

[Home](#)[Archives](#)[Announcements](#)[Publication Ethics](#)[Editorial Team](#)[Author Guidelines](#)[About the Journal](#) ▼[Home](#) / [Archives](#) / [Vol 30 No 1 \(2021\): March](#)**Published:** 2021-03-31

Editorial

The challenges of a small medical journal to have international recognition in Indonesia: editors' perspectives

Hans Joachim Freisleben, Felix Firyanto Widjaja, Farrokh Habibzadeh

1-4

DOI : <https://doi.org/10.13181/mji.ed.215313>Abstract views: **660** PDF downloads: **498** HTML downloads: **155** EPUB downloads: **145**

Basic Medical Research

Elevated extracellular CO₂ level affects the adaptive transcriptional response and survival of human peripheral blood mononuclear cells toward hypoxia and oxidative stress

Septelia Inawati Wanandi, Sekar Arumsari, Edwin Afitriansyah, Resda Akhra Syahrani, Idham Rafly Dewantara, Luthfian Aby Nurachman, Ihya Fakhruzal Amin, Putera Dewa Haryono, Kenny Budiman, Adrianus Jonathan Sugiharta, Amino Aytawan Remedika, Farhan Hilmi Tafikulhakim, Febriana Catur Iswanti, Jason Youngbin Lee, Debabrata Banerjee

5-12



DOI : <https://doi.org/10.13181/mji.oa.203810>

Abstract views: **1120** PDF downloads: **565** HTML downloads: **152** EPUB downloads: **148**

Efficacy of adjuvant intrastromal and combination of intrastromal and intracameral voriconazole in *Aspergillus fumigatus*-induced moderate fungal keratitis in rabbits

Dyah Tjintya Sarika, Melva Louisa, Anna Rozaliyani, Evelina, Made Susiyanti

13-9



DOI : <https://doi.org/10.13181/mji.oa.203726>

Abstract views: **732** PDF downloads: **589** HTML downloads: **187** EPUB downloads: **144**

Clinical Research

Hydroxychloroquine in the treatment of COVID-19 disease: a systematic review and meta-analysis

Amahirany Manzo-Toledo, Rafael Torres-Rosas, Hugo Mendieta-Zerón, Lourdes Arriaga-Pizano, Liliana Argueta-Figueroa

20-32



DOI : <https://doi.org/10.13181/mji.oa.205012>

Abstract views: **1472** PDF downloads: **929** HTML downloads: **223** EPUB downloads: **155**

A randomized controlled trial of infraorbital block using ketamine 1% for intra- and postoperative analgesia in children for ambulatory cleft lip correction

Andi Ade Wijaya Ramlan, Apriliana Ratnaningrum, Arif Hari Martono Marsaban

33-8

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.oa.204395>Abstract views: **778** PDF downloads: **563** HTML downloads: **168** EPUB downloads: **141**

A randomized controlled trial of combination of peppermint, lavender, and turmeric oil for antipruritic agent in pregnant women

Fransisca Retno Asih, Farid Husin, Oki Suwarsa, Irdi Fidrianny, Dany Hilmanto

39-44

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.oa.204467>Abstract views: **1485** PDF downloads: **723** HTML downloads: **186** EPUB downloads: **147**

A prognostic model of excessive lung function decline among Québec apprentices: a cohort exposed to occupational sensitizing agents

Alfi Afadiyanti Parfi, Mahsa Taghiakbari, Meshack Achore, Denyse Gautrin, Gleb Bezgin, Eva Suarthana

45-53

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.oa.204530>Abstract views: **528** PDF downloads: **427** HTML downloads: **133** EPUB downloads: **126**

Validation of EuroSCORE II to predict mortality in post-cardiac surgery patients in East Java tertiary hospital

Yan Efrata Sembiring, Adhitya Ginting, Puruhito, Budiono

54-9

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.oa.204536>Abstract views: **722** PDF downloads: **550** HTML downloads: **237** EPUB downloads: **146**

Community Research

Factors associated with delay in diagnosis among tuberculosis patients in the north of Iran

Mahmood Moosazadeh, Motahareh Kheradmand, Mohsen Aarabi, Mahdi Afshari, Mohammadreza Parsaee, Asghar Nezammahalleh, Amirhossein Hessami

60-5

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.oa.204476>Abstract views: **843** PDF downloads: **545** HTML downloads: **141** EPUB downloads: **130**

Case Report/Series

Middle cerebral artery territory infarction in a COVID-19 patient: a case report

Rizaldy Pinzon, Vincent Ongko Wijaya, Dessy Paramitha

66–70

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.cr.204707>Abstract views: **1098** PDF downloads: **846** HTML downloads: **184** EPUB downloads: **127**

A case of third degree hemorrhagic shock due to total subacute uterine inversion after delivery

William Timotius Wahono, Angela Putri, Yudianto Budi Saroyo, Antonius Joko Nugroho, Ruth Sally, Sugianto Parulian Simanjuntak, Samuel

71–4

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.cr.203862>Abstract views: **1025** PDF downloads: **649** HTML downloads: **232** EPUB downloads: **140**

Review Article

Xanthine oxidase inhibition in SARS-CoV-2 infection: the mechanism and potency of allopurinol and febuxostat in COVID-19 management

Irandi Putra Pratomo, Anna Ariane, Aryo Tedjo, Rudi Heryanto, Rafika Indah Paramita

75–80

 PDF HTML EPUBDOI : <https://doi.org/10.13181/mji.rev.204641>Abstract views: **2017** PDF downloads: **1129** HTML downloads: **272** EPUB downloads: **144**

Rapid advancement in cancer genomic big data in the pursuit of precision oncology

Tiara Bunga Mayang Permata, Sri Mutya Sekarutami, Endang Nuryadi, Angela Giselvania, Soehartati Gondhowiardjo

81-5

 PDF

 HTML

 EPUB

DOI : <https://doi.org/10.13181/mji.rev.204250>

Abstract views: **921** PDF downloads: **588** HTML downloads: **166** EPUB downloads: **128**

Corrigendum

Corrigendum: A randomized clinical trial of freeze-dried amniotic membrane transplantation and conjunctival-limbal graft for pterygium excision and evaluation of conjunctival inflammation marker in tears

Made Susiyanti, Manoa Panjaitan, Grace Wangge, Tjahjono Darminto Gondhowiardjo

86

 PDF

 HTML

 EPUB

DOI : <https://doi.org/10.13181/mji.cg.215394>

Abstract views: **500** PDF downloads: **392** HTML downloads: **115** EPUB downloads: **128**

Erratum

Erratum: Amniotic membrane transplantation for infectious corneal ulcer treatment: a cohort retrospective study

86

 PDF

 HTML

 EPUB

DOI : <https://doi.org/10.13181/mji.er.215430>

Abstract views: **476** PDF downloads: **389** HTML downloads: **148** EPUB downloads: **118**

