APPENDIX to T-Wave Alternans Policy

Prior Authorization Requirements

This service (or procedure) is considered **investigational** in all instances. If you would like to submit additional information please forward to the Prior Authorization Department.

Within five days before the actual date of service, the Provider MUST confirm with Blue Shield of California / Blue Shield of California Life & Health Insurance Company (Blue Shield) that the member's health plan coverage is still in effect. Blue Shield reserves the right to revoke an authorization prior to services being rendered based on cancellation of the member's eligibility. Final determination of benefits will be made after review of the claim for limitations or exclusions.

Questions regarding the applicability of this policy should also be directed to the Prior Authorization Department. Please call 1-800-541-6652 or visit the Provider Portal www.blueshieldca.com/provider.

Evidence Basis for the Policy

Rationale

Microvolt T-wave alternans (MTWA) refers to a beat-to-beat variability in the T-wave amplitude. Because a routine electrocardiogram (EKG) cannot detect these small fluctuations, this test requires specialized sensors to detect the fluctuations and computer algorithms to evaluate the results. T-wave alternans is a provocative test that requires gradual elevation of the heart rate to above 110 beats per minute. The test can be performed in conjunction with an exercise tolerance stress test. Test results are reported as the number of standard deviations by which the peak signal of the T-wave exceeds the background noise. This number is referred to as the "alternans ratio." An alternans ratio of 3 or greater is typically considered a positive result, an absent alternans ratio is considered a negative result, and anything in between is considered indeterminate.

There are several devices and processing software that have received U.S. Food and Drug Administration (FDA) 510(k) clearance for the recording and measurement of MTWA, including the HearTwave® II Microvolt T-Wave Alternans System™ and the CH 2000 Cardiac Diagnostic System™ (Cambridge Heart, Inc., Tewksbury, MA).

Sudden cardiac death is a major public health problem in the United States, accounting for 310,000 to 462,000 deaths annually (Hayes Inc., 2009). The presence of T-wave alternans has been investigated as a risk factor for fatal arrhythmias and sudden cardiac death in patients with a history of myocardial infarction (MI), congestive heart failure, or cardiomyopathy. High-risk

patients may be treated with drugs to suppress the emergence of arrhythmias or undergo implantation of cardiac defibrillators to terminate tachyarrhythmias when they occur. Since sudden cardiac death is one of the most common causes of death after a MI or in patients with dilated cardiomyopathy, there is substantial interest in risk stratification to target therapy.

Patient groups are categorized into those who have not experienced a life-threatening arrhythmia (i.e., primary prevention) and those who have (i.e., secondary prevention). Those who have already experienced an arrhythmia are already at high risk and probably do not require testing. The presence of T-wave alternans is one of many risk factors that have been investigated for identifying candidates for primary prevention. Other risk factors include left ventricular ejection fraction (LVEF), arrhythmias detected on Holter monitor or electrophysiology studies (EPSs), heart rate variability, baroreceptor sensitivity, and signal-averaged electrocardiography (SAECG). Signal-averaged electrocardiography is another technique for risk stratification. This technique measures beat-averaged conduction, while T-wave alternans measures beat-to-beat variability.

Microvolt T-wave alternans testing is one of a host of non-invasive tests proposed as a risk stratification tool for patients eligible for implantable cardioverter defibrillator (ICD) placement, and accordingly MTWA may be used in conjunction with other non-invasive tests. T-wave alternans has also been investigated as a diagnostic test for patients with syncope of unknown origin and as a non-invasive test to identify candidates for further invasive EPS testing.

