Performance of a multisensor implantable defibrillator algorithm for HF monitoring in presence of comorbidities

V.E. Santobuono1, V. Tavoletta2, M. Manzo3, L. Calo4, M. Bertini5, L. Santini6, G. Savarese7, A. Dello Russo8, M. Viscusi9, C. Lavalle10, C. Amellone11, R. Calvanese12, S. Valsecchi13, S. Favale1

1University of Bari, Bari, Italy; 2AO dei Colli - Monaldi Hospital, Naples, Italy; 3San Giovanni di Dio and Ruggi d’Aragona University Hospital, Salerno, Italy; 4Polyclinic Casilino, Rome, Italy; 5University Hospital of Ferrara, Ferrara, Italy; 6G. B. GRASSI Hospital, Rome, Italy; 7San Giovanni Battista Hospital, Foligno, Italy; 8University Hospital Riuniti of Ancona, Ancona, Italy; 9Hospital Sant’anna E San Sebastiano, Caserta, Italy; 10Polyclinic Umberto I, Rome, Italy; 11Maria Vittoria Hospital, Turin, Italy; 12Ospedale del Mare, Naples, Italy; 13Boston Scientific Italy, Milan, Italy

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Background: Cardiovascular and non-cardiovascular comorbidities are common in heart failure (HF) patients and impact disease severity and prognosis. Select modern implantable defibrillators (ICDs) are equipped with multisensor algorithms for HF monitoring. The HeartLogic index combines multiple ICD-based sensor data (heart rate, heart sounds, thoracic impedance, respiration, activity), and the associated alert has proved to be a sensitive and timely predictor of impending HF decompensation in cardiac resynchronization therapy (CRT-D) patients. The algorithm was developed using data from CRT-D patients; the performance in non-CRT ICD patients and the impact of selected comorbidities on performance requires further study.

Methods: The HeartLogic feature was activated in 568 ICD patients (410 with CRT) from 26 centers. The median follow-up was 25 months [25th–75th percentile: 15–35].

Results: During follow-up, 97 hospitalizations were reported (53 cardiovascular) and 55 patients died. We recorded 1200 HeartLogic alerts (0.71 alerts/patient-year) in 370 patients. Overall, the time IN the alert state was 13% of the total observation period. The rate of cardiovascular hospitalizations or death was 0.48/patient-year (95% CI: 0.37–0.60) with the HeartLogic IN alert state and 0.04/patient-year (95% CI: 0.03–0.05) OUT of alert state, with an incidence rate ratio of 13.35 (95% CI: 8.83–20.51, p < 0.001). Among patient characteristics, atrial fibrillation (AF) at implantation (HR: 1.62, 95% CI: 1.27–2.07, p < 0.001) and chronic kidney disease (CKD) (HR: 1.53, 95% CI: 1.21–1.93, p < 0.001) independently predicted alerts. HeartLogic alerts were not associated with CRT vs. non-CRT device implantation (HR: 1.03, 95% CI: 0.82–1.30, p = 0.775). The comparisons of the clinical event rates in the IN alert state with those in the OUT of alert state yielded incidence rate ratios ranging from 9.72 to 14.54 (all p < 0.001) in all groups of patients stratified by: CRT/non-CRT, AF/non-AF, CKD/non-CKD. Indeed, after multivariate correction for CKD and AF at implantation, the time IN the HeartLogic alert state >13% was associated with the occurrence of the combined endpoint of cardiovascular hospitalization or death (HR: 2.54, 95% CI: 1.61–4.01, p < 0.001).

Conclusions: The burden of HeartLogic alerts appears similar between CRT and non-CRT patients, while patients with AF and CKD seem more exposed to alerts. Nonetheless, the ability of the HeartLogic algorithm to identify patients during periods of significantly increased risk of clinical events is confirmed regardless of the type of device, the presence of AF, or CKD.