Front & Back Matter

 PDF

Abstract views: **348** PDF downloads: **236**

[Make a Submission](#)

Current Issue



Vol. 31, Issue 4, December 2022 pp 211–276

pISSN: 0853-1773 eISSN: 2252-8083

Medical Journal of Indonesia

- ✓ Short stature and stunting in Indonesia
- ✓ Interleukin-2 and hemophilia A
- ✓ Mutation of RB1 gene in retinoblastoma
- ✓ Investigations for ocular tuberculosis
- ✓ 13-valent pneumococcal conjugate vaccine
- ✓ Limited joint mobility in diabetes type 1
- ✓ HPV infection risk factors in women
- ✓ Surgical technique for wide cleft palate
- ✓ Subgingival chlorhexidine irrigation
- ✓ Vaginal stones due to ectopic ureter
- ✓ Pancreatoblastoma with pancreatic pseudocysts

mji
<http://mji.ui.ac.id>

Published by the Faculty of Medicine Universitas Indonesia
Official Scientific Journal of the Faculty of Medicine Universitas Indonesia
in collaboration with German-Indonesia Medical Association (DIGM)
Jl. Salemba Raya No. 6 Jakarta 10430
Telp. +62-21-29189160 ext. 201605

Top Reviewer 2022

Congratulations to all reviewers who are listed as the top 5 best reviewers of the year 2022. You are **rewarded to have a 50% discount** on your publication fee. Please email mji@ui.ac.id for further information.

Thank you for your contributions.

Information

For Readers

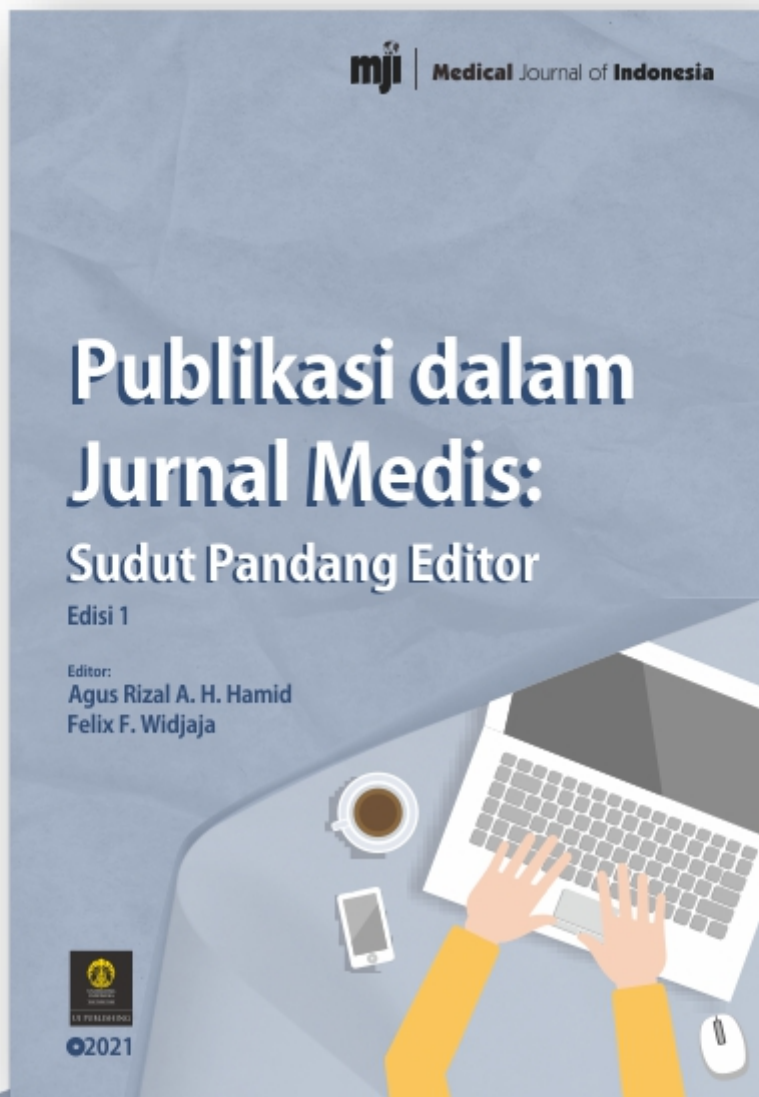
For Authors

For Librarians

Advertisement



Tersedia di seluruh **UI Publishing Official Store**



A guidance from

the right source
is needed most
for not repeating
previous mistakes.

Most read last week

Internet addiction: a new addiction?

👁 28

Safety of a 2-dose primary series of 13-valent pneumococcal conjugate vaccine in Indonesian infants

👁 26

Short stature and stunting in Indonesia: problems and innovative alternative solutions

👁 20

Multiple vaginal stones secondary to an ectopic ureter in an adult female patient: a case report

👁 20

Novel point mutation and intronic mutations of *RB1* gene in retinoblastoma patients in Indonesia

👁 17

Agus Rizal A. H. Hamid

ABSTRACTING & INDEXING

Scopus®

SELENGKAPNYA



Embase®

DOAJ DIRECTORY OF OPEN ACCESS JOURNALS



PKP|INDEX





Link to Download

- ICMJE Conflicts of Interest Statement Form
- Final Checklist
- Title Page
- Original Articles
- Case Reports
- Reviewer Recommendation
- Cover Letter
- MJI reference style (Need to download Mendeley Desktop)

Current Issue

ATOM 1.0

RSS 2.0

RSS 1.0

Our Social Media



AVAILABLE for Advertisement 600 x 110 Px

600 x 110 Px Contact Us at Email : mji@ui.ac.id

[Section Policies](#) | [Correction and Retraction Policies](#) | [Reviewer Acknowledgment](#) | [Contact Us](#) |

00804280

Education Tower 6th Floor, IMERI FKUI, Salemba Raya Street No. 6, Kenari, Senen, Central Jakarta, 10430, Indonesia

Platform &
workflow by
OJS / PKP

[Home](#)[Archives](#)[Announcements](#)[Publication Ethics](#)[Editorial Team](#)[Author Guidelines](#)[About the Journal](#) ▼[Home](#) / [Editorial Team](#)

Editor-in-chief

[Agus Rizal A. H. Hamid](#), Department of Urology, Faculty of Medicine Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus [h-index: 12](#)

Editor-in-chief Emeritus

[Isnani A.S. Suryono](#), Dept. of Histology, Faculty of Medicine Universitas Indonesia, Indonesia; Scopus [h-index: 2](#)

Managing Editor

[Felix F. Widjaja](#), Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus [h-index: 3](#)

Editorial Board Members

[Agnes Kurniawan](#), Department of Parasitology, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus [h-index: 21](#)

Bambang Budi Siswanto, Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Indonesia/National Cardiovascular Center Harapan Kita, Indonesia; Scopus h-index: 15

