中文題目：人工智慧結合心電圖篩檢無症狀左心室功能異常之策略及成本效益分析

英文題目：The Screening Strategy and Cost-Effectiveness of Artificial Intelligence-Enabled Electrocardiogram for Asymptomatic Left Ventricular Dysfunction

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Background: The burden of asymptomatic left ventricular dysfunction (LVD) patients is more prominent than clinical heart failure. Early identification of asymptomatic LVD provides an opportunity to initiate risk factor modification and medical therapy to halt disease progression to symptomatic heart failure, and therefore improve patients' quality of life. Artificial intelligence (AI)-enabled electrocardiogram (ECG) has been proven to identify patients with LVD in an efficient and inexpensive manner. We aimed to evaluate the cost-effectiveness of universal screening for asymptomatic LVD via AI-enable ECG in different age groups and provide a clinical screening strategy.

Methods: A cost-effectiveness analysis of AI-ECG screening for LVD (ejection fraction equal or lower than 40%) compared with no screening via economic modelling was conducted. The performance of the AI-ECG has been validated in our previous article and we applied the algorithm to a prospective cohort from March 2020 to February 2022 in a tertiary hospital, consisting of 28,699 patients in this study. A Markov model incorporating initial screening, subsequent treatment and transition to symptomatic heart failure was built. Transition probabilities and age-sex specific mortality and relevant costs were extracted from published articles. Incremental cost-effectiveness ratio and sensitivity analyses were used to examine the cost-effectiveness and ensure the robustness of results.

Results: The area under the curve of AI-ECG was 0.984, with a sensitivity and a specificity of 92.6% and 93.8%, respectively. Compared to no screening, the universal screening of AI-ECG would save NT$500,960, NT$624,035 and NT$718,405 per quality-adjusted life year gained for patients aged 55, 65 and 75, respectively. In addition, screening for male patients would be more cost-effective than for female patients. These results were robust and consistent throughout internal and external validation sets and under different clinical scenarios.

Conclusions: Applying AI-ECG to screen asymptomatic LVD for patients aged 55 and over universally in our study shows to be cost-effective and would reduce healthcare expenditures compared to no screening. However, the cost-effectiveness would be influenced by local medical costs, the prevalence of LVD and the progression of the disease. Further large and real-world studies are needed to validate the clinical impact and cost-effectiveness of the novel AI algorithm.