

## Original Research Article

**EUROSCORE II AS PREDICTOR OF MORTALITY AND MORBIDITY IN POST-CABG PATIENT IN DR. SOETOMO GENERAL ACADEMIC HOSPITAL****Rama Azalix Rianda**<sup>1a</sup> , **Bambang Pujo Semedi**<sup>2</sup> , **Agus Subagjo**<sup>3</sup> , **Yoppie Prim Avidar**<sup>2</sup> <sup>1</sup> Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia<sup>2</sup> Department of Anesthesiology and Reanimation, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia<sup>3</sup> Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Airlangga/Dr. Soetomo General Academic Hospital, Surabaya, Indonesia<sup>a</sup> Corresponding author: [rama.azalix.rianda-2019@fk.unair.ac.id](mailto:rama.azalix.rianda-2019@fk.unair.ac.id)**ABSTRACT**

**Introduction:** European System for Cardiac Operative Risk Evaluation (EuroSCORE) is a scoring system to predict mortality risk after cardiac surgery. EuroSCORE II was introduced to replace and show superiority over EuroSCORE I which tends to overestimate the risk of heart surgery procedures and have a low discrimination ability. Meanwhile, this is the first study to analyze EuroSCORE II as a predictor of mortality and morbidity in Indonesians. **Objective:** This study aims to analyze EuroSCORE II as a predictor of mortality and morbidity in Indonesians. **Methods:** This is a retrospective study using medical records of CABG patients in Dr. Soetomo General Academic Hospital from January 2016 to December 2017. **Results:** Out of 39 Patients who have performed CABG surgery, most were male (89.7%) with the highest age range of 46-65 years (59%). Deceased patients had an average EuroSCORE II of 22.36% and  $SD \pm 26.97\%$ , while 27 patients who survived had an average EuroSCORE II of 6.78% and  $SD \pm 6.4\%$ . Based on morbidity assessment, EuroSCORE II only accurately predicted the risk of kidney failure and did not properly assess the length of inotropic use, vasopressors, hospitalization time, the risk of arrhythmias, low cardiac output syndrome, Durante-operative bleeding, and the need for blood transfusion. These inaccuracies occurred because the samples that were included varied based on their standard deviation and pattern-less graph. **Conclusion:** EuroSCORE II is inadequate to predict morbidity and mortality in postoperative patients, therefore, it is considered less effective.

**Keywords:** Coronary Heart Disease; CABG; EuroSCORE II; Mortality; Morbidity**ABSTRAK**

**Pendahuluan:** European System for Cardiac Operative Risk Evaluation (EuroSCORE) adalah sistem penilaian untuk memprediksi risiko kematian setelah operasi jantung. EuroSCORE II diperkenalkan untuk menggantikan dan menunjukkan keunggulan daripada EuroSCORE I. Perubahan ini karena EuroSCORE awal cenderung melebih-lebihkan risiko prosedur operasi jantung dan memiliki kemampuan diskriminasi yang rendah. Ini adalah studi pertama yang menilai EuroSCORE II sebagai prediktor mortalitas dan morbiditas pada populasi Indonesia. **Tujuan:** untuk menilai EuroSCORE II sebagai prediktor mortalitas dan morbiditas pada populasi Indonesia. **Metode:** studi retrospektif yang menggunakan rekam medis pasien CABG di Rumah Sakit Umum Dr. Soetomo selama Januari 2016 hingga Desember 2017. **Hasil:** Dari 39 Pasien yang melakukan operasi CABG didominasi oleh pria (89,7%), untuk yang tertinggi rentang usia 46-65 tahun (59%), pasien meninggal memiliki rata-rata EuroSCORE II 22,36% dan standar deviasi  $\pm 26,97\%$ , 27 pasien hidup dengan rata-rata EuroSCORE II 6,78% dan standar deviasi  $\pm 6,4\%$ . dalam menilai morbiditas, EuroSCORE II hanya tepat dalam meramalkan risiko gagal ginjal. Sementara EuroSCORE II tidak dapat digunakan dengan lama penggunaan inotropik, vasopresor, dan lama pasien di rumah sakit, risiko aritmia, sindrom cardiac output rendah, perdarahan selama operasi, dan kebutuhan transfusi darah. Hal ini dapat saja terjadi karena pada sampel ini memiliki variasi yang lebar dilihat dilihat dari standar deviasinya dan masing-masing grafik yang tidak berpola. **Kesimpulan:** Euroscore II tidak adekuat dalam memprediksi morbiditas dan mortalitas, oleh karena itu kurang efektif.