Farrokh Habibzadeh, Shiraz University of Medical Sciences, Shiraz, Iran, Islamic Republic of; Scopus h-index: 15

Grace Wangge, Southeast Asian Ministers of Education Organization Regional Center for Food and Nutrition (SEAMEO RECFON/PKGR), Universitas Indonesia, Indonesia; Scopus h-index: 9

Haku Hotta, Konan Women's University, Kobe, Japan; Scopus h-index: 42

Hans-Joachim Freisleben, German-Indonesian Medical Association (DIGM), Germany; Scopus h-index: 24

Hans-Jürgen Mägert, Anhalt University of Applied Sciences, Germany; Scopus h-index: 25

Harrina E. Rahardjo, Department of Urology, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 4

Inge Sutanto, Department of Parasitology, Faculty of Medicine, Universitas Indonesia, Indonesia, Indonesia; Scopus h-index: 22

Jeanne A. Pawitan, Department of Histology, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 11

Joerg Haier, Nordakademie University of Applied Sciences, Germany; Scopus h-index: 42

Jose R.L. Batubara, Department of Pediatric, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 5

Knut Adermann, Niedersaichsisches Institut für Peptid-Forschung (IPF), Germany; Scopus h-index: 38

Laurentius A. Pramono, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 7

Markus Meyer, Cardiorientis AG, Germany; Scopus h-index: 40

Melva Louisa, Department of Pharmacology and Therapeutics, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 12

Nia Kurniati, Department of Pediatric, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 14

Pradana Soewondo, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 20

Rianto Setiabudy, Department of Pharmacology and Therapeutic, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 12

Saleha Sungkar, Department of Parasitology, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 6

Sentot Santoso, Institute for Clinical Immunology and Transfusion Medicine, Germany; Scopus h-index: 52

Sri W.A. Jusman, Department of Biochemistry and Molecular Biology, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 7

Theddeus O.H. Prasetyono, Department of Plastic Surgery, Faculty of Medicine Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 9

Vivian Soetikno, Department of Pharmacology and Therapeutics, Faculty of Medicine, Universitas Indonesia, Indonesia; Scopus h-index: 21

Wilfred C.G. Peh, Department of Diagnostic Radiology, Khoo Teck Puat Hospital, Singapore, Singapore; Scopus h-index: 39

Associate Editors

Apriani Oendari, Center for Community Health Education Research and Service, Inc. (CCHERS) Boston, Massachusetts, United States;

Ary I. Savitri, Medical Journal of Indonesia, Indonesia; Scopus h-index: 7

Aulia Rizka, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 5

Hariyono Winarto, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 4

Dicky L. Tahapary, Department of Internal Medicine, Faculty of Medicine, Universitas Indonesia/Cipto Mangunkusumo Hospital, Indonesia; Scopus h-index: 11

Anna M. Singal, Department of Clinical Nutrition, Universitas Indonesia Hospital, Indonesia

Assistant Editors

Dania Clarisa, Medical Journal of Indonesia, Indonesia

Devita A. Prabowo, Medical Journal of Indonesia, Indonesia

Frisky N. Salvianny, Medical Journal of Indonesia, Indonesia

Raul Gonzales, Medical Journal of Indonesia, Indonesia

Windu C. H. N. Suryaningrat, Medical Journal of Indonesia, Indonesia

Production Editor

Maytias Tri Pratiwi, Medical Journal of Indonesia, Indonesia

Layout Editors

Ilham Afriansyah, Medical Journal of Indonesia, Indonesia

Tsania Faza, Medical Journal of Indonesia, Indonesia

[Make a Submission](#)

Current Issue



Vol. 31, Issue 4, December 2022 pp 211–276

pISSN: 0853-1773 eISSN: 2252-8083

Medical Journal of Indonesia

- ✓ Short stature and stunting in Indonesia
- ✓ Interleukin-2 and hemophilia A
- ✓ Mutation of RB1 gene in retinoblastoma
- ✓ Investigations for ocular tuberculosis
- ✓ 13-valent pneumococcal conjugate vaccine
- ✓ Limited joint mobility in diabetes type 1
- ✓ HPV infection risk factors in women
- ✓ Surgical technique for wide cleft palate
- ✓ Subgingival chlorhexidine irrigation
- ✓ Vaginal stones due to ectopic ureter
- ✓ Pancreatoblastoma with pancreatic pseudocysts

mji
<http://mji.ui.ac.id>

Published by the Faculty of Medicine Universitas Indonesia
Official Scientific Journal of the Faculty of Medicine Universitas Indonesia
in collaboration with German-Indonesia Medical Association (DIGM)
Jl. Salemba Raya No. 6 Jakarta 10430
Telp. +62-21-29189160 ext. 201605

Top Reviewer 2022

Congratulations to all reviewers who are listed as the top 5 best reviewers of the year 2022. You are **rewarded to have a 50% discount** on your publication fee. Please email mji@ui.ac.id for further information.

Ashish Trivedi

Occupational Health Division, Public Health Services, Ministry of Health, Brunei Darussalam

Novi Silvia Hardiany

Thank you for your contributions.

