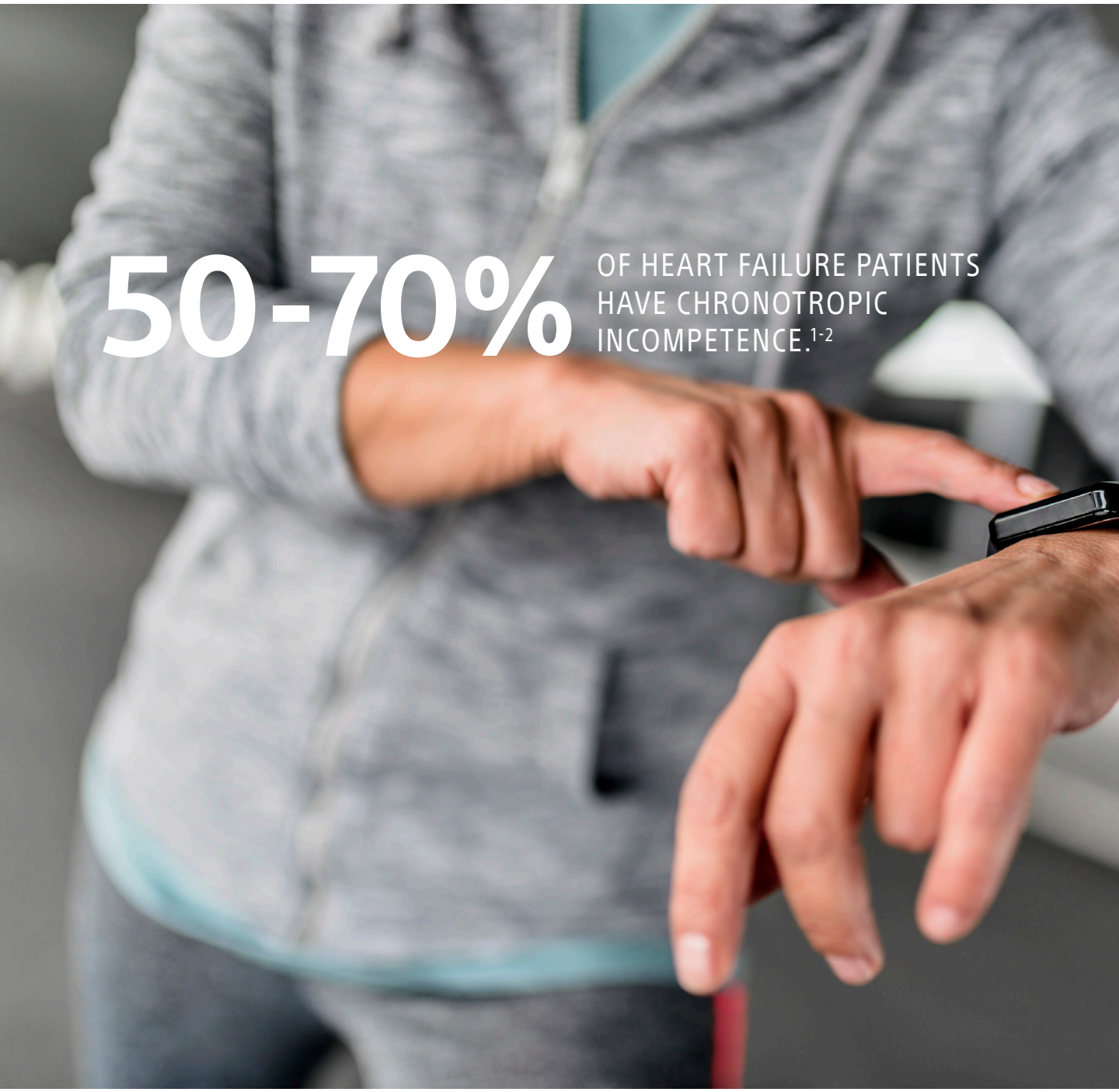
Boston Scientific
Advancing science for life™

RIGHTRATE™
Minute Ventilation

A change of pace. Life at any rate.

