Artificial Intelligence-assisted Electrocardiography for Dyskalemia

Shih-Hua Lin, MD

Division of Nephrology, Department of Medicine, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, R.O.C.

Abstract

The diagnosis of life-threatening dyskalemia almost always relies on the laboratory reports requiring the unexpected turnaround time. Since the cardiac tissue is very sensitive to dyskalemia, electrocardiography (ECG) as a non-invasive bedside tool may detect the potentially fatal dyskalemia with limited accuracy prior to laboratory report. Currently, artificial intelligence (AI) technique can help detect cardiac and non-cardiac diseases affecting on the heart. Using a large data-driven deep learning model (DLM) with annotated ECGs, we have successfully developed the AI-ECG12NET to early detect severe dyskalemia. The clinical applications of ECG12Net for dyskalemia include early recognition of severe dyskalemia with within 1 minute, much faster than laboratory testing, the identification of the underlying causes of dyskalemia (hypokalemic paralysis, thyrotoxic periodic paralysis, digoxin intoxication), rapid exclusion of pseudodyskalemia to avoid inappropriate management, the monitoring of serum potassium (K^+) changes during the treatment of severe dyskalemia, and even the predication of adverse cardiovascular outcomes (previvor). The ECG12Net model could be also incorporated into ECG machines in ambulances or remote areas to facilitate telemedicine and applied to a wearable device for dyskalemia detection. Although AI-assisted ECG12Net may provide a real-time and bloodless detection for dyskalemia, the limitations and factors affecting its accuracy must be understood.