Information

For Readers

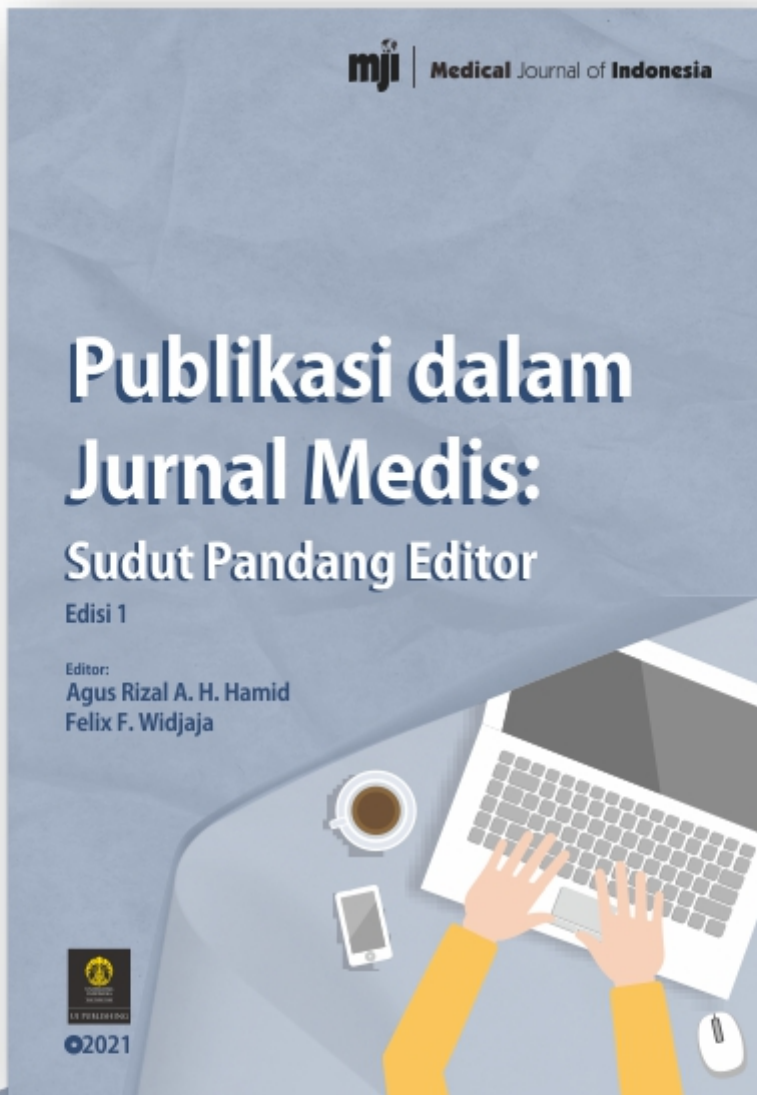
For Authors

For Librarians

Advertisement



Tersedia di seluruh **UI Publishing Official Store**



A guidance from

the right source
is needed most
for not repeating
previous mistakes.

Most read last week

Internet addiction: a new addiction?
👁 28

Safety of a 2-dose primary series of 13-valent pneumococcal conjugate vaccine in Indonesian infants
👁 26

Short stature and stunting in Indonesia: problems and innovative alternative solutions
👁 20

Multiple vaginal stones secondary to an ectopic ureter in an adult female patient: a case report
👁 20

Novel point mutation and intronic mutations of *RB1* gene in retinoblastoma patients in Indonesia
👁 17

Agus Rizal A. H. Hamid

ABSTRACTING & INDEXING

Scopus®

EMERGING SOURCES CITATION INDEX INDEXED

Embase® DOAJ DIRECTORY OF OPEN ACCESS JOURNALS

SELENGKAPNYA























Link to Download

- ICMJE Conflicts of Interest Statement Form
- Final Checklist
- Title Page
- Original Articles
- Case Reports
- Reviewer Recommendation
- Cover Letter
- MJI reference style (Need to download Mendeley Desktop)

Current Issue

ATOM 1.0

RSS 2.0

RSS 1.0

Our Social Media



AVAILABLE for Advertisement 600 x 110 Px

600 x 110 Px Contact Us at Email : mji@ui.ac.id

[Section Policies](#) | [Correction and Retraction Policies](#) | [Reviewer Acknowledgment](#) | [Contact Us](#) |

00804281

Education Tower 6th Floor, IMERI FKUI, Salemba Raya Street No. 6, Kenari, Senen, Central Jakarta, 10430, Indonesia

Platform &
workflow by
OJS / PKP



SJR

Scimago Journal & Country Rank

Enter Journal Title, ISSN or Publisher Name

Home

Journal Rankings

Country Rankings

Viz Tools

Help

About Us



Journal Author Services

Your paper will be matched by subject are US-trained editor with an advanced degree

American Journal Experts



Medical Journal of Indonesia

COUNTRY

Indonesia

Universities and
research institutions in
IndonesiaMedia Ranking in
IndonesiaSUBJECT AREA AND
CATEGORYMedicine
Medicine
(miscellaneous)

PUBLISHER

Faculty of Medicine
Universitas IndonesiaUniversity of Indonesia
in Scimago
Institutions Rankings

H-INDEX

12

PUBLICATION TYPE

Journals

ISSN

08531773, 22528083

COVERAGE


1994-2021


INFORMATION

[Homepage](#)[How to publish in this
journal](#)mji@ui.ac.id

SCOPE

Medical Journal of Indonesia is a peer-reviewed and open access journal that focuses on promoting medical sciences generated from basic sciences, clinical, and community or public health research to integrate researches in all aspects of human health. This journal publishes original articles, reviews, and also interesting case reports. Brief communications containing short features of medicine, latest developments in diagnostic procedures, treatment, or other health issues that is important for the development of health care system are also acceptable. Letters and commentaries of our published articles are welcome.

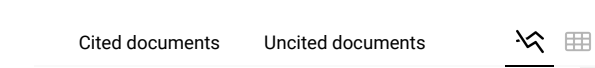
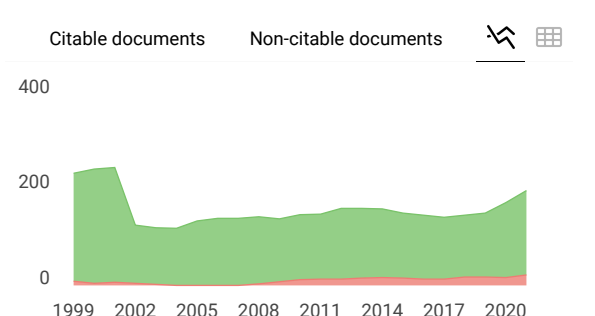
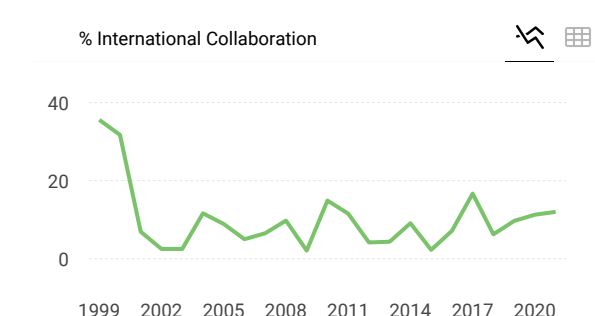
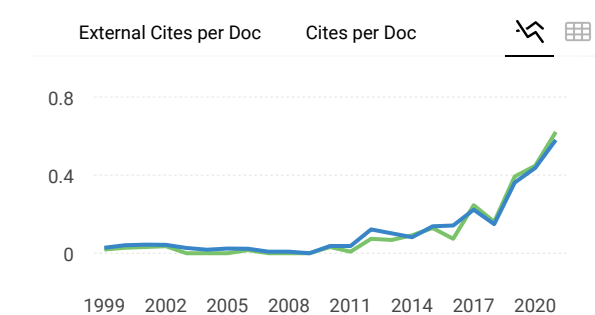
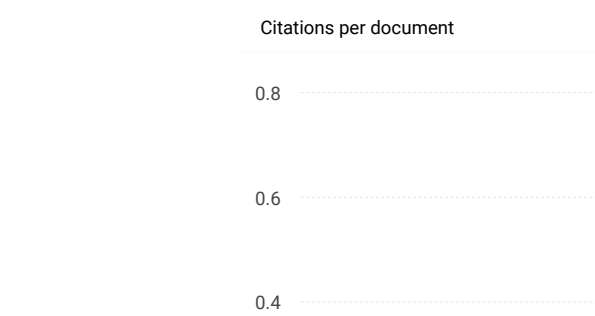
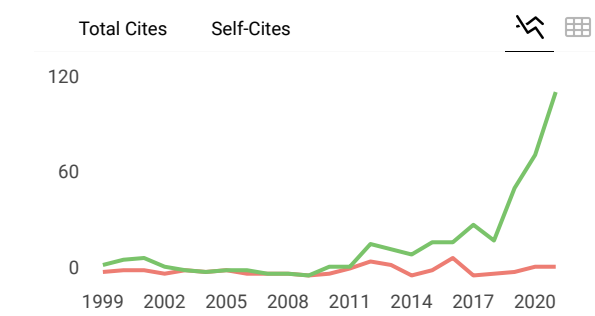
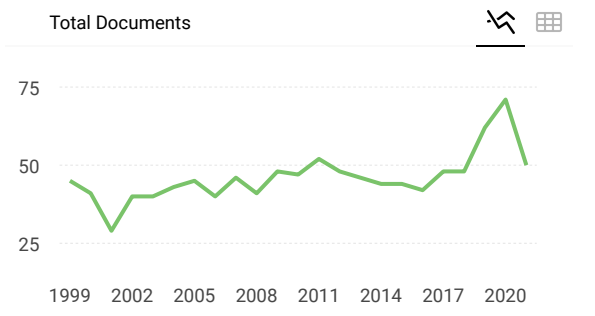
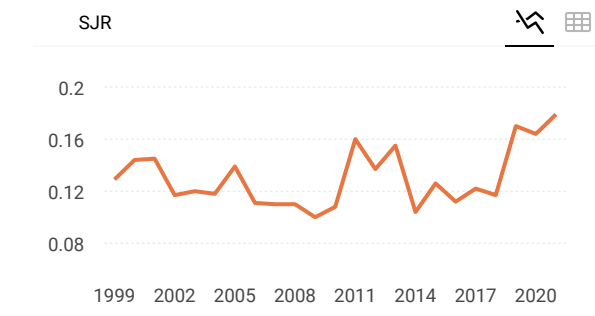
 Join the conversation about this journal

