Temporal characteristics of an integrated diagnostics risk score before and after heart failure hospitalizations in a large real-world population of patients with implantable devices

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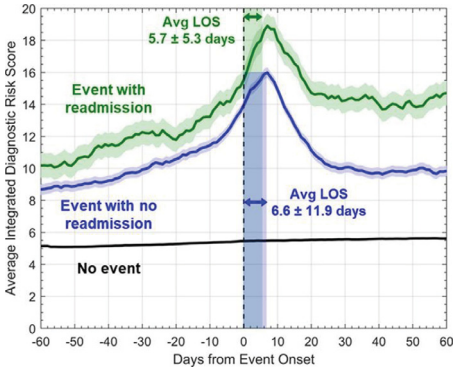
Background: Diagnostic parameters measured in implantable cardioverter defibrillators (ICD) and cardiac resynchronization therapy defibrillators (CRTD) have been shown to change before and after heart failure (HF) events with fluid overload.

Purpose: We investigated the temporal characteristics of an integrated diagnostic risk score before and after HF events in a large real-world cohort of patients with ICD/CRTD devices.

Methods: We linked a de-identified database of aggregated electronic health record (EHR) data (2007–2017) to a manufacturer's device database with continuous diagnostic monitoring data. Patients with ICD/CRTD implants with intra-thoracic impedance diagnostic feature were included for this study. The previously defined integrated diagnostic risk score was derived by combining daily diagnostic data, including intra-thoracic impedance, night-time heart rate, activity, heart rate variability, and atrial fibrillation (AF) burden, ventricular rate during AF, CRT pacing, ventricular tachycardia episodes and shocks, in a Bayesian Belief Network framework. HF event was defined as an inpatient, emergency department, or observation unit stay in a hospital with primary diagnosis of HF and intravenous diuretic administration. Temporal average of daily risk score across all patients in the 60 days pre and post HF events were compared in HF events with and without readmission within 60 days and with no HF event during pre and post follow-up days.

Results: A total of 17,886 patients with 1.8±1.2 years of follow-up met inclusion criteria. The average age of patients was 66.6±12.3 years, with 72% being males, and 51% with ICD devices. The average integrated diagnostics risk score in HF events with and without readmission and with no events is shown in Figure. A total of 1174 patients had 1425 HF events with no readmission for HF within 60 days and 282 patients had 295 HF events which were followed by readmission for HF within 60 days. A total of 17,839 patients had no HF events over 86,858 follow-up months. The average daily risk score across all patients was higher on all 60 days pre and post HF event with readmission compared to HF events with no readmission ($p<0.001$) and both were higher compared to follow-up period with no events ($p<0.001$). The risk score recovers less often after HF events which are followed by readmission within 60 days compared to HF events with no readmission.

Conclusions: In a large real-world population of patients with ICD/CRTD devices, the average integrated diagnostics risk score was higher before and after HF events with readmission compared to HF events with no readmission. Re-admissions are more likely in patients with smaller risk score recovery after HF events.



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