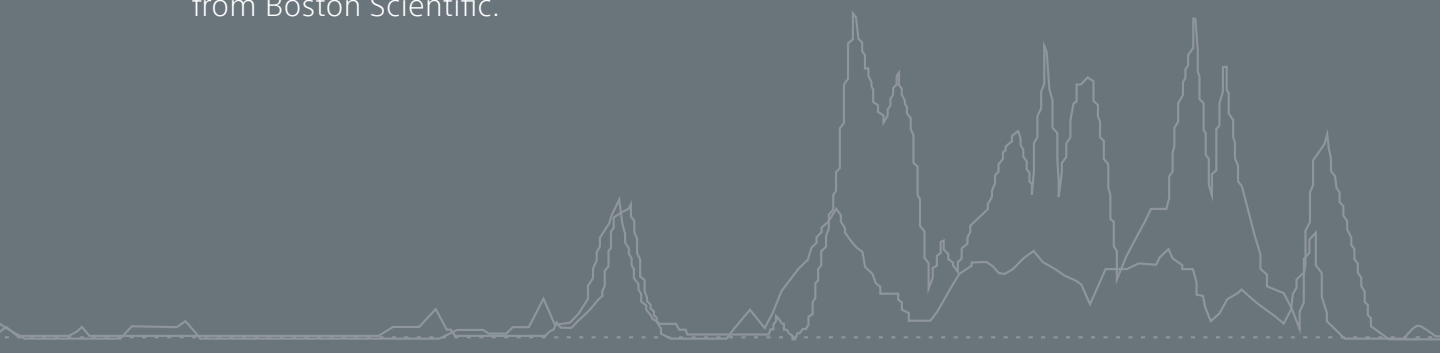

50-70%
OF HEART FAILURE PATIENTS HAVE CHRONOTROPIC INCOMPETENCE.[1-2]

A SENSOR THAT KEEPS UP WITH YOUR PATIENTS.

RIGHTRATE™
Minute Ventilation

RightRate™ Minute Ventilation: the only sensor clinically proven to restore chronotropic competence.[3,4]

Minute ventilation is a physiologic sensor that is highly correlated with breathing. It doesn't require motion of the accelerometer and adjusts heart rate based on changes in movement as well as breathing. It's the only sensor clinically proven to restore chronotropic competence.[3,4] And it's only available from Boston Scientific.



A BODY AT REST MAY NOT BE AT REST.

An accelerometer alone can detect certain activities that trigger the device, but can't always tell when a patient is being active, potentially resulting in inadequate rate response.

There are plenty of everyday movements that should increase your patient's heart rate that an accelerometer may not always detect. Things like:

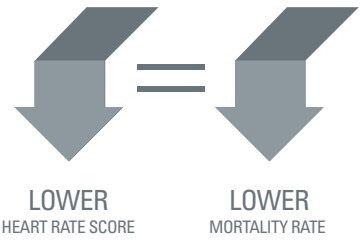
- Carrying groceries
- Working in the garden
- Lifting weights
- Riding a bicycle
- Swimming
- Using a walker
- Holding a grandchild

With RightRate™ Minute Ventilation, you have the power to restore chronotropic competence and give your patients the confidence to keep moving forward.

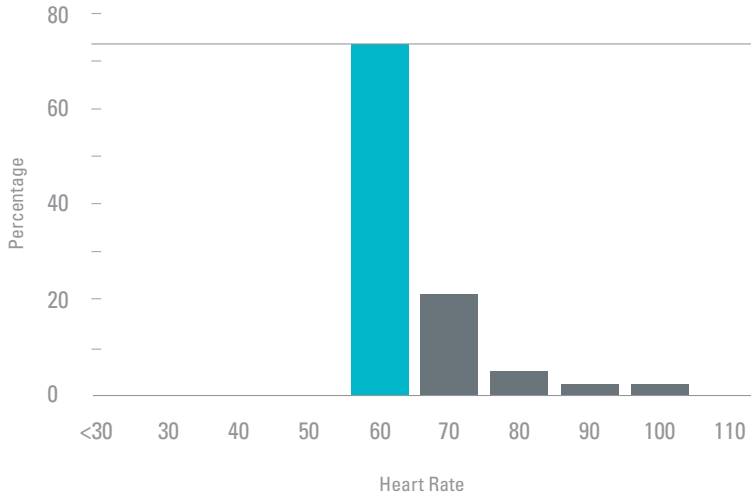
FOLLOW THE DATA.
IMPROVE THE OUTCOME.

Heart Rate (HR) Score

HR Score is a simple measurement that can predict survival. It is defined as the height of the tallest atrial histogram bin. Since a broader range of heart rate is typically better for the patient, a lower HR Score is preferred.[5]

