domingos Ferreira, 4172/405 – Boa Viagem – Recife, PE, Brazil – CEP 51021-040.
E-mail: michel_pompeu@yahoo.com.br

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Conclusions: **The EuroSCORE proved to be a simple and objective index, revealing a satisfactory discriminator of postoperative evolution in patients undergoing CABG surgery at our institution**.

Descriptors: **Myocardial revascularization. Risk. Mortality. Risk assessment/methods.**

Resumo

Objetivos: **O objetivo desse estudo foi avaliar a aplicabilidade do EuroSCORE em pacientes submetidos à cirurgia de revascularização miocárdica na Divisão de Cirurgia Cardiovascular do Pronto Socorro Cardiológico de Pernambuco - PROCAPE.**

Métodos: **Estudo retrospectivo envolvendo 500 pacientes operados entre maio de 2007 a abril de 2010. Os registros continham todas as informações utilizadas para calcular o EuroSCORE. O desfecho de interesse foi óbito. Análises univariada e multivariada por regressão logística *backward* foram aplicadas para verificar associação entre cada variável do EuroSCORE e ocorrência de óbito. Foram calculadas medidas de sensibilidade, especificidade, valor preditivo positivo e valor preditivo negativo. O poder de concordância do EuroSCORE entre mortalidade prevista e observada foi mensurado por meio do índice Kappa. A acurácia do modelo foi avaliada por meio da curva ROC (*receiver operating characteristic*).**

Resultados: **A ocorrência de morte foi de 13% (n=65). Na análise multivariada, nove fatores permaneceram como preditores independentes de morte: doença pulmonar obstrutiva crônica, creatinina >2,3mg/dL, endocardite ativa, estado crítico no pré-operatório, angina instável, fração de ejeção de 30%-50%, infarto agudo do miocárdio <90 dias, cirurgia de emergência e cirurgia adicional. O escore obteve sensibilidade de 88,4%, especificidade de 79,3%, valor preditivo positivo de 40,7%, valor preditivo negativo de 97,7% e 80,6% de concordância. A acurácia mensurada pela área sob a curva ROC foi de 0,892 (IC 95% 0,862-0,922).**

Conclusões: **O EuroSCORE mostrou-se um índice simples e objetivo, revelando-se um discriminador satisfatório de evolução pós-operatória em pacientes submetidos à cirurgia de revascularização miocárdica em nossa instituição.**

Descritores: **Revascularização miocárdica. Risco. Mortalidade. Medição de risco/métodos.**

INTRODUCTION

There is an important role for accurate prediction models of risk in the current practice of cardiac surgery. These models allow surgeons and institutions to compare results in a significant way. They are also useful in surgical decision making, development of informed consent preoperatively, quality and management of health care [1]. The *European System for Cardiac Operative Risk Evaluation* (EuroSCORE) was developed in 128 centers in eight European countries [2]. It was designed to provide a predicted operative mortality up to 30 days in patients undergoing cardiac surgery. It has been validated with good outcomes in Europe, North America, and Japanese populations [3-9]. It has also been used to provide other useful parameters, including long-term mortality [10], the length of stay in the intensive care units (ICU) [11], complications [12,13], and costs in cardiac surgery [11,14]. In the absence of a local model, EuroSCORE is used for risk assessment in different institutions [15].

Risk scoring systems are most applicable when the characteristics of the patient before surgery and his/hers treatment profiles are comparable to those upon which the system originated. For this reason, any risk scoring system can reliably be used only when its validity was tested in the local patient population [16]. Moraes et al. [17] performed a validation study in 752 patients undergoing coronary artery bypass grafting (CABG) at a Brazilian institution in the State of Pernambuco, demonstrating that the EuroSCORE obtained good prediction of mortality (similar to that expected). However, there are doubts about the fact that this study [17] is representative of cardiac surgeries performed in public institutions in the State of Pernambuco, once it was conducted in a private institution. Recently, Carvalho et al. [18] advised against the use of the EuroSCORE as a tool for assessment of operative risk in patients who were to undergo CABG in public hospitals in Rio de Janeiro, in view of the low discriminatory power observed in that study. Nevertheless, the EuroSCORE has not been tested at a public institution in our region.

