

Validity of a model to predict the risk of developing atrial fibrillation after major oncologic thoracic surgery

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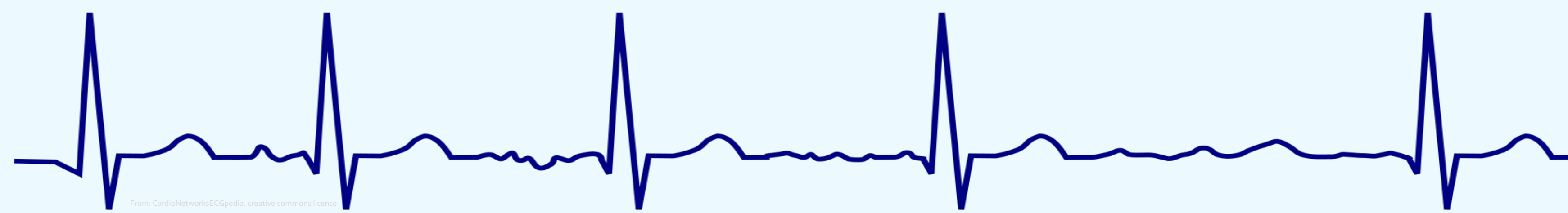
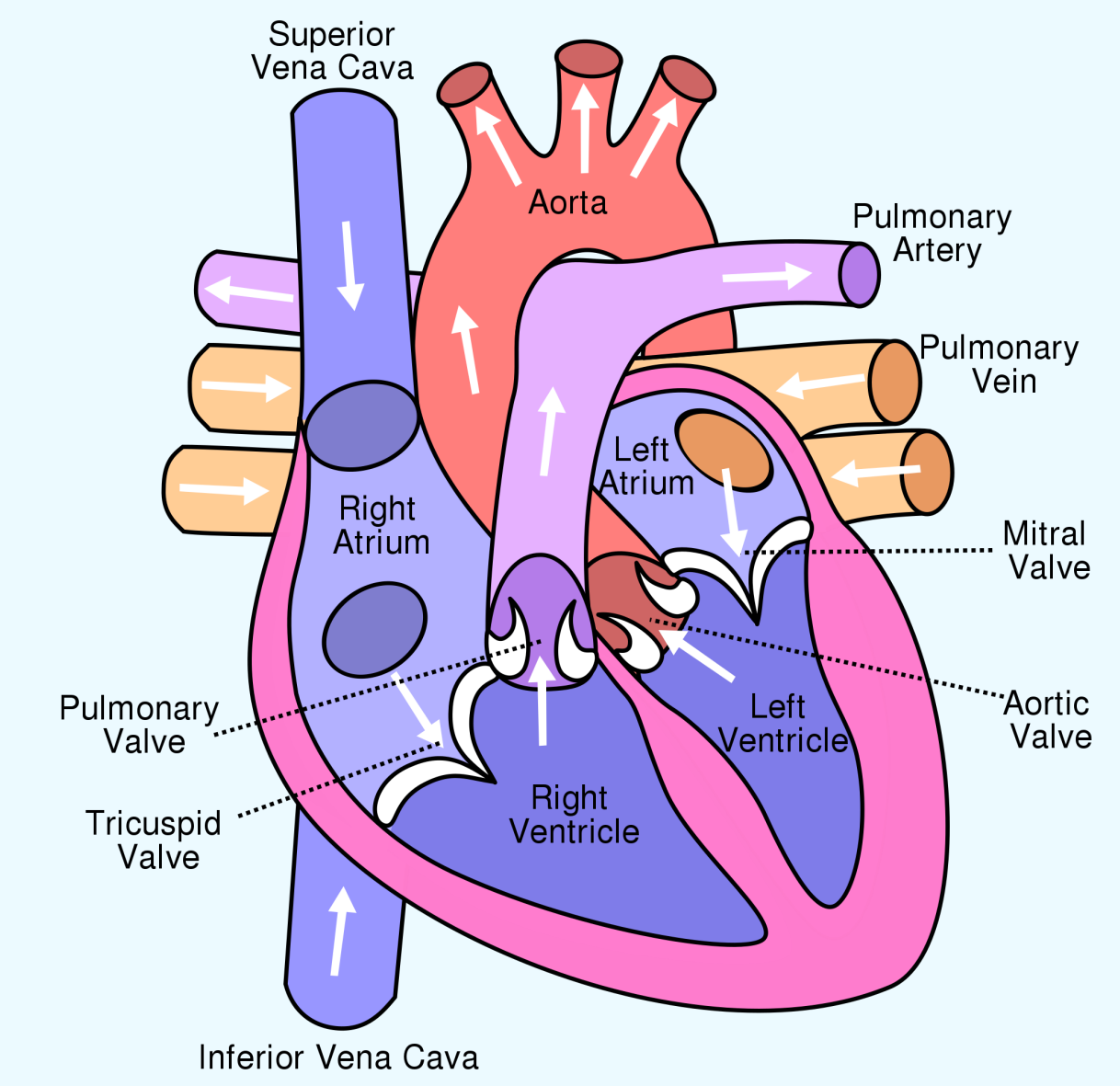
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Abstract

