BlueCross BlueShield of Alabama

Name of Blue Advantage Policy:

Transcatheter Ablation as a Treatment of Atrial Fibrillation

Policy #: 283
Category: Medical

Latest Review Date: July 2020
Policy Grade: A

BACKGROUND:

Blue Advantage *medical policy does not conflict with Local Coverage Determinations (LCDs), Local Medical Review Policies (LMRPs) or National Coverage Determinations (NCDs) or with coverage provisions in Medicare manuals, instructions or operational policy letters. In order to be covered by Blue Advantage the service shall be reasonable and necessary under Title XVIII of the Social Security Act, Section 1862(a)(1)(A). The service is considered reasonable and necessary if it is determined that the service is:*

1. *Safe and effective;*
2. *Not experimental or investigational*;*
3. *Appropriate, including duration and frequency that is considered appropriate for the service, in terms of whether it is:*

    - *Furnished in accordance with accepted standards of medical practice for the diagnosis or treatment of the patient's condition or to improve the function of a malformed body member;*
    - *Furnished in a setting appropriate to the patient's medical needs and condition;*
    - *Ordered and furnished by qualified personnel;*
    - *One that meets, but does not exceed, the patient's medical need; and*
    - *At least as beneficial as an existing and available medically appropriate alternative.*

Routine costs of qualifying clinical trial services with dates of service on or after September 19, 2000 which meet the requirements of the Clinical Trials NCD are considered reasonable and necessary by Medicare. Providers should bill* ***Original Medicare* *for covered services that are related to* ***clinical trials*** *that meet Medicare requirements (Refer to Medicare National Coverage Determinations Manual, Chapter 1, Section 310 and Medicare Claims Processing Manual Chapter 32, Sections 69.0-69.11).*

POLICY:

Effective for dates of service on or after July 1, 2015:

Blue Advantage will treat **transcatheter radiofrequency or cryoablation to treat atrial fibrillation** as a **covered benefit** when used as a treatment for either of the following indications, which have failed to respond to adequate trials of antiarrhythmic medications:

1. Symptomatic paroxysmal or symptomatic persistent atrial fibrillation; or
2. As an alternative to atrioventricular nodal ablation and pacemaker insertion in patients with class II or III congestive heart failure and symptomatic atrial fibrillation.

Blue Advantage will treat **transcatheter radiofrequency ablation or cryoablation to treat atrial fibrillation** as a **covered benefit** when used as an **initial treatment** for patients with **symptomatic paroxysmal atrial fibrillation** for patients with **recurrent symptomatic paroxysmal atrial fibrillation** (>1 episode, with 4 or fewer episodes in the previous 6 months) in whom a **rhythm control strategy** is desired.

Blue Advantage will treat **repeat radiofrequency ablation or cryoablation** as a **covered benefit** in patients with **recurrence of atrial fibrillation and/or development of atrial flutter following the initial procedure.**

Blue Advantage will treat **transcatheter radiofrequency ablation or cryoablation to treat atrial fibrillation** as a **non-covered benefit** and as **investigational** as a treatment **for all indications including, but not limited to cases of atrial fibrillation that do not meet the criteria outlined above**.

Blue Advantage does not approve or deny procedures, services, testing, or equipment for our members. Our decisions concern coverage only. The decision of whether or not to have a certain test, treatment or procedure is one made between the physician and his/her patient. Blue Advantage administers benefits based on the members' contract and medical policies. Physicians should always exercise their best medical judgment in providing the care they feel is most appropriate for their patients. Needed care should not be delayed or refused because of a coverage determination.

DESCRIPTION OF PROCEDURE OR SERVICE:

Atrial fibrillation (AF) frequently arises from an abnormal focus at or near the junction of the pulmonary veins and the left atrium, thus leading to the feasibility of more focused ablation techniques directed at these structures. Catheter-based ablation, using radiofrequency ablation (RFA) or cryoablation, is being studied as a treatment option for various types of AF.

Atrial Fibrillation

Atrial fibrillation (AF) is the most common cardiac arrhythmia, with an estimated prevalence of 0.4% of the population, increasing with age. The underlying mechanism of AF involves interplay between electrical triggering events and the myocardial substrate that permits propagation and

maintenance of the aberrant electrical circuit. The most common focal trigger of AF appears to be located within the cardiac muscle that extends into the pulmonary veins.

AF accounts for approximately one-third of hospitalizations for cardiac rhythm disturbances. Symptoms of AF (e.g., palpitations, decreased exercise tolerance, dyspnea) are primarily related to poorly controlled or irregular heart rate. The loss of atrioventricular (AV) synchrony results in a decreased cardiac output, which can be significant in patients with compromised cardiac function. In addition, patients with AF are at higher risk for stroke, with anticoagulation is typically recommended. AF is also associated with other cardiac conditions, such as valvular heart disease, heart failure, hypertension, and diabetes. Although episodes of AF can be converted to normal sinus rhythm using pharmacologic or electroshock conversion, the natural history of AF is that of recurrence, thought to be related to fibrillation-induced anatomic and electrical remodeling of the atria.

AF can be subdivided into three types:

- paroxysmal (episodes that last fewer than 7 days and are self-terminating),
- persistent (episodes that last for more than 7 days and can be terminated pharmacologically or by electrical cardioversion), or
- Permanent.

Treatment strategies can be broadly subdivided into rate control, in which only the ventricular rate is controlled and the atria are allowed to fibrillate, or rhythm control, in which there is an attempt to reestablish and maintain normal sinus rhythm. Rhythm control has long been considered an important treatment goal for management of AF, although its primacy has recently been challenged by the results of several randomized trials reporting that pharmacologically maintained rhythm control offered no improvement in mortality or cardiovascular morbidity compared with rate control.

However, rhythm control is not curative. A variety of ablative procedures have been investigated as potentially curative approaches, or as modifiers of the arrhythmia such that drug therapy becomes more effective. Ablative approaches focus on interruption of the electrical pathways that contribute to AF through modifying the arrhythmia triggers and/or the myocardial substrate that maintains the aberrant rhythm. The maze procedure, an open surgical procedure often combined with other cardiac surgeries (e.g., valve repair), is an ablative treatment that involves sequential atriotomy incisions designed to create electrical barriers that prevent the maintenance of AF.