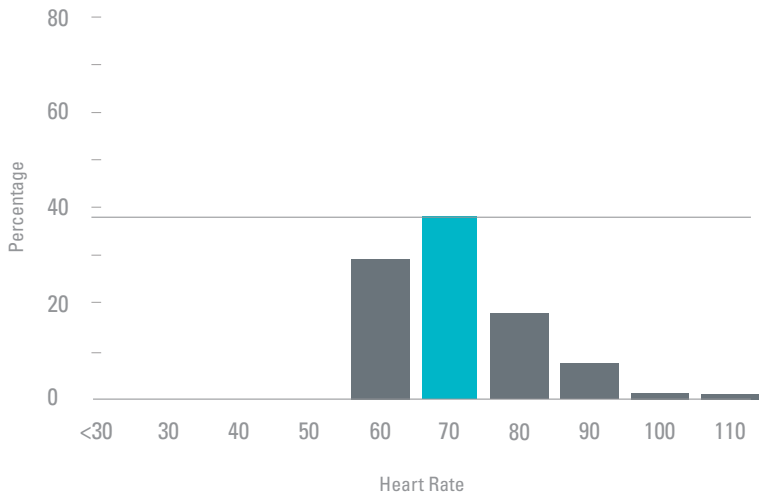


Typical Patient with CI



73 "BAD" ♡ Heart Rate Score

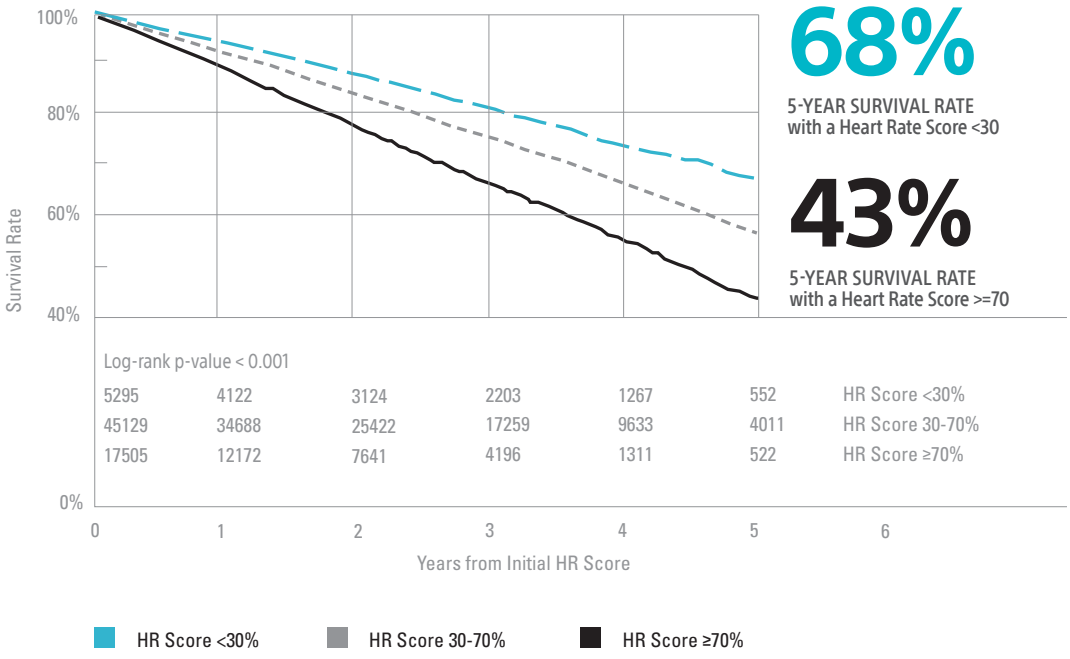
Typical Patient without CI



38 "GOOD" ♡ Heart Rate Score

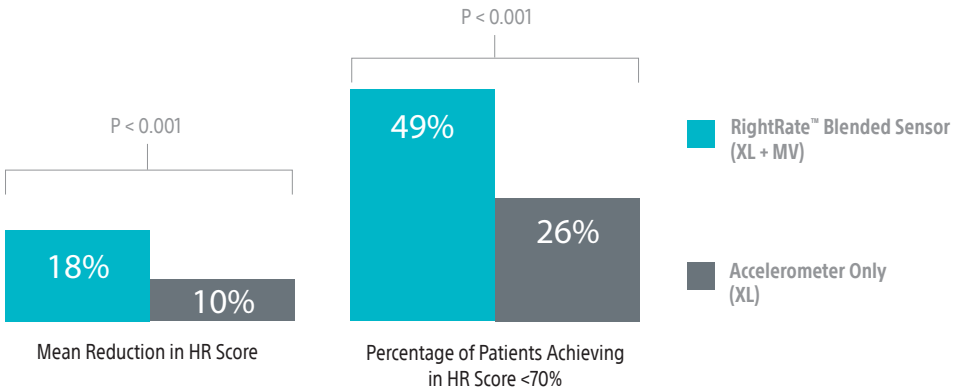
Heart Rate (HR) Score is an independent predictor of mortality.[5]

A LATITUDE™ analysis of 67,929 CRT-D patients showed that patients with an HR Score <30 had a 68% 5-year survival rate.



