Seven Minutes Saved per Study: Prospective Real-World Integration of AI in Outpatient Echocardiography

Background: Artificial intelligence (AI) applications hold substantial promise for improving workflow efficiency in echocardiography laboratories. Limited data exist evaluating the real-world impact of AI integration on laboratory workflow. Image acquisition, post-processing, and preliminary interpretation remain key rate-limiting steps in echocardiographic reporting. Us2.AI is a fully automated AI-based platform capable of processing 2D and Doppler echocardiographic images and generating structured preliminary reports. The platform has received Health Canada approval and demonstrated a strong correlation with human-derived measurements in prior validation studies. We conducted a prospective study evaluating the impact of Us2.AI integration on workflow efficiency in a real-world outpatient community echocardiography laboratory.

Methods: 100 patients undergoing routine outpatient transthoracic echocardiography at Toronto Heart Center, an ambulatory cardiology clinic affiliated with St. Michael's Hospital (Toronto, Canada), were prospectively included. All data were anonymized and stored securely. Preliminary reporting time using AI-assisted analysis was compared with manual interpretation using a paired two-tailed t-test. Agreement between AI-derived and sonographer-derived linear and Doppler measurements was assessed using two one-sided tests (TOST) for equivalence within predefined guideline-informed margins reflecting clinically acceptable interobserver variability. LVEF validation required categorical agreement (>55% or staff-reported range) or ±5% agreement for numeric values. Analyses included only studies with paired available data.

Results: AI-assisted analysis significantly reduced preliminary reporting time compared with manual interpretation, with a mean reduction of 414 seconds per study (6.9 minutes; 95% CI 374–453 seconds; $p < 0.001$). Linear and Doppler measurements demonstrated statistical equivalence with sonographer measurements using TOST analysis. The 90% CI of mean differences fell within predefined equivalence bounds for LV and RV linear dimensions, LVOT diameter, diastolic parameters, left atrial volume index (LAVI), indices of RV systolic function, and estimated RV systolic pressure (RVSP). LVEF concordance using predefined clinical criteria was 87% (83/95 studies). Staff reporting was categorical (>55%) in 79% of studies, with concordance of preserved EF classification in 72/75 cases (96%).

Conclusions: Integration of Us2.AI into a real-world outpatient echocardiography laboratory significantly reduced preliminary reporting time while maintaining clinically acceptable agreement with sonographer-derived measurements. These findings support the potential role of AI-assisted platforms in enhancing workflow efficiency without compromising measurement reliability.