Catheter Ablation for Atrial Fibrillation

Radiofrequency ablation (RFA) using a percutaneous catheter-based approach is widely used to treat a variety of supraventricular arrhythmias, in which intracardiac mapping identifies a discrete arrhythmogenic focus that is the target of ablation. The situation is more complex for AF, because there may be no single arrhythmogenic focus. AF most frequently arises from an abnormal focus at or near the junction of the pulmonary veins and the left atrium, thus leading to the feasibility of more focused, percutaneous ablation techniques. Strategies that have emerged for focal ablation within the pulmonary veins originally involved segmental ostial ablation guided by pulmonary vein potential (electrical approach) but currently more typically involve

circumferential pulmonary vein ablation (anatomic approach). Circumferential pulmonary vein ablation using radiofrequency energy is the most common approach at present. Research into specific ablation and pulmonary vein isolation techniques is ongoing.

Use of current radiofrequency catheters for AF has a steep learning curve because they require extensive guiding to multiple ablation points. The procedure also can be done using cryoablation technology. One of the potential advantages of cryoablation is that cryoablation catheters have a circular or shaped end point, permitting a "one-shot" ablation.

Repeat Procedures
Repeat procedures following initial RFA are commonly performed if AF recurs or if atrial flutter develops postprocedure. The need for repeat procedures may, in part, depend on the clinical characteristics of the patient (e.g., age, persistent vs paroxysmal AF, atrial dilatation), and the type of ablation initially performed. Repeat procedures are generally more limited in scope than the initial procedure. Additional clinical factors are associated with the need for a second procedure, including age, length of AF, permanent AF, left atrial size, and left ventricular ejection fraction.

KEY POINTS:
The most recent literature search was performed through March 19, 2020.

Summary of Evidence
For individuals who have symptomatic paroxysmal or persistent AF who have failed antiarrhythmic drugs who receive RFA or cryoablation, the evidence includes multiple RCTs and systematic reviews. Relevant outcomes are overall survival, symptoms, morbid events, and quality of life. RCTs comparing RFA with antiarrhythmic medications have reported that freedom from AF is more likely after ablation than after medications. Results of long-term follow-up (5-6 years) after ablation have demonstrated that late recurrences continue in patients who are free of AF at 1 year. However, most patients who are AF-free at 1 year remain AF-free at 5 to 6 years. Multiple RCTs comparing cryoablation with RFA have found that cryoablation is noninferior to RFA for AF control. RFA and cryoablation differ in their adverse event profiles. For example, cryoablation is associated with higher rates of phrenic nerve paralysis but may permit a shorter procedure time. Given current data, it would be reasonable to consider both RFA and cryoablation effective for catheter ablation of AF foci or pulmonary vein isolation, provided there is a discussion about the risks and benefits of each. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have symptomatic AF and congestive heart failure who have failed rate control and antiarrhythmic drugs who receive RFA or cryoablation, the evidence includes RCTs and systematic reviews. Relevant outcomes are overall survival, symptoms, morbid events, and quality of life. Findings from RCTs have been supported by other comparative studies, which have reported improvements in AF. It is reasonable to consider both RFA and cryoablation effective for catheter ablation of AF foci or pulmonary vein isolation, provided that there is a discussion about the risks and benefits of each. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

For individuals who have recurrent symptomatic paroxysmal AF who receive RFA or cryoablation as an initial rhythm-control strategy, the evidence includes RCTs, nonrandomized studies, and systematic reviews. Relevant outcomes are overall survival, symptoms, morbid events, and quality of life. The most current RCT with adequate follow-up compared pulmonary vein isolation by catheter ablation (using either cryoablation or RFA to medical therapy. Catheter ablation was not superior to medical therapy for major cardiovascular outcomes but secondary outcomes including AF recurrence favored catheter ablation. QOL measures reported in this RCT favored catheter ablation. Two other RCTs with low risk of bias compared catheter ablation for pulmonary vein isolation with antiarrhythmic medications. One RCT demonstrated reduced rates of AF recurrence, while the other reported reduced cumulative overall AF burden. Together, these results suggest that, when a rhythm-control strategy is desired, catheter ablation is a reasonable alternative to antiarrhythmic drug therapy. While the RCTs comparing ablation with medical therapy were conducted using RFA, it is reasonable to consider both RFA and cryoablation effective for catheter ablation of AF foci or pulmonary vein isolation, provided that there is a discussion about the risks and benefits of each. The evidence is sufficient to determine that the technology results in a meaningful improvement in the net health outcome.

Practice Guidelines and Position Statements

Heart Rhythm Society et al

An expert consensus document on catheter and surgical catheter ablation for atrial fibrillation (AF) was developed jointly by 7 cardiac specialty societies (Heart Rhythm Society [HRS], European Heart Rhythm Association, European Cardiac Arrhythmia Society, American College of Cardiology, American Heart Association, Asia Pacific Heart Rhythm Society, Society of Thoracic Surgeons) in 2012. A related group of cardiac specialty societies (HRS, European Heart Rhythm Association, European Cardiac Arrhythmia Society, Asia Pacific Heart Rhythm Society, Latin American Society of Cardiac Stimulation and Electrophysiology) updated these guidelines in 2017, suggesting the following recommendations for catheter ablation (see Table 1).

Table 1. Guidelines for Management of Catheter Ablation for AF

Recommendation	COR	LOE
Symptomatic AF refractory or intolerant to at least 1 class 1 or 3 antiarrhythmic medication		
Paroxysmal: Catheter ablation is recommended	I	A
Persistent: Catheter ablation is reasonable	IIa	B-NR
Long-standing persistent: Catheter ablation may be considered	IIb	C-LD
Symptomatic AF prior to initiation of antiarrhythmic drug therapy with a class 1 or 3 antiarrhythmic agent		
Paroxysmal: Catheter ablation is reasonable	IIa	B-R
Persistent: Catheter ablation may be considered	IIa	C-EO
Longstanding Persistent: Catheter ablation may be considered	IIb	C-EO

AF: atrial fibrillation; COR: class of recommendation: LOE: level of evidence.

American College of Cardiology et al

In 2014, American College of Cardiology, American Heart Association, and HRS issued guidelines for management of patients with AF. In 2019, the AHA/ACC/HRS conducted a focused update of areas for which new evidence had emerged since the 2014 publication. Together, the guidelines included the following recommendations for rate control and rhythm control (see Table 2).

