Kemampuan Model Kecerdasan Buatan Learning Intelligent for Effective Sonography (LIFES) untuk Deteksi Infark Miokardium pada Pasien dengan Sindroma Koroner Akut Non Elevasi Segmen ST (SKA-NEST) = Diagnostic Value of Learning Intelligent for Effective Sonography (LIFES) Artificial Intelligence Model in Detection Myocardial Infarction among Patients with Non-ST Elevation Acute Coronary Syndrome (NSTEACS)

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Abstrak

Latar Belakang : Deteksi infark pada populasi sindroma koroner akut non elevasi segmen ST (SKA-NEST) pada praktik klinis sulit dan menyebabkan kegagalan stratifikasi risiko yang tepat. Pemeriksaan enzim jantung tidak tersedia secara luas, memiliki waktu tunggu yang lama, dan membutuhkan biaya yang tidak sedikit.

Tujuan : Mengetahui akurasi dasar dan akurasi paska training kecerdasan buatan Learning Intelligent for Effective Sonography (LIFES) dalam mendeteksi infark miokard pada populasi SKA-NEST berdasarkan gambaran ekokardiografi

Metode : Penelitian ini merupakan studi diagnostik yang mengevaluasi kemampuan kecerdasan buatan berbasis deep learning LIFES dalam mendeteksi infark miokard pada pasien SKA-NEST di RSJPDHK pada tahun 2019-2023 berdasarkan gambaran ekokardiografi. Dilakukan transfer learning menggunakan dataset penelitian dan cross validation untuk mengetahui tingkat akurasi model baru paska transfer learning.

Hasil : Sebanyak 721 subjek memenuhi kriteria inklusi dan eksklusi dari tahun 2019-2023. 310 diantaranya adalah pasien infark miokard non elevasi segmen ST (IMA-NEST). Sebanyak 67,8 % subjek adalah laki-laki dengan median usia 61 tahun. Median waktu dilakukan ekokardiografi dari admisi adalah tiga hari. Terdapat perbedaan signifikan pada beberapa parameter ekokardiografi pada kelompok infark vs non infark berupa median FEVKi 53% vs 63 % ($p < 0,001$), median LVEDD 48,8 mm vs 44,6 mm ($p < 0,001$), median rerata E/E’ 12,0 vs 9,8 ($p < 0,001$) dan median LAVI 30 ml/m2 vs 26 ml/m2 ($p < 0,001$). Performa diagnostik LIFES terhadap infark didapatkan paling baik pada tampilan PLAX dengan sensitivitas 88,7 % dan spesifisitas 20,4 % AUC 0,55 pada LIFES fase 2 model 1. Paska transfer learning, model LIFES-MI menghasilkan akurasi terbaik pada tampilan A4C dengan sensitivitas 41,3 % dan spesifisitas 83,7% AUC 0,61.

Kesimpulan Model kecerdasan buatan LIFES fase 2 model 1 memiliki sensitivitas yang baik untuk deteksi infark miokard, sedangkan model LIFES-MI memiliki spesifisitas yang baik dalam mendeteksi infark miokard berdasarkan gambaran ekokardiografi pada populasi SKA-NEST.

.....Background: Detecting myocardial infarction in the non-ST segment elevation acute coronary syndrome (NSTEACS) population in clinical practice is challenging and leads to failure in appropriate risk stratification. Cardiac enzyme assays are not widely available, have long waiting times, and incur significant costs.

Objective: To determine the baseline accuracy and post-training accuracy of the Learning Intelligent for Effective Sonography (LIFES) artificial intelligence in detecting myocardial infarction in the NSTEACS

population based on echocardiographic findings.
Method: This study is a diagnostic study that evaluates the ability of deep learning-based artificial intelligence LIFES in detecting myocardial infarction in NSTEACS patients at RSJPDHK from 2019 to 2023 based on echocardiographic videos.. Transfer learning was performed using the research dataset and cross-validation to determine the accuracy level of the new model post-transfer learning.
Results: A total of 721 subjects met the inclusion and exclusion criteria from 2019 to 2023. Among them, 310 were non-ST segment elevation myocardial infarction (NSTEMI) patients. 67.8% of the subjects were male with a median age of 61 years. The median time from admission to echocardiography was three days. There were significant differences in several echocardiographic parameters between the infarct and non-infarct groups, including median EF% 53% vs 63% ($p < 0.001$), median LVEDD 48.8 mm vs 44.6 mm ($p < 0.001$), median mean E/E' 12.0 vs 9.8 ($p < 0.001$), and median LAVI 30 ml/m2 vs 26 ml/m2 ($p < 0.001$). LIFES diagnostic performance for infarction was best achieved in the PLAX view with sensitivity of 88.7% and specificity of 20.4%, AUC 0.55 in LIFES phase 2 model 1. Post-transfer learning, the LIFES-MI model produced the best accuracy in the A4C view with sensitivity of 41.3% and specificity of 83.7%, AUC 0.61.
Conclusion: The Learning Intelligent for Effective Sonography (LIFES) phase 2 model 1 has good sensitivity for detecting myocardial infarction, while the LIFES-MI model has good specificity in detecting myocardial infarction based on echocardiographic findings in the NSTEACS population.