

Disclosures

- Jeanne E. Poole, M.D.
- Results from the REPLACE Registry
- FINANCIAL DISCLOSURE:
 - Grants/Research Support > 10K
 - BIOTRONIK: REPLACE Registry
 - NIH/NHLBI
 - CABANA
 - SCD-HeFT, 10 year follow up
 - Honoraria – Speaking < 10K
 - Boston Scientific, Medtronic, St. Jude Medical
- UNLABELED/UNAPPROVED USES DISCLOSURE: NONE

**Complication Rates Associated with
Pacemaker and ICD Generator Replacements
when Combined with
Planned Lead Addition or Revision**

Results from the REPLACE Registry

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REPLACE Registry Research Team

Steering Committee:

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Clinical Data Management:

- Novella, Inc.

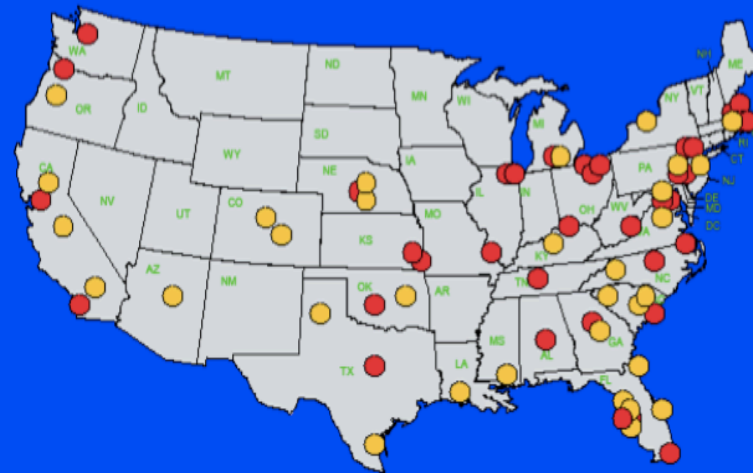
Study Sponsor:

- BIOTRONIK, Inc.



REPLACE Registry Sites

N=713
Patients



- Enrollment:
July 23, 2007 - Nov 7, 2008
- Follow-up ended June 15, 2009

- 37 academic centers
- 32 private hospitals



Top 10 Sites by Enrollment

Site Name	Academic/Private	Enrollment
Desert Cardiology, Palm Springs, CA; Leon Feldman, MD	Private	54
Halifax Medical Center, Daytona Beach, FL; Hanscy Seide, MD	Private	38
St. Joseph Mercy, Ann Arbor, MI; Stuart Winston, DO	Private	30
Spartanburg Regional Spartanburg, SC; John J. Gallagher, MD	Private	25
Emory Healthcare, Atlanta, GA ; Jonathan Langberg, MD	Academic	24
Piedmont Hospital, Atlanta, GA; Dan Dan, MD	Private	23
Union Memorial, Baltimore, MD; David Schamp, MD	Private	23
UAB, Birmingham, AL; Andrew Epstein, MD	Academic	18
University of Chicago, Chicago, IL; Bradley Knight, MD	Academic	18
University of Cincinnati, Cincinnati, OH; Alexandru Costea, MD	Academic	18

REPLACE Registry

- Purpose: To prospectively document complication rates over 6 months in patients undergoing PM or ICD generator replacement procedures
- In an earlier report*, REPLACE identified a major complication rate of 4% in patients who had a PM or ICD generator replacement without planned lead additions or revisions
- This study reports the complication rates in REPLACE patients with planned lead additions or revisions combined with generator replacement

*M. Gleva HRS 2009



REPLACE Study Design

- Prospective, multicenter registry
- Sample size:
 - Target registry of 1750 pts based upon precision for complication estimation (1000 pts for replacement only and 750 pts with lead additions or revisions)
- Inclusion: Planned lead addition or revision, life expectancy > 6 mo
- Exclusion: PM or ICD infection requiring explant, or planned lead extraction for any reason
- Follow-up: Wound check 1-7 wks, clinic/phone visit 3 mo, clinic 6 mo
- Complications: Pre-defined, reviewed by blinded CEC (EP and ID)
- Commercially available devices per investigator choice



Definitions: Major and Minor

Major Complications

- Death \leq 30 days as direct result of the procedure
- Infection \rightarrow IV antibiotics and/or device removal
- Cardiac perforation +/- tamponade
- Pneumo- or hemothorax
- Cardiac / respiratory arrest or ischemia within 24 hrs
- Hemodynamic instability \rightarrow intervention +/- pressors
- Pulmonary embolus
- Stroke within 30 days
- Prolonged hospitalization due to the procedure
- Hematoma \rightarrow evacuation, transfusion, or admission
- Generator or lead malfunction requiring re-operation
- Pocket revision
- Hospital re-admission due to the procedure
- Deep vein thrombosis

Minor Complications

Patient distress or change in status requiring additional clinical evaluation or treatment