Table 2. Guidelines for Rate and Rhythm in Management of AF

Recommendation	COR	LOE
Rate control		
"AV nodal ablation with permanent ventricular pacing is reasonable to control heart rate when pharmacological therapy is inadequate and rhythm control is not achievable."	I	B
"AV nodal ablation with permanent ventricular pacing should not be performed to improve rate control without prior attempts to achieve rate control with medications."	III[a]	C
Rhythm control		
"AF catheter ablation is useful for symptomatic paroxysmal AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication when a rhythm-control strategy is desired."	I	A
"Before consideration of AF catheter ablation, assessment of the procedural risks and outcomes relevant to the individual patient is recommended."	I	C
"AF catheter ablation is reasonable for some patients with symptomatic persistent AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication."	IIa	A
"In patients with recurrent symptomatic paroxysmal AF, catheter ablation is a reasonable initial rhythm-control strategy before therapeutic trials of antiarrhythmic drug therapy, after weighing the risks and outcomes of drug and ablation therapy."	IIa	B
"AF catheter ablation may be considered for symptomatic long-standing (>12 months) persistent AF refractory or intolerant to at least 1 class I or III antiarrhythmic medication when a rhythm-control strategy is desired)."	IIb	B
"AF catheter ablation may be considered before initiation of antiarrhythmic drug therapy with a class I or III antiarrhythmic medication for symptomatic persistent AF when a rhythm-control strategy is desired."	IIb	C
"AF catheter ablation should not be performed in patients who cannot be treated with anticoagulant therapy during and after the procedure."	III[a]	C
"AF catheter ablation to restore sinus rhythm should not be performed with the sole intent of obviating the need for anticoagulation."	III[a]	C
"AF catheter ablation may be reasonable in selected patients with symptomatic AF and HF with reduced left ventricular (LV) ejection fraction (HFrEF) to potentially lower mortality rate and reduce hospitalization for HF"	IIb	B-R

AF: atrial fibrillation; AV: arteriovenous; COR: class of recommendation: LOE: level of evidence.
[a] Not recommended

Although the guidelines did not make a specific recommendation on the use of cryoablation, they did state that "Cryoballoon ablation is an alternative to point-by-point radiofrequency ablation to achieve pulmonary vein isolation."

U.S. Preventive Services Task Force Recommendations
Not applicable

KEY WORDS:
Atrial fibrillation, circumferential pulmonary vein ablation (PVA), pulmonary vein isolation, arrhythmogenic, cryoablation, cryoballoon therapy, cryoballoon intervention, cryoballoon technique, cryoballoon isolation, cryoballoon ablation

APPROVED BY GOVERNING BODIES:
In February 2009, the NaviStar® ThermoCool® Irrigated Deflectable Diagnostic/Ablation Catheter and EZ Steer ThermoCool NAV Catheter (Biosense Webster) received expanded approval by the U.S. Food and Drug Administration (FDA) through the premarket approval process for RFA to treat drug-refractory recurrent symptomatic paroxysmal AF. FDA product code: OAD.

Devices using laser or cryoablation techniques for substrate ablation have been approved by FDA through the premarket approval process for AF (FDA product code: OAE). They include:

- Arctic Front™ Cardiac CryoAblation Catheter and CryoConsole (Medtronic) in 2010.
- TactiCath™ Quartz Catheter and TactiSysQuartz® Equipment (St. Jude Medical) in 2014.
- HeartLight® Endoscopic Ablation System (Cardiofocus) in 2016.
- The Freezor™ Xtra Catheter (Medtronic) in 2016.

Also, numerous catheter ablation systems have been approved by FDA for other ablation therapy for arrhythmias such as supraventricular tachycardia, atrial flutter, and ventricular tachycardia. FDA product code: LPB.

BENEFIT APPLICATION:
Coverage is subject to member's specific benefits. Group specific policy will supersede this policy when applicable.

CURRENT CODING:
CPT Codes:

93656	Comprehensive electrophysiologic evaluation including transseptal catheterizations, insertion and repositioning of multiple electrode catheters with induction or attempted induction of an arrhythmia including left or right atrial pacing/recording when necessary, right

	ventricle pacing/recording when necessary, and HIS bundle recording when necessary with intracardiac catheter ablation of atrial fibrillation by pulmonary vein isolation
93657	**;** additional linear or focal intracardiac catheter ablation of the left or right atrium for treatment of atrial fibrillation remaining after completion of pulmonary vein isolation
93799	Unlisted cardiovascular service or procedure

REFERENCES:

1. Abugattas JP, Iacopino S, Moran D, et al. Efficacy and safety of the second generation cryoballoon ablation for the treatment of paroxysmal atrial fibrillation in patients over 75 years: a comparison with a younger cohort. *Europace.* Nov 1 2017;19(11):1798-1803.
2. AFFIRM Investigators. A comparison of rate control and rhythm control in patients with atrial fibrillation. NEJM, December 2002, Vol. 347, No. 23, pp. 1825-1833.
3. Afzal MR, Chatta J, Samanta A, et al. Use of contact force sensing technology during radiofrequency ablation reduces recurrence of atrial fibrillation: A systematic review and meta-analysis. Heart Rhythm. Sep 2015; 12(9):1990-1996.
4. American College of Cardiology AHA, the Heart Rhythm Society. 2014 ACC/AHA/HRS Guideline on the Management of Patients with Atrial Fibrillation. 2014; //content.onlinejacc.org/article.aspx?articleid=1854230. Accessed April 2015.
5. American College of Physicians AAoFP. Clinical Practice Guidelines: Atrial Fibrillation. 2008; www.aafp.org/patient-care/clinical-recommendations/all/atrial-fibrillation.html. Accessed April 2015.
6. Andrade JG, Khairy P, Guerra PG, et al. Efficacy and safety of cryoballoon ablation for atrial fibrillation: a systematic review of published studies. Heart Rhythm 2011; 8(9):1444-51.
7. Andrade JG, Khairy P, Macle L, et al. Incidence and significance of early recurrences of atrial fibrillation after cryoballoon ablation: insights from the multicenter Sustained Treatment of Paroxysmal Atrial Fibrillation (STOP AF) Trial. Circ Arrhythm Electrophysiol. Feb 2014; 7(1):69-75.
8. Anselmino M, Grossi S, Scaglione M et al. Long-term results of transcatheter atrial fibrillation ablation in patients with impaired left ventricular systolic function. J. Cardiovasc. Electrophysiol. 2013; 24(1):24-32.
9. Anselmino M, Matta M, Castagno D, et al. Catheter ablation of atrial fibrillation in chronic heart failure: state-of-the-art and future perspectives. Europace. Feb 8 2016.
10. Arentz T, et al. Feasibility and safety of pulmonary vein isolation using a new mapping and navigation system in patients with refractory atrial fibrillation. Circulation 2003; 108: 2484-2490.
11. Aryana A, Singh SM, Kowalski M, et al. Acute and long-term outcomes of catheter ablation of atrial fibrillation using the second-generation cryoballoon versus open-irrigated radiofrequency: a multicenter experience. J Cardiovasc Electrophysiol. Aug 2015; 26(8):832-839.
12. Asad ZUA, Yousif A, Khan MS, et al. Catheter Ablation Versus Medical Therapy for Atrial Fibrillation: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Circ Arrhythm Electrophysiol. Sep 2019; 12(9): e007414.

