

**To the Chairman of the Scientific Jury,  
appointed by Order No. R-109-273/20.06.2025  
of the Rector of Medical University - Varna**

## **STATEMENT**

on the dissertation with a title: **"Early postoperative complications in open-heart surgery - a modern approach to risk prediction and stratification,"** submitted for public defense before a scientific jury for the conferral of the educational and scientific degree "Doctor," professional field 7.1 Medicine, scientific specialty "Surgery".

**Author of the dissertation:** Dr. Georgi Stefanov Bachvarov, an independent doctoral student in the "Surgery" doctoral program, professional field 7.1 Medicine, enrolled by order No. P-109-248/14.06.2022 at the Medical University - Varna (MU-Varna).

**Reviewer: Prof. Dr. Zhaneta Georgieva Tyaneva, MD, PhD, MU-Varna,**  
member of the Scientific Jury, approved by the Rector of MU Varna, R-109-273/20.06.2025

### **Biographical data:**

Dr. Bachvarov graduated in medicine in 2006 from the MU-Varna. His professional experience began as a resident doctor at the hospital in Omurtag. From 2010 to 2016, he was a resident physician in surgery. From 2016 to 2018, he specialized in the Clinic of Cardiac Surgery at the St. Marina University Hospital, at the MU-Varna. In 2018, after a successful competition, he became an assistant professor of cardiac surgery in the Department of Cardiovascular Surgery and Angiology at the MU-Varna. Since 2024, he has been appointed head of the Clinic of Cardiac Surgery at the St. Marina University Hospital in Varna. Dr. Bachvarov is currently defending his dissertation work titled: Early postoperative complications in open-heart surgery - a modern approach to risk prediction and stratification. He has specialized in Italy, Israel, Finland, and Spain.

### **Research activity**

**The dissertation:** "Early postoperative complications in open-heart surgery - a modern approach to risk prediction and stratification". Early postoperative complications represent a significant part of postoperative complications and are characterized by a great variety. Cardiovascular complications after open-heart surgery are the most common complications, with rhythm complications having the largest share among them.

**Literature review:** The presented review demonstrates a very good knowledge of the literature sources and extraction of in-depth information from them. Modern statistical methods were used, allowing for the consideration of the interaction of the observed parameters.



**The goal** of the study is clearly and specifically formulated. The doctoral student aims to propose optimal models for defining the risk of early postoperative complications: atrial fibrillation, significant bleeding, delirium, acute kidney injury, and death after open-heart surgery.

**The tasks** are well formulated and executed with precision. The perioperative characteristics of patients who underwent open-heart surgery were studied retrospectively, analyzing preoperative, intraoperative, and postoperative indicators. The predictive value of the perioperative characteristics for the manifestation of postoperative atrial fibrillation and bleeding, as well as delirium and acute kidney injury, were investigated. The predictive value of the perioperative characteristics for the occurrence of a fatal outcome after open-heart surgery were analyzed.

### **Dissertation structure**

The dissertation of Dr. Bachvarov contains 159 pages. The structure of the work is logically built and illustrated with 55 tables and 39 figures. The bibliography includes 320 literary sources. The study was conducted at the Clinic of Cardiac Surgery at the St. Marina University Hospital - Varna. The doctoral student has two publications related to the topic in foreign specialized journals.

**Results and discussion:** The creation of predictive models for the risk of complications after open-heart surgery allows for the optimization of the patient's preoperative preparation and surgical technique. An important point in the dissertation is the simultaneous analysis of 120 indicators, which represent the most significant characteristics from the preoperative, intraoperative, and postoperative periods after open-heart surgery. New-onset atrial fibrillation is considered the most common rhythm disturbance after open-heart surgery. The frequency of bleeding and the number of necessary blood transfusions after open-heart surgery are not small. Acute kidney injury after open-heart surgery is a significant clinical problem. Mortality is the most serious complication after open-heart surgery. The multivariate logistic regression model presented by the doctoral student has a very high OR value and correctness in classifying cases. The model includes 6 indicators: the calculated STS score with 5 additional indicators. **The results** are convincing and precise. They have scientific value and a contributing character. The discussion of the results presents a connection between the author's own results and data from the literature review.

**Conclusions:** The doctoral student has systematized 7 conclusions in response to the set tasks. In Dr. Bachvarov's study, significant predictors for the early manifestation of atrial fibrillation, bleeding, delirium, acute kidney injury, and death after open-heart surgery were identified. Some predictors are presented as a function of time (in dynamics), which undoubtedly refines and strengthens their value. The multivariate logistic models for the prediction of acute kidney injury and death include the calculated value of the validated evaluation scale STS score, which is direct evidence of the precision of the study and the analysis performed. The predictive multivariate logistic models of the analyzed complications simultaneously involve preoperative and intraoperative indicators, and not infrequently, postoperative indicators as well. Correct prediction is a multi-stage process that requires in-depth knowledge of the patient.

**Scientific contributions:** The obtained results have an original clinical character. This is the first retrospective clinical study of its kind in open-heart surgery, analyzing simultaneously one hundred and twenty perioperative indicators for the prediction and stratification of the risk of the most common early

postoperative complications. Predictive models have been created to calculate the expected probability of manifestation for each of the complications, which are distinguished by very high correctness in classifying cases. For the first time, an evaluation model of the probability of new-onset postoperative atrial fibrillation is presented. I agree with the conclusions made and the report on the doctoral student's contributions.

#### **Assessment**

The presented dissertation by Dr. Bachvarov is relevant for modern cardiac surgery. It combines precisely an in-depth analysis of literary data with original research and conclusions. The doctoral student contributes to a substantial clarification of early postoperative complications in open-heart surgery and to modern approaches for risk prediction and stratification. The presented dissertation and scientific publications **meet all the necessary scientometric criteria for awarding the scientific and educational degree "doctor" according to the Regulations on the Development of the Academic Staff and the Regulations of the Medical University of Varna.** The dissertation offers significant original insights as well as confirmatory findings.

I give a positive vote for the award of the scientific and educational degree "Doctor" to: Dr. Georgi Stefanov Bachvarov,

September, 4th 2025  
Varna

Review

Заличено на основание чл. 5,  
§1, б. „В“ от Регламент (ЕС)  
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