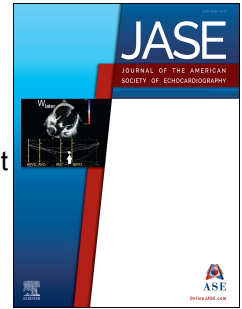


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Artificial Intelligence Optimizes Efficiency and Sonographer Workflow in Routine Adult Transthoracic Echocardiography: A Mixed-Methods Time-Motion Study

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To the Editor:

Artificial intelligence (AI) has become an increasingly valuable tool in echocardiography labs around the world, and has been included in recent American Society of Echocardiography guidelines regarding standardization of echocardiography reporting [1] and assessment of diastolic function [2]. We previously surveyed clinicians in our echo lab three months after launching an AI reporting pilot and discovered that cardiologists and sonographers differed significantly in their AI adoption, with 79% of cardiologists referencing AI measurements and finding it simple to implement, compared to 33% of sonographers [3]. We subsequently launched a second phase of our AI pilot with AI measurements going directly to our echo reports, thus obviating the need for sonographers to obtain manual measurements in most cases. While hypothesized that AI-guided echocardiographic interpretation saves time, its real-world impact on clinical throughput and sonographer quality of life remains poorly studied. We conducted a concurrent mixed-methods time-motion study to objectively evaluate whether an AI-driven workflow optimizes echocardiography lab efficiency as well as sonographer job satisfaction.

We tracked standard adult transthoracic echocardiograms (TTEs) performed by three independent sonographers of varying experience levels. Quantitative acquisition-to-completion study durations were analyzed across two arms: an AI-assisted workflow and a traditional manual contouring protocol (Regular workflow). Quantitative endpoints were paired with a post-study qualitative user experience survey to assess perceived "click burden," impact on scanning flow, and preference for future adoption. Subgroup analyses were stratified by clinical setting (inpatient vs. outpatient). Statistical differences were evaluated using Welch's t-test and Mann-Whitney U tests.

A total of 47 TTEs were evaluated (AI workflow, n = 23; Standard workflow, n = 24). The AI workflow demonstrated a highly significant reduction in total study duration compared to the Standard workflow (20 min 35 s ± 8 min 17 s vs. 31 min 39 s ± 8 min 20 s; p < 0.0001), yielding an average savings of 11 min 04 s (a 35.0%-time savings) per study. Efficiency gains were sustained across clinical environments, with a 39.9%-time savings in the inpatient cohort (16 studies; 17 min 10 s vs. 28 min 35 s; p = 0.0021) and a 32.5%-time savings in the outpatient cohort (31 studies; 22 min 24 s vs. 33 min 11 s; p = 0.0029).

Qualitatively, our findings regarding sonographer satisfaction differed significantly from our original AI pilot. In the current time-motion cohort, 100% of the participating sonographers (n=3) reported a "much lower click burden" and that AI enhanced both their natural scanning flow as well as overall echo lab efficiency. Finally, all 3 surveyed sonographers expressed a preference for future adoption of the AI-based workflow.

Implementation of an AI-driven echocardiography workflow objectively reduces total study time by over one-third in a large academic tertiary care hospital across inpatient and outpatient settings, while reducing sonographer click burden and enhancing scanning flow. AI may improve sonographer quality of life by allowing focus on image acquisition rather than manual measurements. Structuring clinical workflows

around validated AI tools may thus preserve sonographer autonomy while saving time and improving echo lab throughput.

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