RightRate was shown to improve HR Score more than an accelerometer alone.[6]

In an analysis of 501 patients, RightRate Minute Ventilation (XL + MV) was associated with a **Heart Rate Score reduction of 18%**. RightRate converted almost twice as many patients to a Heart Rate Score of < 70% when compared to an accelerometer alone.[6]

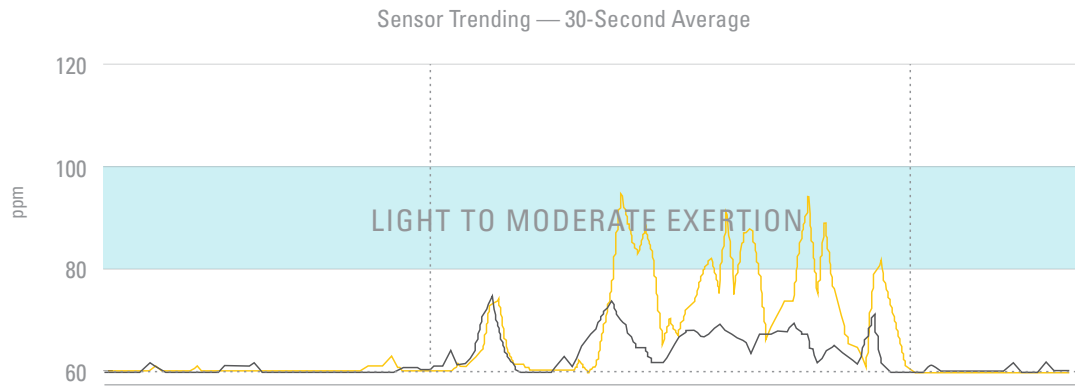


PROGRAM FOR OPTIMIZATION.

RightRate™ Minute Ventilation allows you to customize the programming to meet each patient's individual needs. This innovative feature is best-in-class in sensor technology for implantable devices. As the only sensor clinically proven to restore chronotropic competence, it's the best option for patients with chronotropic incompetence.[3,4]

STEP 1	Assess Chronotropic Competence
STEP 2	Prepare Callibration & Sensor Baseline
STEP 3	Optimize Sensor Trending Data

SETTINGS: RATE ADAPTIVE PACING



A higher standard of care.

Choosing a pulse generator equipped with RightRate™ Minute Ventilation gives you more options to ensure your patients are achieving the optimal heart rate for their everyday activities.

REFERENCES:

1. Samara MA, et al. Chronotropic impairment improves in patients responding to cardiac resynchronization defibrillator therapy (CRT-D). Data from the DECREASE HF Trial. Poster at HRS 2010.
2. Ujeyl A, Stevenson LW, West EK, et al., Impaired heart rate responses and exercise capacity in heart failure patients with paced baseline rhythms. *J Cardiac Fail.* 2011 Mar;17(3):188-195.
3. Freedman RA, Hopper DL, Mah J, et al. Assessment of pacemaker chronotropic response: Implementation of the Wilkoff mathematical model. PACE 2001; 24, 1748-1754.
4. PULSAR MAX Study Clinical Summary. Data on file. https://www.bostonscientific.com/content/dam/Manuals/us/current-rev-en/358487-015_US_S.pdf
5. Wilkoff BL, Richards M, Sharma A, et al. A device histogram-based simple predictor of mortality risk in ICD and CRT-D patients: The Heart Rate Score. *Pacing Clin Electrophysiol*. 2017 Apr;40(4):333-43.
6. Richards, et al., The Addition of Minute Ventilation to Rate Responsive Pacing Improves Heart Rate Score More than Accelerometer Alone. Heart Rhythm 2018. https://doi.org/10.1016/j.hrthm.2018.06.021

CRT-D Systems – RESONATE™HF, RESONATE™, RESONATE™X4, VIGILANT™, VIGILANT™X4, MOMENTUM™, MOMENTUM™ X4

INDICATIONS AND USAGE These Boston Scientific Cardiac Resynchronization Therapy Defibrillators (CRT-Ds) are indicated for patients with heart failure who receive stable optimal pharmacologic therapy (OPT) for heart failure and who meet any one of the following classifications: • Moderate to severe heart failure (NYHA Class III-IV) with EF ≤ 35% and QRS duration ≥ 120 ms; or • Left bundle branch block (LBBB) with QRS duration ≥ 130 ms, EF ≤ 30%, and mild (NYHA Class II) ischemic or nonischemic heart failure or asymptomatic (NYHA Class I) ischemic heart failure.

CONTRAINDICATIONS There are no contraindications for this device.

