Objective: to describe and evaluate patients experience about the App usage.  

Methods: Starting from May 2021, patients with a compatible CIED with RPM capabilities were invited to download and install the App on a mobile device, at 14 Italian arrhythmia centers. In November, patients were asked to reply to an ad hoc questionnaire to describe and evaluate their experience.  

Results: The App was proposed to 242 consecutive patients: 81 at implantation before RPM activation and 161 during follow-up, 79% male, 67% >50years, 58% >secondary education level. 177 (73%) patients successfully installed the App, 49 (20%) declined, 12 (5%) did not have a suitable phone, 4 (2%) experienced technical problems precluding RPM activation. The App was installed by 127 (72%) patients and/or by a caregiver in the remaining cases. Installation problems were reported by 58 (8%) patients, and required telephone support in 12 cases. Notifications of lack of connection were received by 20 (11%) patients, and missed scheduled transmission by 22 (12%) patients. The median time from notification to resolution was 2 days (<1 week in 90%). At the time when the questionnaire was completed, 175 (99%) communicators were regularly transmitting data. The information received from the App were deemed clear and sufficient for the management and the installation of the communicator by 94% of patients. The App was judged useful or very useful for the verification of the monitoring status by 92% of respondents. Its use made 84% of patients feel reassured.  

Conclusion: The App proved to be well accepted. It made patients feel reassured at home and offered support for communicator management and installation. Its use seems to result in very high continuity of monitoring.  

PO-631-06  
ARTIFICIAL INTELLIGENCE-ENABLED MODEL FOR EARLY DETECTION OF LEFT VENTRICULAR HYPERTROPHY AND MORTALITY PREDICTION IN YOUNG TO MIDDLE-AGED ADULTS  
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Background: Concealed left ventricular hypertrophy (LVH) is a prevalent condition that is correlated with a substantial risk of cardiovascular events and mortality, especially in the young to middle-aged adults. Early identification of LVH is warranted.  

Objective: In this work, we aimed to develop an AI-enabled model for early detection and risk stratification of LVH using 12-lead electrocardiograms (ECGs).  

Methods: By deep learning techniques on the ECG recordings from 28,745 patients (20-60 years old), the AI model was developed to detect verified LVH from transthoracic echocardiography and evaluated on an independent cohort. The LVH diagnoses were further correlated with future cardiovascular and all-cause mortality.  

Results: The area under the curve (AUC) of the AI model in diagnosing LVH was 0.89 (sensitivity: 90.3%, specificity: 69.3%), which was significantly better than that of the cardiologists’ diagnosis (AUC: 0.64). In the second independent cohort, the diagnostic performance of the AI model was consistent (AUC: 0.86; sensitivity: 85.4%, specificity: 67.0%). After a follow-up of 6 years, AI-predicted LVH was independently associated with higher cardiovascular or all-cause mortality (hazard ratio: 1.91 and 1.54, respectively) (Figure 1). The predictive power of the AI model for mortality was consistently valid among patients with different ages, sexes, and comorbidities, including hypertension, diabetes mellitus, stroke, heart failure, and myocardial infarction. Last, we also validated the model in the international independent cohort from Japan (AUC:0.83).  

Conclusion: The AI model improved the detection of LVH and mortality prediction in the young to middle-aged population and represented an attractive tool for risk stratification. Early identification by the AI model gives every chance for timely treatment to reverse adverse outcomes.  

PO-631-07  
A NOVEL METHOD FOR EXPLAINABLE DEEP NEURAL NETWORK-BASED INTERPRETATION OF ELECTROCARDIOGRAMS USING VARIATIONAL AUTO-ENCODERS: THE FACTORECG  
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Background: Deep neural networks (DNNs) show excellent performance in interpreting electrocardiograms (ECGs), even for novel applications such as detection of reduced ejection fraction (EF). Despite these promising developments, clinical implementation is hampered by the ‘black box’ nature of most algorithms and the lack of adequate explainability techniques. Especially, currently employed heatmap-based methods have shown to be inaccurate.  

Objective: We aimed to develop a novel method, based on a variational auto-encoder (VAE), to identify the underlying factors of variation in the ECG and use them to develop an inherently explainable pipeline for automatic ECG interpretation.  

Methods: We designed a β-VAE, that used the power of DNNs to learn to summarize the ECG in only 21 continuous factors (the FactorECG) by training on a database with 1.1 million ECG recordings (https://decoder.ecgx.ai). These factors are explainable through visualizations on both the model- and individual patient-level and are subsequently used in common and interpretable statistical methods. The predictive performance of the novel explainable DNN is compared to state-of-the-art ‘black box’ DNNs in three tasks: a conventional ECG interpretation task, detection of reduced EF and prediction of one-year mortality.  

Results: The explainable DNN was able to compress the ECG into 21 generative ECG factors, which are associated with physiologically valid underlying anatomical and (patho)physiological factors. When applying the novel pipeline to the three tasks, the explainable DNN performed on par with the ‘black box’ DNNs in conventional ECG interpretation (AUC 0.94 vs 0.96), detection of reduced EF (AUC 0.90 vs 0.91) and prediction of one-year mortality (AUC 0.76 vs 0.75), while also providing explainability on which ECG features were important for prediction or diagnosis, in contrast to the ‘black box’ DNN (Figure 1).  

Conclusion: Future studies should employ DNNs that are explainable by design to gain confidence in artificial intelligence and make it possible to identify biased models to facilitate better clinical implementation.