 Quartiles



FIND SIMILAR JOURNALS ?

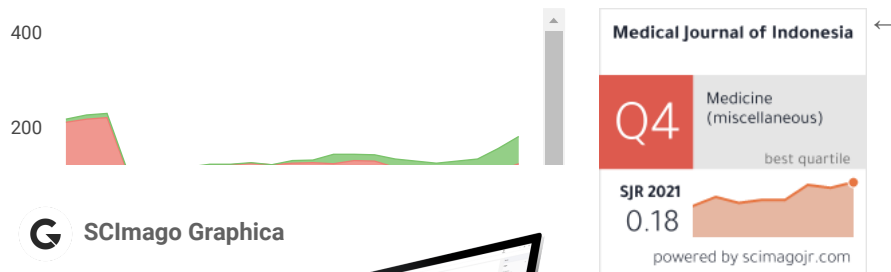
<p>1 BioMed Research International USA</p> <p>48% similarity</p>	<p>2 Medicina (Lithuania) CHE</p> <p>46% similarity</p>	<p>3 BMC Research Notes GBR</p> <p>46% similarity</p>	<p>4 Journal of Ir Medical Res GBR</p> <p>4 s</p>
--	---	---	---



Show this widget in your own website

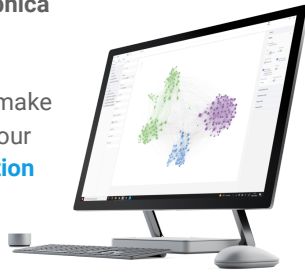
Just copy the code below and paste within your html code:

```
<a href="https://www.scimaç
```



SCImago Graphica

Explore, visually communicate and make sense of data with our [new data visualization tool](#).



Metrics based on Scopus® data as of April 2022

R **Rindang** 2 years ago

Dear Scimago team
how about SJR of this journal in 2018? is it 0.17 (Q4)?
Thank

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear Rindang,

Thank you for contacting us. Indeed, the SJR for 2018 was 0.117 and Q4 in Medicine (misc.) category.

Best Regards, SCImago Team

O **Omry Pakpahan** 2 years ago

Thanks for information about publish jurnal.
Oke
God B

reply



Melanie Ortiz 2 years ago

SCImago Team

Dear Omry, thanks for your participation! Best Regards, SCImago Team

S **Susetyo Trijoko** 3 years ago

I have an article recently presented in the national seminar and would like to sent it to this journal.

reply



Melanie Ortiz 3 years ago

SCImago Team

Dear Susetyo, thank you very much for your comment, we suggest you look for author's instructions/submission guidelines in the journal's website. Best Regards, SCImago Team



syahran wael 4 years ago

how much to pay in paper ?

reply



Elena Corera 4 years ago

SCImago Team

Thank you very much for participating!
Please, check out our FAQs <https://www.scimagojr.com/help.php?q=FAQ>

F **fghr** 5 years ago

is it Q 4?

reply



Elena Corera 5 years ago

SCImago Team

Exactly!

S **sujono riyadi** 5 years ago

please inform me if I enter the article in the medical journal of Indonesia

reply



Elena Corera 5 years ago

SCImago Team

Dear Sujono, we suggest you locate the author's instructions on the journal's website.
Best Regards, SCImago Team

Leave a comment

Name

Email

(will not be published)

Saya bukan robot reCAPTCHA
Privasi • Persyaratan

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by:



Powered by:



Follow us on @ScimagoJR

Scimago Lab, Copyright 2007-2022. Data Source: Scopus®

EST MODUS IN REBUS
Horatio (Satire 1, 1, 106)

[Cookie settings](#)

Validation of EuroSCORE II to predict mortality in post-cardiac surgery patients in East Java tertiary hospital

Yan Efrata Sembiring,¹ Adhitya Ginting,¹ Puruhito,¹ Budiono^{2†}



pISSN: 0853-1773 • eISSN: 2252-8083
<https://doi.org/10.13181/mji.oa.204536>
Med J Indones. 2021;30:54–9

Received: January 31, 2020
Accepted: December 21, 2020

Authors' affiliations:

¹Department of Thoracic Cardiac and Vascular Surgery, Faculty of Medicine, Universitas Airlangga, Soetomo General Hospital, Surabaya, Indonesia,
²Department of Public Health, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia

Corresponding author:

Adhitya Ginting
 Department of Thoracic Cardiac and Vascular Surgery, Faculty of Medicine, Universitas Airlangga, Soetomo General Hospital, Jalan Mayjen Prof. Dr. Moestopo No. 6-8, Surabaya, East Java 60286, Indonesia
 Tel/Fax: +62-31-5501324/
 +62-31-5019228
E-mail: adhitya.ginting@gmail.com

†Deceased in December 30, 2020

ABSTRACT

BACKGROUND The European system for cardiac operative risk evolution (EuroSCORE) II is one of the established risk models used to predict mortality after cardiac surgery. However, its application as a mortality predictor for Indonesian adult cardiac surgery is still unknown. This study aimed to examine the validation of EuroSCORE II in predicting mortality following cardiac surgery in Indonesian adults.

