Boston Scientific

Advancing science for life™

02

Clinical EVIDENCE

New data from EHRA Congress 2024

Cardiac Resynchronisation Therapy Devices

Association between amount of biventricular pacing and heart failure status measured by a multi-sensor implantable defibrillator algorithm (Santini et al.)[1]

Atrioventricular optimisation improves cardiac resynchronization response in patients with long interventricular electrical delays: A pooled analysis of the SMART-AV and SMART-CRT trials (Gold et al.)[2]

CIEDs Remote Monitoring

Device programming and SMART Pass algorithm activation in Subcutaneous Implantable Defibrillator patients: data from a remote monitoring database (Iacopino et al.)[3]

Adherence to remote monitoring recommendations in current clinical practice: data from a remote monitoring database (Bertini et al.)[4]

S-ICD Performance in Real-World Practice

Short- and Long-term Patient-Reported Outcomes of Subcutaneous Implantable Cardioverter-Defibrillator Therapy (Bisignani et al.)[5]

Clinical practice and outcome of S-ICD replacement: results from the multicenter RHYTHM DETECT registry (Bianchi et al.)[6]

ISSUE 02 JUNE 2024

Supported by Monica Campari and Mariolina Lovecchio, Boston Scientific

Contents

JUNE 2024

Summary

This edition of Clinical Evidence explores the latest original data presented at the EHRA Congress in Berlin (7-9 April 2024). The first abstract, already available as a full-length paper, analyses the association between HeartLogic and biventricular pacing in CRT-D patients. Recent findings from the pooled analysis of the SMART-AV and SMART-CRT trials are detailed. Insights into two abstracts concerning remote monitoring in clinical practice are provided. The focus of the first abstract is on S-ICD programming and SMART pass activation, while the second provides an overview of the utilisation and programming of remote monitoring for CIEDs in practical clinical settings. The last abstracts delve into real-world data regarding the good acceptance of the extrathoracic therapy and the safety related to the replacement procedure.

Is There Any Association Between the Percentage of Biventricular Pacing and the CRT-D Detected HF Status?

The relationship between daily biventricular pacing percentage (BiV%) in CRT ICD patients and their HF status, assessed using the HeartLogic algorithm has been investigated. Results were presented at EHRA Congress by Dr Santini, and now is also available on the Cardiovascular Digital Health Journal.[1]

From December 2017 to June 2021, HeartLogic was activated in 306 patients who had received a CRT-D.

During a median follow-up period of 26 months (25th-75th percentile: 15-37), the median BiV% was 98% [25th-75th percentile: 95%-100%] on a patient basis. Among 277 (91%) patients that showed an average BiV percent pacing > 90%, 619 HeartLogic alerts were recorded in 186 (67%) patients.

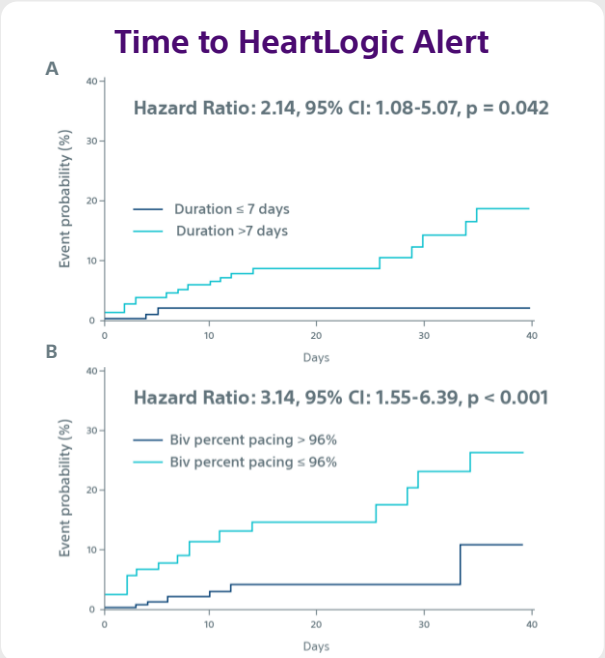


Figure 1: Kaplan–Meier analysis of time to HeartLogic alert. Patients are stratified according to the Biv% pacing reduction duration (A) and the value of BiV% pacing (B).

Overall, daily values associated with the **best clinical status** (highest first heart sound, intrathoracic impedance, patient activity; lowest combined index, third heart sound, respiration rate, night heart rate) were **associated with a BiV% exceeding 99%** (Figure 2).