13. Bertaglia E, Tondo C, De Simone A et al. Does catheter ablation cure atrial fibrillation? Single-procedure outcome of drug-refractory atrial fibrillation ablation: a 6-year multicentre experience. Europace 2010; 12(2):181-7.
14. Blomström-Lundqvist C, Gizurarson S, Schwieler J, et al. Effect of catheter ablation vs antiarrhythmic medication on quality of life in patients with atrial fibrillation: the CAPTAF randomized clinical trial. JAMA. 2019;Epub ahead of print.
15. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Catheter ablation of the pulmonary veins as a treatment for atrial fibrillation. TEC Assessments. 2008; Volume 23 Tab 11.
16. Boho A, Misikova S, Spurny P, et al. A long-term evaluation of cryoballoon ablation in 205 atrial fibrillation patients: a single center experience. Wien Klin Wochenschr. Oct 2015; 127(19-20):779-785.
17. Buiatti A, von Olshausen G, Barthel P, et al. Cryoballoon vs. radiofrequency ablation for paroxysmal atrial fibrillation: an updated meta-analysis of randomized and observational studies. Europace. Mar 01 2017; 19(3):378-384.
18. Bunch TJ, May HT, Bair TL et al. Atrial fibrillation ablation patients have long-term stroke rates similar to patients without atrial fibrillation regardless of CHADS2 score. Heart Rhythm 2013; 10(9):1272-7.
19. Calkins H, Hindricks G, Cappato R, et al. 2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation. *Europace.* Jan 1 2018;20(1):e1-e160.
20. Calkins H, Kuck KH, Cappato R et al. 2012 HRS/EHRA/ECAS expert consensus statement on catheter and surgical ablation of atrial fibrillation: recommendations for patient selection, procedural techniques, patient management and follow-up, definitions, endpoints, and research trial design: a report of the Heart Rhythm Society (HRS) Task Force on Catheter and Surgical Ablation of Atrial Fibrillation. Developed in partnership with the European Heart Rhythm Association (EHRA), a registered branch of the European Society of Cardiology (ESC) and the European Cardiac Arrhythmia Society (ECAS); and in collaboration with the American College of Cardiology (ACC), American Heart Association (AHA), the Asia Pacific Heart Rhythm Society (APHRS), and the Society of Thoracic Surgeons (STS). Endorsed by the governing bodies of the American College of Cardiology Foundation, the American Heart Association, the European Cardiac Arrhythmia Society, the European Heart Rhythm Association, the Society of Thoracic Surgeons, the Asia Pacific Heart Rhythm Society, and the Heart Rhythm Society. Heart Rhythm 2012; 9(4):632-96 e21.
21. Calkins H, Kuck KH, Cappato R, et al. 2012 HRS/EHRA/ECAS expert consensus statement on catheter and surgical ablation of atrial fibrillation: recommendations for patient selection, procedural techniques, patient management and follow-up, definitions, endpoints, and research trial design: a report of the Heart Rhythm Society (HRS) Task Force on Catheter and Surgical Ablation of Atrial Fibrillation. Developed in partnership with the European Heart Rhythm Association (EHRA), a registered branch of the European Society of Cardiology (ESC) and the European Cardiac Arrhythmia Society (ECAS); and in collaboration with the American College of Cardiology (ACC), American Heart Association (AHA), the Asia Pacific Heart Rhythm Society (APHRS), and the Society of Thoracic Surgeons (STS). Endorsed by the governing bodies of the American College of Cardiology Foundation, the American Heart Association, the European Cardiac

Arrhythmia Society, the European Heart Rhythm Association, the Society of Thoracic Surgeons, the Asia Pacific Heart Rhythm Society, and the Heart Rhythm Society. Heart Rhythm. Apr 2012; 9(4):632-696 e621.
22. Cappato R, Calkins H, Chen SA et al. Prevalence and causes of fatal outcome in catheter ablation of atrial fibrillation. J Am Coll Cardiol 2009; 53(19):1798-803.
23. Cappato R, et al. Prospective assessment of late conduction recurrence across radiofrequency lesions producing electrical disconnection at the pulmonary vein ostium in patients with atrial fibrillation. Circulation 2003; 108: 1599-1604.
24. Cardoso R, Mendirichaga R, Fernandes G, et al. Cryoballoon versus radiofrequency catheter ablation in atrial fibrillation: a meta-analysis. J Cardiovasc Electrophysiol. Oct 2016; 27(10):1151-1159.
25. Chen CF, Gao XF, Duan X, et al. Comparison of catheter ablation for paroxysmal atrial fibrillation between cryoballoon and radiofrequency: a meta-analysis. J Interv Card Electrophysiol. Jan 07 2017.
26. Chen HS, Wen JM, Wu SN et al. Catheter ablation for paroxysmal and persistent atrial fibrillation. Cochrane Database Syst Rev 2012; 4:CD007101.
27. Cheng X, Hu Q, Zhou C, et al. The long-term efficacy of cryoballoon vs irrigated radiofrequency ablation for the treatment of atrial fibrillation: A meta-analysis. Int J Cardiol. Feb 15 2015; 181:297-302.
28. Chun KR, Schmidt B, Metzner A, et al. The 'single big cryoballoon' technique for acute pulmonary vein isolation in patients with paroxysmal atrial fibrillation: a prospective observational single centre study. Eur Heart J. Mar 2009; 30(6):699-709.
29. Cosedis Nielsen J, Johannessen A, Raatikainen P, et al. Radiofrequency ablation as initial therapy in paroxysmal atrial fibrillation. N Engl J Med. Oct 25 2012; 367(17):1587-1595.
30. Cummings JE, et al. Brief communication: Atrial-esophageal fistulas after radiofrequency ablation. Annals of Internal Medicine 2006; 144: 572-574.
31. Dagres N, Hindricks G, Kottkamp H et al. Complications of atrial fibrillation ablation in a high-volume center in 1,000 procedures: still cause for concern? J Cardiovasc Electrophysiol 2009; 20(9):1014-9.
32. Davies AJ, Jackson N, Barlow M, et al. Long Term Follow-up of pulmonary vein isolation using cryoballoon ablation. Heart Lung Circ. Mar 2016; 25(3):290-295.
33. Di Biase L, Mohanty P, Mohanty S, et al. 408-08 - Ablation vs. amiodarone for treatment of persistent atrial fibrillation in patients with congestive heart failure and an implanted device: Results from the AATAC Multicenter Randomized Trial. American College of Cardiology Scientific Sessions; March 16, 2015, 2015; San Diego, CA.
34. Dill T, et al. Pulmonary vein diameter reduction after radiofrequency catheter ablation for paroxysmal atrial fibrillation evaluated by contrast-enhanced three-dimensional magnetic resonance imaging. Circulation 2003; 107: 845-850.
35. Dukkipati SR, Cuoco F, Kutinsky I, et al. Pulmonary vein isolation using the visually guided laser balloon: a prospective, multicenter, and randomized comparison to standard radiofrequency ablation. J Am Coll Cardiol. Sep 22 2015; 66(12):1350-1360.
36. Ellis ER, Culler SD, Simon AW et al. Trends in utilization and complications of catheter ablation for atrial fibrillation in Medicare beneficiaries. Heart Rhythm 2009; 6(9):1267-73.
37. Fadahunsi O, Talabi T, Olowoyeye A, et al. Ablation of complex fractionated atrial electrograms for atrial fibrillation rhythm control: a systematic review and meta-analysis. Can J Cardiol. Jul 16 2015.

