

IS4250 Healthcare Analytics Project

**Logistic regression model for identification of right ventricular dysfunction in patients with acute pulmonary embolism by means of computed tomography**

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Summary of Paper

The paper we choose to analyze is titled as “Logistic regression model for identification of right ventricular dysfunction in patients with acute pulmonary embolism by means of computed tomography”. The main purpose of this paper is to increase the accuracy of identifying and predicting right ventricular dysfunction (RVD) experienced by patients with the use of computed tomography pulmonary angiography (CTPA). Most importantly, a logistic regression model constituted of several measurements would be calculated to theoretically support the prediction.

To facilitate the study, 97 sequential patients with acute pulmonary embolism were grouped according to with and without RVD using echocardiographic measurement of pulmonary artery systolic pressure (PASP). PE severity was graded with the pulmonary obstruction score. The following factors were taken into account: CT measurements of heart chambers and mediastinal vessels, position of interventricular septum and presence of contrast reflux into the inferior vena cava. The logistic regression model was prepared by means of stepwise logistic regression.

The result is positive since the calculated model, characterizing 79% sensitivity and 81% specificity, performed much better than single CT-based measurements. Therefore, it leads to the conclusion that logistic regression model is able to identify RVD drastically better than solely CT-based measurements.

Relevance of Paper

<contributions make to the field of healthcare>

Issues

<Issue = what problem does the paper solve>

<Replication>

Challenges

<Challenges = what difficulties the solution faced>

Evaluation of heart failure patients with suspected acute PE is challenging because of the substantial overlap in symptoms and signs of both disorders. Although dyspnea is the most commonly reported symptom in both PE and heart failure, severe dyspnea out of proportion to objective findings of pulmonary vascular congestion suggests that another process such as PE is compromising gas exchange ([Table 1](http://circ.ahajournals.org/content/118/15/1598.full#T1)). Systemic arterial hypotension, cardiogenic shock, or cardiac arrest may be observed in decompensated heart failure or massive PE. Submassive PE should be considered in normotensive heart failure patients with evidence of right heart failure such as elevated jugular venous pressure, tricuspid regurgitation, and an accentuated sound of pulmonic closure (P2). However, heart failure patients often demonstrate signs of right ventricular dysfunction in the absence of PE. Findings consistent with new or worsened right greater than left heart failure such as lower-extremity edema, hepatomegaly, and elevated jugular venous pressure in the absence of significant pulmonary rales should raise concern for subacute or chronic PE.

Laboratory testing of heart failure patients with suspected acute PE is complicated because elevated D-dimer levels may be present in heart failure alone. Similarly, cardiac biomarkers, including troponin, brain-type natriuretic peptide, and pro-brain–type natriuretic peptide, may be difficult to interpret because they often are abnormally elevated in heart failure. Nevertheless, heart failure patients with elevated cardiac biomarkers and findings of new or worsened RV failure should undergo further evaluation for PE. Elevated cardiac biomarkers in the setting of PE correlate with the presence of RV dysfunction, a powerful independent predictor of early mortality.[7](http://circ.ahajournals.org/content/118/15/1598.full#ref-7)

Contrast-enhanced chest CT is the preferred imaging modality to evaluate suspected PE in heart failure patients. However, use of intravenous contrast-enhanced chest CT may be problematic for heart failure patients with chronic kidney disease who will have increased susceptibility to contrast nephropathy. In addition, the rapid bolus administration of intravenous contrast may cause a sudden increase in intracardiac pressures and pulmonary edema. Heart failure patients presenting with pulmonary vascular congestion or systemic hypertension should be stabilized before undergoing chest CT.

http://circ.ahajournals.org/content/118/15/1598.full

Limitations of the Study

Due to the retrospective character of the study, which is designed to analyze pre-existing data that are collected from medical records of patients, the level of evidence could be inferior compared with prospective studies. The result may be prone to selection bias and not representative of the general population if convenience sampling influences control. Therefore, further evaluation of applicability of the calculated logistic regression model should be carried out on a larger group of patients.

Conclusion

<Rewrite the conclusion of the paper>

The paper reveals that the researchers make use of binary logistic regression analysis of CT-based measurements to establish the prognostic model. Although the study has the limitation of retrospection, the combination of CT-derived measurements is depicted to have greater specificity and sensitivity than single-based CT parameters. Based on the test on the group of 97 patients, the model indicates its reliability in assessing RVD based on the acute PE. The feasibility would be evaluated more precisely if a larger sample with PE could be obtained.

Reference

Appendix

<Source code>

Diagram table