

women. Male patients had 11% longer average LOS. Overall, 79% of patients were discharged within the first week.

Conclusion: Our pioneering Hybrid-EM framework represents a significant methodological advancement in predictive analytics for STEMI management within the Australian healthcare ecosystem. Through the synergistic integration of complementary algorithmic approaches, we have engineered a robust prediction tool that consistently outperforms conventional single-algorithm methodologies. Clinical implementation could substantially enhance bed capacity management and care pathway optimisation while addressing the historically underutilised potential of machine learning in cardiovascular resource planning.

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022

A Polygenic Risk Score Predicts Atrial Fibrillation in Initially Healthy Older Individuals Without Cardiovascular Disease

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Aim: Atrial fibrillation increases risk of stroke and heart failure thus early detection is crucial. Traditional AF risk models rely on clinical factors. Incorporating polygenic risk scores (PRS) may improve prediction. This study evaluates a recent AF-PRS in healthy older adults, assessing whether prediction improves when adding PRS to clinical risk scores.

Method: AF-PRS was generated in 12,906 ASPREE participants ≥ 65 years, with no prior cardiovascular disease or AF diagnosis. Adjusted Cox proportional hazards models assessed standardised PRS hazard ratio (aHR) per standard deviation (SD), and compared its predictive ability alone and in combination with clinical risk scores (CHARGE-AF, HARMS2-AF). Sex-stratification analysis was performed. Model performance was evaluated using Harrell's C-Index.

Results: Participants were followed for a median 4.5 years, during which 654 cases of new-onset AF were identified. AF-PRS showed stronger association with risk (aHR:1.59, 95% CI:1.47–1.71) compared to CHARGE-AF (HR:1.50, 95% CI:1.38–1.63) and HARMS2-AF (HR:1.32, 95%CI:1.21–1.44) (all $p < 0.0001$). Individuals in the highest PRS risk quintile had more than 4-fold increased AF risk (aHR:4.41, 95% CI:3.24–5.99, $p < 0.0001$) compared to the lowest quintile. The PRS was more strongly associated with AF risk in women than men (aHR:1.75 vs. 1.47, $p < 0.0001$), with high-risk women 5.54 times more likely to develop AF than women at low genetic risk. The PRS significantly improved risk prediction accuracy ($p < 0.0001$), increasing C-index by 6.3% over clinical risk factors (0.626 $\rightarrow$ 0.689), 7.4% over CHARGE-AF (0.607 $\rightarrow$ 0.681), and 8.0% over HARMS2-AF (0.572 $\rightarrow$ 0.652).

Conclusion: Integrating PRS into AF risk models enhances risk prediction and may enable earlier, targeted prevention, reducing AF-related complications.

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Atrial Structure and Function in Subjects With DCM-Associated Truncating Titin Gene Variants

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Aim: Truncating variants in the Titin gene (*TTNtv*) are the leading cause of dilated cardiomyopathy (DCM) and are associated with atrial fibrillation (AF). Titin is present in both atria and ventricles. We hypothesised that *TTNtv* carriers with normal left ventricular (LV) function may have atrial cardiomyopathy. This study aimed to assess left atrial (LA) structure and function in *TTNtv* carriers using cardiac magnetic resonance (CMR).

Method: Subjects with established *TTNtv* DCM (G+P+, n=12), *TTNtv* carriers (G+P-, n=17), and normal controls (G-P-, n=29) underwent CMR to assess atrial cardiomyopathy.

Results: Baseline demographics were similar between the groups. G+P- subjects had similar LA size, ejection fraction (LAEF), strain, and fibrosis patterns compared to controls but had significantly longer LA time-to-peak strain (LA-TPS) (409 $\pm$ 50ms vs. 359 $\pm$ 51ms, $p=0.006$), even after adjusting for cycle length, age, gender, and atrial volume and left ventricular TPS (LV-TPS). G+P- subjects also showed reduced LV global longitudinal strain (15 $\pm$ 3 vs. 17 $\pm$ 2, $p=0.04$) but normal LV size and ejection fraction. LV-TPS was similar between groups. G+P+ subjects exhibited both atrial and ventricular dysfunction with a reduced LVEF, GLS, LAEF and prolonged LA-TPS.

Conclusions: *TTNtv* carriers with normal LV function show early signs of atrial and ventricular cardiomyopathy. Prolonged LA-TPS, a known predictor for AF recurrence, suggests a potential need for early AF screening in *TTNtv* carriers. Screening strategies for early disease need to take atrial and ventricular function into account. Prospective studies are needed for further validation.

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