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Prof. Petr Widimský and PhD committee of the
Branch Council in the study programme
Cardiovascular Sciences,
Third Faculty of Medicine,
Charles University

Evaluation of the Dissertation of **MUDr. David Bauer** on the topic
"Risk stratification of acute coronary syndrome treated by percutaneous coronary intervention "

To the Board of the Doctoral Program in cardiovascular science,
it is my pleasure to submit herewith the evaluation report on the above doctoral thesis.

- **Scientific topic and clinical significance - Background**

Risk stratification in patients with acute myocardial infarction treated with primary percutaneous coronary intervention represents a central determinant of clinical course and prognosis in contemporary cardiology. Early and late cardiovascular complications significantly influence outcomes following acute myocardial infarction, making accurate risk assessment essential for optimizing patient management after primary PCI.
Improving the identification of patients at low risk of adverse events is of high clinical relevance, as it may enable safe early discharge strategies. The implementation of refined risk stratification may improve clinical outcomes, reduce hospital length of stay, and limit hospitalization-related complications, including infections and prolonged immobilization. At the system level, this may translate into reduced costs, improved patient flow, and increased availability of hospital beds for patients requiring acute cardiovascular care.

- **Evaluation of the thesis**

1) *Project idea and description*
   Based on the clinical considerations outlined above, the candidate's work focused on exploring refined approaches to risk stratification in patients with acute myocardial infarction undergoing primary percutaneous coronary intervention, with particular attention to early discharge eligibility.
   The objectives of this thesis were:
   - To identify patients at low risk after acute coronary syndrome treated with primary percutaneous coronary intervention, in order to safely guide early discharge strategies.
   - To evaluate the role of the PRECISE-DAPT score in prognostic stratification beyond its conventional application for bleeding risk assessment.

- To investigate the impact of the presence or absence of chronic total occlusions on clinical prognosis in a high-risk population with multivessel coronary artery disease.

- Taken together, these objectives contribute to a more comprehensive characterization of patient risk profiles and support the overarching goal of a tailored management in patients with acute myocardial infarction treated with primary PCI. Therefore, the main concept of this thesis is highly timely and of substantial clinical and academic relevance, particularly in the context of increasing hospital admission pressure among patients with cardiovascular disease. The results align well with current efforts toward individualized post–acute myocardial infarction care.

2) *Methodological and statistical point of view*

Using data derived from the institutional hospital database and the Czech national health system registry collected over several years, the candidate identified variables with potential prognostic value for risk stratification in this patient population. Particular appreciation is warranted for the attention given to factors often underestimated in prognostic assessment, such as therapy adherence and return to everyday life activities, including work and hobbies. These elements are highly relevant in patient-centered care, as cardiovascular management should ultimately address not only survival but also quality of life.

From a statistical perspective, a stepwise logistic regression approach was used to identify a set of clinical characteristics associated with improved survival at 30-day follow-up. Receiver operating characteristic (ROC) curve analyses were performed to evaluate the PRECISE-DAPT score, while Kaplan–Meier survival analyses with log-rank testing were applied for the assessment of long-term outcomes. Notably, propensity score matching was employed prior to Kaplan–Meier analyses to reduce bias related to baseline population differences, further strengthening the validity of the findings. Overall, the methodological approach underpinning this research is coherent, well structured, and scientifically sound. Nevertheless, as a minor point for revision, the statistical analysis section may benefit from clearer and more detailed explanation. In particular: 1) is not always clear whether parametric tests (e.g. Student's t-test) were applied for normally distributed variables, as non-parametric tests (Mann–Whitney U) are predominantly reported; 2) the specific analyses in which propensity score matching was applied are not always clearly identifiable, appearing to be limited to the multivessel disease with versus without CTO subanalysis; 3) the rationale for variable selection in the propensity score model should be better justified, particularly regarding the exclusion of clinically relevant parameters such as left ventricular ejection fraction or diabetes mellitus; 4) according to the results of the low-risk selection protocol, bleeding events, one death, and some re-hospitalizations were observed during follow-up. For reasons of completeness and methodological rigor, the inclusion of a predefined safety endpoint accounting for post-discharge complications would further strengthen the evaluation of the proposed early discharge strategy, complementing the current efficacy endpoints. Addressing these minor points would further improve transparency, methodological robustness, and clinical interpretability.

