Biventricular Pacemakers (Cardiac Resynchronization Therapy) for the Treatment of Heart Failure

Policy # 00009
Original Effective Date: 06/05/2002
Current Effective Date: 04/08/2024

Applies to all products administered or underwritten by Blue Cross and Blue Shield of Louisiana and its subsidiary, HMO Louisiana, Inc. (collectively referred to as the "Company"), unless otherwise provided in the applicable contract. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

Note: Automatic Implantable Cardioverter Defibrillator (AIDC) is addressed separately in medical policy 00008.

Note: Cardiac Hemodynamic Monitoring for the Management of Heart Failure in the Outpatient Setting is addressed separately in medical policy 00287.

When Services May Be Eligible for Coverage

Coverage for eligible medical treatments or procedures, drugs, devices or biological products may be provided only if:

- *Benefits are available in the member's contract/certificate, and*
- *Medical necessity criteria and guidelines are met.*

Based on review of available data, the Company may consider biventricular pacemakers with or without an accompanying implantable cardiac defibrillator (ICD) (i.e., a combined biventricular pacemaker plus cardiac defibrillator) as a treatment of heart failure to be **eligible for coverage.****

Patient Selection Criteria

Coverage eligibility for biventricular pacemakers with or without an accompanying ICD as a treatment of heart failure for New York Heart Association (NYHA) class II, III or IV will be considered in individuals who meet **ALL** of the following criteria:

- Left ventricular ejection fraction (LVEF) ≤35%, **AND**
- Sinus rhythm, **AND**
- Individuals treated with guideline-directed medical therapy before implant, such as an angiotensin-converting enzyme (ACE) inhibitor (or an angiotensin receptor-neprilysin inhibitor (ARNi), or angiotensin receptor blocker) and a beta blocker, mineralocorticoid

receptor antagonist, sodium-glucose cotransporter 2 inhibitor, and/or diuretics as needed, **AND**

- Either left bundle branch block (LBBB) OR QRS duration ≥150 ms***

****The Food and Drug Administration (FDA) labeled indications for QRS duration vary by device. For some devices, FDA approval is based on QRS duration of ≥130 (e.g., InSync®‡ device), while for others, it is based on QRS duration ≥120 ms (e.g., CONTAK CD®‡ CRT-D System). These differences in QRS duration arise from differences in the eligibility criteria in the trials on which the FDA approval is based.*

Based on review of available data, the Company may consider biventricular pacemakers with or without an accompanying implantable cardiac defibrillator (ICD [i.e., a combined biventricular pacemaker plus ICD]) for individuals who do not meet the criteria outlined above, but who have an indication for a ventricular pacemaker to be **eligible for coverage**** as an alternative to a right ventricular pacemaker.

Patient Selection Criteria

Coverage eligibility for biventricular pacemakers with or without an accompanying ICD (i.e., a combined biventricular pacemaker plus ICD) as an alternative to a right ventricular pacemaker for individuals who do not meet the criteria outlined above, but who have an indication for a ventricular pacemaker will be considered when **ALL** of the following criteria are met:

- Sinus rhythm or atrial fibrillation: **AND**
- NYHA class I, II, III or IV heart failure; **AND**
- Left ventricular ejection fraction (LVEF) ≤50%; **AND**
- Expected to have high degree of ventricular pacing (close to 100%) with CRT, e.g., presence of high-degree or complete atrioventricular (AV) block, planning AV node ablation, or pharmacologic rate control (See Policy Guidelines); **AND**
- Individuals treated with guideline-directed medical therapy before implant, such as an angiotensin-converting enzyme (ACE) inhibitor (or angiotensin receptor-neprilysin inhibitor (ARNi), or an angiotensin receptor blocker) and a beta blocker, mineralocorticoid receptor antagonist, sodium-glucose cotransporter 2 inhibitor, and/or diuretics as needed.

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When Services Are Considered Investigational

Coverage is not available for investigational medical treatments or procedures, drugs, devices or biological products.

Based on review of available data, the Company considers the use of biventricular pacemakers, with or without an accompanying implantable cardiac defibrillator (ICD [i.e., a combined biventricular pacemaker plus ICD]) as a treatment for individuals with NYHA class I, II, III or IV heart failure when patient selection criteria are not met to be **investigational.***

Based on review of available data, the company considers biventricular pacemakers, with or without an accompanying implantable cardiac defibrillator (ICD [i.e., a combined biventricular pacemaker plus ICD]), as a treatment for heart failure in individuals with atrial fibrillation (AF) who do not meet the above criteria to be **investigational.***

Based on review of available data, the Company considers triple-site (triventricular) cardiac resynchronization therapy (CRT), using an additional pacing lead, to be **investigational.***

Based on review of available data, the Company considers an intrathoracic fluid monitoring sensor is considered to be **investigational*** as a component of a biventricular pacemaker.

