Community-based Detection of Left Ventricular Systolic Dysfunction: Artificial-Intelligence Augmented Electrocardiogram versus N-terminal Pro-B-Type Natriuretic Peptide

Anthony H. Kashou, MD¹, Peter A. Noseworthy, MD², Francisco Lopez-Jimenez, MD², Itzhak Zachi Attia, MS²,
Suraj Kapa, MD², Richard Rodeheffer, MD², Paul A. Friedman, MD², Paul M. McKie, MD²

¹Department of Internal Medicine, Mayo Clinic, Rochester, MN, ²Department of Cardiovascular Diseases, Mayo Clinic, Rochester, MN

INTRODUCTION

- Asymptomatic left ventricular systolic dysfunction (LVSD) is common yet under recognized
- Treatment of asymptomatic LVSD can improve cardiac function, delay symptomatic heart failure (HF) onset, and reduce morbidity and mortality
- No accepted cost-effective means exist to identify asymptomatic LVSD in the community
- Previously, we demonstrated how the application of artificial intelligence (AI) to the standard ECG has predictive value for LVSD
- The ability of AI-ECG to detect LVSD in an unselected, community-based cohort remains unclear

OBJECTIVE

To assess the predictive value of AI-ECG to identify LVSD in a randomly selected, community-based population and compare it to NT-proBNP

METHODS

- Community-based cohort of individuals ≥ 45 years
- NT-proBNP value, ECG, and echocardiogram obtained; symptomatic HF excluded
- Assessed the ability of AI-ECG and NT-proBNP to detect asymptomatic LVSD ($EF \leq 40\%$) in participants in the total population ($n = 1943$), high-risk cohort ($n = 702$; defined as individuals with hypertension, coronary artery disease, prior/current smoking history, or diabetes), men ($n = 933$), women ($n = 1010$), and age > 65 years

RESULTS

Figure 1: Receiver operator curves of AI-ECG and NT-proBNP to identify subjects with an EF $\leq 40\%$ in A) the total population, B) women, C) men, D) the high-risk cohort, E) subjects > 65 years, and F) subjects > 65 years in the high-risk cohort.

DISCUSSION

- AI-ECG algorithm's ability to detect asymptomatic LVSD ($EF \leq 40\%$) performs similar to well-established accepted screening tools
- Limitations: limited sample size; generalizability
- Future work: multicenter, large community-based validation studies; assess clinical applicability

CONCLUSION

- AI-ECG is a robust detector of LVSD and superior to NT-proBNP in an unselected community cohort
- AI-ECG represents a promising screening tool to detect asymptomatic LVSD in the community for patients that may require closer monitoring, risk assessment, and proactive treatment

	Prevalence of EF $\leq 40\%$, n (%)	Screening Test	Positive LR	Negative LR	Screened Needing ECHO (%)	Negative ECHO (%)	Disease Missed (%)
Total population, n = 1943	22 (1.1)	AI ECG	11.3	0.15	8	88	14
		NT-proBNP	4.5	0.11	21	95	9
High-risk, n = 1313	20 (1.5)	AI ECG	14.2	0.11	8	82	10
		NT-proBNP	13.3	0.32	6	93	30
Men, n = 933	19 (2.0)	AI ECG	12.2	0.17	8	80	16
		NT-proBNP	5.9	0.12	17	89	11
Women, n = 1010	3 (0.2)	AI ECG	11.4	0.00	9	97	0
		NT-proBNP	5.5	0.00	18	98	0
Age > 65 years, n = 764	15 (1.9)	AI ECG	8.0	0.08	13	86	7
		NT-proBNP	7.8	0.22	12	87	20
High-risk, Age > 65 years, n = 558	14 (2.5)	AI ECG	10.1	0.08	11	79	7
		NT-proBNP	7.2	0.24	13	84	21

Table 1: ECG-AI and NT-proBNP for detection of asymptomatic LVSD and the implications for screening.