# Myocardial Strain Imaging

**Policy** MP-066

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## Description:

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 development of symptoms and irreversible myocardial dysfunction.

## Policy Statement and Criteria

### 1. Commercial Plans

**U of U Health Plans does NOT cover myocardial strain imaging/testing in individuals who have exposure to medications or radiation that could result in cardiotoxicity as it is considered investigational.**

**U of U Health Plans does NOT cover myocardial strain imaging/testing for any other circumstance as it is considered investigational.**

### 2. Medicaid Plans

**Coverage is determined by the State of Utah Medicaid program; if Utah State Medicaid has no published coverage position and InterQual criteria are not available, the U of U Health Plans Commercial criteria will apply. For the most up-to-date Medicaid policies and coverage, please visit their website at: http://health.utah.gov/medicaid/manuals/directory.php or the Utah Medicaid code Look-Up tool**

3. **Medicare Plans**
   **Coverage is determined by the Centers for Medicare and Medicaid Services (CMS); if a coverage determination has not been adopted by CMS and InterQual criteria are not available, the U of U Health Plans Commercial criteria will apply. For the most up-to-date Medicare policies and coverage, please visit their search website at: [http://www.cms.gov/medicare-coverage-database/overview-and-quick-search.aspx?from2=search1.asp&](http://www.cms.gov/medicare-coverage-database/overview-and-quick-search.aspx?from2=search1.asp&) or [the manual website](#)**

## Clinical Rationale

No direct evidence of the clinical utility of MSI is currently available. The Strain Surveillance of Chemotherapy for Improving Cardiovascular Outcomes (SUCCOUR) trial, currently in progress, will be the first randomized controlled trial of MSI and will provide evidence to inform guidelines regarding the place of MSI for surveillance for cardiotoxicity related to cancer chemotherapy. Preliminary descriptive results on the first 86 patients have been published (Negishi, 2018). SUCCOUR is a randomized controlled trial that will evaluate clinical outcomes for patients who are monitored by myocardial strain imaging or conventional imaging. Patients with an abnormal test result will receive improved blood pressure and glucose control. Protective therapy with ACE inhibitors and beta blockers will be titrated to target dose.  This will be the first trial to assess clinical outcomes based on myocardial strain imaging compared to conventional imaging (limited to evaluation of ejection fraction and valve disease). The SUCCOUR trial will provide evidence to inform guidelines regarding the place of global longitudinal strain for surveillance for cardiotoxicity.

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 ACC guidelines are not cited, however, they note that they used ACC/American Heart Association clinical practice guidelines whenever possible. Of 81 indications considered for strain rate imaging, the panel rated only 4 as “appropriate”. Three of the four 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”. 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 (Hendel, 2018).

In 2017, Reichek notes that evaluation of echocardiographic speckle-tracking (ST) systolic strains and cardiac magnetic resonance imaging (CMR) tagging strain rates have emerged as an important focus in assessment of conditions that impair myocardial function. Development of focused clinical roles for strain imaging has been very slow, despite the fact that methods for strain imaging have been available for nearly 30 years. There have been recurrent concerns about the reliability of echocardiographic strain values, as ST and CMR do not agree on absolute values of global strains. To fully understand the potential of these tests, integration of physiological analysis with strain and strain rate evaluation is needed. Strains, like all myocardial function indices, are variable over time, and their values at a given point in time are determined by afterload and preload at the myocyte level and intrinsic load-independent myocardial contractility and myocardial composition. Because such determination of material properties in intact heart is not feasible at present, assessment of afterload and preload at the myocardial level is limited and somewhat problematic. Finally, the determination of load-independent contractility noninvasively is challenging. It may be feasible using the single-beat noninvasive ventricular elastance approach, but this has not been explored and might not be adequate for strain applications. In conclusion, strain imaging has a long way to go to realize its full potential.