Based on review of available data, the Company considers cardiac resynchronization therapy (CRT) with wireless left ventricular (LV) endocardial pacing is considered to be **investigational*.**

Policy Guidelines

Atrioventricular block with a requirement for a high percentage of ventricular pacing is considered to be present when there is either:

- Third-degree atrioventricular block; or
- Second-degree atrioventricular block or a PR interval of ≥300 ms when paced at 100 beats per minute.

Guideline-directed medical therapy for heart failure is outlined in the 2022 American Heart Association, American College of Cardiology, and Heart Failure Society of America guidelines for the management of heart failure (Heidenreich et al [2022]).

Table 1. NYHA Functional Classification

NYHA Class	Patients with Cardiac Disease(Description of HF Related Symptoms)
Class I (Mild)	Patients with cardiac disease but without resulting in limitation of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation (rapid or pounding heart beat), dyspnea (shortness of breath), or anginal pain (chest pain).
Class II (Mild)	Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain
Class III (Moderate)	Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary activity causes fatigue, palpitation, dyspnea, or anginal pain.
Class IV (Severe)	Patients with cardiac disease resulting in the inability to carry on any physical activity without discomfort. Symptoms of heart failure or the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.

The Criteria Committee of the New York Heart Association. *Nomenclature and Criteria for Diagnosis of Diseases of the Heart and Great Vessels*. 9th ed. Boston, Mass: Little, Brown & Co; 1994:253-256.

Table 2. Classification of HF by LVEF

Type of HF According to LVEF	Criteria
HFrEF (HF with reduced EF)	• LVEF ≤40%
HFimpEF (HF with improved EF)	• Previous LVEF ≤40% and a follow-up measurement of LVEF >40%
HFmrEF (HF with mildly reduced EF)	• LVEF 41%–49% • Evidence of spontaneous or provokable increased LV filling pressures (e.g., elevated natriuretic peptide, noninvasive and invasive hemodynamic measurement)

HFpEF (HF with preserved EF)	• LVEF ≥50% • Evidence of spontaneous or provokable increased LV filling pressures (e.g., elevated natriuretic peptide, noninvasive and invasive hemodynamic measurement)

Guideline-directed medical therapy (GDMT) for individuals with established diagnosis of HFrEF (LVEF 40% or lower); following drug classes have class 1 recommendation:

- Angiotensin receptor-neprilysin inhibitor (ARNi) in New York Heart Association (NYHA) II-III; or angiotensin-converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) in NYHA II-IV
- Beta blocker (i.e., bisoprolol, carvedilol, or sustained-release metoprolol succinate)
- Mineralocorticoid receptor antagonist (MRA; spironolactone or eplerenone)
- Sodium-glucose cotransporter 2 inhibitor (SGLT2 inhibitor)
- Diuretics as needed

GDMT for individuals with established diagnosis of HFmrEF (LVEF 41-49%); following drug classes have been noted with class 1-2b recommendations:

- Diuretics, as needed (1)
- SGLT2i (2a)
- ACEi, ARB, ARNi (2b)
- MRA (2b)
- Evidence-based beta blockers for HFrEF (2b)

Background/Overview

Heart Failure

An estimated 6.7 million adults in the United States 20 years of age and older had heart failure between 2017 to 2020. The prevalence continues to increase over time with the aging of the population. Prevalence of disease is higher in women than men 80 years of age and older. Overall prevalence is especially high in Black individuals. A 2008 study demonstrated that Black individuals had the highest risk of developing heart failure, followed by Hispanic, White, and Chinese individuals in the United States. Higher risk reflected differential prevalence of hypertension, diabetes, and lower socioeconomic status. Black individuals also had the highest proportion of

incident heart failure not preceded by myocardial infarction (75%). Additionally, Black individuals have a greater 5-year case fatality rate associated with heart failure compared to White individuals. It is estimated that 20% to 30% of patients with heart failure have intraventricular conduction disorders resulting in a contraction pattern that is not coordinated and a wide QRS interval on the electrocardiogram. This abnormality appears to be associated with increased morbidity and mortality.