The Pernambuco Cardiogologic Emergency Medical Services (PROCAPE), located in the campus of the University of Pernambuco, is a reference teaching hospital in cardiology and cardiac surgery, providing health care assistance to the metropolitan area of Recife and cities in the State of Pernambuco. The hospital is a public institution that was established in 2006. The surgical procedures in cardiovascular surgery were initiated in May 2007. Although

used at the institution in the preoperative evaluation of surgical risk, the EuroSCORE system has not been validated by the PROCAPE yet.

The aim of this study was to evaluate the applicability of the EuroSCORE in patients undergoing coronary artery bypass surgery at PROCAPE.

METHODS

In this series, it has been retrospectively studied 500 consecutive patients at the PROCAPE Division of Cardiovascular Surgery from May 2007 to April 2010, who underwent coronary artery bypass surgery.

Each patient was evaluated for the presence or absence of 17 risk factors (independent variables) set by the EuroSCORE, respecting the definition of each of them and attributing the correct score (Table 1). Depending on the final score, each patient was placed into one of three risk groups (Table 2), writing down the occurrence of death (dependent variable).

Table 2. Risk classification according to the EuroSCORE.

Class of Risk	Score
Low	0-2
Mean	3-5
High	$\geq$ 6

Data were analyzed using percentages and descriptive statistics: mean and standard deviation. The Student *t*-test (for parametric variables) and the Pearson's Chi-square test or Fisher's exact test (for nonparametric variables) were used. In the study of univariate association of categorical variables, the value of the Odds Ratio and a confidence interval for this parameter with a reliability of 95% was obtained.

To perform the multivariate analysis, a logistic regression model was adjusted explaining the proportion of patients who had mediastinitis with a significant association up to a level of 15% (P <0.15). The model was constructed by the procedure of selecting backward step-by-step variables. It has been maintained in the model, the variables with

Table 1. Risk factors, definitions and the EuroSCORE socoring.

Variables	Definitions	Scoring
Patient-related risks		
Age	per 5 years or part thereof over 60 years	1
Gender	Female	1
COPD	Long term use of bronchodilators or steroids for lung disease	1
Extracradiac Arteriopathy	any one or more of the following: claudication, carotid occlusion or >50% stenosis, previous or planned intervention on the abdominal aorta,limb arteries or carotids	2
Neurological Dysfucntion	Disease severely affecting ambulation or day-to-day functioning	2
Previous Cardiac Surgery	requiring opening of the pericardium	3
Serum Creatinine	> 2.3 mg/dL preoperatively	2
Active Endocarditis	patient still under antibiotic treatment for endocarditis at the time of surgery	3
Critical preoperative state	any one or more of the following: ventricular tachycardia or fibrillation or aborted sudden death, preoperative cardiac massage, preoperative ventilation before arrival in the anaesthetic room,preoperative inotropic support, intraaortic balloon counterpulsation or preoperative acute renal failure (anuria or oliguria<10 ml/hour)	3
Heart-related factors		
Unstable Angina	rest angina requiring iv nitrates until arrival in the anaesthetic room	2
Moderate LV dysfunction	EF 30-50%	1
Severe LV Dysfunction	EF< 30%	3
Recent myocardial infarct	< 90 dias	2
Pulmonary Hypertension	Systolic PA pressure>60 mmHg	2
Operation-related Factors		
Emergency	carried out on referral before the beginning of the next working day	2
Other than isolated CABG	major cardiac procedure other than or in addition to CABG	2
Surgery on thoracic aorta	for disorder of ascending, arch or descending aorta	3
IVC postinfarct		4

COPD: chronic obstructive pulmonary disease; PA: pulmonary artery; EF: ejection fraction; CABG: coronary artery bypass graft surgery; AMI: acute myocardial infarction; PASP: pulmonary artery systolic pressure; IVC: interventricular communication

significance up to 15% ($P < 0.15$). By this procedure, the initial model involving all variables selected has been set.

At each step, a non-significant variable is removed, and a new model is adjusted to a point that all remained variables in the model have a significant contribution to a certain level of significance chosen previously to explain the probability of that patient's death. At each step, the variable with the smallest contribution to the model (or variable with the greater *P* value) is removed and a new model is set with the remaining variables in the model. This procedure is repeated until no variable can be removed. Through the model, adjusted odds ratio values are estimated according to the independent variables placed on the model [19].

Sensitivity, specificity, positive predictive value, and negative predictive value of EuroSCORE scoring for the population studied were calculated. The Kappa index to evaluate the agreement between prediction outcome by the score and that observed in the study was used.