In a 2021 systematic review McGregor assessed the literature on myocardial strain imaging for detection of cardiotoxicity from chemotherapy in cancer patients. A total of 31 studies were identified. Of these, only two reported hard clinical endpoints such as cardiac events and development of clinical heart failure. No assessment of study quality or meta-analysis was reported. There was some overlap with the 2014 systematic review discussed below, but most studies were published more recently than that systematic review's search dates. The majority of included studies assessed patients with breast cancer, while some included hematologic malignancies, and three included patients with sarcoma. Overall, the review concluded that myocardial strain imaging has benefits, such as helping to overcome limitations of LVEF assessment adding reliability to diagnosis and prognostication regarding subclinical cardiotoxicity, but also limitations, such as variations in strain values based on loading conditions and patient-related factors.

In 2020, Hayes provided a health technology assessment of myocardial strain imaging (MSI) using speckle-tracking echocardiography for diagnosis and prognosis in patients who have dilated cardiomyopathy (DCM). Patients enrolled in the reviewed studies were adults who had known or suspected DCM with ischemic or idiopathic etiology. No studies evaluating the use of MSI in children with DCM met inclusion criteria. The evidence base for this report comprises 13 prospective or retrospective cohort studies and 4 prospective or retrospective case-control studies that evaluated diagnostic or prognostic uses of MSI in patients with DCM. A study of 50 adverse cardiac events (ACE) in 87 DCM patients found that early diastolic strain rate (DSR) had the highest accuracy for prognosis of ACE. Accuracy based on an area under the receiver-operating characteristic curve (AUC) was 0.91 for early DSR, a statistically significant improvement in AUC versus the MSI parameters global longitudinal strain (GLS) (0.79), mechanical dispersion (MD) (0.79), and systolic strain rate (0.69) and all other echocardiographic parameters. No other studies reported measurement of DSR. One study found that left ventricular torsion had 92% sensitivity and 73% specificity for prognosis of myocardial recovery but none of the other studies reported measurement of this MSI parameter. A study in 130 DCM patients that evaluated MSI for prognosis of response to cardiac resynchronization therapy (CRT) found that radial intraventricular dyssynchrony and right atrial area (RAA) index had significant correlations with response to CRT and that RAA index had 87% sensitivity and 95% specificity for prognosis of response. In, conclusion, Hayes found that the available studies have not provided sufficient evidence to evaluate diagnostic uses of MSI in DCM patients. Although some prognostic studies found that certain MSI parameters had statistically significant correlations with health outcomes, results were inconsistent across studies and the parameter that appeared most accurate for prognosis (early DSR) was only measured in one study. Also, no studies of the clinical utility of MSI were identified to evaluate whether the diagnostic and prognostic information obtained from MSI can be used to improve patient management. Therefore, additional studies are needed to identify the optimal MSI parameters in DCM patients and demonstrate that MSI provides meaningful improvements in health outcomes for patients.

In collaboration with 9 other professional organizations, including the American Association for Thoracic Surgery (AATS), American Heart Association (AHA), American Society of Echocardiography (ASE), American Society of Nuclear Cardiology (ASNC), Hearth Rhythm Society (HRS), Society for Cardiovascular Angiography and Interventions (SCAI), Society of Cardiovascular Computed Tomography (SCCT), Society for Cardiovascular Magnetic Resonance (SCMR), and the Society of Thoracic Surgeons (STS), the American College of Cardiology (ACC) published appropriate use guidelines for multimodality cardiac imaging in the assessment of cardiac structure and function in nonvalvular heart disease in 2019

(Doherty et. al.). These guidelines state that myocardial strain or strain rate imaging with speckle echocardiography may be appropriate for the following indications related to cardiomyopathy:

- Initial screening evaluation of first-degree relative of patient with inherited cardiomyopathy.
- Initial evaluation of patients who have signs or symptoms of suspected acquired or inherited cardiomyopathy.
- Comprehensive evaluation of undefined cardiomyopathy.
- Reevaluation of known cardiomyopathy with a change in clinical status or cardiac examination or to guide therapy.