- Atrial fibrillation is a critical and common problem after non-cardiac thoracic surgery
 - o associated with significant increases in post-operative morbidity, length of stay, ICU admission, and mortality¹
- A predictive model to assess the risk a patient will suffer from post-operative atrial fibrillation (POAF) would allow:
 - o early identification of predisposed patients
 - o the implementation of preventative strategies
- objective of study → externally validate the Passman model
 - o uses age, sex, and preoperative resting heart rate to determine risk of POAF
 - o Other factors including surgery type, occurrence of adverse events, and other comorbidities are also collected
- Data recorded over the past 10 years by Ottawa Hospital Thoracic Surgery group → being processed for use as the validation sample in the model
- Validation sample will be compared to the development sample for distribution of predictors and occurrence of atrial fibrillation
- If the model demonstrates similar discrimination in the validation sample as compared to the development sample, it would strengthen the model's validity
 - o Could then be implemented into patient management pathways
- The addition of this predictive model could:
 - o enhance practice recommendations
 - o give clinicians a tool to accurately assess patients' risk for POAF
 - o allow for prophylactic measures ultimately reducing morbidity

Background Information

- Atrial fibrillation is the most common arrhythmia after non-cardiac thoracic surgery
 - o associated with significant increases in post-operative morbidity, length of stay, ICU admission and mortality¹
- It can cause immediate circulatory instability requiring rapid intervention
 - o If it continues → can increase the patient's risk of thromboembolic events such as stroke and limb ischemia²
- Patients who develop POAF often have an increased length of hospital stay with reported mean increase of 2 to 14 days^{3 4}
- In some cases, atrial fibrillation may even contribute to mortality
 - o One study found an increase in mortality from 4.8 to 8.1 percent associated with atrial fibrillation after esophagectomy⁴
- Mechanisms of POAF incompletely understood, risk factors well documented
 - o Independent predictors of POAF include: history of congestive heart failure, concomitant lung disease, advanced age, preoperative tachycardia and male gender^{4 5 6}
 - o Surgical stress has also been shown to play a significant role in the development of atrial fibrillation.
 - One study found that patients undergoing bilobectomy or pneumonectomy had significantly increased risk of atrial fibrillation over patients undergoing a lobectomy (odds ratio of 1.64 and 1.95 respectively)⁷
- Multiple strategies to prevent atrial fibrillation have been effective at reducing atrial fibrillation, but minimal uptake among clinicians⁸
 - o Remains difficult to identify high risk patients preoperatively
- There is a need for a validated predictive model to guide clinicians in prophylactic therapy⁴
- Literature review reveals three predictive models for estimating a patient's risk of developing POAF in non-cardiac thoracic patients^{7 9 10}
 - o Best suited model: Passman has developed tool using data of patients undergoing major oncologic thoracic resection
 - Has highest c statistic of the models (0.65-0.73 depending on group, compared to 0.62)⁶,
 - only includes age, sex and resting heart rate → could be applied to the preoperative clinic setting
 - Has only been internally validated
- External validation is a critical step in assessing if the prediction model will be effective in clinical practice^{11 12}