The accuracy (or discriminatory ability of the model) was calculated using the area under the ROC curve (receiver operating characteristic curve) constructed from the sensitivity (correct prediction of death) and specificity (correct prediction of survival) calculated for each score value.

We considered $P = 5\%$ as statistically significant. The statistical analysis was performed using SPSS® (Statistical Package for the Social Sciences) for Windows version 15 (SPSS, Chicago, Illinois, USA).

The Research and Ethics Committee from the Osvaldo Cruz University Hospital/Pernambuco Cardiogologic Emergency Medical Services – PROCAPE (CEP/HUOC/PROCAPE), approved the study under opinion nº 072/2010.

RESULTS

The mean age of the study population was 62.1 ± 9.9 and 59% were male. The frequency of death in the study population was 13% (n = 65). According to the classification of the EuroSCORE, 23.8% (n = 119) were low-risk operative mortality patients, 46.2% (n = 231) were medium-risk patients, and 30% (n = 150) were high-risk patients for death.

According to the EuroSCORE, It has been observed a statistically significant ($P < 0.0001$) association between the class score and the observed deaths in the study (Table 3). In patients classified as low-risk of operative mortality, no deaths occurred. In patients classified as medium-risk of operative mortality, the frequency of death was 3.5% (n = 8), whereas in high-risk patients of operative mortality, the incidence of death was 38% (n = 57).

The prevalence of risk factors involved in both the EuroSCORE, and the current study is presented in Table 4. One must observe that, in comparison with the population enrolled in the study in which the EuroSCORE was actually originated, the current study highlights a higher prevalence of the following factors: female gender, COPD, previous heart surgery, creatinine > 2.3 mg / dL, unstable angina, AMI <90 days, and PASP > 90mmHg. On the other hand, the EuroSCORE study population showed a higher prevalence of the following factors: age > 60 years, extracardiac arteriopathy, critical preoperative state, and additional procedure to CABG.

Table 3. Association of the risk scoring according the EuroSCORE and the occurrence of death in the study population.

Scoring by the EuroSCORE	Outcome		Total
	Death	Survival	
Low	—	119 (100%)	119
Mean	8 (3.5%)	223 (96.5%)	231
High	57 (38.0%)	93 (62%)	150

P-value = < 0.0001

Table 4. Frequency (%) of the risk factors in the present study and in the EuroSCORE original study.

Risk Factors	Present Stuydy (n=500)	EuroSCORE (n=19030)
Age > 60 years	60.6	66.8
Female	41.0	27.8
COPD	8.4	3.9
Extracardiac Arteriopathy	3.8	11.3
Neurological Dysfunction	1.4	1.4
Previous Cardiac Surgery	10.6	7.3
Creatinine>2.3 mg/dL	4.0	1.8
Actiove Endocarditis	1.0	1.0
Critical preoperative state	2.2	4.1
Unstable Angina	39.8	8.0
EF% (30 a 50)	26.2	25.6
EF% < 30	3.2	5.8
AMI < 90 dias	35.2	9.7
PASP > 60 mmHg	7.8	2.0
Emergency Operation	2.0	4.9
Other than isolated CABG	3.4	36.4
Surgery on thoracic aorta	0.6	2.4
IVC postinfarct	0.8	0.2

COPD: chronic obstructive pulmonary disease; PA: pulmonary artery; EF: ejection fraction; CABG: coronary artery bypass graft surgery; AMI: acute myocardial infarction; PASP: pulmonary artery systolic pressure; IVC: interventricular communication

The results of the univariate analysis for the studied variables, are depicted in Table 5 as follows: the number of patients in each one of the categories, the percentage of death in each subgroup, the odds ratio, and respective confidence interval of 95%. The following variables: COPD

Table 5. Association of risk factors for death according to EuroSCORE and the occurrence of death in the univariate analysis.

