Clinical Policy Title: Echocardiographic assessment of myocardial strain for cancer patients having undergone chemotherapy

Clinical Policy Number: 04.01.07

Effective Date: April 1, 2016
Initial Review Date: November 18, 2015
Most Recent Review Date: January 20, 2016
Next Review Date: January 2017

Related policies:

None.

ABOUT THIS POLICY: Keystone First has developed clinical policies to assist with making coverage determinations. Keystone First’s clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of “medically necessary,” and the specific facts of the particular situation are considered by Keystone First when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Keystone First’s clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Keystone First’s clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Keystone First will update its clinical policies as necessary. Keystone First’s clinical policies are not guarantees of payment.

Coverage policy

Keystone First considers the use of echocardiographic assessment of myocardial strain to measure cardiac impairment in cancer patients treated with chemotherapy to be clinically proven and, therefore, medically necessary.

Limitations:

All other uses of echocardiographic assessment of myocardial strain may or may not be medically necessary depending on the purpose of the test.

Note: The following CPT/HCPCS code is not listed in the Pennsylvania Medicaid fee schedule:

0399T - Myocardial strain imaging (quantitative assessment of myocardial mechanics using image-based analysis of local myocardial dynamics) (List separately in addition to code for primary procedure)

Alternative covered services:

Various forms of echocardiography.
**Background**

Echocardiographic strain and strain-rate imaging is a relatively new means of assessing myocardial function. This technology is one of the diagnostic methods considered potentially more advanced than conventional echocardiography, as it is able to evaluate components of cardiac function, including those functions not visually accessible. Strain and strain-rate imaging are often effective means of measuring prognosis of cardiac disease, along with effects of various therapies on the heart. Strain is another means of describing “stretching” of the myocardial system, while strain rate is the rate of this deformity.

The high prevalence of cancer and the growing number of chemotherapy drugs used to treat cancer patients make precise measurements of various organ functions a vital part of treatment. In particular, chemotherapy can be cardiotoxic.

Historical studies of early changes in myocardial function have used conventional echocardiography to assess biological impact, but in recent years, other technologies have offered the potential to improve this function. Among these new methods are two-dimensional (2-D) and three-dimensional (3-D) echocardiography, Tissue Doppler-derived strain imaging, and speckle tracking echocardiography (STE).

The most commonly-measured cardiac functions in post-chemotherapy patients are left ventricular systolic (LVS) function and left ventricular ejection fraction (LVEF).

**Searches**

Keystone First searched PubMed and the databases of:
- UK National Health Services Centre for Reviews and Dissemination.
- Agency for Healthcare Research and Quality’s National Guideline Clearinghouse and other evidence-based practice centers.
- The Centers for Medicare & Medicaid Services (CMS).

We conducted searches on November 4, 2015. Search terms were: “myocardial strain imaging,” “chemotherapy” and “cancer.”

We included:
- **Systematic reviews**, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
- **Guidelines based on systematic reviews.**
- **Economic analyses**, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

**Findings**

A number of studies have addressed ways to improve assessment of myocardial function after chemotherapy through echocardiography. Nearly all of them have focused on breast cancer survivors or adult survivors of childhood cancer. Various chemotherapy drugs known to cause cardiovascular side effects have been studied, including but not limited to:
• Anthracyclines (doxorubicin and epirubicin).

• Human epidermal growth factor receptor type 2 monoclonal antibody.

• Trastuzumab.

Many reports are not controlled trials assessing which type of echocardiography best detects cardiovascular problem, but merely addresses the efficacy of a particular form of echocardiography.

Some professional societies have produced guidelines on the topic. One is from the European Society for Medical Oncology (Bovelli, 2010). A more recent version is from the American Society of Echocardiography and European Association of Cardiovascular Imaging (Plana, 2014). Both extol the benefits of echocardiography due to its ability to assess more than ventricular function in a relatively low-cost, non-invasive, and radiation-free manner.

As echocardiography technology evolved, and newer models were used, several experts raised the question of whether more specialized echocardiographs could be more sensitive to any reductions in cardiac functions after chemotherapy for cancer. One speculated whether 2-D echocardiography in long-term child cancer survivors (which found low strain rates) produced superior results. (Mavinkurve-Groothuis, 2010) Another stated that myocardial strain imaging had the potential to detect changes in function from chemotherapy earlier than before. (Stoodley, 2011 – Heart Lung Circ).

Several recent controlled trials that compared types of echocardiography found:

• One meta-analysis found that for 1,504 chemotherapy patients, speckle tracking echocardiography (STE) of peak systolic global longitudinal strain (GLS) appears to be the best predictor of cardiotoxicity. (Thavendiranathan, 2014).

• A study of 25 children with acute lymphatic leukemia (versus 30 healthy controls) found a 3-D echocardiogram was the most reproducible technique for measuring LVEF over one year, following chemotherapy for breast cancer patients (Theavndiranathan, 2013).

• A study of 43 breast cancer patients treated with chemotherapy found heart changes responded better to sensitive echocardiograph monitors compared to conventional echocardiography (Sawaya, 2012)

Results of use of myocardial strain imaging for assessing cardiac damage after chemotherapy have been reported in the professional medical literature. However, no studies comparing the efficacy or outcomes of myocardial strain imaging with other types of advanced echocardiography have been conducted. Without these controlled trials, it is difficult to differentiate the effectiveness of this technique. Moreover, myocardial strain imaging is acknowledged to detect cardiac changes at an earlier date than others. We shall continue to review the literature for any new reports on this technology.
Summary of clinical evidence:

<table>
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<tr>
<th>Citation</th>
<th>Content, methods, recommendations</th>
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<tbody>
<tr>
<td>None</td>
<td>No meta analyses or randomized controlled trials comparing echocardiographic strain imaging for cardiac changes after chemotherapy with other techniques.</td>
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Glossary

**2-D echocardiography** — In B-mode (brightness mode) ultrasound, a linear array of transducers simultaneously scans a plane through the body that can be viewed as a two-dimensional image on screen.

**3-D echocardiography** — Ultrasound probe connected to a data processing system that enables detailed anatomical assessment of cardiac pathology, particularly valvular defects, and cardiomyopathies.

**Doppler tissue imaging** — Doppler echocardiography, using for pulsed or continuous wave Doppler ultrasound, and used for tissue motion and velocity measurement.

**Echocardiography** — A test of heart function using ultrasound waves.

**Left ventricular ejection fraction (LVEF)** — A measure of how well the lower left pumping chamber of the heart contracts to send blood to the rest of the body.

**Myocardial strain imaging** — A relatively new form of echocardiography to assess myocardial function, including changes from chemotherapy to cancer patients.

**Speckle tracking echocardiography (STE)** — An echocardiographic imaging technique that analyzes the motion of tissues in the heart by using the naturally occurring speckle pattern in the myocardium or blood when imaged by ultrasonic waves.

References

**Professional society guidelines/other:**


**Peer-reviewed references:**


**Clinical trials:**

Searched clinicaltrials.gov on November 5, 2015, using term “myocardial strain imaging.” One study found, none relevant (recruiting participants).

**CMS National Coverage Determinations (NCDs):**

No NCDs identified as of the writing of this policy.

**Local Coverage Determinations (LCDs):**

No LCDs identified as of the writing of this policy.

**Commonly submitted codes**

Below are the most commonly submitted codes for the services and items subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

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<td>T45.1X5</td>
<td>Adverse effect of Doxorubicin, Mitoxantrone, 5-FU</td>
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<td>Z08</td>
<td>Encounter for follow-up examination after completed treatment for malignant neoplasm</td>
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