Prognostic or risk stratification test evaluation consists of:

- Appraising test technical performance, including definitions of positive and negative results and reproducibility of the test
- Determining how accurately the test discriminates patients who will, from those who will not experience the event of interest
- Evaluating the impact of test result on clinical management of the patient and a determination whether changes in clinical management result in an improvement of overall health outcomes

Primary prevention ICD trials (e.g., MADIT-II and SCD-HeFT) have changed the perspective on selection and risk stratification for use of ICDs (Moss et al., 2002). In the MADIT-II trial, ICDs were shown to be effective in patients selected on the basis of prior MI and reduced ejection fraction; SCD-HeFT inclusion criteria required reduced ejection fraction but not previous MI. Prior studies of ICDs had selected patients using results of electrophysiologic testing and symptoms (Buxton et al., 1999; Moss et al., 1996). Given results from these trials, it is critical whether any additional risk stratification tool(s) can identify with sufficient accuracy patients who might or might not benefit from ICD implantation. For example, can T-wave alternans testing identify patients who would otherwise be appropriate for an ICD based on trial inclusion criteria, but who would actually not benefit from an ICD (See Blue Shield Medical Policy: Implantable Cardioverter Defibrillators).

The rationale for T-wave alternans testing is primarily that patients with a negative result will not benefit from an ICD. Accordingly, the most convincing evidence would be obtained from a randomized trial restricted to alternans-negative patients. Such a trial is lacking. Evidence from prospective cohort studies can accurately define the predictive ability of MTWA for sudden

cardiac death. This evidence on risk may impact clinical management, if there are well-defined levels of risk that are linked to different management strategies.

Literature Review

Blue Cross Blue Shield Association (BCBSA) Technology Evaluation Center (TEC) Assessments

A June 2005 TEC Assessment evaluated the use of MTWA to risk stratify patients in whom ICDs would be used for primary prevention of sudden cardiac death. The Assessment identified 18 studies using MTWA to prospectively stratify the risk of a subsequent event (total n=2,931). Most studies interpreted MTWA blinded to other information. The incidence of endpoints (either ventricular tachyarrhythmic events [VTEs] or death) ranged from 3% to 51% across studies. Six studies included patients with ischemic cardiomyopathy, four non-ischemic cardiomyopathy, and eight patients selected by a variety of means, such as those referred for electrophysiologic testing.

Two patient indications were considered: 1) patients eligible for ICD placement for primary prevention of sudden death, and 2) patients not eligible for ICD placement. It is possible that the negative or positive predictive value (NPV, PPV) of MTWA results might be used to support decision making regarding ICD placement. Specifically, for the first patient indication, negative MTWA results might be used to identify a subset of patients at low likelihood of subsequent VTEs and thus unlikely to benefit from ICD placement. While a few studies found that MTWA testing had high sensitivity and high NPV for future VTE, there was considerable variation in diagnostic performance in the published literature. Reported sensitivities ranged from 75% to 100%, NPVs from 73% to 100%, and likelihood ratios for a negative test result varied between 0 and 0.42. The reasons for variation in diagnostic performance characteristics are not well-established (recently suggested related to varied use of beta blockers during testing (Chan et al., 2010) as later discussed). Differences in pretest risk of VTE would most influence NPV; however, the Assessment also noted that it would also be important to understand whether MTWA diagnostic performance might vary according to population characteristics, such as etiology of cardiomyopathy. The diagnostic characteristics derived from the studies evaluated may not directly apply to patients eligible for ICD therapy.

The 2005 TEC Assessment concluded the evidence insufficient to determine whether the use of MTWA leads to improved net health outcomes or whether it is as beneficial as any established alternatives. Therefore, the use of MTWA testing for risk stratifying patients being considered for ICD therapy for primary prevention of sudden death did not meet the TEC criteria.

A 2006 TEC Assessment reviewed a smaller number of studies addressing the question of whether MTWA can identify patients who would otherwise meet clinical indications for ICDs but whose risk of death is so low that they would not benefit. The critical evidence sought was the absolute risk of VTE or sudden death in those patients who have a negative MTWA test, and whether it can be determined whether this risk is consistent with no potential benefit from ICD therapy. Three studies were reviewed restricting analyses to patients who met criteria for ICD therapy.