Treatment
Biventricular pacemakers using 3 leads (1 in the right atrium, 1 endocardial in the right ventricle, 1 epicardial for the left ventricle), also known as cardiac resynchronization therapy (CRT), have been investigated as a technique to coordinate the contraction of the ventricles, thus improving patients' hemodynamic status. Originally developed CRT devices typically used 2 ventricular leads for biventricular pacing. Devices and implantation techniques have been developed to allow for multisite pacing, with the goal of improving CRT response. This may be accomplished in 1 of 2 ways: through the use of multiple leads within the coronary sinus (triventricular pacing) or through the use of multipolar left ventricular pacing leads, which can deliver pacing stimuli at multiple sites. Wireless left ventricular endocardial pacing is also being evaluated for patients who are not candidates for or do not respond to standard epicardial pacing leads.

FDA or Other Governmental Regulatory Approval

U.S. Food and Drug Administration (FDA)
There are numerous CRT devices, combined implantable cardioverter-defibrillator (ICD) plus CRT devices (CRT-D), and combined CRT plus fluid monitoring devices. Some devices are discussed here. For example, in 2001, the InSync®‡ Biventricular Pacing System (Medtronic), a stand-alone biventricular pacemaker, was approved by the U.S. Food and Drug Administration (FDA) through the premarket approval process for the treatment of patients with New York Heart Association (NYHA) class III or IV heart failure, on a stable pharmacologic regimen, who also have a QRS duration of 130 ms or longer and a left ventricular ejection fraction (LVEF) of 35% or less. Devices by Guidant (CONTAK-CD®‡ CRT-D System) and Medtronic (InSync®‡ ICD Model 7272) have been approved by the FDA through the premarket approval process for combined CRT defibrillators for patients at high risk of sudden cardiac death due to ventricular arrhythmias and who have NYHA class III or IV heart failure with a LVEF of 35% or less, QRS interval 130 ms or longer (≥120 ms for the Guidant device), and remain symptomatic despite a stable, optimal heart failure

drug therapy. In 2006, Biotronik Inc. received premarket approval from the FDA for its combined CRT-D device with ventricular pacing leads (Tupos LV/ATx CRT-D/Kronos LV-T CRT-D systems); in 2013, the company received the FDA approval for updated CRT-D devices (Ilesto/Iforia series). On the basis of the Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy (MADIT-CRT) study, indications for 3 Guidant CRT-D (Cognis®‡, Livian®‡, and Contak Renewal; Boston Scientific) devices were expanded to include patients with heart failure who receive stable optimal pharmacologic therapy for heart failure and who meet any of the following classifications:

- Moderate-to-severe heart failure (NYHA class III or IV) with an ejection fraction less than 35% and QRS interval greater than 120 ms.
- Left bundle branch block with a QRS interval greater than or equal to 130 ms, ejection fraction less than 30%, and mild (NYHA class II) ischemic or nonischemic heart failure or asymptomatic (NYHA class I) ischemic heart failure.

In April 2014, the FDA further expanded indications for multiple Medtronic CRT devices to include patients with NYHA class I, II, or III heart failure, who have an LVEF of 50% or less on stable, optimal heart failure medical therapy, if indicated, and have atrioventricular block that is expected to require a high percentage of ventricular pacing that cannot be managed with algorithms to minimize right ventricular pacing. The expanded indication was based on data from the Biventricular versus Right Ventricular Pacing in Heart Failure Patients with Atrioventricular Block (BLOCK HF) study, a Medtronic-sponsored randomized controlled trial that evaluated the use of CRT in patients with NYHA class I, II, or III heart failure, LVEF of 50% or less, and atrioventricular block.

Several CRT devices have incorporated a fourth lead, providing quadripolar pacing. The Medtronic Viva™‡ Quad XT and the Viva Quad S have a fourth lead, and the Medtronic Attain Performa®‡ has a left ventricular lead, which received clearance for marketing from the FDA in August 2014. The Dynagen™‡ X4 and Inogen™‡ X4 devices (Boston Scientific) also incorporate a fourth lead. Other CRT devices with quadripolar leads have been approved for use outside of the U.S. (eg, St. Jude Quartet™‡ left ventricular lead).

Multiple devices manufactured by Medtronic combine a CRT with the OptiVol™‡ monitoring system. For example, in 2005, the InSync Sentry®‡ system was approved by the FDA through the supplemental premarket approval process. This combined biventricular pacemaker plus ICD is also equipped to monitor intrathoracic fluid levels using bioimpedance technology, referred to as

OptiVol™‡ Fluid Status Monitoring. Bioimpedance measures, defined as the electrical resistance of tissue to flow of current, are performed many times a day using a vector from the right ventricular coil on the lead in the right side of the heart to the implanted pacemaker devices; changes in bioimpedance reflect intrathoracic fluid status and are evaluated using a computer algorithm. For example, changes in a patient's daily average of intrathoracic bioimpedance can be monitored; differences in the daily average are compared with a baseline and reported as the OptiVol™‡ Fluid Index. It has been proposed that these data may be used as an early warning system of cardiac decompensation or may provide feedback that enables a physician to tailor medical therapy. Medical policy 00287 addresses the use of external bioimpedance devices as stand-alone devices to assess cardiac output noninvasively.

