

## Peer Review File

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### Reviewer A

- 1) Hospital mortality of 8% is very high and needs robust explanation
- 2) Ejection Fraction should be tested
- 3) Disease related factors and operation related factors should be tested

Objectives of the paper and importance of the research question.

Database derived analysis of reporting a rather mixed population of case series.

Patients underwent open heart surgery of any kind (non-specified, by the authors)

**Reply:** Thank you very much for this valuable and high quality comment. We considered this issue at the beginning of the article design and we were keen to categorise these surgical modalities. But after mining and analysing the database, we were not able to categorise the surgical modalities in the same detail as we had initially designed. This is a problem inherent in our use of the database for analysis. It was not possible for us to include surgical modalities in our study for better analysis. We offer our sincerest apologies.

The authors attempt to reduce bias by using training and validation cohort.

There is a clear statement by the authors as to exactly what are they looking, in these series.

There was a clear question to be answered.

How accurate and precise was their approach? The sample size was not particularly large for creating a nomogram.

The population studied was heterogeneous in terms of disease related factors (Ischemic heart disease, Valvular heart disease etc) patient related factors (Congestive Heart failure, Ejection Fraction, etc) and operation related factors (type of procedure etc).

### Methods

- 1) The sample size was collected during surgical activity between 2008 to 2019.
- 2) out of 4.852 surgeries, 880 patients were enrolled in the study: The exclusion criteria should be described in more detailed manner, as more than 4000 patients were excluded.

**Reply:** We reviewed all the extracted data according to the mode of surgery, and found that more patients did not really undergo open heart surgery assisted by extracorporeal circulation, and more patients underwent percutaneous interventional cardiac surgery, and we deleted these percutaneous interventional cardiac surgery patients by reviewing them one by one according to the mode of surgery, and, due to the high number of missing data of patients, a large number of patients were missing the factors that we wanted to include in the study, in order to retain enough patient cases and have more factors for the study, and at the same time to ensure the statistical

science in the study process, finally 880 patients were deleted. wanted to include, we chose to remove factors with more than 5% missing data in order to retain a sufficient number of patients and have a large number of factors to study, and to ensure the scientific validity of statistics during the study process, resulting in 880 patients being included in the study.

3) Variable extraction: a) Acute Myocardial Infarction: Must be a clear definition and timing, b) Peripheral vascular disease: this is a broad spectrum and should be defined, ie severe carotid disease, abdominal aneurysms etc c) Cerebrovascular disease: again, this is a “broad spectrum” term and should be narrow down to a “measurable” definition. With other wards those 3 terms used by the authors (AMI, PVD, CVD), in my opinion, should have precise definitions.

**Reply:** We extracted the types of preoperative concomitant diseases of the patient that were not new postoperative complications, for example, if the patient had a history of AMI disease before surgery, etc. The MIMIC database uses the International Classification of Diseases and Ninth Revision (ICD-9) codes to categorise the diseases and enter the data into the database. For the way the data were extracted, we extracted the diseases according to the International Classification of Diseases and 10th Revision (ICD-10) codes and did not privately classify these concomitant diseases. The database is a large, publicly available and widely recognised database, trusted by a wide range of researchers in the profession. Your comments are very scientific and reasonable and we strongly agree with them. However, there is nothing we can do about this as the database has already been categorised in detail by the creator of the database at the time of entry. We can only draw conclusions as far as possible from the available data.

4) Did the authors look at the Ejection Fraction (EF) in those cases?

**Reply:** Due to the absence of detailed ultrasound imaging results in the MIMIC IV database and the large number of patients with missing data, we did not include this factor in our study after a trade-off to ensure that as many study variables as possible were included; if we had included this result, the sample size of the study would have been considerably reduced, and the credibility of the study would have been further diminished. This is a shortcoming of our study, and in future studies we will separately investigate the effect of EF values on the prognosis of open heart surgery. Also referring to other articles, EF values can indeed have an impact on the prognosis of open heart surgery, which will be studied in more detail in future studies.