There were no indications for which myocardial strain or strain rate imaging were deemed as appropriate in patients with cardiomyopathy. These recommendations do not provide an evidence basis for clinical utility of this testing even in these circumstances.

A 2017 summary (Armenian et. al.) from the American Society of Clinical Oncology (ASCO) guideline on Prevention and Monitoring of Cardiac Dysfunction in Survivors of Adult Cancers found 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 ASCO also notes that screening for asymptomatic cardiac dysfunction using advanced imaging could lead to added distress in cancer survivors.

## Applicable Coding

### CPT Codes

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| **93356** | Myocardial strain imaging using speckle tracking-derived assessment of myocardial mechanics (List separately in addition to codes for echocardiography imaging) |

### HCPCS Codes

No applicable codes

### References:


1. Armenian, S. H., et al. (2017). "Prevention and Monitoring of Cardiac Dysfunction in Survivors of Adult Cancers: American Society of Clinical Oncology Clinical Practice Guideline Summary." J Oncol Pract 13(4): 270-275.
2. Doherty, JJ, Kort, SS, Mehran, RR, et al. ACC/AATS/AHA/ASE/ASNC/HRS/SCAI/SCCT/SCMR/STS 2019 Appropriate Use Criteria for Multimodality Imaging in the Assessment of Cardiac Structure and Function in Nonvalvular Heart Disease: A Report of the American College of Cardiology Appropriate Use Criteria Task Force, American Association for Thoracic Surgery, American Heart Association, 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. J Am Soc Echocardiogr, 2019 Feb 13. PMID 30744922. Accessed March 31, 2021. Available at: https://www.asecho.org/wp-content/uploads/2019/07/AUC-for-MMI-Nonvalvular-HD-2019.pdf
3. Food and Drug Administration (FDA) software clearances. Accessed March 31, 2021. Available at: • K201062: Syngo Ultrasound Apps Suite; Siemens Medical Solutions, USA, Inc.; • K190913: QLAB Advanced Quantification Software 13.0; Philips Healthcare; June 18, 2019; • K170847: EchoPAC Plug-in; GE Medical Systems Ultrasound and Primary Care Diagnostics, LLC, June 14, 2017; • K131822: UltraExtend USWS-900A; Toshiba America Medical Systems, Inc.; July 23, 2013.
4. Hayes, Inc. (2020) Health Technology Assessment. “Myocardial Strain Imaging by Speckle-Tracking Echocardiography for Evaluation of Dilated Cardiomyopathy”. September 24, 2020. Accessed March 30, 2021. Available at: https://evidence.hayesinc.com/report/dir.myocardialstrain4712

5. Hendel, RR, Lindsay, BB, Allen, JJ, Brindis, RR, et al.(2018) ACC Appropriate Use Criteria Methodology: 2018 Update: A Report of the American College of Cardiology Appropriate Use Criteria Task Force. J. Am. Coll. Cardiol., 2018 Feb 24;71(8). PMID 29471942.
6. McGregor, P. C., et al. (2021). "Role of myocardial strain imaging in surveillance and management of cancer therapeutics-related cardiac dysfunction: A systematic review." Echocardiography 38(2): 314-328.
7. Negishi, TT, Thavendiranathan, PP, Negishi, KK, Marwick, TT, et al.(2018) Rationale and Design of the Strain Surveillance of Chemotherapy for Improving Cardiovascular Outcomes: The SUCCOUR Trial. JACC Cardiovasc Imaging, 2018 Jun 18;11(8). PMID 29909105.
8. Reichek, N. (2017). "Myocardial Strain: Still a Long Way to Go." Circ Cardiovasc Imaging 10(11).
9. Smiseth, OA, Torp, H, Opdahl, A, Haugaa, KH, Urheim, S. Myocardial strain imaging: how useful is it in clinical decision making? Eur Heart J. 2016;37:1196-207. PMID: 26508168

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