WARNINGS • Always have external defibrillation equipment available during implant and electrophysiologic testing. • Ensure that an external defibrillator and medical personnel skilled in CPR are present during post-implant device testing should the patient require external rescue.
• Do not use defibrillation patch leads with the pulse generator system.
• Do not use this pulse generator with another pulse generator.
• Program the pulse generator Tachy Mode(s) to Off during implant, explant, or postmortem procedures. • Do not kink, twist, or braid the lead with other leads as doing so could cause lead insulation abrasion damage or conductor damage. • For leads that require the use of a Connector Tool, use caution handling the lead terminal when the Connector Tool is not present on the lead. Do not contact the lead terminal with any surgical instruments or electrical connections such as PSA (alligator) clips, ECG connections, forceps, hemostats, and clamps. This could damage the lead terminal, possibly compromising the sealing integrity and result in loss of therapy or inappropriate therapy, such as a short within the header. • Do not contact any other portion of the DF4–LLHH or DF4–LLHO lead terminal, other than the terminal pin, even when the lead cap is in place. Do not contact any other portion of the IS4–LLLL lead terminal, other than the terminal pin, even when the lead cap is in place. • When implanting a system that uses both a DF4–LLHH or DF4–LLHO and IS4–LLLL lead, ensure that the leads are inserted and secured in the appropriate ports. Inserting a lead into an incorrect port will result in unanticipated device behavior (potentially leaving the patient without effective therapy). • Do not use atrial tracking modes in patients with chronic refractory atrial tachyarrhythmias. • Do not use atrial-only modes in patients with heart failure. • Left ventricular lead dislodgement to a position near the atria can result in atrial oversensing and left ventricular pacing inhibition. • Physicians should use medical discretion when implanting this device in patients who present with slow VT. Programming therapy for slow monomorphic VT may preclude CRT delivery at faster rates if these rates are in the tachyarrhythmia zone. • Advise patients to seek medical guidance before entering environments that could adversely affect the operation of the active implantable medical device, including areas protected by a warning notice that prevents entry by patients who have a pulse generator. • All devices except for those with an LV: LV-1 lead connection are considered MR Conditional. For these devices, unless all of the MRI Conditions of Use are met, MRI scanning of the patient does not meet MR Conditional requirements for the implanted system. Significant harm to or death of the patient and/or damage to the implanted system may result. Do not expose patients with non-MR Conditional devices to MRI scanning. Strong magnetic fields may damage the pulse generator and/or lead system, possibly resulting in injury to or death of the patient. • For potential adverse events applicable when the Conditions of Use are met or not met, refer to the MRI Technical Guide. • Do not subject a patient with an implanted pulse generator and/or lead to diathermy. • If desired, ensure that Patient Triggered Monitor (PTM) is enabled prior to sending the patient home by confirming the magnet response is programmed to Store EGM. • Once the Patient Triggered Monitor feature has been triggered by the magnet and an EGM has been stored, or after 60 days have elapsed from the day that Store EGM was enabled, the Magnet Response programming automatically will be set to Inhibit Therapy. When this happens, the patient should not apply the magnet because tachyarrhythmia therapy could be inhibited.

PRECAUTIONS For specific information on precautions, refer to the following sections of the product labeling: clinical considerations, sterilization and storage, implantation, device programming, environmental and medical therapy hazards, hospital and medical environments, follow up testing, explant and disposal, supplemental precautionary information. Advise patients to avoid sources of EMI because EMI may cause the pulse generator to deliver inappropriate therapy or inhibit appropriate therapy. Moving away from the source of the EMI or turning off the source usually allows the pulse generator to return to normal operation.

