

INPLASY PROTOCOL

To cite: Xie et al. Application of Machine Learning in Detection of Atrial Fibrillation in ECG: Systematic Review and Meta-analysis. Inplasy protocol 202310047. doi: 10.37766/inplasy2023.1.0047

Received: 16 January 2023

Published: 16 January 2023

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Review Stage at time of this submission: Formal screening of search results against eligibility criteria.

Conflicts of interest:
None declared.

Application of Machine Learning in Detection of Atrial Fibrillation in ECG: Systematic Review and Meta-analysis

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Review question / Objective: How accurate is the machine learning algorithm in diagnosing the onset of atrial fibrillation?
PICOS: P (population): patients with atrial fibrillation; I (intervention): Supervise machine learning algorithm; C (comparison): the accuracy of conventional diagnostic tools previously published; O (result): diagnosis or prediction of atrial fibrillation; S(study design): All peer-reviewed reports using any study design will be included.

Condition being studied: Atrial fibrillation (AF) is one of the most common arrhythmias. There are many patients with AF all over the world, and the incidence rate increases with age. However, the diagnostic rate of auxiliary examination for atrial fibrillation is low at present. Given that machine learning (ML) is widely used in the medical field, the use of ML to assist in the diagnosis of atrial fibrillation has also become a research hotspot.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 16 January 2023 and was last updated on 16 January 2023 (registration number INPLASY202310047).

INTRODUCTION

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METHODS

Participant or population: patients with atrial fibrillation.

Intervention: Supervise machine learning algorithm.

Comparator: The accuracy of conventional diagnostic tools previously published.

Study designs to be included: All peer-reviewed reports using any study design will be included.

Eligibility criteria: Inclusion criteria: meeting the diagnostic criteria for atrial fibrillation. The diagnostic criteria of atrial fibrillation are as follows: 1. The p wave of each lead disappears and is replaced by f wave of different size and shape. 2. The atrial frequency is between 350~600 beats/minute. 3. RR interval is absolutely irregular. Inclusion criteria: using the diagnostic criteria of atrial fibrillation: 1. p wave of each lead disappeared and replaced by f wave of different size and shape. 2. The atrial frequency is between 350~600 beats/minute. 3. RR interval is absolutely irregular.

Information sources: Source: Pubmed, Web of Science and Cochrane Library; Search date: unlimited; Language restriction: not specified in advance.

Main outcome(s): Machine learning accuracy, AUC, ROC, sensitivity and specificity for diagnosis of atrial fibrillation

Quality assessment / Risk of bias analysis: Two review authors will independently assess the risk of bias using the QUADAS-2 criteria, which consists of four domains: patient selection, index test, reference

standard, flow and timing. Disagreements between the reviewers will be resolved by discussion, and with the involvement of a third independent intensivist.

Strategy of data synthesis: We provide a narrative synthesis of the results around the types of machine learning, the variables used in the machine learning model, the definition of the results, and the specific types of atrial fibrillation. If more than one machine learning type is given in a paper, we will extract and review all machine learning types by the same method mentioned above. We will summarize the AUC, sensitivity and specificity of machine learning. According to the threshold set in the study, the total sensitivity/specificity will be estimated, otherwise the SROC curve will be generated.

If the research proves sufficiently homogeneous, we intend to use quantitative synthesis of data. If possible, we will use the random effect model to evaluate the diagnostic sensitivity and specificity of the machine learning model. Heterogeneity will be passed by χ^2 or Fisher exact test.

Subgroup analysis: If the data proves to be sufficiently homogeneous, subgroup analysis will be conducted for the types of different machine learning algorithms, the variables used in the machine learning model, the publication year of the paper, and the size of the extracted ECG signal samples.

Sensitivity analysis: We will use STATA software to conduct sensitivity analysis, and reflect the sensitivity of this article by observing the change of effect quantity after removing one article.

Country(ies) involved: China.

Keywords: Machine Learning; Atrial Fibrillation; ECG.

Contributions of each author:

Author 1 - Chenggong Xie.

Author 2 - Zhao Wang.

Author 3 - Zhiwen Wang.

Author 4 - Xiaoyu Tong.

Author 5 - Hui Yin.
Author 6 - Hao Liang.

Support: This research study was supported by the grants of National Natural Science Foundation of China (No.82274411), Science and Technology Innovation Program of Hunan Province (No.2022RC1021), Natural Science Foundation of Hunan Province (No.2022JJ40300).