Outcome measures/ Results presentation

1)The results are well presented

2) The Tables/ Figures are well-constructed

3) Hospital mortality of 8% is extremely high following Heart Surgery with the use of Cardiopulmonary bypass. The aetiology should be justified by the authors.

**Reply:** The 8% operative mortality rate is very high and needs to be proven

aetiologically. A large number of patients were deleted due to missing data, while the aim of this study was to develop a prognostic model for patients undergoing open heart surgery, some patients were deleted due to missing data.

4) PVD, AMI and CVD scores points from the patient's history, with a "Yes" or "No" ticking box? Please explain.

**Reply:** We extracted the types of preoperative concomitant diseases of the patient that were not new postoperative complications, for example, if the patient had a history of AMI disease before surgery, etc. The MIMIC database uses the International Classification of Diseases and Ninth Revision (ICD-9) codes to categorise the diseases and enter the data into the database. For the way the data were extracted, we extracted the diseases according to the International Classification of Diseases and 10th Revision (ICD-10) codes and did not privately classify these concomitant diseases. The database is a large, publicly available and widely recognised database, trusted by a wide range of researchers in the profession. Your comments are very scientific and reasonable and we strongly agree with them. However, there is nothing we can do about this as the database has already been categorised in detail by the creator of the database at the time of entry. We can only draw conclusions as far as possible from the available data.

#### Interpretation of the results

Overall, this paper represents a series of heterogeneous population.

Questions:

1) Line 216 -223: The statements are vague and general. The authors should be more specific because CVD, AMI and PVD are generalized terms.

2) Line 224 onwards: There is no mention on the impact of Ejection fraction in early outcome following cardiac surgery. There is also no mention of the procedure performed (CABG, Aortic/ Mitral Valve etc) and the impact on the early outcome.

#### Reviewer B

##### Some Suggestions / Comments:

Line 1, 24, 29, and so on, please check: "nomogram" (style issue, lower case)

Line 18: "undergoing" => "underwent"

Line 20: "will be subjected" => "were subjected" (simple past tense for Method and Result presentation)

Line 22, 116: "will be analyzed" => "were analyzed" (simple past tense for Method and Result presentation)

Line 25: "was plotted" => "was constructed" (word choice)

Line 26: “the calibration of the model was evaluated by” => “the evaluation of the model was performed by” (word choice)

Line 50: “those patients” => “the groups of patients”

Line 52: “did not use” => “do not use” (simple present tense would be fine for general facts or beliefs description)

Line 53: “and were lacking in the immediate postoperative assessment” => “and fail to provide immediate postoperative assessment” (presentation)

Line 58: “wanted to” => “would like to” (presentation)

Line 63: please first define “MIMIC-IV” (abbreviations have to be defined in both the Abstract and the Main Text.)

Line 64: “is the first ~~model~~ to predict”

Line 77: “was reviewed” => “were reviewed” (subject-verb alignment)

Line 81-82: “All patients who underwent...codes were extracted, totaling 4,852 patients.” (proper sentence, make use of passive voice, past tense, number format for easy reading)

Line 104-107: please convert to simple past tense for Method presentation

Line 109, 110: “were presented” (simple past tense for Method and Result presentation)

Line 112, 113, 123: “is” => “was” (simple past tense for Method and Result presentation)

Line 137: “used” (simple past tense for Method and Result presentation)

Line 159: “19 factors” => “Nineteen factors” (spell out the number if it starts the sentence)

Line 160: “chose” (simple past tense for Method and Result presentation)

Line 161: “9” => “nine” (better to spell out number <10 for formal writing; please check across the whole paper)

Line 182-183: “showed”; “exceeded”; “reached” (simple past tense for Method and

Result presentation)

Line 191: “his” => “the”

Line 196: “received” => “has received” (tense)

Line 198, 199: “becomes”; “are gradually discovered” (simple present tense would be fine for general facts or beliefs description)

Line 200: “and this flaw ~~that~~ has been”

Line 202: “have developed” (tense)

Line 207: “analyses” => “analyze” (verb usage here)

**Reply:** Thank you very much for your advice on our manuscripts. According to your suggestion, we have made corresponding modifications to the manuscript.