METHODS This retrospective cohort study collected data from the medical records and the database of the Department of Thoracic Cardiac and Vascular Surgery at Soetomo General Hospital, Surabaya. Data on the EuroSCORE II variables were collected for patients aged >18 years who underwent coronary artery bypass, heart valve, heart tumors, aortic surgeries, or a combination of these surgeries between January 2016 and December 2018. In-hospital mortality prediction was calculated using the online calculator at www.euroscore.org. The calibration of the EuroSCORE II model was conducted using the Hosmer–Lemeshow test, and discrimination analysis was done using receiver operating characteristic (ROC) curves with area under the ROC curve (AUC) calculation.

RESULTS A total of 213 patients met the inclusion criteria and were analyzed for this study. Mortality was 8.9%. The predicted and actual mortalities were 1.74% and 8.9%, respectively. The significance (*p*-value) of the Hosmer–Lemeshow test was 0.55, indicating good calibration. The AUC of ROC curve was 0.85 (95% CI = 0.77–0.92, *p*<0.001), suggesting good discrimination.

CONCLUSIONS EuroSCORE II has a good calibration and discrimination for cardiac surgery in Indonesian adults.

KEYWORDS cardiac surgery, mortality, prognosis, treatment outcome

In recent decades, the hospital mortality for coronary artery bypass graft (CABG), which is the most common surgical procedure in the world, has fallen from 2.8% to 1.6% (shrinking by about 43%) even in a population of patients who are older and more exposed to the disease. Based on the Society for Thoracic Surgery database, the mortality rate for 774,000 CABG was 2.3%, and for 109,000 isolated valve surgeries was 3.4%.¹ The recommendation of

the predictor and risk stratification is important in the current practice to achieve an objective prediction of mortality risk.² The European system for cardiac operative risk evaluation (EuroSCORE) has been used since firstly introduced in 1999.³ This system has been used extensively to estimate mortality risk and as a benchmark for evaluating cardiac surgery in >1,300 official citations in the medical literature.⁴ Therefore, EuroSCORE II has been available since

October 2011 and has been developed to overcome previous EuroSCORE.⁵ In China, studies have been conducted to assess the performance of EuroSCORE II. According to the study, the EuroSCORE II was good in the group of patients with middle to low risk.⁶ Most importantly, pre-operative risk assessment also allows doctors to provide realistic expectations to both the patients and their families concerning the potential risks and benefits of surgery. Thus, they can decide reasonable decisions related to the management of their diseases.⁷

Indonesian population is generally known as late presenter, mostly due to its geographical location, which is far from our center and poverty. Furthermore, patients with valvular heart disease are dominated by rheumatic causes rather than degenerative and thus usually younger and has more calcified valves. Thus far, the data for EuroSCORE used in Indonesia are still unavailable. EuroSCORE II was developed to predict risk for in-hospital mortality after cardiac surgery. As the EuroSCORE II data in Indonesia are also unavailable, the in-hospital mortality was analyzed instead. In this study, we initially observed the validation of EuroSCORE II for adult cardiac surgery including CABG, heart valve surgery, heart tumor surgery, aorta surgery, or a combination of these surgeries. This study aimed to examine the relationship between the EuroSCORE II stratification and post-cardiac surgery in Indonesian adult mortality.

METHODS

This retrospective cohort study collected secondary data from the medical records of Soetomo General Hospital in Surabaya and the database of the Department of Thoracic Cardiac and Vascular Surgery, Universitas Airlangga. This research received approval from the Ethics Committee of Soetomo General Hospital (1298/KEPK/VII/2019). The sample size was determined by total population sampling.

The inclusion criteria of this study were adults who underwent a coronary artery bypass surgery, heart valve surgery, heart tumor surgery, aorta surgery, or a combination of these surgeries treated by the Department of Thoracic Cardiac and Vascular Surgery in Soetomo General Hospital, Surabaya from January 1, 2016 to December 31, 2018. Data with incomplete medical records were excluded from this study.

Age and body mass index (BMI) were presented as mean and range data. Age was taken from medical record when a patient was admitted for surgery. BMI was calculated by dividing the body weight (kg) by height (m) squared when a patient was admitted for surgery. Renal impairment was divided into three categories based on creatinine clearance calculated using Cockcroft-Gault formula for EuroSCORE II taken when a patient was admitted for surgery: on dialysis (regardless of value), moderate (50–85 ml/min), and severe (<50 ml/min). Extracardiac arteriopathy was examined in all subjects by ultrasound with history taking and characterized by one or more of the following: claudication, carotid occlusion or stenosis of >50%, amputation for arterial disease, and history of interventions in the foot or carotid abdominal aorta. Poor mobility was determined by deterioration of mobility that resulted in musculoskeletal or neurological dysfunction. Chronic lung disease was assessed during hospitalization for surgery by pulmonologist and determined according to the use of bronchodilators or steroids for the treatment of lung disease. Endocarditis was assessed using Duke Criteria and according to EuroSCORE II then was confirmed by a continuous antibiotic therapy before the surgery. Critical preoperative conditions were determined using the patient's history of ventricular tachycardia, ventricular fibrillation, or aborted sudden death in the preoperative period. Left ventricular (LV) function was assessed based on four categories: good (left ventricular ejection fraction [LVEF] of >50%), moderate (LVEF of 31–50%), bad (LVEF of 21–30%), and very bad (LVEF of <20%). Recent myocardial infarction was determined by the presence of a myocardial infarction <90 days from the first onset and confirmed by history taking with medical record for laboratory examination. Pulmonary hypertension assessed by cardiologist using an echocardiography and determined by the pulmonary artery systolic pressure classified into one of two classes: moderate (pulmonary artery pressure [PAP] 31–55 mmHg) or severe (PAP >55 mmHg). The level of urgency of surgery was classified into four classifications: elective (routine scheduled surgery), urgent (requires surgery when the patient was treated), emergency (requires surgery 1 day before the workday since it was decided for surgery), and saves lives (requires cardiac resuscitation—lung help along with travel to the operating room or just before induction of anesthesia). Intervention of the heart

was obtained by observing the ongoing surgical types, e.g., CABG surgery, heart valves replacement or repair, partial replacement of the aorta, heart defects repair, maze procedures, and cardiac tumors resection.