The WiSE-CRT (EBR Systems) provides CRT with a small wireless electrode that is implanted within the left ventricle and controlled by ultrasound. It has European CE approval and is being studied in a multicenter pivotal trial.

FDA product code: NIK.

Rationale/Source

This medical policy was developed through consideration of peer-reviewed medical literature generally recognized by the relevant medical community, U.S. Food and Drug Administration approval status, nationally accepted standards of medical practice and accepted standards of medical practice in this community, technology evaluation centers, reference to federal regulations, other plan medical policies, and accredited national guidelines.

Description

Cardiac resynchronization therapy (CRT), which consists of synchronized pacing of the left and right ventricles, is intended to treat patients with heart failure and dyssynchronous ventricular contractions. Treatment involves placement of a device that paces both ventricles and coordinates ventricular pacing to maximize cardiac pumping function and left ventricular ejection fraction (LVEF).

Summary of Evidence
For individuals who have New York Heart Association (NYHA) class III or IV heart failure with an LVEF of 35% or less who are in sinus rhythm, treated with guideline-directed medical therapy, and have either left bundle branch block (LBBB) or a QRS interval of 150 ms or more who receive CRT with or without defibrillator, the evidence includes randomized controlled trials (RCTs) and systematic reviews of RCTs. Relevant outcomes are overall survival (OS), symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. There is a large body of clinical trial evidence supporting the use of CRT in patients with NYHA class III or IV heart failure. The RCTs have consistently reported that CRT reduces mortality, improves functional status, and improves quality of life for patients with NYHA class III or IV heart failure. Multiple subgroup analyses of RCTs have demonstrated that the benefit of CRT is mainly restricted to patients with LBBB or QRS interval greater than 150 ms. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have NYHA class II heart failure with an LVEF of 30% or less who are in sinus rhythm, treated with guideline-directed medical therapy, and have either LBBB or a QRS interval of 150 ms or more who receive CRT with or without defibrillator, the evidence includes RCTs and systematic reviews of RCTs. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. For patients with NYHA class II heart failure, at least 4 RCTs assessing CRT have been published. A mortality benefit was reported in 1 of the 4 trials, the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). None of the other 3 RCTs reported a mortality difference, but a subgroup analysis of the Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy (MADIT-CRT) trial reported a mortality benefit for patients with LBBB. Among other outcome measures, hospitalizations for heart failure showed consistent reductions, but quality of life and functional status did not improve. Multiple subgroup analyses of RCTs have demonstrated that the benefit of CRT is mainly restricted to patients with LBBB or a QRS interval greater than 150 ms. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have NYHA class I heart failure who receive CRT with or without defibrillator, the evidence includes RCTs and systematic reviews of RCTs. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. Few patients with NYHA class I heart failure have been included in RCTs. The MADIT-CRT trial included 265 patients with class I heart failure. While the treatment effect on death and hospitalization favored

combined implantable cardioverter-defibrillator plus CRT devices versus implantable cardioverter-defibrillator alone for class I patients, the confidence interval was large and included a 25% to 30% increase in events. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have NYHA class I, II, III or IV heart failure with LVEF of 50% or less and atrioventricular nodal block with requirement for a high percentage of ventricular pacing, treated with guideline-directed medical therapy, who receive CRT with or without defibrillator, the evidence includes RCTs. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. For patients who have atrioventricular nodal block, some degree of left ventricular dysfunction, and who would not necessarily meet conventional criteria for CRT but would require ventricular pacing, a large RCT has demonstrated improvements in heart failure-related hospitalizations and urgent care visits among patients treated with CRT instead of right ventricular pacing alone. For patients who require ventricular pacing but have no left ventricular dysfunction, results of a small RCT have suggested that biventricular pacing is associated with improved measures of cardiac function, but the trial was small and underpowered to detect differences in clinical outcomes. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have heart failure and atrial fibrillation who receive CRT with or without defibrillator, the evidence includes 6 RCTs and a registry study. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. Results from RCTs have been conflicting, with 3 reporting improvements for patients with atrial fibrillation, including an all-cause mortality benefit, and others reporting no significant improvements. A registry study reported significant improvements in mortality and hospitalizations for patients with heart failure and atrial fibrillation treated with CRT plus defibrillator compared with implantable cardioverter-defibrillator alone. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have heart failure and atrioventricular nodal block who receive CRT, the evidence includes RCTs. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. One large RCT demonstrated that CRT led to reductions in heart failure-related hospitalizations and urgent care visits among patients with heart failure and atrioventricular block who would not necessarily meet conventional criteria for CRT. For