In the study cohort, 455 instances of BiV% dropping below 98% after consistent pacing periods have been identified.

Based on ROC curve analysis:

- BiV% drops exceeding 7 days predicted alerts with 90% sensitivity and 55% specificity
- BiV% ≤ 96% predicted alerts with 74% sensitivity and 81% specificity

The risk of HeartLogic alert was higher during:

- Longer episodes of reduced BiV% (hazard ratio: 2.68; 95% CI: 1.02-9.72; p = 0.045)
- Lower BiV% (hazard ratio: 3.97; 95% CI: 1.74-9.06; p = 0.001)

Key Findings:

- **A clear association between lower daily BiV% and worsening heart failure status**, as detected by the HeartLogic, has been confirmed (Figure 1).
- Despite a relatively modest degree and duration of the observed pacing reductions, these episodes were associated with a **significantly increased risk of HF events diagnosed by the ICD**.

Figure 2: Daily BiV% and average combined index and sensor values at different BiV% *p < 0.05 vs values observed with BiV% > 99%.

SmartDelay™ Clinical Benefit: Results of Pooled Analysis

DATA FROM EHRA 2024

Effect of Atrioventricular Optimisation on Cardiac Resynchronisation Response

SmartDelay is a features available on Boston Scientific cardiac resynchronisation therapy (CRT) devices that calculates the optimal sensed and paced atrioventricular (AV) delay based on left ventricular lead location, intrinsic AV interval, and baseline QRS width.

To assess the effect of SmartDelay on CRT response in patients with long interventricular electrical delay ≥ 70 ms, a pooled dataset from SMART-AV and SMART-CRT has been analysed. SMART-AV and SMART-CRT were prospective, randomised, multicentre clinical trials. Patients in both studies were randomised to be programmed with an atrioventricular optimisation (AVO) algorithm (SmartDelay) or fixed AV delay (120 ms).

The primary endpoint was **CRT response**, defined as ≥ 15% reduction in left ventricular end-systolic volume at 6 months follow-up.

The pooled analysis has been presented as Late Breaking Clinical Trial by Dr Leclercq during EHRA Congress and the full-length paper has been simultaneously published on Heart Rhythm Journal by Dr Gold.[2]

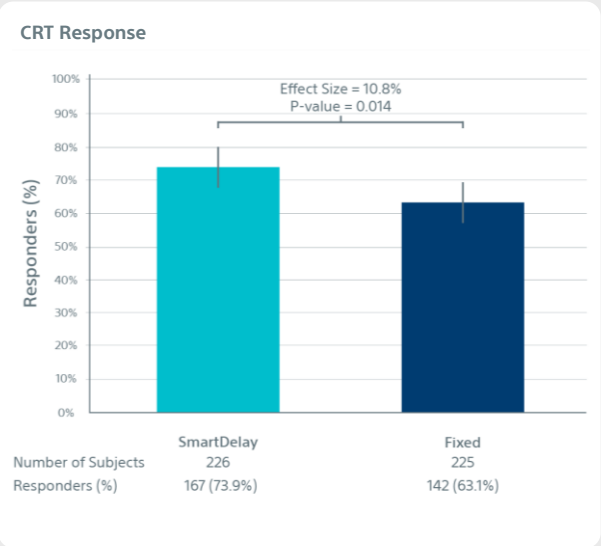


Figure 3: CRT response in the SmartDelay group compared with the fixed atrioventricular delay group.

CRT Reverse Remodelling

Left Ventricular End-Systolic Volume (LVESV) Reduction

-35% SmartDelay vs **-24.9%** Fixed delay

P = 0.005

Left Ventricular End-Diastolic Volume (LVEDV) Reduction

-19.2% SmartDelay vs **-15.5%** Fixed delay

p = 0.015

Left Ventricular Ejection Fraction (LVEF) Increase

41.2% SmartDelay vs **31.3%** Fixed delay

p = 0.012

Results

A total of 451 patients (226 in SmartDelay group and 225 in fixed AV delay group) were pooled, as they meet SMART-CRT inclusion criteria: CRT indication and at least one RV-LV duration ≥ 70 ms between programmable RV lead and LV pacing configuration.

Comparing the two groups, no statistically significant differences in any baseline parameters have been observed, except for the recommended sensed AV delay (SmartDelay, 111 ± 31 ms; fixed, 120 ± 35 ms; p = 0.005).

