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Letters

RESEARCH LETTER

Early Detection of Cardiorespiratory Diseases at Everton BEAT-Breathlessness Community Hub

How Football Can Help Save Lives

Breathlessness commonly affects 10% to 20% of the adult population and two-thirds of adults >60 years of age,[1] leading to 4% to 5% of primary care visits or emergency presentations and 12% of hospitalizations.[2] Heart failure (HF) and chronic obstructive pulmonary disease (COPD) are common causes of breathlessness, implicated in nearly two-thirds of presentations.[3] Differentiating 1 condition from the other is difficult because of shared risk factors and comorbidities, leading to delayed diagnoses and preventable adverse outcomes, particularly in areas of socioeconomic deprivation. Coexistence of HF and COPD (35%)[1] leads to a near doubling of deleterious outcomes (hospitalization or mortality).[4] We developed the 1-stop BEAT Breathlessness Community Hub at EitC (Everton in the Community), the official charity of Everton Football Club, located in the 1% most deprived area nationally. The objective was to harness the brand of football, through community engagement and health care awareness events, for the targeted early detection of HF and COPD and the prompt initiation of guideline-directed medical therapy for improved patient outcomes.

What is the clinical question being addressed?
Can the brand of football be used for early detection of HF and COPD in the community?

What is the main finding?
Our study showed that the reach of football and AI-aided point-of-care diagnostics enabled early diagnosis of HF, COPD, atrial fibrillation, and undiagnosed hypertension.

People ≥40 years of age were invited to cardiorespiratory health awareness events through invitations sent by primary care teams, social media, and communications from EitC and Liverpool City Council. A health awareness coordinator from EitC engaged local communities attending existing programs and neighborhood health and well-being events. The team included a consultant cardiologist, specialist nurses (HF and respiratory), a psychologist, smoking cessation counselors, and volunteers from the Pumping Marvellous Foundation (the United Kingdom's charity for patients with HF). Anonymized demographic data were collected (age, sex, comorbidities, and ethnicity/race). Symptom screening for HF used BEAT-HF questions (breathlessness, exhaustion, ankle swelling, time for N-terminal pro-B-type natriuretic peptide [NT-proBNP] if any of these symptoms was present). Clinical checks included blood pressure (BP), pulse, a rhythm check using 30-second 6-lead electrocardiography (AliveCor, Kardia), volume status, and auscultation as indicated. People with elevated finger-stick (LumiraDx) NT-proBNP (≥400 ng/L) underwent clinical examinations and echocardiography (Kosmos, EchoNous; artificial intelligence [AI] reporting by Us2.ai) performed by a trained HF specialist nurse or a general practitioner, with images vetted by cardiologist and followed by referral for standard echocardiography. The AI-enabled echocardiographic protocol included AI-automated assessment of left and right ventricular structure and systolic and diastolic function, including left atrial size and pulmonary pressure. The utility of AI to allow task shifting in echocardiography has been previously demonstrated,[5,6] and AI-automated measurements have been shown to be interchangeable with human echocardiography core laboratory experts.[7] People with risk factors (smoking, occupational exposure) and respiratory symptoms (breathlessness, chronic cough, sputum production, recurrent chest infections) underwent AI-enabled spirometry. This health care initiative was funded by AstraZeneca (funding covered specialist nurses, BP machines, 6-lead electrocardiography, point-of-care NT-proBNP,

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TABLE 1 Multivariate Logistic Regression Analysis of the Association of Heart Failure With Patient Characteristics

	OR (95% CI)	*P* Value
Age, y	1.28 (1.16-1.42)	<0.0001
Sex	0.915 (0.262-3.200)	0.89
Ethnicity	2.0 (0.1-4.0)	0.40
Hypertension	13.0 (2.2-19.1)	0.007
Diabetes	0.703 (0.161-3.080)	0.64
Atrial fibrillation	2.90 (0.99-3.40)	0.05
COPD	2.93 (0.67-12.79)	0.15
Lipid lowering therapies	1.50 (0.42-5.33)	0.52
Breathlessness	5.7 (2.9-12.1)	<0.0001
Exhaustion	4.9 (3.1-10.1)	<0.001
Ankle swelling	3.5 (1.6-6.1)	0.01

