

# Coding an Acute Myocardial Infarction: Unravelling the Mystery

by Karen Carr, MS, BSN, RN, CCDS, CDIP, and Lisa Romanello, MSHI, BSN, RN, CCDS, CDIP

## WHITE PAPER

**Summary:** The following white paper offers an overview of the types of acute myocardial infarctions and their accompanying coding requirements. The paper also contains tips for CDI professionals querying providers regarding these complex conditions and some helpful resources.

## FEATURES

- Understanding MIs..... 1
- Querying for specificity of the AMI ..... 4
- The Third Universal Definition of MI ..... 6
- MI Classification Tip Sheet ..... 7
- Official Coding Guidelines for MI ..... 9
- References ..... 10

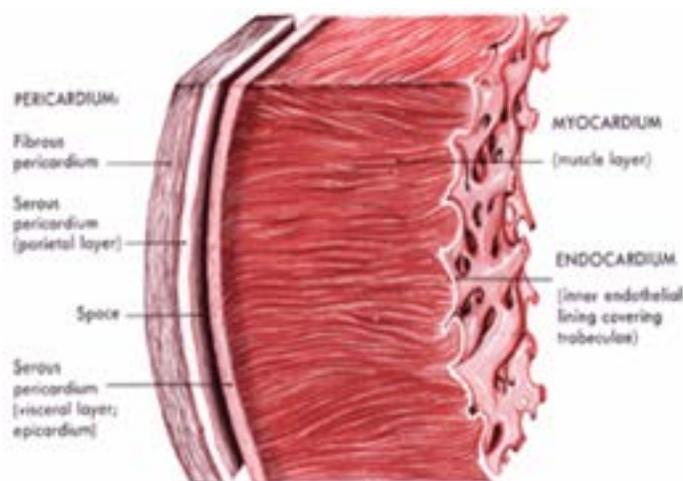
Ischemic heart disease continues to be the leading cause of death in the United States and worldwide (World Health Organization, 2017). It's no surprise that myocardial infarctions (MI) are frequently seen as reportable conditions when coding inpatient encounters. Recent ICD-10-CM changes offer new codes to further specify the type and cause of MIs.

## Understanding MIs

How and where the myocardial death occurs determines the ICD-10-CM code assignment.

MIs are categorized in several ways. Historically, MIs were categorized based on the thickness of the myocardial necrosis. A transmural MI occurs when the myocardial necrosis is full thickness (extending from the endocardium through the myocardium to the epicardium), and a non-transmural MI includes necrosis of the endocardium or the endocardium and myocardium only. Electrocardiogram findings are more commonly used to identify the type of MI. This includes ST-elevation MIs (STEMI), non-ST-elevation MIs (NSTEMI), Q-wave MIs, and non-Q-wave MIs. The terms Q-wave and non-Q-wave, transmural and non-transmural MIs are not often used by today's clinicians. See Figure 1 for a look at the layers of the heart wall.

**Figure 1: Scientific Informer (September 19, 2015). Layers of the heart.**



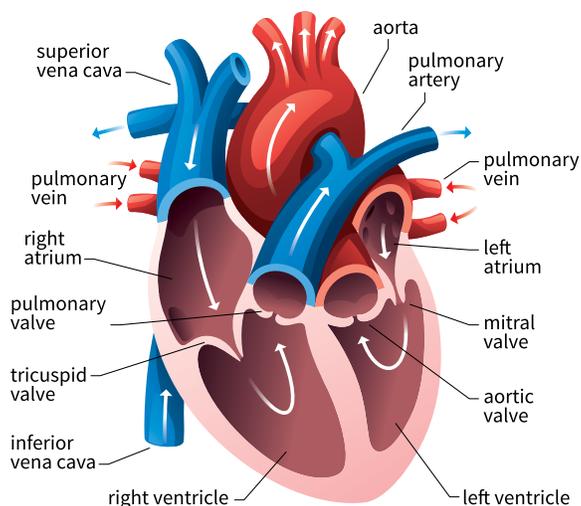
An important change in the new 2018 ICD-10-CM *Official Guidelines for Coding and Reporting* is the addition of a code for an unspecified AMI (I21.9). Previously, the unspecified AMI defaulted to a STEMI (I21.3).

“Management practice guidelines often distinguish between STEMI and non-STEMI, as do many of the studies on which recommendations are based,” according to Bolooki and Askari (2010).