Patients programmed with SmartDelay were more likely to respond to CRT (Figure 3) and exhibited greater reverse remodeling. SmartDelay patients with recommended sensed AV delays outside the fixed nominal range (100 – 120 ms) were 2.3 times more likely to respond to CRT than fixed AV delay patients (OR (95% CI) = 2.3 (1.4 – 3.9) p = 0.0001).

Key Findings:

- **More patients responded to CRT when programmed with SmartDelay** than a fixed AV delay of 120 ms.
- In the 63% of patients with a recommended AV delay outside the nominal industry standard (100-120 ms), **SmartDelay patients had a 2.3-fold increased odds of CRT response**.

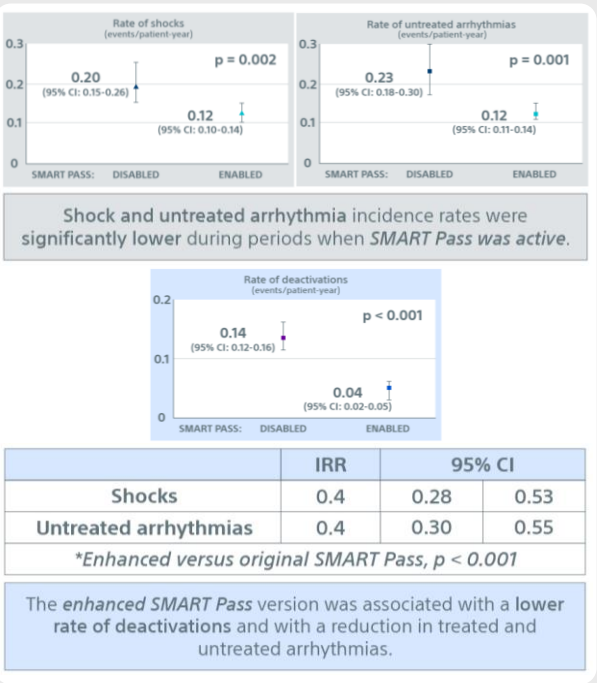
Improvements in S-ICD Programming and Enhanced Feature

The extent to which the "UNTOUCHED"[7] programming approach – conditional zone between 200 and 250 bpm and shock zone > 250 bpm – is adopted in clinical practice has been little studied, as the activation status of the SMART Pass filter.

Data from 670 S-ICD patients followed on the LATITUDE™ system across 17 Italian centres were presented by Dr Iacopino at EHRA.[3]

Key Findings:

- In current clinical practice, S-ICD implantation centres often program **high cut-off rates** for arrhythmia detection.
- Most patients have **SMART Pass consistently enabled** during follow-up. This is associated with significantly lower rates of detected and treated arrhythmias.
- The **enhanced SMART Pass version*** seems associated with lower deactivation rate, and with further **decrease** in treated and untreated detected **arrhythmias**.



	IRR	95% CI	
Shocks	0.4	0.28	0.53
Untreated arrhythmias	0.4	0.30	0.55

**Enhanced versus original SMART Pass, p < 0.001*

The *enhanced SMART Pass* version was associated with a **lower rate of deactivations** and with a reduction in treated and untreated arrhythmias.

Figure 4: Rates of treated and untreated episodes with and without SMART PASS.

Adherence to the Guidelines for Remote Monitoring of CIEDs in Clinical Practice

Data from 6553 CIED patients followed on the LATITUDE system at 26 Italian centers were analysed and the results were presented by Dr Bertini at EHRA Congress.[4]

The number of patients enrolled in LATITUDE significantly increased during the observation period (Figure 5).

As of the January 2024 data extraction, 4723 patients had transmitted data in the last 12 months and among these, 639 (14%) were **NOT MONITORED**, with no significant differences among CIED types.

Scheduled device transmissions occurred at least once every 3 months in 96% of patients. Among the 4084 monitored patients at the time of data extraction, **34267 scheduled transmission were reviewed in 2023**.

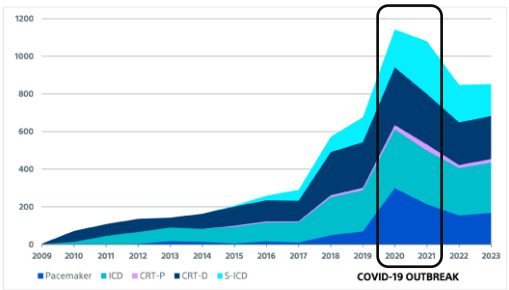


Figure 5: Latitude enrolment trend.