Characteristics	Occurrence of Death – n (%)	OR – CI (95%)	*P*-valor
Age			
≤ 60 anos	27 (13.7)	1.0	—
> 60 anos	42 (13.9)	1.01 (0.60 – 1.71)	0.961
Gender			
Female	27 (13.2)	1.0	—
Male	42 (14.2)	1.09 (0.65 – 1.84)	0.734
COPD			
No	58 (12.7)	1.0	—
Yes	11 (26.2)	2.45 (1.17 – 5.13)	0.018*
Extracardiac Arteriopathy			
No	67 (13.9)	1.0	—
Yes	2 (10.5)	0.73 (0.16 – 3.22)	0.674
Neurological dysfunction			
No	69 (14.0)	1.0	—
Yes	___	Not done	—
Previous Cardiac Surgery			
No	60 (13.4)	1.0	—
Yes	9 (17.0)	1.32 (0.61 – 2.84)	0.479
Creatinine>2.3mg/dL			
No	62 (12.9)	1.0	—
Yes	7 (35.0)	3.63 (1.39 – 9.45)	0.008*
Active endocarditis			
No	65 (13.1)	1.0	—
Yes	4 (80.0)	26.5 (2.91 – 240.4)	0.004*
Critical preoperative state			
No	61 (12.5)	1.0	—
Yes	8 (72.7)	18.7 (4.83 – 72.4)	0.000*
Unstable Angina			
No	31 (10.3)	1.0	—
Yes	38 (19.1)	2.06 (1.23 – 3.43)	0.006*
EF% (30 a 50)			
No	34 (9.2)	1.0	—
Yes	35 (26.7)	3.59 (2.13 - 6.06)	0.000*
EF% <30			
No	66 (13.3)	1.0	—
Yes	3 (18.7)	1.46 (0.41 – 5.27)	0.562
AMI < 90 dias			
No	28 (8.6)	1.0	—
Yes	41 (23.3)	3.21 (1.90 – 5.41)	0.000*
PASP > 60mmHg			
No	58 (12.6)	1.0	—
Yes	11 (28.2)	2.73 (1.29 – 5.78)	0.009*
Emergency Operation			
No	64 (13.1)	1.0	—
Yes	5 (50.0)	6.66 (1.87 – 23.6)	0.003*
Other than isolated CABG			
No	61 (12.6)	1.0	—
Yes	8 (47.1)	6.15 (2.29 – 16.5)	0.000*
Surgery on thoracic aorta			
No	69 (13.9)	1.0	—
Yes	—	Não calculado	—
IVC postinfarct			
No	67 (13.5)	1.0	—
Yes	2 (50.0)	6.40 (0.89 – 46.2)	0.066

** Statistically significant association (P < 0.05)*

(OR = 2.45; 1.17 to 5.13), active endocarditis (OR = 26.5; 2.91 to 240.4), serum creatinine > 2.3 mg / dL (OR = 3.63; 1.39 to 9.45), critical condition preoperatively (OR = 18.7; 4.83 to 72.4), unstable angina (OR = 2.06; 1.23 to 3.43), ejection fraction of 30% to 50% (OR = 3.59; 2.13 to 6.06), myocardial infarction < 90 days (OR = 3.21; 1.90 to 5.41) PASP > 60 mmHg (OR = 2.73; 1.29 to 5.78), emergency surgery (OR = 6.66; 1.87 to 23.6), and additional surgery for CABG (OR = 6.15; 2.29 - 16.5) were statistically significant in relation to increased chance of death.

A multivariate analysis using logistic regression by the backward method is presented in Table 6. The following variables remained in the model as independently factors associated with higher odds of death: COPD (OR = 3.81; 1.59 to 9.13), active endocarditis (OR = 36.3; 3.34 - 393.9), serum creatinine > 2.3 mg / dL (OR = 3.34; 1.08 to 10.4), critical preoperative state (OR = 19.7; 4.19 to 93.0) , unstable angina (OR = 2.97; 1.59 to 5.56), ejection fraction of 30% to 50% (OR = 3.40; 1.86 to 6.23), myocardial infarction < 90 days (OR = 3.78; 2.00 to 7.14), emergency surgery (OR = 11.5; 2.75 to 48.0), and additional surgery to CABG (OR = 5.20; 1.49 to 18.1).

It can be observed in Table 7 the predictive power of statistics of the EuroSCORE. T can also be observed an agreement of 80.6% with a Kappa index of 0.454 between the predicted mortality and the observed score, which shows moderate agreement. According to the measures of sensitivity and specificity, it can be observed probabilities of 88.4% and 79.3%, respectively, i.e., the score has a high probability of identifying both the death and the survival to operation. However, the positive predictive value (probability of death was classified as a high-risk) was 40.7%. Thus, it is expected that of 100 patients classified with a high-risk scoring, only 41 (approximately) indeed died. On the other hand, the score has a negative predictive value (probability of survival among patients diagnosed with low and medium risk) of 97.7%. Thus, it is expected that of 100 patients classified with a low or medium risk scoring, 98 (estimate value) did not actually die. It can be concluded that the use of the score has a great ability to identify patients who will survive the surgical procedure.