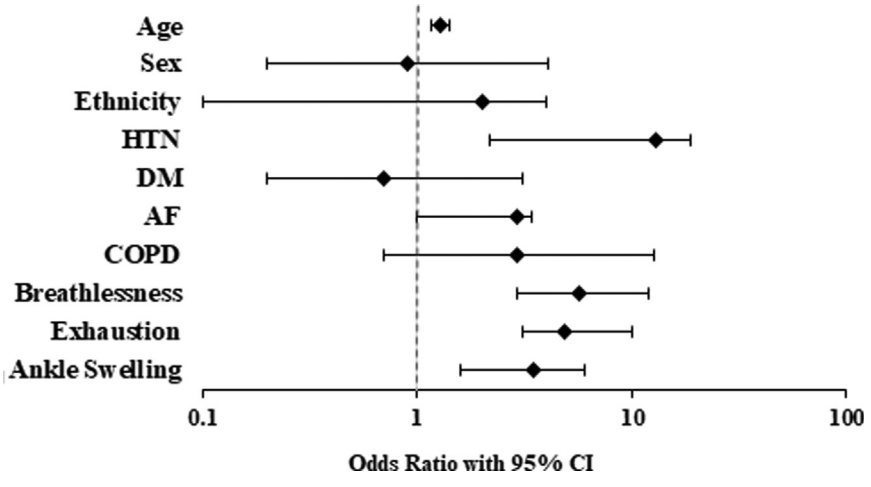
COPD = chronic obstructive pulmonary disease.

AI-enabled echocardiography, and spirometry). Our project did not require ethical approval, as it was a quality improvement initiative that did not involve randomization or changing treatment or patient care from accepted standards, and the findings are not generalizable.

Of 1,112 people (mean age 60.9 ± 13.1 years, 45% women, 11.2% minority ethnicities [5% Asian, 4% Black, 2% mixed]) attending the hub from May to October 2024, 335 (30%) had known diagnoses of hypertension. Increased BP was detected in 352 individuals (32%), of whom 200 (57%) did not have known diagnoses of hypertension. A total of 106 attendees (10%) were known to have diabetes, 254 (23%) had hypercholesterolemia, and atrial fibrillation was detected in 34 (3.1%). NT-proBNP was tested in 25% of the total cohort (272 of 1,112) on the basis of positive BEAT symptoms. Of those tested, 16% (44 of 272) had elevated NT-proBNP (≥400 ng/L), and 21% (56 of 272) had NT-proBNP between 125 and 400 ng/L (not investigated further as per UK guidelines). AI-enabled echocardiography and specialist review confirmed HF in 33 of 1,112 attendees (3%) and 75% of those with NT-proBNP >400 ng/L (40% with HF with reduced ejection fraction, 54% with HF with preserved ejection fraction, and 6% with HF with mildly reduced ejection fraction). These classifications were similar between AI-enabled and standard echocardiography in 33 of 33 patients. Following AI-enabled echocardiography and specialist review at the "1-stop visit," 18% individuals (6 of 33) were onboarded to the acute HF virtual ward for home and ambulatory intravenous diuretic agents and prompt initiation of guideline-directed medical therapy prior to standard echocardiography; 1 patient underwent emergency pacemaker implantation. AI-enabled spirometry and specialist assessment detected COPD in 12% of attendees. Combined HF and COPD were present in 30% of attendees. Multivariate logistic regression analysis (Table 1, Figure 1) showed that age, hypertension, and BEAT symptoms (breathlessness, exhaustion, ankles swelling) were associated with higher odds of new HF diagnosis.

Our study demonstrated an innovative approach to achieve timely diagnosis of HF and COPD through community engagement, using the reach of a Premier

FIGURE 1 Forest Plot Showing Multivariate Logistic Regression Analysis of the Association of Heart Failure With Patient Characteristics



AF = atrial fibrillation; COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; HTN = hypertension.

League football club to help access people who may not otherwise respond to community health care screening strategies and incorporating AI-enabled point-of-care diagnostic tools in a 1-stop community hub. Our results showed a notable prevalence of undiagnosed hypertension, atrial fibrillation, HF, and COPD in a community-based population. In socioeconomically deprived areas where pressures on primary care are more severe and people may be less engaged in health promotion activities, innovative strategies such as the BEAT Breathlessness project can enable early diagnosis and timely treatment of individuals with HF ("BEAT to Treat"), COPD, and other treatable conditions for the prevention of adverse patient outcomes.

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