- Pocket dehiscence \rightarrow outpatient
- Hematoma >7 days +/- tenseness or drainage
- Pain lasting >7 days \rightarrow narcotics
- Cellulitis treated as an outpatient
- Blistering of the skin from tape or glue \rightarrow sig. pt. discomfort
- Stitch abscess \rightarrow antibiotics
- Device re-programming due to significant pt. symptoms or status change (e.g., syncope, hypotension or dyspnea)



Baseline Characteristics

(N = 713 Patients)

Patient Characteristics		Medications	
Age	70 ± 13 yrs	ACE or ARB	72%
Female	24%	Beta blockers	79%
Minorities	12%	Statin	61%
Diabetes	30%	ASA	50%
Creatinine ≥ 1.3 mg/dl	19%	Warfarin	46%
Prior MI	40%	Clopidogrel/ticlopidine	16%
CABG/Valve surgery	40%	Antiarrhythmic drug	24%
EF (N = 530 pts)	30 ± 13%	- Amiodarone	17%
NYHA Class I or II	27%		
NYHA Class III or IV	56%		



Existing Device and Planned Procedure

Existing Device	
PM	46%
ICD	45%
CRT-D or CRT-P	9%
Duration of implant	4 ± 3 yrs
Planned Procedure	
Upgrade to CRT	57%
Single → dual PM or ICD	18%
Revise existing LV lead	4%
Revise existing RA or RV lead	15%
Evaluate potential need for revision	6%
Generator Replacement Indications	
ERI/EOL	32%
Advisory	0.7%
Malfunction	3%

Results: Minor Complications

Complication Type	Pts with Complications (N)	Pt Event Rate (95% CI)
Hematoma with tenseness	16	2.2%
Hematoma without tenseness	15	2.1%
Re-programming for significant symptoms/changed status	13	1.8%
Blistering	6	0.8%
Cellulitis	2	0.3%
Other minor and single frequency events	11	1.5%
Total Pts \geq 1 Minor Comp	54	7.6% (5.7%, 9.8%)

Major Complications: Peri-Operative (≤ 24 hr)

Complications	Pts with Complications (N)	Pt Event Rate (95% CI)
Cardiac perforation	5	0.7%
Pneumothorax	4	0.6%
Hemothorax	2	0.3%
Major hemodynamic instability	2	0.3%
Cardiac arrest	2	0.3%
CS dissection \rightarrow aborted procedure	1	0.1%
Respiratory arrest	1	0.1%
Drug reaction \rightarrow aborted procedure	1	0.1%
Death during procedure	0	0%
Total Pts ≥ 1 Major Comp ≤ 24 hours	17	2.4% (1.4%, 3.8%)

Major Complications > 24 hours

Complications	Pts with Complications (N)	Pt Event Rate (95% CI)
Malfunction → reopening pocket	46	6.5%
Unplanned lead addition/removal	26	3.7%
Prolonged hospitalization	18	2.5%
Pocket hematoma	11	1.5%
Deaths	8	1.1%
Hospital readmission	7	1.0%
Infection	6	0.8%
Pocket revision	4	0.6%
Deep vein thrombosis	4	0.6%
Acute renal failure	2	0.3%
Other (single frequency events)	6	0.8%
Total Pts \geq 1 Major Comp > 24 hrs	100	14.0% (11.6%, 16.8%)

Rate of Any Major Complication by Type of Lead Procedure Performed

Procedure (N)	Pts with Complications (N)	Pt Event Rate	(95% CI)
LV Lead Add/Revise* (N = 434)	81	18.7%	(15.1%, 22.6%)
RA/RV Lead Add/Revise † (N = 234)	26	11.1%	(7.4%, 15.9%)
No Lead Add/Revise (N = 45)	2	4.4%	(0.5%, 15.2%)

* Successful implant or revision of LV lead – 89%

† Successful implant or revision of RAVRV lead – 96%



Summary of Complications

Total	No. of Complications	Pts with Complications (N)	Pt Event Rate	(95% CI)
Major	163	109	15.3%	(12.7%, 18.1%)
Minor	64	54	7.6%	(5.7%, 9.8%)
Total	227	149	20.9%	(18.0%, 24.1%)

Infections Only	Pts with Complications (N)	Pt Event Rate	(95% CI)
Major*	6	0.8%	(0.3%, 1.8%)
Minor	2	0.3%	(0.0%, 1.0%)
Total	8	1.1%	(0.5%, 2.2%)

*5 required system extraction



REPLACE Conclusions

- PM and ICD generator replacements that include planned lead additions or revisions are associated with:
 - A low total infection rate (1.1%)
 - A modest peri-operative major patient event rate (2.4%)
 - A 6 mo significant major patient event rate (15.3%)
- LV lead additions or revisions are associated with a substantial (18.7%) major patient event rate
- This prospectively collected data provides comprehensive risk rates for physicians to consider when planning to upgrade PM or ICD systems