The required data for EuroSCORE include gender, renal impairment, extracardiac arteriopathy, poor mobility, previous cardiac surgery, chronic lung disease, endocarditis, critical preoperative, diabetes on insulin, New York Heart Association classification, Canadian Cardiovascular Society class 4 angina, ventricular function, recent myocardial infarction, pulmonary hypertension, surgical urgency, weight of the intervention, and surgery on the thoracic aorta, which were presented as sum and percentage. In-hospital mortality prediction was done using the online calculator from the site www.euroscore.org. The statistical analyses were done using the SPSS software version 23 (IBM Corp., USA).

The calibration of the EuroSCORE II model was analyzed using the Hosmer–Lemeshow test. Calibration is a statistical step that refers to the ability of a risk capital to harmonize results of estimated figures and observations across the scattered data. The discrimination was analyzed using receiver operating characteristic (ROC) curves and calculating the area under the ROC curve (AUC). Discrimination determines the ability of a capital to sort between groups of people, for example patients who live or die during hospital treatment.

RESULTS

This study was performed from January 2016 to December 2018. A total of 292 adults who underwent cardiac surgery including coronary artery bypass surgery (n = 218), heart valve surgery (n = 65), heart

Table 1. Characteristics of patients undergoing cardiac surgery

Variable	Result, n (%) (N = 213)
Age (years), mean (SD) range	54 (12) 19–82
Male sex	164 (77.0)
BMI (kg/m ²), mean (SD) range	24.4 (2.9) 19.3–41.4
Renal impairment	
None	134 (62.9)
Moderate	67 (31.5)
Severe	12 (5.6)
Extracardiac arteriopathy	4 (1.9)
Poor mobility	13 (6.1)

Table 1. (continued)

Variable	Result, n (%) (N = 213)
Previous cardiac surgery	1 (0.5)
Chronic lung disease	18 (8.5)
Active endocarditis	1 (0.5)
Critical preoperative state	32 (15.0)
Diabetes on insulin	53 (24.9)
NYHA	
Class 1	66 (31.0)
Class 2	94 (44.1)
Class 3	47 (22.1)
Class 4	6 (2.8)
CCS class 4 angina	8 (3.8)
LV function	
EF >50%	159 (74.6)
EF 31–50%	45 (21.1)
EF 21–30%	8 (3.8)
EF <21%	1 (0.5)
Recent MI	19 (8.9)
Pulmonary hypertension	
None	170 (79.8)
Moderate	33 (15.5)
Severe	10 (4.7)
Urgency of operation	
Elective	202 (94.8)
Urgent	11 (5.2)
Weight of the intervention	
Isolated CABG	127 (59.6)
Single non-CABG	56 (26.3)
2 procedures	24 (11.3)
3 procedures	6 (2.8)
Surgery on thoracic aorta	1 (0.5)

BMI=body mass index; CABG=coronary artery bypass graft; CSS=Canadian Cardiovascular Society; EF=ejection fraction; EuroSCORE=European system for cardiac operative risk evaluation; LV=left ventricle; MI=myocardial infarction; NYHA=New York Heart Association; SD=standard deviation

Table 2. Predicted vs. observed mortality between isolated CABG valve, and combined surgery

	Isolated CABG (N = 127)	Valvular surgery (N = 56)	Combined surgery (N = 31)
Predicted mortality	1.75%	1.65%	1.82%
Observed mortality	7.87%	8.83%	10%

CABG=coronary artery bypass graft

Table 3. Cross-tabulation analysis of the EuroSCORE II based on quintiles of risk

Quintile of EuroSCORE II	Alive (n)		Died (n)		Total (n)
	Observed	Expected	Observed	Expected	
0.5–0.69%	43	39.2	0	3.8	43
0.7–0.91%	43	40.1	1	3.9	44
0.92–1.3%	38	36.4	2	3.6	40
1.31–2.30%	41	41	4	4	45
2.31–11.49%	29	37.3	12	3.7	41

EuroSCORE=European system for cardiac operative risk evaluation

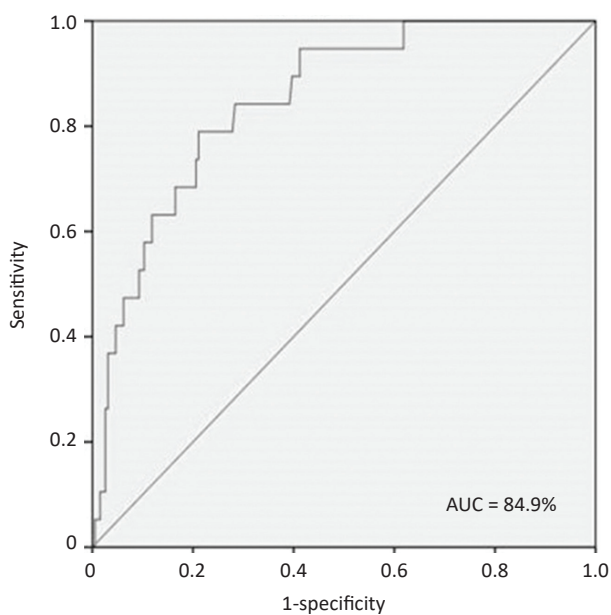


Figure 1. ROC curves for the EuroSCORE II in adults undergone cardiac surgery. AUC=area under ROC curve; EuroSCORE=European system for cardiac operative risk evaluation; ROC=receiver operating characteristic

tumors surgery (n = 8), aorta surgery (n = 1), or a combination of these surgeries in the Department of Thoracic Cardiac and Vascular Surgery at Soetomo General Hospital were retrospectively reviewed. Of 292 patients, 213 patients met the inclusion criteria for this study, and 79 patients (27.0%) had incomplete medical records which met the exclusion criteria. Demographics and comorbidity are illustrated in Table 1.

In this study, the EuroSCORE II was used to estimate the mortality. The mortality rate was 19 out of 213 patients (8.9%). The observed and predicted mortality among different group of surgery is described in Table 2.

Table 3 shows the observed and predicted mortality in the quintiles of the EuroSCORE II. It can be

inferred that the EuroSCORE II predicted the mortality in the risk group of 1.31–2.3%, whereas in the risk group of <1.3%, the score tended to overestimate the mortality rate.

Median (range) of EuroSCORE II was 1.03 (0.5–11.9). Furthermore, the data were classified using cut-off point (≤ 1.03 and >1.03). The p-value of the Hosmer–Lemeshow test was 0.55, which indicates good calibration. The AUC of the ROC (Figure 1) was 0.85 (95% confidence interval [CI] = 0.77–0.92, and $p < 0.001$) for the total sample, suggesting a good discrimination.