If the documentation of an unspecified AMI defaults to a STEMI, but it is not treated as a STEMI, this could adversely affect quality measures for clinical performance. Specifically, based on the 2017 recommendations of the American Hospital Association and the American College of Cardiology Foundation, the established goal of treatment for a patient with a diagnosis of an acute STEMI is an elapsed time of 90 minutes or less from first medical contact to primary percutaneous coronary intervention (PCI) when presenting to a facility with PCI capabilities.

AMIs are further identified by site, which corresponds with the coronary artery involved (e.g., inferior wall MI, anterior wall MI, etc.), physicians should document which coronary artery was affected to capture the most specific code available. Figure 2 shows the various coronary arteries.

**Figure 2: The coronary arteries**



Documentation of a transmural MI unspecified by site will code as I21.9, AMI unspecified, but when specified by site or artery will code as a STEMI. Non-transmural MIs code as an NSTEMI.

The cause of an MI further defines the type of MI and the ICD-10-CM code assignment. As mentioned earlier, the revised definition of a MI in 2007 emphasized the causes of the MI. The classification of MIs was divided into five types, which is an important piece of the universal definition.

## Coding an Acute Myocardial Infarction: Unravelling the Mystery

A type 1 MI is often referred to as a “spontaneous” MI and is commonly associated with coronary artery disease (CAD) and myocardial necrosis secondary to plaque rupture, erosion, dissection, ulceration, or erosion that results in a thrombus in one or more of the coronary arteries (Simons, 2017).

A type 2 MI occurs when myocardial necrosis results from either a reduction in oxygen supply or decreased blood flow to the heart or an increase in the heart’s need (demand) for oxygen. According to Sandoval, Smith, Thordsen, & Apple (2014), anemia, tachyarrhythmia, and respiratory failure were the most common conditions predisposing patients to a type 2 MI, and “it is anticipated that it [type 2 MIs] will be detected more frequently once high sensitivity cardiac troponin assays are approved for clinical use in the United States.”

Some other examples of increased demand include severe aortic valve disease, hypertension, and shock. In a study by Saaby et al. (2013), one-fourth of the patients observed with AMIs were diagnosed with a type 2 MI, and of those, half had no significant CAD. Please note that it is a common error to call out type 2 MIs as NSTEMI type 2. A type 2 MI is an AMI by definition and not a NSTEMI.

Per Sandoval et al. (2014), “the current ‘gold standard’ definition for type 2 MI remains undetermined,” and there are no specific criteria universally adopted to diagnose type 2 MI nor “formal guidelines available regarding the management of type 2 MI.” However, Stein et al. (2014) did identify “distinct demographics, increased prevalence of multiple comorbidities, a high-risk cardiovascular profile and an overall worse outcome” in patients diagnosed with a type 2 MI compared to those diagnosed with a type 1 MI. Specifically, they found patients diagnosed with type 2 MI to be older and female, and to have a higher incidence of prior MIs, PCI or coronary artery bypass graft (CABG), heart failure, chronic renal failure, and diabetes. “It is conceivable,” they stated, “that elderly patients with multiple comorbidities and an underlying coronary disease would be more susceptible to clinical changes that may interfere with the delicate balance of myocardial supply and demand, ensuing in type 2 MI” (Stein et al., 2014).

Included in the universal definition of MIs (but seen documented less frequently) are type 3 MI, types 4a and 4b MI, and type 5 MI. Type 3 MI refers to an AMI when there is evidence of myocardial ischemia based on ECG finding and/or a new left bundle branch block, but death occurs before cardiac biomarkers can be obtained (Simons, 2017). Type 4a MI is an MI occurring after PCI. Type 4b MI is associated with stent thrombosis after PCI. Type 5 MI is associated with an MI after a CABG procedure (Simons, 2017).

A final distinguishing factor for coding purposes is the age of the MI. Subsequent MIs are MIs occurring within four weeks or less of the initial MI. Code I22 is used for subsequent type 1 STEMI, NSTEMI, and AMI, unspecified. A code for the initial MI (I21.-) must be included.

The sequencing of these codes depends on the reason for admission. If the subsequent MI is identified as a type 2 STEMI or NSTEMI, assign only I21.A1 and I21.A9 for type 3, 4, and 5 MIs. MIs that occurred more than four weeks prior but are still being treated have the appropriate aftercare code assigned, and those no longer needing treatment are coded as I25.2, old MI.

## Querying for specificity of the AMI

Without specific criteria and treatment guidelines, there is room for subjectivity among clinicians in the diagnosis of a type 2 MI. Until the 2018 ICD-10-CM *Official Guidelines for Coding and Reporting*, there were no codes to distinguish between a type 1 and a type 2 MI. Sandoval et al. (2014) stated, “clinicians are unable to diagnose a patient with type 2 MI without being penalized by International Classification of Diseases coders for deviating from the accepted guideline-driven ACS therapies that are required by Centers for Medicaid and Medicare Services (e.g., aspirin on arrival and discharge, beta-blocker, statin prescribed on discharge, and so on), even though these therapies might not be appropriate for type 2 MI.”