38. Falk RH. Management of atrial fibrillation—Radical reform or modest modification? NEJM, December 2002, Vol. 347, No. 23, pp. 1883-1884.
39. Forleo GB, Mantica M, De Luca L et al. Catheter ablation of atrial fibrillation in patients with diabetes mellitus type 2: results from a randomized study comparing pulmonary vein isolation versus antiarrhythmic drug therapy. J Cardiovasc Electrophysiol 2009; 20(1):22-8.
40. Fuster V, et al. ACC/AHA/ESC Guidelines for the management of patient's atrial fibrillation: Executive summary. JACC, October 2001, Vol. 38, No. 4, pp. 1231-1265.
41. Fuster V, Ryden LE, Cannom DS et al. ACC/AHA/ESC 2006 guidelines for the management of patients with atrial fibrillation--executive summary: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Revise the 2001 Guidelines for the Management of Patients With Atrial Fibrillation). J Am Coll Cardiol 2006; 48(4):854-906.
42. Ganesan AN, Shipp NJ, Brooks AG et al. Long-term outcomes of catheter ablation of atrial fibrillation: a systematic review and meta-analysis. J Am Heart Assoc 2013; 2(2):e004549.
43. Geng J, Zhang Y, Wang Y, et al. Catheter ablation versus rate control in patients with atrial fibrillation and heart failure: A multicenter study. Medicine (Baltimore). Dec 2017;96(49):e9179.
44. Gjesdal K, Vist GE, Bugge E et al. Curative ablation for atrial fibrillation: a systematic review. Scand Cardiovasc J 2008; 42(1):3-8.
45. Gupta A, Perera T, Ganesan A et al. Complications of catheter ablation of atrial fibrillation: a systematic review. Circ Arrhythm Electrophysiol 2013; 6(6):1082-8.
46. Haeusler KG, Koch L, Herm J et al. 3 Tesla MRI-detected brain lesions after pulmonary vein isolation for atrial fibrillation: results of the MACPAF study. J. Cardiovasc. Electrophysiol. 2013; 24(1):14-21.
47. Haeusler KG, Koch L, Ueberreiter J et al. Stroke risk associated with balloon based catheter ablation for atrial fibrillation: Rationale and design of the MACPAF Study. BMC Neurol 2010; 10:63.
48. Hakalahti A, Biancari F, Nielsen JC, et al. Radiofrequency ablation vs. antiarrhythmic drug therapy as first line treatment of symptomatic atrial fibrillation: systematic review and meta-analysis. Europace. Mar 2015; 17(3):370-378.
49. Herm J, Fiebach JB, Koch L et al. Neuropsychological effects of MRI-detected brain lesions after left atrial catheter ablation for atrial fibrillation: long-term results of the MACPAF study. Circ Arrhythm Electrophysiol 2013; 6(5):843-50.
50. Hu X, Jiang J, Ma Y, et al. Is there still a role for additional linear ablation in addition to pulmonary vein isolation in patients with paroxysmal atrial fibrillation? An Updated Meta-analysis of randomized controlled trials. Int J Cardiol. Apr 15 2016; 209:266-274.
51. Hunter RJ, Baker V, Finlay MC, et al. Point-by-point radiofrequency ablation versus the cryoballoon or a novel combined approach: a randomized trial comparing 3 methods of pulmonary vein isolation for paroxysmal atrial fibrillation (the Cryo versus RF trial). J Cardiovasc Electrophysiol. Dec 2015; 26(12):1307-1314.
52. Hunter RJ, Berriman TJ, Diab I et al. A Randomised Controlled Trial of Catheter Ablation versus Medical Treatment of Atrial Fibrillation in Heart Failure (THE CAMTAF TRIAL). Circ Arrhythm Electrophysiol 2014.

53. Hunter RJ. Point by Point RF Ablation Versus the Cryoballoon or a Novel Combined Approach: a RTC Comparing Three Methods of PVI for Paroxysmal AF (The Cryo versus RF Trial). Paper presented at: Heart Rhythm Society2014; San Francisco, CA.
54. Hussein AA, Saliba WI, Martin DO et al. Natural history and long-term outcomes of ablated atrial fibrillation. Circ Arrhythm Electrophysiol 2011; 4(3):271-8.
55. Jais P, Cauchemez B, Macle L et al. Catheter ablation versus antiarrhythmic drugs for atrial fibrillation: the A4 study. Circulation 2008; 118(24):2498-505.
56. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol. Dec 02 2014; 64(21):e1-76.
57. January CT, Wann LS, Calkins H, et al. 2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. J Am Coll Cardiol. Jul 09 2019; 74(1): 104-132.
58. Jones DG, Haldar SK, Hussain W et al. A randomized trial to assess catheter ablation versus rate control in the management of persistent atrial fibrillation in heart failure. J. Am. Coll. Cardiol. 2013; 61(18):1894-903.
59. Jourda F, Providencia R, Marijon E, et al. Contact-force guided radiofrequency vs. second-generation balloon cryotherapy for pulmonary vein isolation in patients with paroxysmal atrial fibrillation-a prospective evaluation. Europace. Feb 2015; 17(2):225-231.
60. Joy PS, Gopinathannair R, Olshansky B. Effect of ablation for atrial fibrillation on heart failure readmission rates. Am J Cardiol. Nov 1 2017;120(9):1572-1577.
61. Julia J, Chierchia GB, de Asmundis C, et al. Regular atrial tachycardias following pulmonary vein isolation for paroxysmal atrial fibrillation: a retrospective comparison between the cryoballoon and conventional focal tip radiofrequency techniques. J Interv Card Electrophysiol. Mar 2015; 42(2):161-169.
62. Katritsis DG, et al. Ablation of superior pulmonary veins compared to ablation of all four pulmonary veins: A randomized clinical trial. Journal of Cardiovascular Electrophysiology, June 2004, Vol. 15, No. 6, pp. 641-645.
63. Kay GN, Ellenbogen KA, Giudici M et al. The Ablate and Pace Trial: a prospective study of catheter ablation of the AV conduction system and permanent pacemaker implantation for treatment of atrial fibrillation. APT Investigators. J. Interv. Card. Electrophysiol. 1998; 2(2):121-35.
64. Khan MN, Jais P, Cummings J et al. Pulmonary-vein isolation for atrial fibrillation in patients with heart failure. N Engl J Med 2008; 359(17):1778-85.
65. Kirchhof P, Benussi S, Kotecha D, et al. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Europace. Nov 2016; 18(11):1609-1678.
66. Koch L, Haeusler KG, Herm J et al. Mesh ablator vs. cryoballoon pulmonary vein ablation of symptomatic paroxysmal atrial fibrillation: results of the MACPAF study. Europace 2012; 14(10):1441-9.
67. Kojodjojo P, O'Neill MD, Lim PB, Malcolm-Lawes L, et al. Pulmonary venous isolation by antral ablation with a large cryoballoon for treatment of paroxysmal and persistent atrial

