A HEART FAILURE RISK PREDICTION SCORE FOR PEOPLE WITH HIV IN SOUTH AFRICA

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BACKGROUND

- **ART-treated people with HIV (PWH)** are at increased risk of heart failure with preserved ejection fraction (HFpEF).[1]
- **The diagnosis and care of established HFpEF is** challenging in resource-constrained primary care settings. Existing HFpEF risk scores do not account for HIV-related risk and rely on advanced imaging with expert interpretation.[2,3]
- Screening of ART-PWH to identify individuals at risk of early HFpEF may allow for aggressive risk factor modification, and prevention of HF progression.

AIM

- Develop a **practical HFpEF risk prediction score tailored to ART-treated PWH** in sub-Saharan Africa presenting to primary healthcare settings.

METHODS

- **Study design & Setting**: Cross-sectional study at a primary care clinic in Khayelitsha, South Africa
- **Participants**: 1508 adults aged ≥40 years (1008 PWH (on ART ≥1 year, virally suppressed); 500 HIV-uninfected controls).
- **Data collected**: Demographics, BMI, smoking status, hypertension, diabetes, HIV status, point-of-care BNP, ECG and echocardiography (cardiologist-reviewed)
- **HFpEF definition**: All of:
  - HF symptoms or BNP ≥35 pg/Ml, preserved LVEF (≥50%), diastolic dysfunction (structural abnormalities and increased filling pressure), absence of isolated RV failure, congenital HD, valvular or pericardial disease, primary pulmonary HTN, COPD
- **Statistical analyses**:
  - Four multivariable logistic regression (MLR) models: Model 1 (MLR with demographics and clinical factors); Model 2 (Model 1 + BNP); Model 3 (Model 1 + ECG abnormalities); Model 4 (Model 1 + BNP + ECG abnormalities)
  - Models AUCs compared with a random forest classifier (with all the Model 4 variables; Figure 1)
  - Final model translated into a nomogram-based risk score (Figure 2A) and evaluated using additional diagnostic test metrics (Figure 3)

A simple, clinic-based risk score can aid in identification of ART-treated PWH who are at risk of early HFpEF in South Africa.

RESULTS

- **Undiagnosed HFpEF** was identified in 8% (118/1508 - Table 1); **Nomogram**: Based on Model 2 (age, sex, HIV status, smoking, hypertension, BMI, and BNP - Figure 2A) due to requiring fewer input variables and therefore more practical for clinical implementation.
- **Nomogram Diagnostic Performance and Clinical Utility**: AUC of 0.77 (95% CI 0.72-0.81); Sensitivity of 90% at a nomogram score threshold of 110, Specificity of 90% at a score threshold of 211; Consistent high negative predictive value for HFpEF prevalences ranging from 5-20% (Figure 3).

Figure 1: ROC curves for predicting early HFpEF.

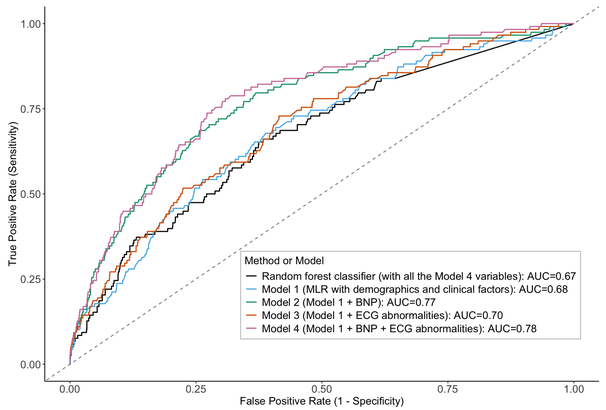


Figure 2: Nomogram-based risk score for predicting early HFpEF (A) and scores distribution (B).

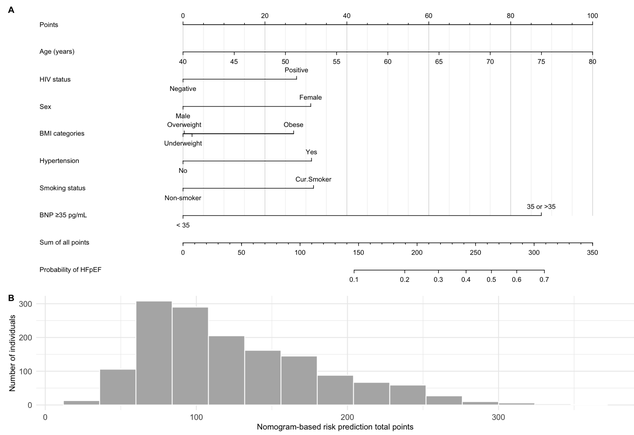


Figure 3: PPV and NPV of the nomogram-based risk prediction score by various HFpEF prevalences.

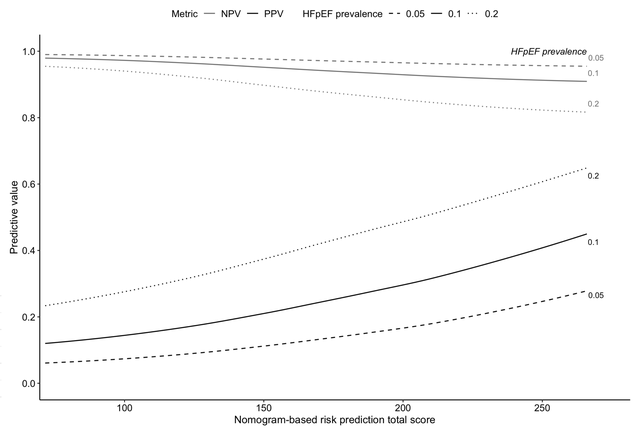


Table 1: Participant Characteristics.

	All people (N=1508[1])	Without HFpEF (n=1390[1])	HFpEF (n=118[1])
Age (yrs), Median (Q1-Q3)	48.0 (43.0-53.0)	47.0 (43.0-53.0)	51.0 (47.0-57.0)
PWH, n (%)	1008 (66.8)	923 (66.4)	85 (72.0)
Female sex at birth, n (%)	1165 (77.3)	1064 (76.5)	101 (85.6)
Obese, n (%)	626 (41.5)	565 (40.6)	61 (51.7)
Diabetic, n (%)	145 (9.6)	132 (9.5)	13 (11.0)
Hypertension, n (%)	570 (37.8)	503 (36.2)	67 (56.8)
Current smoker, n (%)	333 (22.1)	307 (22.1)	26 (22.0)
BNP ≥35 pg/mL, n (%)	283 (18.9)	223 (16.2)	60 (50.8)
LVH by ECG, n (%)	296 (19.6)	259 (18.6)	37 (31.4)
LAE by ECG, n (%)	63 (4.2)	56 (4.0)	7 (5.9)

CONCLUSIONS

- Undiagnosed HFpEF affects 8% of middle-aged South Africans, including among PWH.
- We developed a **simple, low-cost risk score** using routinely available clinical information and point-of-care BNP.
- This **tool can guide timely referral**, allow for aggressive risk modification (e.g., weight reduction, and BP control) and potentially reduce the burden of established or advanced HFpEF among ART-treated PWH in South Africa.

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PLAIN LANGUAGE SUMMARY: A simple, clinic-based tool using routine clinical information can aid in identification of ART-treated PWH who are at risk of early HFpEF in South Africa.