**Kata kunci:** Penyakit Jantung Koroner; CABG; EuroSCORE II; Mortalitas; Morbiditas

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## INTRODUCTION

Coronary Heart Disease (CHD) is among the leading causes of mortality and morbidity globally, including Europe. The common approach to coronary revascularization for patients with blood vessels is Coronary Artery Bypass Graft (CABG) surgery due to its symptomatic and prognostic benefits (1). It has been shown that preoperative risk scores are important tools for risk assessment, cost-benefit analysis, and therapeutic trend study. Meanwhile, various scoring systems were also developed to predict mortality after adult cardiac surgery (2).

Since 1999, European System for Cardiac Operative Risk Evaluation (EuroSCORE) was used worldwide as an assessment for mortality prediction. In 2011, EuroSCORE II was introduced due to the inadequate ability for discrimination of the previous assessment and its overestimation of cardiac surgery risk (3).

From September to November 1995 in 8 European countries, EuroSCORE was shown to affect mortality in 19,030 patients in 128 surgical centers (4). Meanwhile, between December 2011 and October 2012 in India, EuroSCORE II had a satisfying calibration power with good model compatibility in 537 patients who passed through cardiac surgery, including 498 patients eligible for EuroSCORE II calculations (5). In Pakistan, it is fairly good as a predictor of immediate postoperative mortality in low and medium-risk groups after cardiac surgery (6).

EuroSCORE II has not been used to assess mortality risk in Indonesia. Therefore, this study aims to assess EuroSCORE II as a predictor of mortality and morbidity in post-

CABG patients and determine whether it can be used for the Indonesian population.

## METHODS

This is a retrospective study analyzing EuroSCORE II as a predictor of mortality and morbidity in Indonesians. A total of 39 post-CABG patients in Dr. Soetomo General Academic Hospital, Surabaya, from January 2016 to December 2017 were included. The data such as age, sex, and EuroSCORE II were retrieved from medical records. Meanwhile, EuroSCORE II is composed of 3 major components, namely patients, cardiac, and operation-related factors.

Morbidity includes inotropic-vasopressor usage, length of stay, blood transfusion, arrhythmia risks, renal failure, low cardiac output syndrome, and Durante-operative bleeding. This study recorded demographic and clinical data, as well as the information needed to calculate the predicted risk of surgery using the additive European System for Cardiac Operative Risk Evaluation (7). Moreover, incomplete medical records are excluded.

## RESULTS AND DISCUSSION

In this study, the demographic data were taken in form of gender and age. Based on the demographic characteristics of CABG patients in Dr. Soetomo General Academic Hospital as shown in Table 1, 89.7% of the 39 patients were male, while 10.3% were female. Furthermore, the highest age group was 46-65 years, which is 59% out of all age ranges.

**Table 1.** Demographic Characteristics of CABG Patients

Variable	Total (n=39)	Percentage (100%)
<b>Gender</b>		
Male	35	89.7%
Female	4	10.3%
<b>Age</b>		
26-45 years	5	12.8%
46-65 years	23	59%
>65 years	11	28.2%

The prevalence of CHD patients is higher in men than women for all age groups (8). From 2016 to 2017, most CHD patients were men (89.7%). In Iran, between 2017 and 2015, sex distribution from a total of 1,010 patients was 67.6% male and 32.4% female (9) (10).

Meanwhile, CHD is more prevalent in the age group of  $\geq 40$  years (10,11). The risk of CHD increases in males, the older age (age  $>40$  years in men and  $>45$  years in women), family history of CHD, smoking, hypertension (high blood pressure), diabetes, obesity, and low physical activity (12).

The 10% score of EuroSCORE II is the best cutoff in predicting postoperative mortality (10%, 15 from 920 patients, 1.6% compared to 10%, 23 from 107 patients, 21.5%,  $p < 0.0001$ ). This cutoff value has a sensitivity of 91.5%, specificity of 60.5%, a negative predictive value of 98.4%, and an accuracy of 90.3% (13). However, it was not effective enough in predicting patient mortality after CABG surgery. This is because, in this study, there were 9 patients with EuroSCORE II above 10%, while only one patient experienced postoperative mortality. Moreover, there was one patient

with EuroSCORE II below 10% that did not survive due to cardiogenic shock and also all deceased patients were female. Barili et al reported that mortality incidence was significantly higher in women which were 17.3% compared to 9.8% in men, with a  $p < 0.008$ . Based on standard deviation, both deceased and living patients had a fairly wide sample variation based on standard deviation, therefore, EuroSCORE II is not always appropriate in assessing mortality risk (14).