Now that codes are available to distinguish between types of MIs, the subjectivity in diagnosing still remains. This, in turn, lends itself to subjectivity as to when to query for a type 2 MI. In accordance with the Third Universal Definition of MI, Sandoval et al. (2014) recommend the following in regard to requirements for diagnosing a type 2 MI:

*Supply-demand type 2 MI should be diagnosed when there is evidence of myocardial necrosis in a clinical setting consistent with an acute supply/demand imbalance, without plaque rupture, in which there is a rise and/or fall of cTn with at least 1 value >99th upper-reference limit, plus at least 1 other MI criteria according to the Universal Definition of MI.*

Based on this recommendation, when there are indicators of myocardial damage and the documentation of a supply and demand mismatch or a condition that would cause a supply and demand mismatch, and there is no documentation of an associated diagnosis, a query should be considered. A query may be considered when further specification of a documented AMI is needed.

It is important to note that the term “acute coronary syndrome” (ACS) is often applied to patients in whom there is a suspicion of myocardial ischemia. There are three types of ACS: STEMI, NSTEMI, and unstable angina (UA). ACS will code as I249, Acute ischemic heart disease, unspecified. When there is no rise or fall in the biomarkers or other evidence of myocyte injury, this code may be appropriate. If, however, ACS is documented and there are indicators of myocardial necrosis, a query to clarify the type of ACS may be considered.

## Coding an Acute Myocardial Infarction: Unravelling the Mystery

The following query samples will help guide CDI programs in developing their own MI queries. Following the samples, there are two tip sheets to aid in identification of clinical indicators for each type of MI, as well as the coding nuances associated with each type.

Following the query samples, there are a couple other resources included in this paper, including an MI tip sheet which provides coding tips for each type of MI in a digestible manner, and a reference from the ICD-10-CM/PCS *Official Guidelines for Coding and Reporting*.

### Query example 1:

Patient presented with shortness of breath and was admitted for acute hypoxic respiratory failure. The troponins were 2.0; 5.1; 4.2. A cardiac catheterization was completed and showed non-obstructing CAD. The physician documented “elevated troponins secondary to supply and demand mismatch.” Would you please document the known or suspected diagnosis associated with these clinical findings?

- AMI Type II
- AMI, unspecified
- Cardiac ischemia secondary to supply and demand mismatch without myocardial damage
- Unable to determine
- Other appropriate diagnosis:

### Query example 2:

Current data in the patient’s medical record: 75-year-old male admitted with shortness of breath, chest pain, and hemoglobin of 6.0.

- Progress note of 1/2/18 indicates a diagnosis of AMI due to severe anemia
- Progress note of 1/4/18 indicates “demand ischemia due to severe anemia”

Clinical indicators and treatment:

- Serial troponins with abnormal values
- Transfusion of three units of packed red blood cells
- Oxygen at two liters per nasal cannula

Please clarify the type of AMI this patient is being treated for as:

- NSTEMI
- AMI type II
- Type 1 MI not further specified
- Other appropriate diagnosis: \_\_\_\_\_

## The Third Universal Definition of MI

- Detection of a rise and/or fall of cardiac biomarker values and with at least one of the following:
  - Symptoms of ischemia
  - Development of pathologic Q-waves in the electrocardiogram (ECG)
  - New or presumed new significant ST-Segment-T wave (ST-T) changes or new left bundle branch block (LBBB)
  - Identification of an intracoronary thrombus by angiography or autopsy
  - Imaging evidence of new loss of viable myocardium or a new regional wall motion abnormality
- Cardiac death with symptoms suggestive of myocardial ischemia and presumed new ischemia ECG changes or new LBBB, but death occurred before cardiac biomarkers were obtained, or before cardiac biomarker values would be increased.
- Percutaneous coronary intervention (PCI)-related MI was defined by elevation of biomarker values in patients with normal baseline values or a rise of values >20 percent if the baseline values are elevated but stable or falling. In addition, either:
  - Symptoms suggestive of myocardial ischemia,
  - New ischemic ECG changes or new LBBB, or
  - Angiographic loss of patency of a major coronary artery or a side branch or persistent slow- or no-flow or embolization, or (iv) imaging demonstration of new loss of viable myocardium or new regional wall motion abnormality are required
- Stent thrombosis associated with MI when detected by coronary angiography or autopsy in the setting of myocardial ischemia and with a rise and/or fall of cardiac biomarkers with at least one value above the 99th percentile
- Coronary artery bypass graft surgery (CABG)-associated MI was defined by elevation of cardiac biomarker in patients with normal baseline values. In addition, either (i) new pathologic Q waves or new LBBB, (ii) angiographic documented new graft or native coronary artery occlusion, or (iii) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