Bloomfield et al. (2004) followed 177 patients over an average of 20 months for all-cause mortality. Hohnloser et al. (2003) selected ICD-eligible patients from two previously published

studies and followed them over 2 years for sudden cardiac death or cardiac arrest. Among those with a negative MTWA test, the actuarial 2-year mortality rate was 3.8%. For those with a non-negative MTWA test, the actuarial 2-year mortality rate was 17.8%. Arrhythmic outcomes were not reported in this study.

In Hohnloser et al. (2003), patients who met MADIT-II criteria were pooled from two previously published studies. The study reported all-cause mortality, rates of sudden cardiac death or cardiac arrest, and rates of VTE. For all-cause mortality estimated at 2 years, those with negative MTWA tests had a mortality rate of 12.5%, whereas those with non-negative MTWA tests had a mortality rate of 21.4%. For the primary outcome of sudden death or cardiac arrest, patients with negative MTWA tests had a 0% rate, and those with non-negative MTWA tests had a 15.6% rate. For the secondary outcome of all ventricular arrhythmic events, those with a negative MTWA test had a 5.7% rate, and those with non-negative tests had a 31.1% rate.

In Chow et al. (2006), a total of 768 consecutive patients with ischemic cardiomyopathy (LVEF<35%) and no prior history of ventricular arrhythmia were followed up for a mean of 18 months. Because event rates in the patients with and without ICDs are not comparable, only outcomes for the 376 patients who received only medical therapy were reported in the TEC Assessment. Thus the results might be accompanied by potential selection bias. It appeared that the MTWA-negative patients who did not receive ICDs compared to the MTWA-negative patients who did receive ICDs had less severe heart failure (mean LVEF: 29.3% vs. 26.9%, respectively). At 18 months' mean follow-up, the all-cause mortality rate was 8.4% in MTWA-negative patients and 21.8% in MTWA non-negative patients. For arrhythmic deaths, the rate was 3.4% in MTWA-negative patients and 11.2% in MTWA non-negative patients.

The 2006 TEC Assessment concluded that although MTWA does stratify risk in ICD-eligible patients, evidence of sufficient accuracy to infer clinical utility was lacking. A modeling study by Chan et al. (2006) assumed a 2.7% annual sudden death rate among MTWA-negative patients and calculated that patients would still benefit from ICD therapy. Although modeling is not definitive, the study suggests that even the lower risk of arrhythmia in MTWA-negative patients is not low enough to preclude some benefit from ICD therapy.

Other Systematic Reviews

In 2009, a Hayes Inc. Technology Assessment reviewed 23 studies involving 9002 patients with idiopathic dilated cardiomyopathy, non-ischemic dilated cardiomyopathy, hypertrophic cardiomyopathy, hypertensive heart disease, valvular heart disease, prior or acute myocardial infarction, coronary artery disease, symptomatic or congestive heart failure, or ischemic cardiomyopathy. The study concluded there was some proven benefit of MTWA testing with standard criteria for the above mentioned patients who were at risk for sudden cardiac death and met criteria for ICD placement when used as a replacement for an invasive EPS to assist in avoiding ICD insertion in patients with negative MTWA results. However, the authors also advised that further research was required to fully clarify clinical indications, contraindications, treatment parameters, and/or impact on health outcomes. Further, there was insufficient evidence to advise MTWA testing for adult patients with Brugada syndrome (long QT syndrome), pediatric patients with heart disease, standard MTWA testing with non-standard criteria, and

ambulatory MTWA testing. Annual reviews by Hayes through September of 2013 did not change these conclusions.