Table 2 shows that the mean EuroSCORE II for deceased patients was 22.36% with a standard deviation of  $\pm 26.97\%$  while living patients were 6.78% with a standard deviation of  $\pm 6.4\%$ . Although deceased patients had higher EuroSCORE II than the living, one died from cardiogenic shock with a low EuroSCORE II value of 3.29%.

**Table 2.** EuroSCORE II in assessing mortality risk in CABG postoperative patients

Mortality	Total (n=39)	EuroSCORE II Mean $\pm$ SD
Yes	2	22.36% $\pm$ 26.97%
No	37	6.78% $\pm$ 6.4%

Figure 1 shows a non-patterned graph of EuroSCORE II for the inotropic duration in each CABG postoperative patient. This is because patients with a lower EuroSCORE II of 17.17% had an inotropic duration of 28 days. Meanwhile, patients with a higher value of 41.43% did not use inotropic compared to patients with a lower EuroSCORE II.

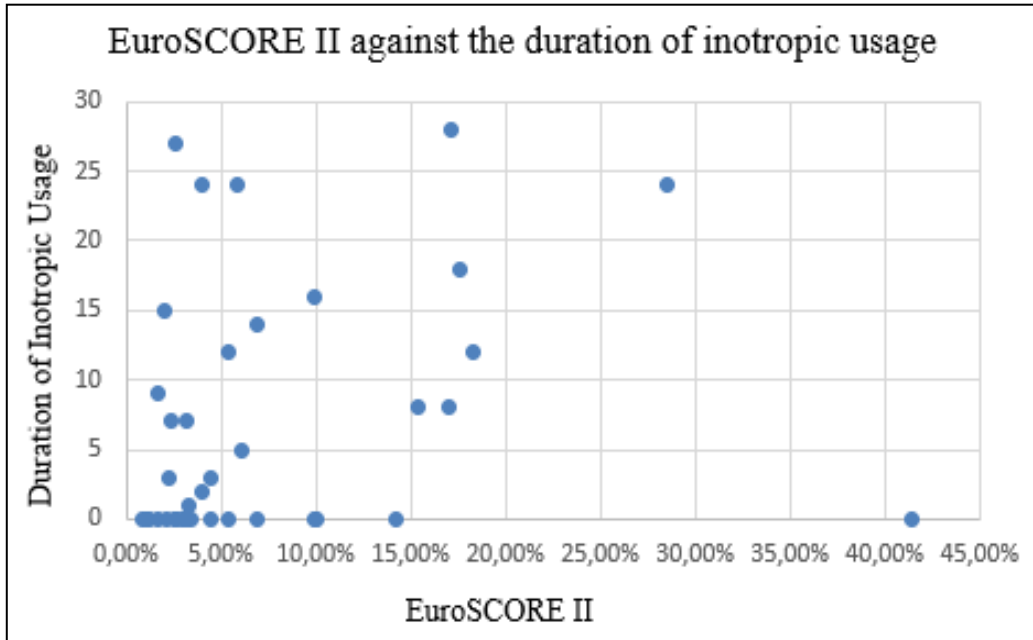


Figure 1. EuroSCORE II Against Inotropic Duration

Figure 2 shows a non-patterned graph of EuroSCORE II for the vasopressor duration in each CABG postoperative patient. This is because patients with a lower EuroSCORE II

of 5.82% had a vasopressors duration for 36 days, while those with a higher value of 41.43% had a duration of 7 day.

