Hypertrophic Cardiomyopathy in Student Athletes: HCM Detection From Echocardiograms Through a CNN Deep Learning Algorithm

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Hypertrophic Cardiomyopathy (HCM) is a heritable heart muscle disease and is the leading cause of sudden cardiac death (SCD) in young adults and teenagers, most notably youth athletes. HCM has a high prevalence in the general population, having an estimated prevalence of 1 in 200 with 80% of cases showing little to no symptoms. Two-thirds of athlete deaths caused by HCM occur in athletes under the age of 17. Despite its high prevalence, HCM has relatively low recognition in clinical practice, indicating that most individuals go undiagnosed. Echocardiography, an ultrasound cardiac imaging modality, is the gold-standard for the diagnosis of HCM. However, this method can be expensive and time-consuming. The objective of this study is to develop a deep learning model for the efficient identification of HCM from cardiac ultrasounds. A multi-layer convolutional neural network (CNN) was trained and optimized to analyze image datasets published by the EchoNet database. By detecting specific measurements and patterns in the ultrasounds, the CNN model was able to accurately detect the presence of HCM. As a result, the model yielded an overall accuracy of 94%. The findings demonstrate that an automated deep-learning system using a CNN can assist in screening for athletes at risk of SCD while maintaining a high level of quality. My proposed method for HCM detection shows significant promise in improving patient outcomes.

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