Results from two meta-analyses (Calo et al., 2011; Chan et al., 2010) suggest that some discrepancies in prior study results can be explained by lower predictive performance of MTWA in studies where beta-blockers were withheld prior to testing. The subgroup finding, although plausible, requires confirmation. Merchant et al. (2012) conducted a patient-level analysis identifying studies enrolling more than 100 patients studied by the spectral method. Studies with 15% or more patients having ICDs were excluded, as were those in which 15% or more of the arrhythmic outcomes were attributed to appropriate ICD therapy. Studies (n=2) using older protocol and instruments were also excluded. Of 17 identified studies, 5 met inclusion criteria. Patients with ICDs were excluded from the final analysis, yielding a sample of 2,883. Among patients with LVEF <35% (n=1,004) and negative MTWA testing, the annual sudden cardiac death rate was 0.9% versus 4.0% and 4.6% in the positive and indeterminate groups. The report did not state whether all selection criteria were established a priori. In addition, no sensitivity analyses were reported accounting for excluded patients and studies. Gupta et al. (2012) performed a study-level meta-analysis including 20 prospective cohort studies collectively enrolling 5,945 patients with MTWA obtained by the spectral method. They estimated that a negative MTWA decreased the annual fatal and non-fatal VTE rate from 5.9% to 2.6% in SCD-HeFT-like patients, and from 8.9% to 6.4% in MADIT-II-like patients. The authors concluded that spectral MTWA testing would not “sufficiently modify the risk of VTE to change clinical decisions.”

Prospective Cohort Studies

Since the 2006 TEC Assessment, results from five multicenter studies provide the most informative evidence regarding the potential clinical utility of MTWA for risk stratification prior to ICD placement.

Between June 2001 and July 2004, the T-Wave Alternans in Patients with Heart Failure (ALPHA) registry enrolled 446 patients with New York Heart Association (NYHA) class II and III heart failure and LVEF equal to or less than 40% from 9 centers across Italy (Salerno-Uriarte et al., 2007). Heart failure etiologies included idiopathic dilated cardiomyopathy (n=326), hypertensive cardiomyopathy (n=72), valvular causes (n=9), and others (n=39). The primary endpoint was a composite of cardiac death and life-threatening ventricular arrhythmias. Mean patient age was 59 (SD=12.5) years; 78% were male; and median follow-up was 19 months. MTWA results were negative in 34.6%, non-negative in 65.4% (44.8% positive, 20.6% indeterminate). The primary endpoint occurred in 29 (9.9%) of 292 with non-negative results, compared to 4 (2.6%) of 154 in the negative group. A survival model attempting to adjust for between-group differences in prognostic factors yielded a relative hazard of 4.0 (95% confidence interval [CI]: 1.2 to 13.3). The test's NPV through 18-months' follow-up was 97.3% (95% CI: 95.4 to 99.8%). Thirty-three patients with non-negative and 6 with negative results received ICDs. Sensitivity analyses accounting for the impact of ICD implantation on differential event occurrence yielded similar results-those with ICDs had more events recorded. These findings are consistent with most prior observational research finding negative MTWA results associated with fewer arrhythmic outcomes in nonischemic cardiomyopathy. Limitations of the study include lack of a randomized comparison or using MTWA results to direct ICD placement, and

between-group differences in prognostic factors including age, LVEF, use of angiotensin-converting enzyme (ACE) inhibitors and digitalis, and QRS duration. Although the investigators attempted to control for imbalances, the number of events (n=33) was insufficient to obtain valid estimates while accounting for more than a single prognostic factor or variable reflected in the wide confidence intervals. Furthermore, ICD placement is not indicated for primary prevention among individuals with LVEF greater than 35%. For these reasons, there is substantial uncertainty accompanying the results and few conclusions can be drawn.