patients who require ventricular pacing but have no left ventricular dysfunction, results of a small RCT have suggested that biventricular pacing is associated with improvement in cardiac function, but the trial was small and underpowered to detect differences in clinical outcomes. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have heart failure who receive triple-site CRT, the evidence includes small RCTs and a meta-analysis that included nonrandomized studies. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. The available RCTs have reported improved outcomes on at least 1 measure of functional status or quality of life with triple-site CRT compared with conventional CRT. However, the trials were small and had methodologic limitations. Also, outcomes reported differed across studies. Triple-site CRT was also associated with higher radiation exposure and a greater number of additional procedures post-implantation. Larger, high-quality RCTs are needed to define better the benefit-risk ratio for triple-site CRT compared with conventional CRT. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

For individuals who have heart failure who receive CRT combined with remote fluid monitoring, the evidence includes 3 RCTs. Relevant outcomes are OS, symptoms, functional outcomes, quality of life, hospitalizations, and treatment-related morbidity. Three RCTs have reported no improvement in outcomes associated with remote fluid monitoring for patients with heart failure. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Supplemental Information

Clinical Input From Physician Specialty Societies and Academic Medical Centers

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

2012 Input

In response to requests, input was received from 1 physician specialty society and 8 academic medical centers while this policy was under review in 2012. There was consensus with the medically necessary statements. For patients with class I heart failure, there was mixed input as to whether

cardiac resynchronization therapy (CRT) should be medically necessary. Regarding the duration of the QRS complex, commentators acknowledged that the literature supported use mainly in patients with a QRS interval greater than 150 ms, but most reviewers disagreed with restricting CRT use to patients in that group because that duration was not currently the accepted standard of care. For patients with atrial fibrillation, the input was mixed on whether biventricular pacing improves outcomes.

Practice Guidelines and Position Statements
Guidelines or position statements will be considered for inclusion in 'Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American College of Cardiology et al
The American College of Cardiology (ACC), American Heart Association, and Heart Rhythm Society (2019) published joint guidelines on the evaluation and management of patients with bradycardia and cardiac conduction delay. These guidelines included the following recommendations on CRT (see Table 3).

Table 3. Joint Guidelines on Treatment of Patients with Bradycardia and Cardiac Conduction Delay

Recommendation	COR	LOE
"In patients with atrioventricular block who have an indication for permanent pacing with a LVEF between 36% and 50% and are expected to require ventricular pacing more than 40% of the time, it is reasonable to choose pacing methods that maintain physiologic ventricular activation (e.g., cardiac resynchronization therapy [CRT] or His bundle pacing) over right ventricular pacing."	IIa	B-R^{SR}
"In patients with atrioventricular block who have an indication for permanent pacing with a LVEF between 36% and 50% and are expected to require ventricular pacing less than 40% of the time, it is reasonable to choose right ventricular pacing	IIa	B-R

Recommendation	COR	LOE
over pacing methods that maintain physiologic ventricular activation (e.g., CRT or His bundle pacing)."		

COR: class of recommendation; CRT: cardiac resynchronization therapy; LOE: level of evidence; LVEF: left ventricular ejection fraction; SR: systematic review.

A focused update to 2008 guidelines for device-based treatment of cardiac rhythm abnormalities was published jointly by ACC Foundation, American Heart Association, and Heart Rhythm Society in 2012. The ACC and American Heart Association (2013) subsequently published guidelines for the management of heart failure. These guidelines made recommendations on CRT for heart failure that are in line with those made by the ACC, American Heart Association, and Heart Rhythm Society related to CRT for heart failure in 2012. The ACC, American Heart Association, and Heart Failure Society of America published guidelines on the management of heart failure (2022) to replace the 2013 guidelines. The most recent recommendations on CRT for heart failure from the guidelines are included in Table 4.