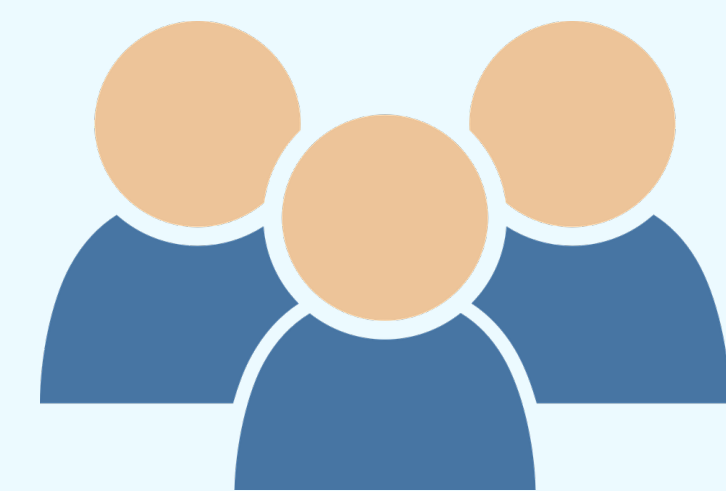


Hypothesis

It is predicted that the external validation of Passman's tool will demonstrate a similar ability to identify patients at risk and predict occurrence of atrial fibrillation when applied to the validation sample. This would strengthen its validity as a useful tool for estimating risk of post-operative atrial fibrillation in thoracic surgery patients.



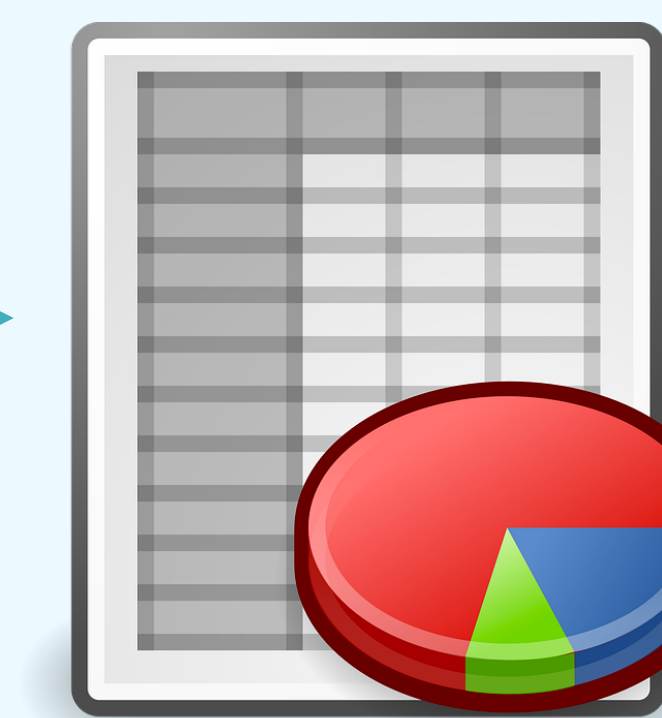
Methodology



Sample population: patients undergoing major oncologic non-cardiac thoracic surgery at the Ottawa Hospital between January 01, 2008 and December 31, 2017.



Retrospective chart review, collect data on: age, sex, type of surgery, date of surgery, occurrence of atrial fibrillation, grade of atrial fibrillation, Pulmonary function, comorbidities (including diabetes, CAD, hypertension, PVD, CHF, COPD, smoking history, clinical staging), preoperative resting heart rate



The framework for external validation developed by Debray and colleagues is used¹². First, the relative distribution of predictors, occurrence of atrial fibrillation and baseline patient information is compared between the validation sample and the development sample. Second, the calibration and discrimination of the model in the validation sample is assessed (standard deviation of linear predictor and c-statistic).



Compare the model predicted values versus the actual probabilities of atrial fibrillation. This allows to evaluate the ability of the predictive model to discriminate between patients at risk and those without risk. Also allows to assess the accuracy of the model and identify possible areas that need improvement to enhance it.

Significance

- Externally validated predictive model for post-operative atrial fibrillation would:
 - o Facilitate early identification of patients predisposed to POAF
 - o Lay the foundation for implementing prevention strategies
- AATS and STS have published practice guidelines for prevention and management of atrial fibrillation → outline risk factors for POAF and recommended prevention strategies
 - o Neither incorporate a tool to predict a patient's risk of atrial fibrillation
- Addition of a prediction model to practice guidelines could potentially enhance practice recommendations by providing clinicians with the means to quickly and accurately assess patients' risk for POAF and provide prophylactic therapy
- Predictive model also has the potential to lay the groundwork to test prevention strategies in patients who are at greatest risk of atrial fibrillation
- These implementations together could be a significant step towards reducing a critical and common complication of non-cardiac thoracic surgery
- Ultimately decrease length of stay, ICU admission, post-operative morbidity, and mortality

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