POTENTIAL ADVERSE EVENTS Based on the literature and on pulse generator and/or lead implant experience, the following alphabetical list includes the possible adverse events associated with implantation of products described in this literature: • Air embolism • Allergic reaction • Bleeding • Bradycardia • Cardiac tamponade • Chronic nerve damage • Component failure • Conductor coil fracture • Death • Electrolyte imbalance/dehydration • Elevated thresholds • Erosion • Excessive fibrotic tissue growth • Extracardiac stimulation (muscle/nerve stimulation) • Failure to convert an induced arrhythmia • Fluid accumulation • Foreign body rejection phenomena • Formation of hematomas or seromas • Heart block • Inability to defibrillate or pace • Inappropriate therapy (e.g., shocks and antitachycardia pacing [ATP] where applicable, pacing) • Incisional pain • Incomplete lead connection with pulse generator • Infection including endocarditis • Insulating myocardium during defibrillation with internal or external paddles • Lead dislodgment • Lead fracture • Lead insulation breakage or abrasion • Lead perforation • Lead tip deformation and/or breakage • Local tissue reaction • Loss of capture • Myocardial infarction (MI) • Myocardial necrosis • Myocardial trauma (e.g., tissue damage, valve damage) • Myopotential sensing • Oversensing/undersensing • Pacemaker-mediated tachycardia (PMT) • Pericardial rub, effusion • Pneumothorax • Pulse generator migration • Shunting current during defibrillation with internal or external paddles • Syncope
• Tachyarrhythmias, which include acceleration of arrhythmias and early, recurrent atrial fibrillation • Thrombosis/thromboemboli • Valve damage • Vasovagal response • Venous occlusion • Venous trauma (e.g., perforation, dissection, erosion) • Worsening heart failure. For a list of potential adverse events associated with MRI scanning, refer to the ImageReady MR Conditional Defibrillation System MRI Technical Guide. Patients may develop psychological intolerance to a pulse generator system and may experience the following: • Dependency • Depression • Fear of shocking while conscious • Fear that shocking capability may be lost • Imagined shocking • Fear of premature battery depletion • Fear of device malfunction. Additionally, potential adverse events associated with the implantation of a coronary venous lead system include: • Allergic reaction to contrast media • Breakage/failure of implant instruments • Prolonged exposure to fluoroscopic radiation • Renal failure from contrast media used to visualize coronary veins.

Refer to the product labeling for specific indications, contraindications, warnings/precautions and adverse events. Rx only. 92436222 (Rev. B.6)

ICD Systems – RESONATE™ HF, RESONATE™ EL, PERCIVA™ HF, PERCIVA™, VIGILANT™ EL, MOMENTUM™ EL ICD

INDICATIONS AND USAGE Boston Scientific implantable cardioverter defibrillators (ICDs) are intended to provide ventricular antitachycardia pacing (ATP) and ventricular defibrillation for automated treatment of life-threatening ventricular arrhythmias.

CONTRAINDICATIONS Use of these Boston Scientific pulse generators are contraindicated for the following: patients whose ventricular tachyarrhythmias may have reversible cause, such as: digitalis intoxication, electrolyte imbalance, hypoxia, sepsis; or patients whose ventricular tachyarrhythmias have a transient cause, such as: acute myocardial infarction (MI), electrocution, drowning; or patients who have a unipolar pacemaker.

WARNINGS Read this manual thoroughly before implantation to damage to the pulse generator and/or lead. For single patient use only. Do not reuse, reprocess, or resterilize. Always have external defibrillation equipment available during implant and electrophysiologic testing. Ensure that an external defibrillator and medical personnel skilled in CPR are present during post-implant device testing should the patient require external rescue. Do not use this pulse generator with another pulse generator. Program the pulse generator Tachy Mode(s) to Off during implant, explant, or postmortem procedures to avoid inadvertent high voltage shocks. Do not kink, twist, or braid the lead with other leads as doing so could cause lead insulation abrasion damage or conductor damage. For leads that require the use of a Connector Tool, use caution handling the lead terminal when the Connector Tool is not present on the lead. Do not directly contact the lead terminal with any surgical instruments or electrical connections such as PSA (alligator) clips, ECG connections, forceps, hemostats, and clamps. Do not contact any other portion of the DF4–LLHH or DF4–LLHO lead terminal, other than the terminal pin, even when the lead cap is in place. Do not use atrial tracking modes in patients with chronic refractory atrial tachyarrhythmias. Tracking of atrial arrhythmias could result in ventricular tachyarrhythmias. Advise patients to seek medical guidance before entering environments that could adversely affect the operation of the active implantable medical device, including areas protected by a warning notice that prevents entry by patients who have a pulse generator. RESONATE HF, RESONATE, PERCIVA HF, PERCIVA, VIGILANT and MOMENTUM devices are considered MR Conditional. For these devices, unless all of the MRI Conditions of Use are met, MRI scanning of the patient does not meet MR Conditional requirements for the implanted system, and significant harm to or death of the patient and/or damage to the implanted system may result. Do not expose patients with non-MR conditional devices to MRI scanning. For potential adverse events applicable when the Conditions of Use are met or not met, refer to the MRI Technical Guide. Do not subject a patient with an implanted pulse generator and/or lead to diathermy. If desired, ensure that Patient Triggered Monitor is enabled prior to sending the patient home. Once the Patient Triggered Monitor feature has been triggered by the magnet and an EGM has been stored, or after 60 days have elapsed from the day that Store EGM was enabled, the patient should not apply the magnet.

PRECAUTIONS For specific information on precautions, refer to the following sections of the product labeling: clinical considerations, sterilization and storage, implantation, device programming, environmental and medical therapy hazards, hospital and medical environments, home and occupational environments, follow up testing, explant and disposal, supplemental precautionary information.