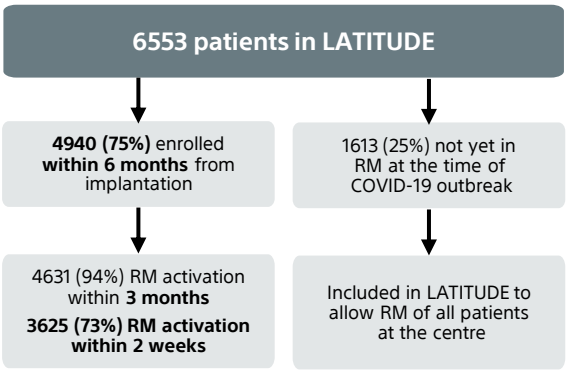


Figure 6: Latitude enrolment and activation.

Key Findings:

- Remote monitoring adoption is increasing, but there remains a need for improvement in **patient connectivity** and **programming optimisation**.
- A substantial proportion of patients are not-monitored and **remote alerts** are often **not tailored** to specific patient need.
- Scheduled transmissions and in-office visits are still frequent.

*Available from July 2022.

Favorable Short- and Long-Term Patient Reported Outcomes from S-ICD Therapy

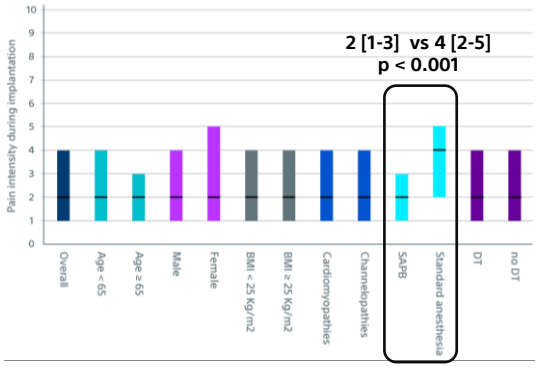
There is an increasing emphasis on incorporating patients' perspectives into quality care assessments. New data related to the pain experienced by patients during S-ICD implantation and their acceptance during follow-up were presented at EHRA.[5]

One hundred and forty-nine consecutive patients underwent S-ICD implantation were prospectively enrolled at 11 centres.

Key Findings:

- In current clinical practice, the S-ICD implantation resulted in **minimal discomfort**, especially with novel anesthetic techniques.
- **Serratus Anterior Plane Block** (SAPB) was associated with significantly **lower pain intensity** during implantation.
- During follow-up, the **S-ICD is well-accepted**, even among patients who may exhibit higher psychological distress.
- Patients that underwent SAPB showed better Florida Patients Acceptance Survey score (FPAS), as well as those who did not underwent defibrillation test (DT).

Pain Intensity During Implantation



Florida Patients Acceptance Score

78[67-87] SAPB vs **69[63-79]** Standard Anesthesia — *p < 0.05* — **73[62-80]** DT vs **82[67-90]** No- DT

Figure 7: Pain intensity during Implantation and S-ICD acceptance score during follow-up, according to different implantation technique.

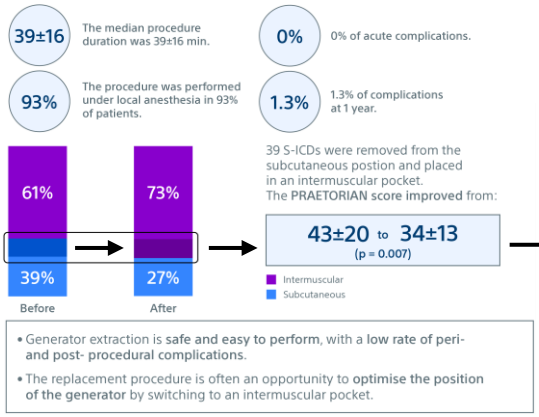
S-ICD Generator Replacement in Clinical Practice: Acute and Mid-Term Outcomes

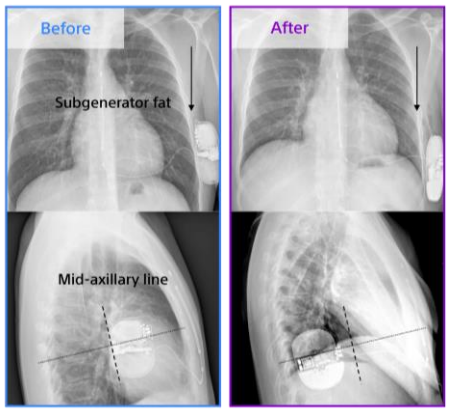
Bianchi *et al.,* reported their experience with S-ICD generator replacement, now also available in the ***Heart Rhythm*** journal, describing current procedural practices and measuring acute and mid-term outcomes within a large multicentre registry.[6]

From 2013 to 2022, 2,718 consecutive patients undergoing de-novo implantation of an S-ICD were enrolled in the ***Rhythm Detect Registry***. For the present analysis, 319 S-ICD generator requiring replacement for battery depletion were analysed.