3) *Images and Table*

- Table 5: probably also "Age" should be highlighted in green as selecting prognostic variables
- Figure 6: P-value between Group A and Group B for each time period is advisable
- Figure 7: same of Figure 6
- Figure 8: time period in the X axis for each mark
- Figure 9: same of Figure 6 and 7

4) *Results and impact in clinical daily practice*

The results of this thesis demonstrate that a structured and multimodal approach to risk stratification after acute coronary syndrome treated with primary percutaneous coronary intervention can effectively identify patients at low risk who may safely benefit from early discharge strategies. Through the analysis of real-world clinical, laboratory, and procedural data, the candidate has developed a robust framework for individualized post–acute myocardial infarction management. Overall, the candidate has conducted an excellent research work characterized by methodological rigor, clinical relevance, and a strong translational perspective. Importantly, the proposed risk stratification protocol has already been implemented at the candidate's institution, leading to a modification of clinical practice and representing a tangible indicator of the clinical value of this research. By enabling the safe identification of low-risk patients suitable for early discharge, the protocol may reduce hospital length of stay and hospitalization-related complications while optimizing healthcare resource utilization. Furthermore, the inclusion of functional recovery and return to everyday life activities highlights the relevance of this work in addressing quality of life as an integral component of cardiovascular care.

5) *Suggestions*

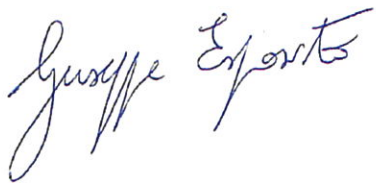
In the thesis, prognostic indicators in acute coronary syndromes are appropriately categorized into clinical, laboratory, and imaging variables assessed at different time points. While this approach is methodologically sound, risk stratification could be further strengthened by integrating variables collected during and after PCI, rather than relying exclusively on pre-procedural scores such as GRACE or Killip class. Additional clinical variables of interest may include electrocardiographic features (dynamic ST–T changes, arrhythmias, conduction disturbances) and ischemic time parameters. From a laboratory perspective, peak troponin and serum lactate levels could complement existing clinical scores to refine hemodynamic and prognostic assessment. With regard to imaging and physiology, non-invasive coronary CT in selected NSTEMI patients, intravascular imaging during PCI, and indices of microvascular dysfunction such as the index of microcirculatory resistance may provide incremental prognostic information. These aspects could be addressed as a minor revision in the introductory section to further support a multimodal and time-dependent approach to risk stratification.

- **Final and cohomprensive Evaluation**

The thesis is clearly written, well structured, and supported by an appropriate and comprehensive set of references. Figures and Tables are generally of good quality; however, for publication purposes and to further enhance clarity and interpretability, some figures may benefit from minor revisions, particularly regarding figure legends and p-value reporting.
Through this thesis, Dr. Bauer has demonstrated a solid medical and scientific understanding of the subject matter, as well as the ability to conduct systematic and methodologically sound clinical research.

As expected in a complex clinical research project, certain aspects of the study could be further refined, particularly with regard to methodological details and data presentation. These limitations do not detract from the overall scientific value of the work. The thesis provides clear evidence of the candidate's ability to conceive a clinically meaningful research project, to develop it in a structured and scientifically appropriate manner, and to bring it to completion with relevant and informative results. The scientific merit of the project is further supported by its tangible impact on clinical practice at the candidate's institution. On the basis of these considerations, the candidate can be recommended to proceed to the final step of his PhD programme and to the discussion of his doctoral thesis.

- **Personal Acknowledgement**

I have had the honor of knowing Dr. Bauer not only as a highly competent professional, but above all as a person. It has been a pleasure to work with him, to grow together, and to share achievements and successes, as well as setbacks and disappointments. Always available, with a rare eagerness to learn and an exceptional level of dedication, Dr. Bauer has left a meaningful mark on our team, demonstrating that professional excellence is not only defined by work itself, but also by the quality of time spent together.
It has been a genuine pleasure for me to share this important milestone with him.
Ad maiora, Professor Bauer.

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