According to the results presented in the area under the ROC curve (overall capacity of the measure used to distinguish individuals with and without probability of death), the accuracy measured was 89.2%. Thus, the EuroSCORE shows a well-predicted operative mortality occurrence in patients undergoing coronary artery bypass surgery at the PROCAPE (Figure 1).

Table 6. Association of risk factors for death according the EuroSCORE and the occurrence of death in a multivariate logistic regression analysis.

Risk Factors	OR (IC 95%)	*P*-value
COPD	3.81 (1.59 – 9.13)	0.003
Creatinine >2.3mg/dL	3.34 (1.08 – 10.4)	0.037
Active Endocarditis	36.3 (3.34 – 393.9)	0.003
Critical preoperative state	19.7 (4.19 – 93.0)	0.000
Unstable Angina	2.97 (1.59 – 5.56)	0.001
EF% (30 a 50)	3.40 (1.86 – 6.23)	0.000
AMI < 90 dias	3.78 (2.00 – 7.14)	0.000
Emergency Operation	11.5 (2.75 – 48.0)	0.001
Other than isolated CABG	5.20 (1.49 – 18.1)	0.010

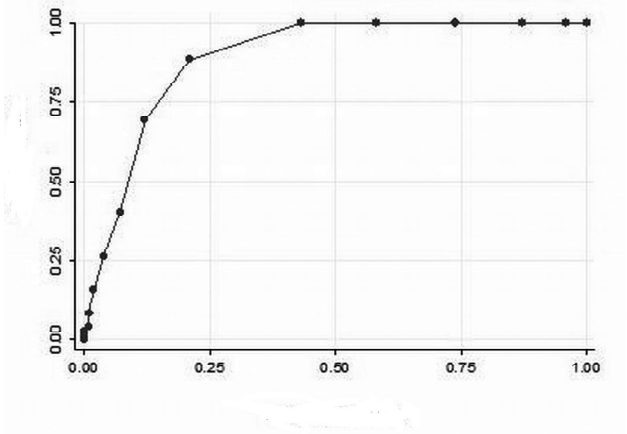

Fig. 1 – EuroSCORE ROC curve in predicting mortality in patients undergoing coronary artery bypass graft surgery at PROCAPE. Area under the curve = 89.2% (86.2% – 92.2%)

Table 7. Concordance statistics, sensitivity, specificity, positive and negative predictive values.

EuroSCORE Scoring	Death		
	Yes	No	Statistics
High	57	93	Agreement = 80.6%
Mean	8	223	Kappa = 0.454 (0.376 – 0.532)
Low	0	150	Sensibility = 88.4% (80.8 – 96.0)
			Specificity = 79.3% (75.5 – 83.1)
			PPV = 40.7% (32.8 – 48.5)
			NPV = 97.7% (96.1 – 99.3)

PPV = positive predictive value; NPV = negative predictive value

DISCUSSION

The mortality rate of 13% in-hospital postoperative of undergoing coronary artery bypass graft (CABG) surgery at the Pernambuco Cardiologic Emergency Medical Services (PROCAPE) is considered high. An important aspect is the fact that we are studying a population undergoing operations at a public institution. Moraes et al. [17] performed a study involving 752 patients undergoing CABG in private institution, showing a mortality rate of 1.7%. On the other hand, Oliveira et al. [20] recently published a study involving public hospitals and showed an in-hospital mortality rate ranging from 7% to 14.3%. Another recent study [18] involving 600 patients undergoing CABG at public hospitals has shown a mortality rate in the in-hospital phase of 12.2%. Apparently, there is some influence of the institutional factor (public vs private), in which it has been observed that the in-hospital mortality rate at public institutions is higher than the in-hospital mortality rate at private institutions. This may be related to the probable difference between the population assisted by private institutions (population that has better access to both basic and major complexity health services) and the population assisted by public institutions (population that has restricted access to basic health services and an even more restricted access to high-tech services). Another aspect that should influence the institutional dichotomy (public versus private) is the difference in the availability of resources that surely must exist between the two types of institution.