POTENTIAL ADVERSE EVENTS Based on the literature and on pulse generator and/or lead implant experience, the following alphabetical list includes the possible adverse events associated with the included devices: Air embolism; Allergic reaction; Bleeding; Bradycardia; Cardiac tamponade; Chronic nerve damage; Component failure; Conductor coil fracture; Death; Elevated thresholds; Erosion; Excessive fibrotic tissue growth; Extracardiac stimulation (muscle/nerve stimulation); Failure to convert an induced arrhythmia; Fluid accumulation; Foreign body rejection phenomena; Formation of hematomas or seromas; Heart block; Heart failure following chronic RV apical pacing; Inability to defibrillate or pace; Inappropriate therapy (e.g., shocks and antitachycardia pacing (ATP) where applicable, pacing; Incisional pain; Incomplete lead connection with pulse generator; Infection including endocarditis; Insulating myocardium during defibrillation with internal or external paddles; Lead dislodgement; Lead fracture; Lead insulation breakage or abrasion; Lead perforation; Lead tip deformation and/or breakage; Local tissue reaction; Loss of capture; Myocardial infarction (MI); Myocardial necrosis; Myocardial trauma (e.g., tissue damage, valve damage); Myopotential sensing; Oversensing/undersensing; Pacemaker-mediated tachycardia (PMT); Pericardial rub, effusion; Pneumothorax; Pulse generator migration; Shunting current during defibrillation with internal or external paddles; Syncope; Tachyarrhythmias, which include acceleration of arrhythmias and early, recurrent atrial fibrillation; Thrombosis/thromboemboli; Valve damage; Vasovagal response; Venous occlusion; Venous trauma (e.g., perforation, dissection, erosion); Worsening heart failure. For a list of potential adverse events associated with MRI scanning, refer to the MRI Technical Guide. Patients may develop psychological intolerance to a pulse generator system and may experience the following: Dependency; Depression; Fear of premature battery depletion; Fear of a device malfunction.

Refer to the product labeling for specific indications, contraindications, warnings/precautions and adverse events. Rx only. 92436178 (Rev. B.3)

VISIONIST™, VISIONIST™ X4, VALITUDE™, VALITUDE™ X4, INTUA™, INVIVE™ CRT-P

INDICATIONS AND USAGE Boston Scientific cardiac resynchronization therapy pacemakers (CRT-Ps) are indicated for patients with moderate to severe heart failure (NYHA Class III/IV) including left ventricular dysfunction (EF ≤ 35%) and QRS duration ≥ 120 ms and remain symptomatic despite stable optimal pharmacological therapy (OPT) for heart failure. Atrial tracking modes are also indicated for patients who may benefit from maintenance of AV synchrony. Adaptive-rate pacing is indicated for patients exhibiting chronotropic incompetence and who would benefit from increased pacing rates concurrent with increases in minute ventilation and/or physical activity.

CONTRAINDICATIONS These Boston Scientific pulse generators have the following contraindications: • In patients who have a separate implanted cardioverter defibrillator (ICD) with transvenous leads; • Unipolar pacing or use of the MV/Respiratory Sensor with a Subcutaneous Implantable Cardioverter Defibrillator (S-ICD) is contraindicated because it may cause inappropriate therapy or inhibition of appropriate S-ICD therapy; • Minute ventilation is contraindicated in patients with both unipolar atrial and ventricular leads; • Single-chamber atrial pacing is contraindicated in patients with impaired AV nodal conduction; • Atrial tracking modes are contraindicated in patients with chronic refractory atrial tachyarrhythmias (atrial fibrillation or flutter), which might trigger ventricular pacing; • And asynchronous pacing is contraindicated in the presence (or likelihood) of competition between paced and intrinsic rhythms.