fibrillation: medium-term outcomes and non-randomized comparison with pulmonary venous isolation by radiofrequency ablation. Heart 2010; 96:1379-84.
68. Krittayaphong R, Raungrattanaamporn O, Bhuripanyo K et al. A randomized clinical trial of the efficacy of radiofrequency catheter ablation and amiodarone in the treatment of symptomatic atrial fibrillation. J Med Assoc Thai 2003; 86 Suppl 1:S8-16.
69. Kuck KH, Brugada J, Furnkranz A, et al. Cryoballoon or radiofrequency ablation for paroxysmal atrial fibrillation. N Engl J Med. Jun 09 2016; 374(23):2235-2245.
70. Kuck KH, Furnkranz A, Chun KR, et al. Cryoballoon or radiofrequency ablation for symptomatic paroxysmal atrial fibrillation: reintervention, rehospitalization, and quality-of-life outcomes in the FIRE AND ICE trial. Eur Heart J. Oct 07 2016; 37(38):2858-2865.
71. Kuck KH, Merkely B, Zahn R, et al. Catheter Ablation Versus Best Medical Therapy in Patients With Persistent Atrial Fibrillation and Congestive Heart Failure: The Randomized AMICA Trial. Circ Arrhythm Electrophysiol. Dec 2019; 12(12): e007731.
72. Lakhani M, Saiful F, Parikh V, et al. Recordings of diaphragmatic electromyograms during cryoballoon ablation for atrial fibrillation accurately predict phrenic nerve injury. Heart Rhythm. Mar 2014; 11(3):369-374.
73. Lee MA, et al. The effect of atrial pacing therapies on atrial tachyarrhythmia burden and frequency. JACC, June 2003, Vol. 41, No. 11, pp. 1926-1932.
74. Lellouche N, Jais P, Nault I et al. Early recurrences after atrial fibrillation ablation: prognostic value and effect of early reablation. J Cardiovasc Electrophysiol 2008; 19(6):599-605.
75. Linhart M, Bellmann B, Mittmann-Braun E et al. Comparison of cryoballoon and radiofrequency ablation of pulmonary veins in 40 patients with paroxysmal atrial fibrillation: a case-control study. J. Cardiovasc. Electrophysiol. 2009; 20(12):1343-8.
76. Linhart M, Nielson A, Andrie RP, et al. Fluoroscopy of spontaneous breathing is more sensitive than phrenic nerve stimulation for detection of right phrenic nerve injury during cryoballoon ablation of atrial fibrillation. J Cardiovasc Electrophysiol. Aug 2014; 25(8):859-865.
77. Liu XH, Chen CF, Gao XF, et al. Safety and efficacy of different catheter ablations for atrial fibrillation: a systematic review and meta-analysis. Pacing Clin Electrophysiol. Aug 2016; 39(8):883-899.
78. Luik A, Merkel M, Hoeren D et al. Rationale and design of the FreezeAF trial: a randomized controlled noninferiority trial comparing isolation of the pulmonary veins with the cryoballoon catheter versus open irrigated radiofrequency ablation in patients with paroxysmal atrial fibrillation. Am. Heart J. 2010; 159(4):555-60 e1.
79. Luik A, Radzewitz A, Kieser M, et al. Cryoballoon versus open irrigated radiofrequency ablation in patients with paroxysmal atrial fibrillation: the prospective, randomized, controlled, noninferiority FreezeAF study. Circulation. Oct 6 2015; 132(14):1311-1319.
80. Malmborg H, Lonnerholm S, Blomstrom P et al. Ablation of atrial fibrillation with cryoballoon or duty-cycled radiofrequency pulmonary vein ablation catheter: a randomized controlled study comparing the clinical outcome and safety; the AF-COR study. Europace 2013; 15(11):1567-73.
81. Mansour M, et al. Efficacy and safety of segmental ostial versus circumferential extra—Ostial pulmonary vein isolation for atrial fibrillation. Journal of Cardiovascular Electrophysiology, May 2004, Vol. 15, No. 5, pp. 532-537.