The current preoperative profile of the patients undergoing CABG put in question the operative mortality rate as reliable and satisfactory indicators to evaluate the quality of services provided in the public arena. Not to consider the presence of risk factors could lead to misleading conclusions, especially when applied to a specialty where it is known that the sickest patients (those with multivessel disease, which "coincidentally" are carriers of a greater number of comorbidities) are the ones who benefit the most from surgical treatment compared to the conservative medical treatment [21]. It is enough to observe that the present study highlighted a higher prevalence (compared to the original EuroSCORE study) factors as female gender, COPD, heart surgery, creatinine > 2.3 mg / dL, unstable angina, AMI <90 days, and PASP > 60 mmHg. All these factors are well known to increase the surgical risk.

The low positive predictive value of EuroSCORE in our population when compared to other series [3,7,22] may derive from its retrospective application. This fact makes the institutional factor a possible confounding factor of the model performance. If the institution has more severe individuals with a greater number of comorbidities, it will obviously have its mortality rate increased, which forces the model to predict correctly a higher number of cases of death to get a good level of positive predictive value.

The EuroSCORE tends to be more "generous" with clinical practices, which involve large amounts of patients at low risk (once the predicted mortality is generally overestimated in relation to mortality, what causes the surgeons to think the patients are dying less than expected, what leads them to conclude its practices are adequate) [9]. On the other hand, it has the effect of "punishing" the surgeons with practices involving large amounts of high-risk patients (once the expected mortality is generally underestimated in relation to the observed mortality, what causes the surgeons to think patients are dying more than expected, leading them to conclude that their clinical practices are inadequate) [9]. Probably, it does not have importance in a large mixed practice, but it will reflect negatively on the surgeons with lower amounts of routine cases and a high proportion of unstable patients and at with higher risk [9]. The high volume of practice in private institutions in the United States show operative mortality rates approaching to zero, which is not compensated by series at centers with mixed casuistry or not supported populations [9].

The consequence is that the patients who most need the surgery, those in which the difference in perspective in terms of survival between with and without surgery are greater, may be deprived of the opportunity to undergo surgery. This happens because surgeons become more scared to operate on the patients who are classified into the pre-operative period as a high-risk patient for death related to surgery. This can also cause the surgeons to adopt an attitude of aversion to high-risk patients, which is not consistent with good medical practice. PROCAPE surgeons, despite recognizing the high-risk patients, they do operate them, which exposes them to a greater chance to operate patients who will die in the postoperative period. The accuracy of the EuroSCORE in this study measured 89.2% under the ROC curve, which means a good accuracy. This observation, in some degree, provides a substrate for justification of our mortality rate. Once the model is based on the clinical-surgical patients' profile, and this model could distinguish individuals with and without probability of death with a good degree of accuracy, It can be inferred that the clinical-surgical profile contributes significantly to this mortality rate, which shows the severity of patients who are operated on at our institution.

An important aspect to be addressed is the death by non-cardiovascular causes among patients classified as high-risk by EuroSCORE (representing 87.7% of all deaths in this study). One example is the fact that 15.8% (n = 9) of deaths in this group had mediastinitis as a cause. This is a much more common problem among CABG surgeries

compared to other procedures in cardiac surgery [23]. Although the EuroSCORE did not measure the risk of catastrophic infectious events (since it was designed to measure risk of death), it is known that mediastinitis is associated with high mortality rates, which can reach up to 40% [23]. In a previous publication from our institution [23] it has been shown that the mediastinitis had a mortality rate of 32%. In fact, when we apply a statistical model in the population of this study, we found that mediastinitis increased the probabilities of death 3.52 times (CI 1.52 to 8.16). This association was statistically significant ($P = 0.006$).

The EuroSCORE has served us well and has proven to be reliable. The consensus is that EuroSCORE needs to be reviewed, or more appropriately speaking, updated. In fact, a new model is already being prepared [24]. About 250 European centers have signed up to participate in data collection for the new model. An important consideration for the uptadated EuroSCORE should be the inclusion of some definitions. The controversy about the ideal definition of "high-risk" should perhaps be better addressed.

CONCLUSION

The EuroSCORE has proven to be a simple and objective index, revealing a discriminating satisfactory postoperative outcome in patients undergoing coronary artery bypass surgery at the Pernambuco Cardiogologic Emergency Medical Services (PROCAPE).

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