Key Findings:

- The pulse generator was **easily removed** from both subcutaneous and intermuscular pockets.
- Many operators chose to **switch to an intermuscular pocket** at the time of replacement.
- The intermuscular pocket resulted in an **improved PRAETORIAN score** without an increase in complications or procedural time.
- Defibrillation testing was rarely performed at replacement.
- Within 12 months following replacement, a **low rate of surgical intervention** was observed.





The S-ICD relocated from a subcutaneous to an intermuscular pocket is more posterior without fat interposition between the generator and the chest.

Key Messages

- **HeartLogic™ Algorithm and Biventricular Pacing:**
  Maintaining optimal BiV pacing is crucial to prevent HF exacerbation. The HeartLogic alert, early detecting the HF worsening as consequence of BiV% reduction, facilitate the optimisation of the Biv% and avoid the HF worsening.
- **SmartDelay™ Clinical Benefit: Results of Pooled Analysis:**
  SmartDelay may provide clinical benefit to CRT patients with prolonged interventricular delay (≥ 70 ms).
- **Remote Monitoring in Clinical Practice:**
  From a picture of current clinical practice, captured through remote monitoring system, it can be observed that most S-ICD patients have SMART Pass enabled during follow-up and this is associated with significantly lower rates of detected and treated arrhythmias.

  Remote monitoring is still suboptimal in Italian clinical practice: solutions are needed to enhance patient enrollment, ensure continuous patient connectivity, and reduce the burden of non-actionable transmission, implementing an alert-based strategy.
- **S-ICD Performance in Real-World Practice:**
  Improved acceptance was observed in patients who underwent SAPB, highlighting the significance of enhanced patient implantation experience for long-term outcomes.

  The S-ICD replacement, often an opportunity to optimise the generator's position, is a safe and easy to perform procedure.

1. Santini L., Calò L., D'Onofrio A. *et al.* Association between amount of biventricular pacing and heart failure status measured by a multisensor implantable defibrillator algorithm. Cardiovascular Digital Health Journal, 2024. doi.org/10.1016/j.cvdhj.2024.02.005.

2. Gold MR, Auricchio A, Leclercq C. *et al.* Atrioventricular optimization improves cardiac resynchronization response in patients with long interventricular electrical delays: A pooled analysis of the SMART-AV and SMART-CRT trials. Heart Rhythm. 2024 Apr 9:S1547-5271(24)02277-X. doi: 10.1016/j.hrthm.2024.03.1783.

3. Iacopino *et al.* Device programming and SMART Pass algorithm activation in Subcutaneous Implantable Defibrillator patients: data from a remote monitoring database. Presented at EHA Congress 2024 and available on ESC 365 platform.

4. Bertini *et al.* Adherence to remote monitoring recommendations in current clinical practice: data from a remote monitoring database, Presented at EHRA Congress 2024 and available on ESC 365 platform.

5. Bisignani *et al.* Short- and Long-term Patient-Reported Outcomes of Subcutaneous Implantable Cardioverter-Defibrillator Therapy, Presented at EHRA Congress 2024 and available on ESC 365 platform.

6. Bianchi V, Francia P, Ricciardi G, *et al.* Clinical practice and outcome of S-ICD replacement: results from the multicenter RHYTHM DETECT registry. Heart Rhythm. 2024 Apr 9:S1547-5271(24)02366-X. doi: 10.1016/j.hrthm.2024.04.039.

7. Gold MR, Lambiase PD, El-Chami MF, *et al.* Primary results from the understanding outcomes with the S-ICD in primary prevention patients with low ejection fraction (UNTOUCHED) trial. Circulation. 2021;143(1):7–17.

CAUTION:

The law restricts these devices to sale by or on the order of a physician. Indications, contraindications, warnings, and instructions for use can be found in the product labelling supplied with each device, or at www.IFU-BSCI.com. Products shown for INFORMATION purposes only and may not be approved or for sale in certain countries. This material not intended for use in France.

Boston Scientific

Advancing science for life™

www.bostonscientific.eu

CRM-1871408-AA

CE 2797