The Alternans Before Cardioverter Defibrillator (ABCD) (Costantini et al., 2009) cohort study enrolled primary prevention candidates for ICD implantation (sponsored by St. Jude Medical and Cambridge Heart). All patients underwent MTWA and an EPS. The primary goal was to demonstrate non-inferiority of MTWA EPS testing in selecting primary prevention patients for ICD implantation; that the PPV and NPV of MTWA would be not worse than 10% of EPS PPV and NPV. A total of 629 participants were enrolled at 43 centers in the United States, Germany, and Israel with ischemic cardiomyopathy, ejection fraction less than 40%, and no history of cardiac arrhythmia (a primary prevention sample). Due to protocol violations, 63 participants were excluded, yielding an analytic sample of 566. Following EPS and MTWA testing, ICDs were implanted if results were positive for either test. When both tests were negative, ICD placement was left to the discretion of the treating physician; 70% of this group received ICDs. Patients were followed up a median of 1.9 years. The primary outcome was a composite of appropriate ICD therapy (n=55) or arrhythmic death (n=10). Electrophysiological testing was positive in 39% and negative in 61%. For MTWA results, a “MTWA strategy” was defined whereby patients with indeterminate tests were subsequently judged positive or negative based on the EPS result. These “strategies” had similar positive and negative predictive values for the composite outcome at 1 year (MTWA strategy: PPV 9%, NPV 95%; EPS: PPV 11%, NPV 96%). The results raise a number of issues. First, current evidence does not warrant ICD for primary prevention in patients with ejection fractions of 35% to 40%. Second, predictive values for MTWA reported were not independent of EPS results; those with indeterminate MTWA results were classified according to EPS results. Patients receiving ICDs for primary prevention would, however, not undergo EPS testing. Additionally, in the 30% of the MTWA-negative patients not receiving ICDs, the diagnosis of arrhythmic events was likely underestimated due to lack of electrogram recording. Finally, in some cases, approximately 50% of “appropriate” ICD shocks may be unnecessary, as many arrhythmias terminate spontaneously (Ellenbogen et al., 2006). While of interest, the study does not inform questions regarding the clinical utility of MTWA testing.

Microvolt T-Wave Alternans Testing for Risk Stratification of Post-MI Patients (MASTER I) (Chow et al., 2008a) was designed to determine whether MTWA predicted life-threatening ventricular tachyarrhythmic events (LTVTEs) in MADIT-II type patients (LVEF <30% post-MI) treated with an ICD. Patients were enrolled at 50 centers across the United States (n=575); mean age was 65 years (SD=11), 84% were male, and average follow-up was 2.1 (SD=0.9) years. The MTWA results were non-negative in 63% (51% positive and 12% indeterminate); initially indeterminate tests were repeated. All patients received ICDs. In MTWA non-negative and negative patients, LTVTE occurred at annual rates of 6.3% and 5.0%, respectively; a non-negative MTWA result was not significantly associated with LTVTE. Although mean follow-up exceeded 2 years, there were few (n=7, 1.2%) arrhythmic deaths. In contrast, the 2-year sudden

cardiac death rate in the MADIT-II ICD arm was 4.9% (Greenberg et al., 2004). Reasons for this difference are not clear but could reflect improved medical care, better defibrillator technology and programming, or patient selection. Finally, some critique use of LTVTE as an endpoint, as not all will result in sudden cardiac death if left untreated. However, to alter these results would require differential rates of spontaneous termination in MTWA-negative and MTWA-positive patients. Currently no evidence supports that suggestion.

The companion MASTER II results were presented at a late-breaking session of the 2008 American College of Cardiology (ACC) meeting and remain only in abstract form (Chow et al., 2008b). The study enrolled 348 patients, mean age 64 years (SD=10), 85% male, at 50 centers with ischemic-related LVEF of 31-40%. MTWA results were indeterminate in 45, positive in 132, and negative in 171; 48% of participants received ICDs. LTVTE occurred in 7 MTWA-positive and 4 MTWA-negative patients. Event rates among patients with indeterminate tests were not reported. When patients with positive and negative MTWA results were compared, there was no association with LTVTE (hazard ratio: [HR]: 1.22, 95% CI: 0.34 to 4.39), although event rates were low. It is unclear why patients with indeterminate test results were excluded from the reported analyses. (Registered as NCT00305214, as of April 2013, neither study results nor indication of complete publication were posted at online site ClinicalTrials.gov. A complete publication was also not identified in the search conducted for the 2013 policy update.)

A substudy of the SCD-HeFT trial evaluated the prognostic value of MTWA in 490 patients at 37 sites (of 2,521 patients enrolled in the trial) (Gold et al., 2008). The sample was similar to the larger SCD-HeFT population; 76% male, mean age 59 years (SD=12), mean LVEF 24% (SD=7), 49% had ischemic heart disease, and 71% NYHA class II heart failure. MTWA results were positive in 37%, negative in 22%, and indeterminate in 41%. Protocol recommended indeterminate tests to be repeated. Proportions MTWA-positive, MTWA-negative, or MTWA-indeterminate results were similar in those randomly assigned to ICD/placebo and amiodarone. The primary composite endpoint included first appropriate ICD discharge, sustained ventricular tachycardia/fibrillation, or sudden cardiac death; patients randomly assigned to amiodarone were excluded from analysis of the primary endpoint due to inability to ascertain appropriate discharge. Over a median 30-month follow-up in the ICD/placebo arm, MTWA-positive patients (n=139) did not have a distinguishable increase in events compared to MTWA-negative group (n=72) (HR: 1.24, 95% CI: 0.60 to 2.59); nor MTWA-non-negative (n=272) compared to MTWA-negative (n=72) (HR: 1.28, 95% CI: 0.65 to 2.53). Microvolt T-wave alternans was not associated with all-cause mortality in the combined ICD/placebo and amiodarone sample. While commentators have pointed out the high proportion of indeterminate results, these results do not support clinical utility for MTWA prior to ICD placement in SCD-HeFT eligible patients.

A multicenter, prospective observational study (the PREVENT-SCD study) of real-world Japanese patients with LV ejection fraction </= 40% due to ischemic or non-ischemic cardiomyopathies evaluated the prognostic value of T-wave alternans for lethal ventricular tachyarrhythmia (Shizuta et al., 2012). Of the 453 patients that enrolled in the study, 280 (62%) were eligible for the MTWA test. The MTWA test was negative in 82 patients (29%), which accounted for 18% of the total population. Primary endpoints were a composite of sudden cardiac death, sustained rapid VT or ventricular fibrillation (VF), and appropriate defibrillator therapy for rapid VT or VF. Median follow-up was 36 months. The 3-year event-free rate for the

primary endpoint was significantly higher in MTWA-negative patients (97%) than in MTWA non-negative patients (89.5%, p=0.037) and those who were ineligible for the MTWA test (84.4%, p=0.003). The researchers reported that multivariable analysis identified both non-negative MTWA and ineligibility for the MTWA test to be independent predictors of the primary end point. The authors concluded that MTWA showed high negative predictive ability for lethal VT in patients with LV dysfunction; however, the MTWA-negative patients only represented 18% of the total population. The patients that were ineligible for the MTWA test were at highest risk for lethal VT. Limitations to the study included a small population of subjects and a slow rate of enrollment which may have included some selection bias. Additionally, the number of patients screened and excluded from the study was not recorded and due to the inclusion of appropriate ICD therapy in the primary endpoints may have overestimated arrhythmic events. The authors strongly advised that their study required further investigation with larger patient populations and longer term follow-up.

Conclusions

Evidence from prospective cohort studies and systematic reviews establishes that MTWA can be used to risk stratify patients on the risk of sudden cardiac death. In patients who have indications for an ICD, a negative MTWA test lowers the risk of sudden cardiac death, while a positive test increases the risk. However, this risk stratification is unlikely to result in management changes that improve outcomes. The NPV of MTWA is not high enough to forego ICD placement in patients with a negative MTWA test. Other management changes, such as medication adjustments, may be made on the basis of this test, but the impact of these management changes is uncertain.

Practice Guidelines and Position Statements

The 2006 American College of Cardiology(ACC)/American Heart Association(AHA)/European Society of Cardiology (ESC) 2006 Guidelines for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death (Zipes et al., 2006) include T-wave alternans testing as IIa recommendation: “It is reasonable to use T-wave alternans for improving the diagnosis and risk stratification of patients with ventricular arrhythmias or who are at risk for developing life-threatening ventricular arrhythmias. (Level of Evidence: A).”

The current 2008 ACC/AHA practice guidelines for adults with ST-elevation and non-ST-elevation myocardial infarction do not identify T-Wave alternans as a test for the management of patients with ventricular arrhythmias (Krumholz et al., 2008).

A 2011 Consensus Guideline issued by the International Society for Holter and Noninvasive Electrocardiography (Verrier et al., 2011) concluded, “[o]verall, although TWA appears to be a useful marker of risk for arrhythmic and cardiovascular death, there is as yet no definitive evidence that it can guide therapy.”

Summary

Microvolt T-wave alternans is one available method to risk stratify patients who may be at risk for sudden cardiac death and has been proposed to assist in selecting patients for ICD treatment. Results from prospective multicenter studies enrolling various patient populations undergoing ICD placement as part of primary prevention strategies do not support clinical utility from

MTWA used to risk stratify and therefore guide placement. This conclusion, expressed in the 2006 TEC Assessment, is also supported by recent prospective studies designed to evaluate the utility of MTWA and by pooled analyses.

Additionally, there is currently no published evidence from RCTs that demonstrates the clinical utility of the T-wave alternans testing. In the absence of such trials, it cannot be determined how use of T-wave alternans testing changes patient management/treatment decisions and impacts health outcomes. Therefore, this technology is considered investigational.

Benefit Application

Benefit determinations should be based in all cases on the applicable contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

Some state or federal mandates (e.g., Federal Employee Program (FEP)) prohibit Plans from denying Food and Drug Administration (FDA) - approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of FDA-approved technologies on the basis of medical necessity alone.

This Policy relates only to the services or supplies described herein. Benefits may vary according to benefit design; therefore, contract language should be reviewed before applying the terms of the Policy. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement.

Type	Number	Description
CPT	93025	Microvolt T-wave alternans for assessment of ventricular arrhythmias
HCPC	None	
ICD9 Procedure	None	
ICD9 Diagnosis	All Diagnoses	

Type	Number	Description
Place of Service	All Places of Service	

Tables

N/A

Definitions

N/A

Index / Cross Reference of Related BSC Medical Policies

The following Medical Policies share diagnoses and/or are equivalent BSC Medical Policies:

N/A

Key / Related Searchable Words

- Microvolt T Wave Alternans
- MTWA
- TWA
- T wave alternans
- T-Wave alternans

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Policy History

This section provides a chronological history of the activities, updates and changes that have occurred with this Medical Policy.

Effective Date	Action	Reason
12/1/2005	New Policy MPC adopted CTAF consent of BCBSA TEC Vol. 20, No. 9	Medical Policy Committee
8/1/2006	MPC reconfirmed BCBSA TEC Vol. 20, No. 9 Statement unchanged	Medical Policy Committee
12/7/2006	CTAF Assessment reviewed; no changes	Medical Policy Committee
10/1/2010	Policy title change from T-Wave Alternans (aka: Microvolt T- Wave Alternans: MTWA) Policy revision without position change	Medical Policy Committee
10/9/2013	Policy revision without position change. Policy placed on No Further Routine Literature Review and Update Status.	Medical Policy Committee

The materials provided to you are guidelines used by this plan to authorize, modify, or deny care for persons with similar illness or conditions. Specific care and treatment may vary depending on individual need and the benefits covered under your contract. These Policies are subject to change as new information becomes available.

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