WARNINGS • Always have external defibrillation equipment available during implant and electrophysiologic testing. • Using multiple pulse generators could cause pulse generator interaction, resulting in patient injury or a lack of therapy delivery. • In response to applicable nonrecoverable or repeat fault conditions, the pulse generator will switch irreversibly to Safety Core operation. Safety Core pacing may be unipolar, which may interact with an ICD. Safety Core behavior is affected by MRI Protection Mode. • Do not kink, twist, or braid the lead with other leads as doing so could cause lead insulation abrasion damage or conductor damage. • For leads that require the use of a Connector Tool, use caution handling the lead terminal when the Connector Tool is not present on the lead. Do not contact the lead terminal with any surgical instruments or electrical connections such as PSA (alligator) clips, ECG connections, forceps, hemostats, and clamps. This could damage the lead terminal, possibly compromising the sealing integrity and result in loss of therapy or inappropriate therapy, such as a short within the header. • Do not contact any other portion of the IS4–LLLL lead terminal, other than the terminal pin, even when the lead cap is in place. • Do not use atrial tracking modes in patients with chronic refractory atrial tachyarrhythmias. • Do not use atrial-only modes in patients with heart failure. • Lead Safety Switch should be programmed Off for patients with an ICD. Unipolar pacing due to Lead Safety Switch is contraindicated for patients with an ICD. • Automatic Lead Recognition should be programmed to Off before implant with patients with an ICD. • Unipolar pacing due to RAAT is contraindicated and should be programmed off for patients with an ICD. • Left ventricular lead dislodgement to a position near the atria can result in atrial oversensing and left ventricular pacing inhibition. • If programmed to a fixed atrial Sensitivity value of 0.15 mV, or a fixed sensitivity value of 2.0 mV or less in a unipolar lead configuration in any chamber, the pulse generator may be more susceptible to electromagnetic interference. • Advise patients to seek medical guidance before entering environments that could adversely affect the operation of the active implantable medical device. • VISIONIST X4 and VALITUDE X4 devices are considered MR Conditional. For these devices, unless all of the MRI Conditions of Use are met, MRI scanning of the patient does not meet MR Conditional requirements for the implanted system. Significant harm to or death of the patient and /or damage to the implanted system may result. **All other devices covered by this statement are not MR conditional**. Do not expose patients with non-MR Conditional devices to MRI scanning. For potential adverse events when Conditions of Use are met or not met, refer to the MRI Technical Guide. • Do not subject a patient with an implanted pulse generator and/or lead to diathermy.

PRECAUTIONS The CRT-Ps have not been evaluated for pediatric use. For specific information on precautions, refer to the following sections of the product labeling: clinical considerations, sterilization and storage, implantation, device programming, environmental and medical therapy hazards, hospital and medical environments, home and occupational environments, follow up testing, explant and disposal, supplemental precautionary information. These pulse generators are compatible for use with a Subcutaneous Implantable Cardioverter Defibrillator (S-ICD) when implanted with bipolar leads and programmed to a bipolar pacing configuration.

POTENTIAL ADVERSE EVENTS Based on the literature and on pulse generator and/or lead implant experience, the following alphabetical list includes the possible adverse events associated with implantation of products described in this literature: • Air embolism • Allergic reaction • Bleeding • Bradycardia • Cardiac tamponade • Chronic nerve damage • Component failure • Conductor coil fracture • Death • Electrolyte imbalance/dehydration • Elevated thresholds • Erosion • Excessive fibrotic tissue growth • Extracardiac stimulation (muscle/nerve stimulation) • Fluid accumulation • Foreign body rejection phenomena • Formation of hematomas or seromas • Heart block • Inability to pace • Inappropriate pacing • Incisional pain • Incomplete lead connection with pulse generator • Infection including endocarditis • Lead dislodgment • Lead fracture • Lead insulation breakage or abrasion • Lead perforation • Lead tip deformation and/or breakage • Local tissue reaction • Loss of capture • Myocardial infarction (MI) • Myocardial necrosis • Myocardial trauma (e.g., tissue damage, valve damage) • Myopotential sensing • Oversensing/undersensing • Pacemaker-mediated tachycardia (PMT) • Pericardial rub, effusion • Pneumothorax• Pulse generator migration • Shunting current during defibrillation with internal or external paddles • Syncope • Tachyarrhythmias, which include acceleration of arrhythmias and early, recurrent atrial fibrillation• Thrombosis/thromboemboli • Valve damage • Vasovagal response • Venous occlusion • Venous trauma (e.g., perforation, dissection, erosion) • Worsening heart failure. For a list of potential adverse events associated with MRI scanning, refer to the MRI Technical Guide. Patients may develop psychological intolerance to a pulse generator system and may experience the following: • Dependency • Depression • Fear of premature battery depletion • Fear of device malfunction. Additionally, potential adverse events associated with the implantation of a coronary venous lead system include: • Allergic reaction to contrast media • Breakage/failure of implant instruments • Prolonged exposure to fluoroscopic radiation • Renal failure from contrast media used to visualize coronary veins.

Refer to the product labeling for specific indications, contraindications, warnings/precautions and adverse events. Rx only. 92436229 (Rev. B.3)

CAUTION: Federal law (USA) restricts this device to sale by or on the order of a physician. Rx only. Prior to use, please see the complete "Directions for Use" for more information on Indications, Contraindications, Warnings, Precautions, Adverse Events, and Operator's Instructions.

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Medical Professionals:
1.800.CARDIAC (227.3422)

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