Table 4. 2022 Joint Guidelines on Device-Based Treatment of Cardiac Rhythm Abnormalities

Recommendation	COR	LOE
CRT is indicated for patients who have LVEF less than or equal to 35%, sinus rhythm, LBBB with a QRS duration greater than or equal to 150 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT	I	B[a]
CRT can be useful for patients who have LVEF less than or equal to 35%, sinus rhythm, LBBB with a QRS duration 120 to 149 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT	IIa	B[b]
CRT can be useful for patients who have LVEF less than or equal to 35%, sinus rhythm, a non-LBBB pattern with a QRS duration greater than or equal to 150 ms, and NYHA class II, III, or ambulatory class IV symptoms on GDMT	IIa	B[a]
CRT is reasonable in patients with high-degree or complete heart block and LVEF of 36% to 50%	IIa	B[a]

Recommendation	COR	LOE
CRT can be useful in patients with atrial fibrillation and LVEF less than or equal to 35% on GDMT if a) the patient requires ventricular pacing or otherwise meets CRT criteria and b) AV nodal ablation or pharmacologic rate control will allow near 100% ventricular pacing with CRT	IIa	B[b]
CRT can be useful for patients on GDMT who have LVEF less than or equal to 35% and are undergoing new or replacement device placement with anticipated requirement for significant (>40%) ventricular pacing	IIa	B[b]
CRT may be considered for patients who have LVEF less than or equal to 30%, ischemic etiology of heart failure, sinus rhythm, LBBB with a QRS duration of greater than or equal to 150 ms, and NYHA class I symptoms on GDMT	IIb	B[b]
CRT may be considered for patients who have LVEF less than or equal to 35%, sinus rhythm, a non-LBBB pattern with QRS duration 120 to 149 ms, and NYHA class III/ambulatory class IV on GDMT	IIb	B[b]
CRT is not recommended in patients with QRS duration less than 120 ms	III[c]	B[a]
CRT is not recommended for patients with NYHA class I or II symptoms and non-LBBB pattern with QRS duration less than 150 ms	III[c]	B[b]
CRT-D is not indicated for patients whose comorbidities and/or frailty limit survival with good functional capacity to less than 1 year	III[c]	C[d]

AV: atrioventricular; COR: class of recommendation; CRT: cardiac resynchronization therapy; CRT-D: cardiac resynchronization therapy with defibrillation; GDMT: guideline-directed medical therapy; LBBB: left bundle branch block; LOE: level of evidence; LVEF: left ventricular ejection fraction; NYHA: New York Heart Association; RCT: randomized controlled trial.
[a]Moderate quality evidence from 1 or more RCTs..
[b]Moderate-quality evidence from 1 or more well-designed, well-executed nonrandomized studies, observational studies, or registry studies.
[c]No benefit.
[d]Limited data.

Heart Failure Society of America
The Heart Failure Society of America (2010) released comprehensive guidelines on the management of heart failure. The guidelines were updated in conjunction with the ACC and American Heart Association in 2022; updated recommendations can be found above, in Table 4.

National Institute for Health and Care Excellence
The NICE (2014) guidance provided recommendations on CRT for heart failure. The recommendations for patients with left ventricular ejection fraction of 35% or less are listed in Table 5.

Table 5. Guidelines on Management of Cardiac Resynchronization Therapy for Heart Failure

Indication	Recommendation
NYHA class I-IV with QRS interval <120 ms	CRT not recommended
NYHA class IV with QRS interval 120 to 149 ms and without LBBB	CRT-P recommended
NYHA class II-III with QRS interval 120 to 149 ms and with LBBB	CRT-D recommended
NYHA class III-IV with QRS interval 120 to 149 ms and with LBBB	CRT-P recommended
NYHA class I-III with QRS interval ≥150 ms (with or without LBBB)	CRT-D recommended
NYHA class III-IV with QRS interval ≥150 ms (with or without LBBB)	CRT-P recommended

CRT: cardiac resynchronization therapy; CRT-D: cardiac resynchronization therapy with implantable cardioverter-defibrillator; CRT-P: cardiac resynchronization therapy with pacemaker; LBBB: left bundle branch block; NYHA: New York Heart Association.

U.S. Preventive Services Task Force Recommendations
Not applicable.

Medicare National Coverage
There is no national coverage determination. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

Ongoing and Unpublished Clinical Trials
Some currently ongoing and unpublished trials that might influence this review are listed in Table 6.

Table 6. Summary of Key Trials

NCT No.	Trial Name	Planned Enrollment	Completion Date
Ongoing			
NCT01994252	Resynchronization/Defibrillation for Ambulatory Heart Failure Trial in Patients With Permanent Atrial Fibrillation (RAFT-PermAF)	200	Mar 2023
NCT02962791	Prospective Randomized Trial Comparing TRIPLE Site ventriculAr Stimulation Versus Conventional Pacing in CRT canDidates: TRIPLEAD Trial	166	Oct 2021
NCT04225520	Assessment of Mechanical Dyssynchrony as Selection Criterion for Cardiac Resynchronization Therapy	700	Dec 2029
NCT02454439	Assessment of Cardiac Resynchronization Therapy in Patients With Wide QRS and Non-specific Intraventricular Conduction Delay: a Randomized Trial	200	July 2024
NCT03366545[a]	Observation of Clinical Routine Care for Heart Failure Patients Implanted With BIOTRONIK CRT Devices	3000	June 2025

NCT: national clinical trial.