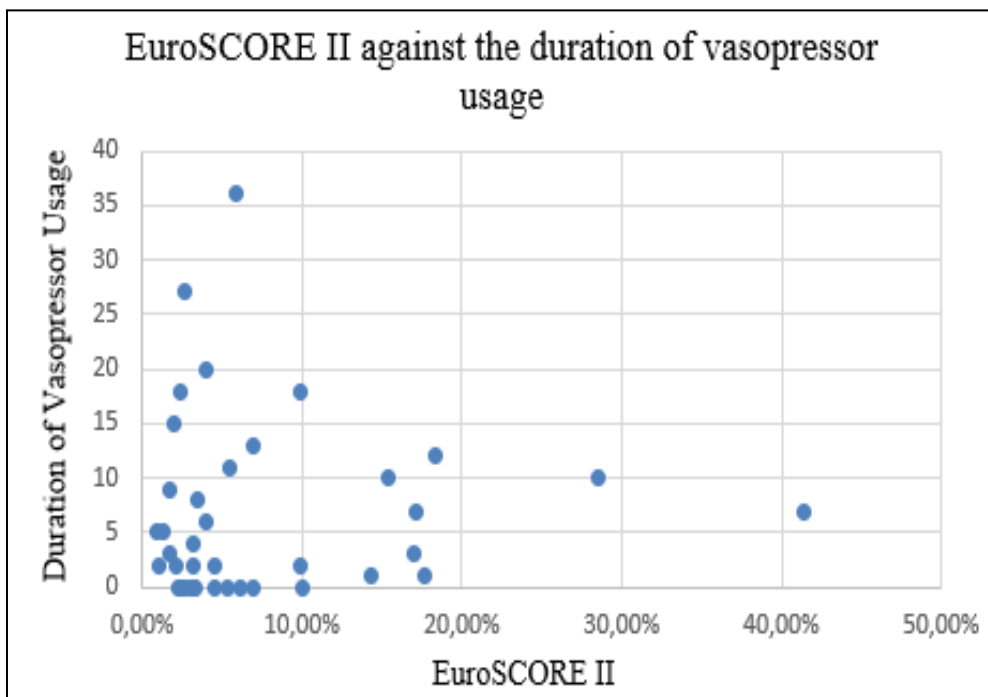


Figure 2. EuroSCORE II Against Vasopressors Duration

A previous study showed that EuroSCORE II is better at predicting inotropic

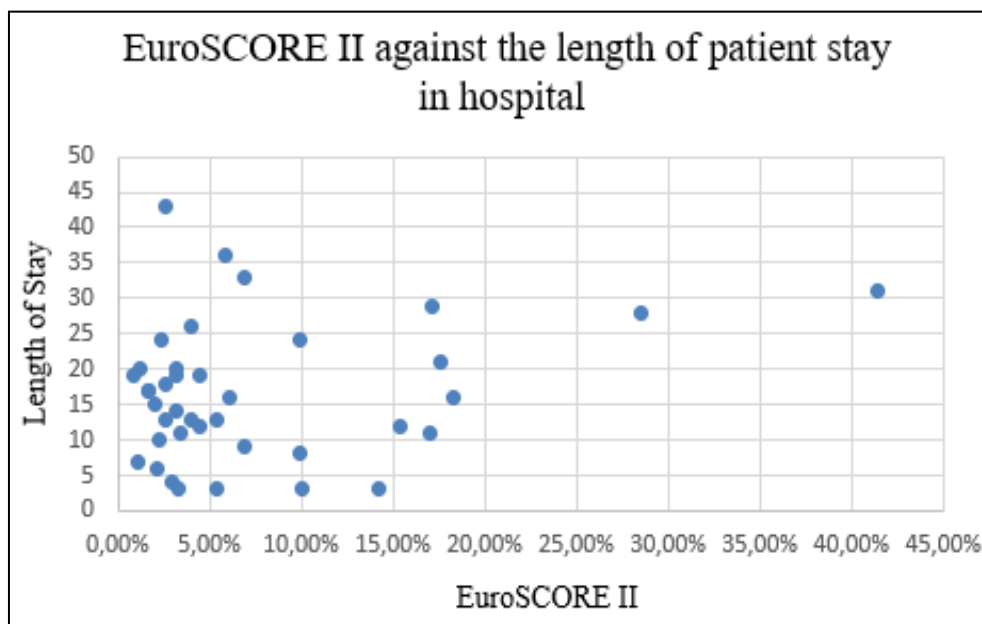
duration (15). Biancari et al stated that EuroSCORE II with a score of 10% or greater

is a strong predictor of prolonged inotropic use with a value of 67.3% compared to 25.0%,  $p < 0.0001$  (13). However, both Figures 1 and 2 show a pattern-less graph between EuroSCORE II and the duration of inotropic and vasopressors use. This is because patients with low EuroSCORE II as shown in the graphs did not always have a short duration of inotropic and vasopressor use. However, some had a long duration of use that exceed patients with higher EuroSCORE II.