82. Mark DB, Anstrom KJ, Sheng S, et al. Effect of catheter ablation vs medical therapy on quality of life among patients with atrial fibrillation: the CABANA randomized clinical trial. JAMA. 2019;Epub ahead of print.
83. Marrouche NF, Brachmann J, Andresen D, et al. Catheter ablation for atrial fibrillation with heart failure. *N Engl J Med.* Feb 1 2018;378(5):417-427
84. Mont L, Bisbal F, Hernandez-Madrid A et al. Catheter ablation vs. antiarrhythmic drug treatment of persistent atrial fibrillation: a multicentre, randomized, controlled trial (SARA study). Eur. Heart J. 2013.
85. Mont L, Bisbal F, Hernandez-Madrid A, et al. Catheter ablation vs. antiarrhythmic drug treatment of persistent atrial fibrillation: a multicentre, randomized, controlled trial (SARA study). Eur Heart J. Feb 2014; 35(8):501-507.
86. Morillo CA, Verma A, Connolly SJ, et al. Radiofrequency ablation vs antiarrhythmic drugs as first-line treatment of paroxysmal atrial fibrillation (RAAFT-2): a randomized trial. JAMA. Feb 19 2014; 311(7):692-700.
87. Morillo CA, Verma A, Connolly SJ, et al. Radiofrequency ablation vs antiarrhythmic drugs as first-line treatment of paroxysmal atrial fibrillation (RAAFT-2): a randomized trial. JAMA. Feb 19 2014; 311(7):692-700.
88. Nair GM, Nery PB, Diwakaramenon S et al. A Systematic Review of Randomized Trials Comparing Radiofrequency Ablation with Antiarrhythmic Medications in Patients with Atrial Fibrillation. J. Cardiovasc. Electrophysiol. 2009; 20(2):138-44.
89. Nakamura K, Naito S, Sasaki T, et al. Randomized comparison of contact force-guided versus conventional circumferential pulmonary vein isolation of atrial fibrillation: prevalence, characteristics, and predictors of electrical reconnections and clinical outcomes. J Interv Card Electrophysiol. Dec 2015; 44(3):235-245.
90. Neumann T, Vogt J, Schumacher B, et al. Circumferential pulmonary vein isolation with the cryoballoon technique results from a prospective 3-center study. J Am Coll Cardiol. Jul 22 2008; 52(4):273-278.
91. Neumann T, Wojcik M, Berkowitsch A et al. Cryoballoon ablation of paroxysmal atrial fibrillation: 5-year outcome after single procedure and predictors of success. Europace 2013; 15(8):1143-9.
92. Nielsen JC, Johannessen A, Raatikainen P, et al. Long-term efficacy of catheter ablation as first-line therapy for paroxysmal atrial fibrillation: 5-year outcome in a randomised clinical trial. Heart. Mar 2017; 103(5):368-376.
93. Noheria A, Kumar A, Wylie JV, Jr. et al. Catheter ablation vs antiarrhythmic drug therapy for atrial fibrillation: a systematic review. Arch Intern Med 2008; 168(6):581-6.
94. Nyong J, Amit G, Adler AJ, et al. Efficacy and safety of ablation for people with non-paroxysmal atrial fibrillation. Cochrane Database Syst Rev. Nov 22 2016; 11:CD012088.
95. Oral H, et al. Catheter ablation for paroxysmal atrial fibrillation: Segmental pulmonary vein ostial ablation versus left atrial ablation. Circulation 2003; 108: 2355-2360.
96. Oral H, et al. Pulmonary vein isolation for paroxysmal and persistent atrial fibrillation. Circulation, March 2002; 105: 1077-1081.
97. Oral H, et al. A tailored approach to catheter ablation of paroxysmal atrial fibrillation. Circulation 2006; 113: 1824-1831.
98. Oral H, Pappone C, Chugh A et al. Circumferential pulmonary-vein ablation for chronic atrial fibrillation. N Engl J Med 2006; 354(9):934-41.

99. Packer DL, Kowal RC, Wheelan KR et al. Cryoballoon ablation of pulmonary veins for paroxysmal atrial fibrillation: first results of the North American Arctic Front (STOP AF) pivotal trial. J. Am. Coll. Cardiol. 2013; 61(16):1713-23.
100. Packer DL, Mark DB, Robb RA, et al. Effect of catheter ablation vs antiarrhythmic drug therapy on mortality, stroke, bleeding, and cardiac arrest among patients with atrial fibrillation: the CABANA randomized clinical trial. JAMA. 2019;Epub ahead of print.
101. Pappone C, Augello G, Sala S et al. A randomized trial of circumferential pulmonary vein ablation versus antiarrhythmic drug therapy in paroxysmal atrial fibrillation: the APAF Study. J Am Coll Cardiol 2006; 48(11):2340-7.
102. Pappone C, et al. Pulmonary vein denervation enhances long-term benefit after circumferential ablation for paroxysmal atrial fibrillation. Circulation, January 2004; 109: 327-334.
103. Pappone G, et al. Mortality, morbidity, and quality of life after circumferential pulmonary vein ablation for atrial fibrillation. JACC, July 2003, Vol. 42, No. 2, pp. 185-197.
104. Paylos JM, Hoyt RH, Ferrero C et al. Complete pulmonary vein isolation using balloon cryoablation in patients with paroxysmal atrial fibrillation. Rev. Esp. Cardiol. 2009; 62(11):1326-31.
105. Paylos JM, Hoyt RH, Ferrero C, et al. Complete pulmonary vein isolation using balloon cryoablation in patients with paroxysmal atrial fibrillation. Rev Esp Cardiol. Nov 2009; 62(11):1326-1331.
106. Pokushalov E, Romanov A, De Melis M et al. Progression of atrial fibrillation after a failed initial ablation procedure in patients with paroxysmal atrial fibrillation: a randomized comparison of drug therapy versus reablation. Circ Arrhythm Electrophysiol 2013; 6(4):754-60.
107. Providencia R, Lambiase PD, Srinivasan N, et al. Is there still a role for complex fractionated atrial electrogram ablation in addition to pulmonary vein isolation in patients with paroxysmal and persistent atrial fibrillation? Meta-analysis of 1415 patients. Circ Arrhythm Electrophysiol. Oct 2015; 8(5):1017-1029.
108. Reddy VY, Dukkipati SR, Neuzil P, et al. Randomized, controlled trial of the safety and effectiveness of a contact force-sensing irrigated catheter for ablation of paroxysmal atrial fibrillation: results of the TactiCath Contact Force Ablation Catheter Study for Atrial Fibrillation (TOCCASTAR) study. Circulation. Sep 8 2015; 132(10):907-915.
109. Saad E, et al. Pulmonary vein stenosis after radiofrequency ablation of atrial fibrillation: Functional characterization, evolution, and influence of the ablation strategy. Circulation, December 2003; 108: 3102-3107.
110. Sawhney N, Anousheh R, Chen WC et al. Five-year outcomes after segmental pulmonary vein isolation for paroxysmal atrial fibrillation. Am J Cardiol 2009; 104(3):366-72.
111. Schmidt B, Neuzil P, Luik A, et al. Laser balloon or wide-area circumferential irrigated radiofrequency ablation for persistent atrial fibrillation: a multicenter prospective randomized study. Circ Arrhythm Electrophysiol. Dec 2017;10(12).
112. Schmidt M, Dorwarth U, Andresen D et al. Cryoballoon versus RF Ablation in Paroxysmal Atrial Fibrillation: Results from the German Ablation Registry. J. Cardiovasc. Electrophysiol. 2014; 25(1):1-7.
113. Schmidt M, Dorwarth U, Andresen D, et al. German ablation registry: Cryoballoon vs radiofrequency ablation in paroxysmal atrial fibrillation-One-year outcome data. Heart Rhythm. Apr 2016; 13(4):836-844.