References

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Policy History

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04/18/2002	Medical Policy Committee review
06/05/2002	Managed Care Advisory Council approval
06/24/2002	Format revision. No substance change to policy.
06/01/2004	Medical Director review. Format revision. Clinical criteria revision.
06/15/2004	Medical Policy Committee review
06/28/2004	Managed Care Advisory Council approval
11/02/2004	Medical Director review. Clinical criteria revision
11/16/2004	Medical Policy Committee review
11/29/2004	Managed Care Advisory Council approval
04/05/2005	Medical Director review
04/18/2005	Medical Director review
04/22/2005	Medical Director review
04/27/2005	Medical Policy Committee review. Clinical criteria revision. Combination automatic implantable cardiac defibrillators (AICD) and biventricular pacemakers criteria further defined; "patients with New York Heart Association (NYHA) Class III or IV CHF, with a QRS duration of >120-130 msec". FDA labeled indication for the InSync device and CONTAK CD® CRT-D System added. Investigational statement added to address cases not meeting clinical criteria.
04/04/2007	Medical Director review
04/18/2007	Medical Policy Committee approval. Policy statements revised indicating that intrathoracic bioimpedance is considered investigational as a component of a biventricular pacemaker; patient selection criteria for combined biventricular pacemaker/ACID revised to indicate that a combined device would be considered medically necessary in patients who meet the criteria for a biventricular pacemaker alone. Rationale /Source and Background/Overview updated.
04/02/2008	Medical Director review

04/16/2008	Medical Policy Committee approval. No changes to policy statement.
04/02/2009	Medical Director review
04/15/2009	Medical Policy Committee approval. No changes to policy statement.
04/08/2010	Medical Policy Committee approval
04/21/2010	Medical Policy Implementation Committee approval. Added statement "Based on review of available data, the Company considers biventricular pacemakers with or without an accompanying implantable cardiac defibrillator as a treatment of NYHA class I or II heart failure to be investigational to the policy.
04/07/2011	Medical Policy Committee approval
04/13/2011	Medical Policy Implementation Committee approval. Sinus rhythm added to the list of patient selection criteria.
04/12/2012	Medical Policy Committee review
04/25/2012	Medical Policy Implementation Committee approval. Cardiac resynchronization therapy use in patients with NYHA class II heart failure meeting specific criteria now may be considered eligible for coverage; all other uses in mild heart failure (e.g., class I) considered investigational. The term "congestive" was removed from the title and text.
02/04/2013	Coding revised
04/03/2014	Medical Policy Committee review
04/23/2014	Medical Policy Implementation Committee approval. Additional investigational statement added for triple-site (triventricular) CRT.
04/02/2015	Medical Policy Committee review
04/20/2015	Medical Policy Implementation Committee approval. Updated rationale/source and references. Coverage eligibility unchanged.
08/03/2015	Coding update: ICD10 Diagnosis code section added; ICD9 Procedure code section removed.
04/07/2016	Medical Policy Committee review
04/20/2016	Medical Policy Implementation Committee approval. Coverage statement with criteria added for CRT in patients with heart failure and AV block. Existing coverage criteria changed to include presence of LBBB (and QRS >120-130 ms) OR QRS >150 ms.
01/01/2017	Coding update: Removing ICD-9 Diagnosis Codes
04/06/2017	Medical Policy Committee review
04/19/2017	Medical Policy Committee approval. Coverage eligibility unchanged.