Figure 3 shows a non-patterned graph of EuroSCORE II for the length of stay in hospital in each CABG postoperative patient. Based on the graph, patients with a low

EuroSCORE II of 2.64% pass through 43 days of hospitalization, while those with a higher value of 41.43% had less length of stay, which was 31 days.

A pattern-less graph is also shown between EuroSCORE II and the length of hospitalization, which indicated that EuroSCORE II has low discriminatory power in predicting the length of hospitalization. In Iran, EuroSCORE II can not be used as the only assessment for risk estimation in CABG postoperative patients due to discriminatory power in predicting early morbidity, length of stay in the hospital, and ICU (16).



**Figure 3.** EuroSCORE II against the length of patient stay in hospital

The 3 graphs show a pattern-less figure, which indicated that EuroSCORE II cannot properly assess the duration of inotropic, vasopressors, and length of stay in hospital.

This study also assessed EuroSCORE II in predicting the risk of morbidity in CABG postoperative patients. The components of morbidity include blood transfusion, arrhythmia, renal failure, low cardiac output syndrome, and bleeding during surgery. Meanwhile, the results of EuroSCORE II on

the morbidity component are shown in Table 3.

Studies showed that patients with higher EuroSCORE II need red blood cell transfusion (17). At Dr. Soetomo General Academic Hospital, the patient's demand for blood transfusion increases in response to an increase of EuroSCORE II. However, patients who did not need blood transfusions also have a higher EuroSCORE II than patients who only need 1-2 blood packs. This occurs

because of a fairly wide sample variation, therefore, EuroSCORE II does not always accurately predict the need for blood transfusions.

**Table 3.** EuroSCORE II in assessing the risk of morbidity in CABG postoperative patients

Variable	Total (n=39)	EuroSCORE II Mena ± SD
<b>Blood Transfusion</b>		
1 pack	20	5,79% ± 6,31%
2 pack	6	7,79% ± 5,75%
3 pack	3	12,84% ± 8,84%
No	10	9,52% ± 12,44%
<b>Renal Failure</b>		
Yes	2	10,31% ± 9,71%
No	37	7,43% ± 8,42%
<b>Low Cardiac Output Syndrome</b>		
Yes	5	3,39% ± 1,53%
No	34	8,19% ± 8,8%
<b>Bleeding Durante operation</b>		
Yes	31	7,35% ± 8,97%
No	8	8,46% ± 5,84%
<b>Arrhythmia</b>		
Yes	8	7,25% ± 6,5%
No	31	7,66% ± 8,88%

EuroSCORE II is more accurate in predicting the risk of renal failure because one of its assessment components is renal function. In renal failure of patients, there is a higher average EuroSCORE II value (10.31%) compared to patients who did not suffer renal failure (7.43%). In Brazil, the risk of renal failure increases in line with an increase in EuroSCORE, with sensitivity and specificity at a score of 3.5% (18).

Moreover, EuroSCORE II with a score of 10% is a strong predictor of Low Cardiac Output Syndrome, with a value of 27.1% compared to 10.7%,  $p < 0.0001$  (13). In this study, EuroSCORE II was unable to predict the risk of low cardiac output syndrome in CABG postoperative patients. This is because patients with low cardiac output syndrome had a lower average EuroSCORE II value of

3.39% compared to those without low cardiac output syndrome (8.19%).

The risk of Durante-operative bleeding in CABG patients was not also assessed because EuroSCORE II has a poor discriminatory power in predicting major complications such as intraoperative stroke, stroke incidence in the first 24 hours, postoperative myocardial infarction, wound infection, gastrointestinal complications, and re-exploration for bleeding (16).

EuroSCORE II is also poor in discriminating the risk of arrhythmias because the patients had a lower mean of 7.25% compared to others without this condition namely 7.66%. The inaccuracy of EuroSCORE II in assessing the components of morbidity occurs because patients with each morbidity have an average value of EuroSCORE II lower than patients who do not suffer. Based on standard deviation, the overall morbidity components have a fairly wide sample variation, therefore, EuroSCORE II is not always accurate in assessing the overall risk of morbidity.

## CONCLUSION

EuroSCORE II is inadequate to predict morbidity and mortality in postoperative patients, therefore, it is considered less effective.

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