114. Scott PA, Silberbauer J, Murgatroyd FD. The impact of adjunctive complex fractionated atrial electrogram ablation and linear lesions on outcomes in persistent atrial fibrillation: a meta-analysis. Europace. Mar 2016; 18(3):359-367.
115. Shah RU, Freeman JV, Shilane D et al. Procedural complications, rehospitalizations, and repeat procedures after catheter ablation for atrial fibrillation. J Am Coll Cardiol 2012; 59(2):143-9.
116. Shemin RJ, Cox JL, Gillinov AM et al. Guidelines for reporting data and outcomes for the surgical treatment of atrial fibrillation. Ann Thorac Surg 2007; 83(3):1225-30.
117. Shi LZ, Heng R, Liu SM, et al. Effect of catheter ablation versus antiarrhythmic drugs on atrial fibrillation: A meta-analysis of randomized controlled trials. Exp Ther Med. Aug 2015; 10(2):816-822.
118. Snow V, Weiss KB, LeFevre M et al. Management of newly detected atrial fibrillation: a clinical practice guideline from the American Academy of Family Physicians and the American College of Physicians. Ann Intern Med 2003; 139(12):1009-17.
119. Squara F, Zhao A, Marijon E, et al. Comparison between radiofrequency with contact force-sensing and second-generation cryoballoon for paroxysmal atrial fibrillation catheter ablation: a multicentre European evaluation. Europace. May 2015; 17(5):718-724.
120. Stabile G, Bertaglia E, Senatore G et al. Catheter ablation treatment in patients with drug-refractory atrial fibrillation: a prospective, multi-centre, randomized, controlled study (Catheter Ablation For The Cure Of Atrial Fibrillation Study). Eur Heart J 2006; 27(2):216-21.
121. Stabile G, et al. Is pulmonary vein isolation necessary for curing atrial fibrillation? Circulation, August 2003; 108: 657-660.
122. Su W, Orme GJ, Hoyt R, et al. Retrospective review of Arctic Front Advance Cryoballoon Ablation: a multicenter examination of second-generation cryoballoon (RADICOOL trial). J Interv Card Electrophysiol. Apr 2018;51(3):199-204.
123. Takigawa M, Takahashi A, Kuwahara T, et al. Long-term follow-up after catheter ablation of paroxysmal atrial fibrillation: the incidence of recurrence and progression of atrial fibrillation. Circ Arrhythm Electrophysiol. Apr 2014; 7(2):267-273.
124. Teunissen C, Kassenberg W, van der Heijden JF, et al. Five-year efficacy of pulmonary vein antrum isolation as a primary ablation strategy for atrial fibrillation: a single-centre cohort study. Europace. Feb 2 2016.
125. Theis C, Konrad T, Mollnau H, et al. Arrhythmia termination versus elimination of dormant pulmonary vein conduction as a procedural end point of catheter ablation for paroxysmal atrial fibrillation: a prospective randomized trial. Circ Arrhythm Electrophysiol. Oct 2015; 8(5):1080-1087.
126. Tzou WS, Marchlinski FE, Zado ES et al. Long-term outcome after successful catheter ablation of atrial fibrillation. Circ Arrhythm Electrophysiol 2010; 3(3):237-42.
127. Vaidya K, Arnott C, Russell A, et al. Pulmonary Vein Isolation Compared to Rate Control in Patients with Atrial Fibrillation: A Systematic Review and Meta-analysis. Heart Lung Circ. Aug 2015; 24(8):744-752.
128. Van Belle Y, Janse P, theuns D, et al. One year follow-up after cryoballoon isolation of the pulmonary veins in patients with paroxysmal atrial fibrillation. Europase 2008; 10:1270-6.
129. Van Gelder I, et al. A comparison of rate control and rhythm control in patients with recurrent persistent atrial fibrillation. NEJM, December 2002, Vol. 347, No. 23.

130. Verma A, Jiang CY, Betts TR, et al. Approaches to catheter ablation for persistent atrial fibrillation. N Engl J Med. May 7 2015; 372(19):1812-1822.
131. Vogt J, Heintze J, Gutleben KJ et al. Long-term outcomes after cryoballoon pulmonary vein isolation: results from a prospective study in 605 patients. J. Am. Coll. Cardiol. 2013; 61(16):1707-12.
132. Waldo AL, Wilber DJ, Marchlinski FE et al. Safety of the open-irrigated ablation catheter for radiofrequency ablation: safety analysis from six clinical studies. Pacing Clin. Electrophysiol. 2012; 35(9):1081-9.
133. Wasserlauf J, Pelchovitz DJ, Rhyner J, et al. Cryoballoon versus radiofrequency catheter ablation for paroxysmal atrial fibrillation. Pacing Clin Electrophysiol. Apr 2015; 38(4):483-489.
134. Wazni OM, et al. Circumferential pulmonary-vein ablation for atrial fibrillation. NEJM, May 2006, Vol. 354, No. 21, pp. 2289-2291.
135. Wazni OM, et al. Radiofrequency ablation vs. antiarrhythmic drugs as first-line treatment of symptomatic atrial fibrillation: A randomized trial. JAMA, June 2005; 293(21): 2634-2640.
136. Wazni OM, Marrouche NF, Martin DO et al. Radiofrequency ablation vs antiarrhythmic drugs as first-line treatment of symptomatic atrial fibrillation: a randomized trial. JAMA 2005; 293(21):2634-40.
137. Weerasooriya R, Khairy P, Litalien J et al. Catheter ablation for atrial fibrillation: are results maintained at 5 years of follow-up? J Am Coll Cardiol 2011; 57(2):160-6.
138. Wilber DJ, Pappone C, Neuzil P et al. Comparison of antiarrhythmic drug therapy and radiofrequency catheter ablation in patients with paroxysmal atrial fibrillation: a randomized controlled trial. JAMA 2010; 303(4):333-40.
139. Wood MA and Ellenbogen KA. Catheter ablation of chronic atrial fibrillation—the gap between promise and practice. NEJM, March 2006; 354: 967-969.
140. Wyse DG, Waldo AL, DiMarco JP et al. A comparison of rate control and rhythm control in patients with atrial fibrillation. N Engl J Med 2002; 347(23):1825-33.
141. Xu J, Huang Y, Cai H, et al. Is cryoballoon ablation preferable to radiofrequency ablation for treatment of atrial fibrillation by pulmonary vein isolation? A meta-analysis. PLoS One. 2014; 9(2):e90323.
142. Zhu M, Zhou X, Cai H, et al. Catheter ablation versus medical rate control for persistent atrial fibrillation in patients with heart failure: A PRISMA-compliant systematic review and meta-analysis of randomized controlled trials. Medicine (Baltimore). Jul 2016; 95(30):e4377.
143. Zhuang Y, Yong YH, Chen ML. Updating the evidence for the effect of radiofrequency catheter ablation on left atrial volume and function in patients with atrial fibrillation: a meta-analysis. JRSM Open. Mar 2014; 5(3):2054270414521185.

POLICY HISTORY:

Adopted for Blue Advantage, January 2007
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