05/03/2018 Medical Policy Committee review
05/16/2018 Medical Policy Implementation Committee approval. Changed "a combined biventricular pacemaker/implantable cardiac defibrillator" to "a combined biventricular pacemaker plus implantable cardiac defibrillator" where it appears in the coverage section. Replaced "a stable pharmacologic medical regimen" with "guideline-directed medical therapy" for patients treated before implant in the Patient Selection Criteria. Coverage eligibility unchanged.
07/05/2018 Medical Policy Committee review
07/11/2018 Medical Policy Implementation Committee approval. Policy statement added that cardiac resynchronization therapy with wireless left ventricular endocardial pacing is considered investigational.
07/03/2019 Medical Policy Committee review
07/18/2019 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.
03/05/2020 Medical Policy Committee review
03/11/2020 Medical Policy Implementation Committee approval. Added New York Heart Association (NYHA) class II to coverage with criteria to Classes III and IV coverage for biventricular pacemakers with or without an accompanying ICD as a treatment of heart failure. Removed previous coverage with criteria for New York Heart Association (NYHA) class II. Added the NYHA Functional Classification table to the Policy Guidelines section.
10/12/2020 Coding update
03/04/2021 Medical Policy Committee review
03/10/2021 Medical Policy Implementation Committee approval. Combined the first two investigational statements to include NYHA class I, II, III or IV heart failure.
09/30/2021 Coding update
03/03/2022 Medical Policy Committee review
03/09/2022 Medical Policy Implementation Committee approval. Revisions made to the second.set of Patient Selection Criteria by adding a new first bullet and revising the forth bullet, respectively as follows:

- Sinus rhythm or atrial fibrillation: AND
- Expected to have high degree of ventricular pacing (close to 100%) with CRT, e.g., presence of atrioventricular (AV) block, planning AV node ablation, or pharmacologic rate control (See Policy Guidelines); AND

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12/07/2022	Coding update
03/02/2023	Medical Policy Committee review
03/08/2023	Medical Policy Implementation Committee approval. Replaced "patients" with "individuals". Clarified guideline-directed medical therapy in the coverage criteria and Policy Guidelines section. Coverage eligibility unchanged.
03/07/2024	Medical Policy Committee review
03/13/2024	Medical Policy Implementation Committee approval. Coverage eligibility unchanged.

Next Scheduled Review Date: 03/2025

Coding

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Biventricular Pacemakers (Cardiac Resynchronization Therapy) for the Treatment of Heart Failure

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Current Effective Date: 04/08/2024

Codes used to identify services associated with this policy may include (but may not be limited to) the following:

Code Type	Code
CPT	0515T, 0516T, 0517T, 0518T, 0519T, 0520T, 0521T, 0522T, 33211, 33213, 33217, 33224, 33225, 33226, 33228, 33229, 33230, 33231, 33249
HCPCS	C1721, C1785, C2619, C2621, C7540
ICD-10 Diagnosis	All related diagnoses

*Investigational – A medical treatment, procedure, drug, device, or biological product is Investigational if the effectiveness has not been clearly tested and it has not been incorporated into standard medical practice. Any determination we make that a medical treatment, procedure, drug, device, or biological product is Investigational will be based on a consideration of the following:

A. Whether the medical treatment, procedure, drug, device, or biological product can be lawfully marketed without approval of the U.S. Food and Drug Administration (FDA) and whether such approval has been granted at the time the medical treatment, procedure, drug, device, or biological product is sought to be furnished; or
B. Whether the medical treatment, procedure, drug, device, or biological product requires further studies or clinical trials to determine its maximum tolerated dose, toxicity, safety, effectiveness, or effectiveness as compared with the standard means of treatment or diagnosis, must improve health outcomes, according to the consensus of opinion among experts as shown by reliable evidence, including:
    1. Consultation with technology evaluation center(s);
    2. Credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community; or
    3. Reference to federal regulations.

**Medically Necessary (or "Medical Necessity") - Health care services, treatment, procedures, equipment, drugs, devices, items or supplies that a Provider, exercising prudent clinical judgment, would provide to a patient for the purpose of preventing, evaluating, diagnosing or treating an illness, injury, disease or its symptoms, and that are:

A. In accordance with nationally accepted standards of medical practice;
B. Clinically appropriate, in terms of type, frequency, extent, level of care, site and duration, and considered effective for the patient's illness, injury or disease; and

C. Not primarily for the personal comfort or convenience of the patient, physician or other health care provider, and not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient's illness, injury or disease.

For these purposes, "nationally accepted standards of medical practice" means standards that are based on credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community, Physician Specialty Society recommendations and the views of Physicians practicing in relevant clinical areas and any other relevant factors.

‡ Indicated trademarks are the registered trademarks of their respective owners.

NOTICE: If the Patient's health insurance contract contains language that differs from the BCBSLA Medical Policy definition noted above, the definition in the health insurance contract will be relied upon for specific coverage determinations.

NOTICE: Medical Policies are scientific based opinions, provided solely for coverage and informational purposes. Medical Policies should not be construed to suggest that the Company recommends, advocates, requires, encourages, or discourages any particular treatment, procedure, or service, or any particular course of treatment, procedure, or service.

NOTICE: Federal and State law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage.