

Myocardial Strain Imaging

Medicare Advantage Medical Policy #MA-132

Original Effective Date: 12/01/2025

Current Effective Date: 12/01/2025

Applies to all products administered or underwritten by the Health Plan, unless otherwise provided in the applicable contract. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

When Services Are 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 Health Plan may consider myocardial strain imaging for individuals receiving chemotherapy that could result in cardiotoxicity to be **eligible for coverage**** when primary echocardiography on the same date of service is also medically necessary.

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 Health Plan considers cardiac MRI with myocardial strain or stress imaging to be **investigational.***

Based on review of available data, the Health Plan considers myocardial strain imaging in all other situations to be **investigational.***

Background/Overview

The term 'strain' indicates dimensional or deformational change under force. When used in echocardiography, the term 'strain' is used to describe the magnitude of shortening, thickening, and lengthening of the myocardium through the cardiac cycle. The most frequent measure of myocardial strain is the deformation of the left ventricle in the long axis, termed global longitudinal strain. During systole, ventricular myocardial fibers shorten with movement from the base to the apex. Global longitudinal strain is used as a measure of global left ventricle function and provides a quantitative myocardial deformation analysis of each left ventricle segment. Myocardial strain imaging is intended to detect subclinical changes in left ventricle function in patients with a preserved left ventricle ejection fraction, allowing for early detection of systolic dysfunction. Since strain imaging can identify left ventricle dysfunction earlier than standard methods, this raises the possibility of heart failure prophylaxis and primary prevention before the patient develops symptoms and irreversible myocardial dysfunction. Potential applications of speckle-tracking echocardiography are coronary artery disease, ischemic cardiomyopathy, valvular heart disease, dilated cardiomyopathy, hypertrophic cardiomyopathies, stress cardiomyopathy, and chemotherapy-related cardiotoxicity.

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Myocardial strain can be measured by cardiac magnetic resonance imaging (MRI), tissue Doppler imaging, or by speckle-tracking echocardiography. Tissue Doppler strain imaging has been in use since the 1990s but has limitations that include angle dependency and significant noise. In 2016, Smiseth et al reported that the most widely used method of measuring myocardial strain at the present time is speckle-tracking echocardiography. In speckle-tracking echocardiography, natural acoustic markers generated by the interaction between the ultrasound beam and myocardial fibers form interference patterns (speckles). These markers are stable, and speckle-tracking echocardiography analyzes the spatial dislocation (tracking) of each point (speckle) on routine 2-dimensional sonograms. Echocardiograms are processed using specific acoustic-tracking software on dedicated workstations, with offline semiautomated analysis of myocardial strain. The 2-dimensional displacement is identified by a search with image processing algorithms for similar patterns across 2 frames. When tracked frame-to-frame, the spatiotemporal displacement of the speckles provides information about myocardial deformation across the cardiac cycle. Global longitudinal strain provides a quantitative analysis of each left ventricle segment, which is expressed as a percentage. In addition to global longitudinal strain, speckle-tracking echocardiography allows evaluation of left ventricle rotational and torsional dynamics.

FDA or Other Governmental Regulatory Approval

U.S. Food and Drug Administration (FDA)

A number of image analysis systems have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Examples of these are shown in Table 1. For example, the Echolnsight^{®†} software system (Epsilon Imaging) "enables the production and visualization of 2-dimensional tissue motion measurements (including tissue velocities, strains, strain rates) and cardiac structural measurement information derived from tracking speckle in tissue regions visualized in any B mode (including harmonic) imagery loops as captured by most commercial ultrasound systems" (K110447). The FDA determined that this device was substantially equivalent to existing devices (eg, syngo^{®†} US Workplace, Siemens, K091286) for analysis of ultrasound imaging of the human heart.

Table 1. Examples of Software That Have Received FDA Clearance

Brand Name	Manufacturer	510(k) Number	FDA Product Code	Clearance Date
Myostrain	Myocardial Solutions	K182756	LNH	02/14/2019
Vivid	GE	K181685	IYN	10/25/2018
Aplio	Toshiba	K173090	IYN	01/11/2018

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2D CARDIAC PERFORMANCE ANALYSIS	Tomtec	K120135	LLZ	04/13/2012
EchoInsight	Epsilon Imaging	K110447	LLZ	05/27/2011
Q-lab	Phillips	K023877	LLZ	12/23/2002

FDA: Food and Drug Administration.

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.

Myocardial strain refers to the deformation (shortening, lengthening, or thickening) of the myocardium through the cardiac cycle. Myocardial strain can be measured by tissue Doppler imaging or, more recently, speckle-tracking echocardiography. Speckle-tracking echocardiography uses imaging software to assess the movement of specific markers in the myocardium that are detected in standard echocardiograms. It is proposed that a reduction in myocardial strain may indicate sub-clinical impairment of the heart and can be used to inform treatment before the development of symptoms and irreversible myocardial dysfunction.

Summary of Evidence

For individuals who have exposure to medications or radiation that could result in cardiotoxicity who receive myocardial strain imaging, the evidence includes systematic reviews of observational studies and a randomized controlled trial (RCT). Relevant outcomes include symptoms, morbid events, quality of life, treatment-related mortality, and treatment-related morbidity. A systematic review of 13 studies with 384 patients treated for cancer suggests that myocardial strain imaging with tissue Doppler imaging or speckle-tracking echocardiography may be able to identify changes in myocardial deformation that precede changes in left ventricle ejection fraction. Two recently published observational studies reported conflicting evidence at 6 months post-radiotherapy on whether longitudinal strain reduction was associated with radiotherapy dose. Although myocardial strain imaging may detect sub-clinical myocardial changes, the value of these changes in predicting clinical outcomes or guiding therapy is uncertain. In the Strain Surveillance of Chemotherapy for Improving Cardiovascular Outcomes (SUCCOUR) RCT, left ventricle surveillance with global longitudinal strain was associated with an increased use of cardioprotective therapy and a lower incidence of cancer-therapy-related cardiac dysfunction as compared to left ventricular ejection fraction surveillance. However, no difference in the primary endpoint of final left ventricular ejection fraction at 1-year follow-up was observed between the groups and interpretation of findings was

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limited by important design and relevance limitations. At 3-year follow-up, despite the increase in the use of cardioprotective therapies in the global longitudinal strain-guided group, there were minimal differences in the change in left ventricular ejection fraction between groups. Additional studies are indicated to better define the threshold for cardioprotective therapy and assess whether a global longitudinal strain-guided approach to cardioprotective therapy reduces the long-term risk of heart failure and improves clinical outcomes. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

A recent review of the literature regarding cardiac magnetic resonance (CMR) imaging in appraising myocardial strain highlighted the following limitations:

- **Lack of Large-Scale, Prospective Trials:** Most evidence is from small, single-center studies or retrospective analyses.
- **Incremental Value Unclear:** There is limited proof that adding CMR strain to standard imaging changes management or improves patient outcomes.
- **No Consensus Guidelines for Routine Use:** Current societal guidelines do not recommend CMR strain as a standard clinical tool; it is considered investigational.
- **Cost-Effectiveness Data Missing:** No robust economic analyses to justify coverage.

In conclusion, while CMR strain imaging is promising and technically robust, evidence is insufficient to support routine clinical use or insurance coverage at this time. It is mainly used in research or specialized centers, not as a standard reimbursable test.

Supplemental Information

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

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

In 2019, the American College of Cardiology, American Association for Thoracic Surgery, American Heart Association (AHA), American Society of Echocardiography, American Society of Nuclear Cardiology, Heart Rhythm Society, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, and the Society of Thoracic Surgeons published appropriate use criteria for multimodality imaging in the assessment of cardiac structure and function in nonvalvular heart disease (Table 2).

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Using a modified Delphi approach, the panel rated indications as “appropriate”, “may be appropriate”, and “not appropriate”. The specific studies that formed the basis of the American College of Cardiology guidelines are not cited; however, they note that they used American College of Cardiology/American Heart Association clinical practice guidelines whenever possible.

Of 81 indications considered for strain rate imaging, the panel rated only 4 as “appropriate” (Table 2). Three of the 4 concerned evaluation (initial or follow-up) in patients prior to and following exposure to potentially cardiotoxic agents. The other indication was follow-up testing to clarify initial diagnostic testing for patients with suspected hypertrophic cardiomyopathy. The guidelines did not separate out imaging with speckle tracking and tissue Doppler and did not make recommendations related to the comparative effectiveness of these imaging modalities.

The panel rated 14 other indications “may be appropriate” (Table 2). According to the panel, interventions in this category should be performed depending on individual clinical patient circumstances and patient and provider preferences, including shared decision making.

Table 2. Summary of American College of Cardiology Appropriate Use Criteria for Myocardial Strain Imaging

Clinical Scenario and Indication	Rating
<i>Initial evaluation in an asymptomatic patient:</i>	
- Initial evaluation prior to exposure to medications/radiation that could result in cardiotoxicity/heart failure	Appropriate
- Initial cardiac evaluation of a known systemic, congenital, or acquired disease that could be associated with structural heart disease	May be appropriate
- Screening evaluation for structure and function in first-degree relatives of a patient with an inherited cardiomyopathy	May be appropriate
- Preparticipation assessment of an asymptomatic athlete with 1 or more of the following: abnormal examination, abnormal ECG, or definite (or high suspicion for) family history of inheritable heart disease)	May be appropriate
<i>Initial evaluation of a patient with clinical signs and/or symptoms of heart disease:</i>	
- Initial evaluation when symptoms or signs suggest heart disease	May be appropriate
- Arrhythmias or conduction disorders: Newly diagnosed LBBB; Nonsustained VT	May be appropriate
- Palpitations/presyncope/syncope: Clinical symptoms or signs consistent with a cardiac diagnosis known to cause presyncope/syncope (including but not limited to hypertrophic cardiomyopathy and heart failure)	May be appropriate

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Clinical Scenario and Indication	Rating
- Respiratory failure/exertional shortness of breath: Exertional shortness of breath/dyspnea or hypoxemia of uncertain etiology	May be appropriate
- HF/cardiomyopathy: Initial evaluation of known or suspected HF (systolic or diastolic) based on symptoms, signs, or abnormal test results to assess systolic or diastolic function and to assess for possible etiology (CAD, valvular disease); Suspected inherited or acquired cardiomyopathy (eg, restrictive, infiltrative, dilated, hypertrophic)	May be appropriate
- Device therapy: Known implanted pacing/ICD/CRT device with symptoms possibly due to suboptimal device settings	May be appropriate
- Cardiac transplantation: Monitoring for rejection or coronary arteriopathy in a cardiac transplant recipient	May be appropriate
- Other: Suspected pericardial diseases	May be appropriate
<i>Sequential or follow-up testing to clarify initial diagnostic testing:</i>	
- Evaluation of suspected hypertrophic cardiomyopathy	Appropriate
- Re-evaluation (1 y) in a patient previously or currently undergoing therapy with potentially cardiotoxic agents	Appropriate
- Periodic reevaluation in a patient undergoing therapy with cardiotoxic agents and worsening symptoms	Appropriate
- Pulmonary hypertension in the absence of severe valvular disease	May be appropriate
- Comprehensive further evaluation of undefined cardiomyopathy	May be appropriate
- Evaluation of suspected cardiac amyloidosis	May be appropriate
<i>Sequential or follow-up testing: new or worsening symptoms or to guide therapy</i>	
Re-evaluation of known structural heart disease with change in clinical status or cardiac examination or to guide therapy	May be appropriate
Re-evaluation of known cardiomyopathy with a change in clinical status or cardiac examination or to guide therapy	May be appropriate
Re-evaluation of known HF (systolic or diastolic) with a change in clinical status or cardiac examination without a clear precipitating change in medication or diet	May be appropriate

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Clinical Scenario and Indication	Rating
Re-evaluation for CRT device optimization in a patient with worsening HF	May be appropriate

CAD: coronary artery disease; CRT: cardiac resynchronization therapy; ECG: electrocardiogram; HF: heart failure; ICD: implantable cardioverter-defibrillator; LBBB: left bundle branch block; VT: ventricular tachycardia.

Source: Adapted from Doherty et al (2019).

American Heart Association

A 2023 scientific statement from the AHA regarding cancer treatment-associated cardiovascular toxicity included some discussion of global longitudinal strain. The authors acknowledged that some definitions of cancer therapy-related cardiac dysfunction (CTRCD) rely on the use of changes in strain; however, there are no specific recommendations regarding appropriate use of global longitudinal strain in the statement. Additionally, the statement does not provide recommendations regarding cardiac MRI for myocardial strain imaging.

American Society of Clinical Oncology

In 2017, the American Society of Clinical Oncology noted that measurement of strain has been demonstrated to have some diagnostic and prognostic use in patients with cancer receiving cardiotoxic therapies but that there have been no studies demonstrating that early intervention based on changes in strain alone can result in changes in risk and improved outcomes. The American Society of Clinical Oncology also notes that screening for asymptomatic cardiac dysfunction using advanced imaging could lead to added distress in cancer survivors.

International Cardio-Oncology Society

A 2021 consensus statement from the International Cardio-Oncology Society included global longitudinal strain in the definitions of mild and moderate asymptomatic CTRCD. Mild CTRCD was defined as an LVEF of at least 50% AND a new relative decline in global longitudinal strain by more than 15% from baseline AND/OR new rise in cardiac biomarker. Moderate CTRCD was defined as new LVEF reduction by at least 10% to an LVEF of 40% to 49% OR new LVEF reduction by less than 10% to an LVEF of 40% to 49% AND new relative decline in global longitudinal strain by more than 15% from baseline AND/OR new rise in cardiac biomarker.

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.

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Ongoing and Unpublished Clinical Trials

Some currently ongoing and unpublished trials that might influence this review are listed in Table 3.

Table 3. Summary of Key Trials

Study	Trial Name	Planned Enrollment	Completion Date
<i>Ongoing</i>			
NCT04547465	The Role of 2D Speckle-tracking Echocardiography in Diagnosis Chemotherapy-induced Cardiomyopathy in Breast Cancer Patients with High Cardiovascular Risk Factors	300	Dec 2023 (unknown status)
NCT04429633	Strain-based vs. Left Ventricular Ejection Fraction-based Cardiotoxicity Prevention Strategy in Patients With Breast Cancer Who Treated With Adjuvant Trastuzumab	136	Jul 2023 (unknown status)

NCT: national clinical trial.

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09/16/2025 Utilization Management Committee review/approval. New policy.

Next Scheduled Review Date: 09/2026

Coding

The five character codes included in the Health Plan Medical Policy Coverage Guidelines are obtained from Current Procedural Terminology (CPT®)‡, copyright 2024 by the American Medical Association (AMA). CPT is developed by the AMA as a listing of descriptive terms and five character identifying codes and modifiers for reporting medical services and procedures performed by physician.

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CPT is a registered trademark of the American Medical Association.

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

Code Type	Code
CPT	93356
HCPCS	C9762, C9763
ICD-10 Diagnosis	C00.0-D49.9, Z51.11, Z51.81, Z79.899, Z92.21, Z92.3

*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

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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 Health Plan’s 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 Health Plan recommends, advocates, requires, encourages, or discourages any particular treatment, procedure, or service, or any particular course of treatment, procedure, or service.

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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.

Medicare Advantage Members

Established coverage criteria for Medicare Advantage members can be found in Medicare coverage guidelines in statutes, regulations, National Coverage Determinations (NCD)s, and Local Coverage Determinations (LCD)s. To determine if a National or Local Coverage Determination addresses coverage for a specific service, refer to the Medicare Coverage Database at the following link: <https://www.cms.gov/medicare-coverage-database/search.aspx>. You may wish to review the Guide to the MCD Search here: <https://www.cms.gov/medicare-coverage-database/help/mcd-benehelp.aspx>.

When coverage criteria are not fully established in applicable Medicare statutes, regulations, NCDs or LCDs, internal coverage criteria may be developed. This policy is to serve as the summary of evidence, a list of resources and an explanation of the rationale that supports the adoption of this internal coverage criteria.

InterQual®

InterQual® is utilized as a source of medical evidence to support medical necessity and level of care decisions. InterQual® criteria are intended to be used in connection with the independent professional medical judgment of a qualified health care provider. InterQual® criteria are clinically based on best practice, clinical data, and medical literature. The criteria are updated continually and released annually. InterQual® criteria are a first-level screening tool to assist in determining if the proposed services are clinically indicated and provided in the appropriate level or whether further evaluation is required. The utilization review staff does the first-level screening. If the criteria are met, the case is approved; if the criteria are not met, the case is referred to the medical director.