DISCUSSION

Preoperative risk assessments have been widely discussed in several studies. After being introduced in the 1990s, the EuroSCORE was used to estimate mortality in patients with complex cardiac surgery. Several similar studies have been carried out to evaluate the accuracy of the EuroSCORE on a particular population. A study involving 621 patients from a cardiac surgery institution in Greece conducted EuroSCORE II of patients who underwent cardiac surgery with an observed mortality rate of 3%. The estimated mortality rate was 1.3%, and the ROC curve showed a high discrimination ability (AUC = 0.848, 95% CI = 0.75–0.94, and $p < 0.001$).⁸ In India, a study involving 911 patients was conducted to assess the EuroSCORE II in relation to patients who underwent heart surgery with an observed mortality rate of 5.7%. The estimated mortality rate was 2.93%, and the ROC curve showed a high discriminatory ability (AUC = 0.76, 95% CI = 0.69–0.82).⁹ In other study that involved 4,034 patients from 20 cardiac surgery institutions in Spain, the EuroSCORE II estimated mortality rate of 5.7% in patients who underwent cardiac surgery with an observed mortality rate of 6.5%. The study showed

a high discrimination ability (AUC = 0.97, 95% CI = 0.76–0.82), which shows the adequacy of EuroSCORE II as an assessment for the risk of cardiac surgery.¹⁰ Other study conducted in Asia, specifically China, in 2006–2011 by Zhang et al¹¹ involved 3,479 patients undergoing heart valve surgery assessed using the EuroSCORE and EuroSCORE II. A mortality rate of 3.32% was observed, whereas the estimated mortality rate using the EuroSCORE was 3.33%. The estimated number using the EuroSCORE II was 2.52%. The discriminatory ability was found higher in EuroSCORE II (AUC = 0.792) than EuroSCORE.¹¹

The EuroSCORE II, published in 2011 after the previous version, tends to overestimate mortality. A database was created by collecting data on 22,381 patients from 154 institutions in 43 countries. Although Zhang et al¹¹ conducted studies with Asian characteristics that were similar to Indonesian characteristics, none of the data originated from Indonesian institutions. It should be noted that demographics, patient profiles, and surgical situations and conditions are different in each country. The data from our study showed good calibration and discrimination of the EuroSCORE II which can be used as an established modality in terms of predicting the risk of in-hospital mortality after cardiac surgery. The use of this score influences the decision making of surgeons, especially in cases of high-risk cardiac surgery, to reduce the volume of high-risk surgery.¹² Apart from the pros and cons, Bridgewater et al¹³ suggested that its use is limited to a consideration tool for surgeons and work units in the selection at the lower risk end. Decision-making must still be considered comprehensively by the heart team and the patient. Gogbashian et al¹² added that the surgeon's professionalism and common sense in the assessment as well as other risk factors also need to be investigated further.

Several risk assessments tools, such as EuroSCORE, have been put forward in recent years as an addition to the risk assessment after heart surgery. However, the tool was formerly made based on certain databases which came from certain populations. We found that the EuroSCORE II is a good predictor of in-hospital mortality after cardiac surgery in Indonesian adults. Age is a significant predictor of mortality according to the EuroSCORE II.⁵ However, the average age in our study is lower than the age in the database of the EuroSCORE II.

In our center, only 11 urgent surgeries were performed with no emergency/salvage surgery due to the priority treatment of emergency patients which was measured by the hemodynamic stability at the intensive care unit. They thus underwent cardiac surgery the following day, resulting in urgent surgery.¹⁴ The limitation of this study includes the study population of only one cardiac surgery institution; therefore, this study cannot describe the entire population of patients who underwent cardiac surgery throughout Indonesia. Further research with a broader sample of patients involving more than one cardiac surgery institutions in Indonesia is suggested. In conclusion, the EuroSCORE II has a good calibration and discrimination in Indonesian adults. However, we found a significant under-prediction between predicted mortality and the actual observed mortality.

Conflict of Interest

The authors affirm no conflict of interest in this study.

Acknowledgment

None.

Funding Sources

None.

REFERENCES

- Peterson ED. Innovation and comparative-effectiveness research in cardiac surgery. *N Engl J Med*. 2009;361(19):1897–9.
- Prins C, Jonker ID, Smit FE, Botes L. Cardiac surgery risk-stratification models. *Cardiovasc J Afr*. 2012;23(3):160–4.
- Ad N, Holmes SD, Patel J, Pritchard G, Shuman DJ, Halpin L. Comparison of EuroSCORE II, original EuroSCORE, and The Society of Thoracic Surgeons Risk Score in cardiac surgery patients. *Ann Thorac Surg*. 2016;102(2):573–9.
- Siregar S, Groenwold RH, de Heer F, Bots ML, van der Graaf Y, van Herwerden LA. Performance of the original EuroSCORE. *Eur J Cardiothorac Surg*. 2012;41(4):746–54.
- Nashef SA, Roques F, Sharples LD, Nilsson J, Smith C, Goldstone AR, et al. EuroSCORE II. *Eur J Cardiothorac Surg*. 2012;41(4):734–44; discussion 744–5.
- Bai Y, Wang L, Guo Z, Chen Q, Jiang N, Dai J, et al. Performance of EuroSCORE II and SinoSCORE in Chinese patients undergoing coronary artery bypass grafting. *Interact Cardiovasc Thorac Surg*. 2016;23(5):733–9.
- Lloyd-Jones D, Adams R, Carnethon M, De Simone G, Ferguson TB, Flegal K, et al. Heart disease and stroke statistics—2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation*. 2009;119(3):e21–181.
- Stavridis G, Panaretos D, Kadda O, Panagiotakos DB. Validation of the EuroSCORE II in a Greek cardiac surgical population: a prospective study. *Open Cardiovasc Med J*. 2017;11:94–101.
- Kar P, Geeta K, Gopinath R, Durga P. Mortality prediction in Indian cardiac surgery patients: validation of European System for Cardiac Operative Risk Evaluation II. *Indian J Anaesth*. 2017;61(2):157–62.
- García-Valentín A, Mestres CA, Bernabeu E, Bahamonde JA, Martín I, Rueda C, et al. Validation and quality measurements

for EuroSCORE and EuroSCORE II in the Spanish cardiac surgical population: a prospective, multicentre study. *Eur J Cardiothorac Surg*. 2016;49(2):399–405.

11. Zhang GX, Wang C, Wang L, Lu FL, Li BL, Han L, et al. Validation of EuroSCORE II in Chinese patients undergoing heart valve surgery. *Heart Lung Circ*. 2013;22(8):606–11.
12. Gogbashian A, Sedrakyan A, Treasure T. EuroSCORE: a systematic review of international performance. *Eur J Cardiothorac Surg*. 2004;25(5):695–700.
13. Bridgewater B, Grayson AD, Jackson M, Brooks N, Grotte GJ, Keenan DJ, et al. Surgeon specific mortality in adult cardiac surgery: comparison between crude and risk stratified data. *BMJ*. 2003;327(7405):13–7.
14. Axelsson TA, Mennander A, Malmberg M, Gunn J, Jeppsson A, Gudbjartsson T. Is emergency and salvage coronary artery bypass grafting justified? The Nordic Emergency/Salvage coronary artery bypass grafting study. *Eur J Cardiothorac Surg*. 2016;49(5):1451–6.