<b>Myocardial Infarction Classification</b>		
Type 1	Spontaneous MI secondary to a primary coronary event such as plaque erosion and/ or rupture, ulceration, fissuring with resulting intraluminal thrombus	<p>STEMI type 1</p> <p>I21.0–I21.2 – identified by site</p> <p>I21.3 – unspecified site</p> <p>NSTEMI type 1</p> <p>I21.4</p> <p>AMI, unspecified</p> <p>I21.9</p>
Type 2	AMI secondary to supply and demand mismatch (e.g., coronary spasm, anemia, hypotension, respiratory failure, etc.)	<p>STEMI type 2</p> <p>I21.A1</p> <p>NSTEMI type 2</p> <p>I21.A1</p> <p>Use an additional code for the underlying cause</p> <p>Do not assign I24.8, other forms of acute ischemic heart disease for the demand ischemia</p>
Type 3	Sudden cardiac arrest secondary to suspected AMI, but death occurs before cardiac biomarkers in the blood are drawn or have time to appear	<p>AMI type 3</p> <p>I21.A9</p> <p>“Code also” the related complication</p>

Type 4a	MI associated with PCI	AMI types 4a, 4b, 5 I21.A9
Type 4b	MI associated with stent thrombosis	“Code also” and “code first” notes should be followed related to complications, and for coding of post-procedural MIs during or following cardiac surgery
Type 5	MI associated with CABG	
Subsequent MI	Occurring ≤ 4 weeks (28 days) from initial MI	
Old MI	> 4 weeks old and no longer needing treatment	Old MI I25.2

### ICD-10-CM Official Guidelines for Coding and Reporting FY 2018 (pp. 47-49)

The FY 2018 updates for ICD-10-CM include the following information related to coding STEMI and NSTEMI:

- ICD-10-CM codes and guidelines for type 1 MI:
  - Type 1 STEMI and transmural MIs identified by site or coronary artery
    - I21.0–I21.2
  - Type 1 STEMI without the site documented
    - I21.3, STEMI of unspecified site
  - Transmural MI, without the specified site or artery
    - I21.9, AMI, unspecified
  - Type 1 NSTEMI and non-transmural/subendocardial MIs
    - I21.4
  - If a type 1 NSTEMI evolves to STEMI, assign the STEMI code
  - If a type 1 STEMI converts to NSTEMI due to thrombolytic, code the STEMI
  - I21.9, AMI, unspecified, is the default for unspecified AMI or unspecified type
- ICD-10-CM codes and guidelines for type 2 MI:
  - Type 2 AMI (STEMI and NSTEMI)
    - Assign to code I21.A1, MI type 2 with a code for the underlying cause
    - Do not assign code I24.8, other forms of acute ischemic heart disease for the demand ischemia
  - Sequencing of type 2 AMI or the underlying cause is dependent on the circumstances of admission
- ICD-10-CM codes and guidelines for type 3, 4a, 4b, 4c, and 5 MI:
  - Assign code I21.A9, other MI type
  - The “Code also” and “Code first” notes should be followed related to complications, and for coding of post-procedural MI during or following cardiac surgery
- ICD-10-CM codes and guidelines for subsequent MI:
  - A code from category I22, Subsequent STEMI and NSTEMI, is to be used when a patient has suffered a type 1 MI or unspecified AMI and has a new AMI within the four-week time frame of the initial AMI
    - A code from category I22 must be used in conjunction with a code from category I21
    - The sequencing of the I22 and I21 codes depends on the circumstances of the encounter
    - Do not assign code I22 for subsequent MIs other than type 1 or unspecified
  - For a subsequent type 2 MI, assign only code I21.A1
  - For a subsequent type 4 or type 5 MI, assign only code I21.A9

## References

- Bolooki, H. M., & Askari, A. (2010). Acute myocardial infarction. Cleveland Clinic Center for Continuing Education. Retrieved from <http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/cardiology/acute-myocardial-infarction>
- Centers for Disease Control (CDC). (2017). ICD-10-CM official guidelines for coding and reporting, FY 2018. Retrieved from <https://www.cms.gov/medicare/Coding/ICD10/Downloads/2018-ICD-10-CM-Coding-Guidelines.pdf>
- Leon-Chisen, N., and Rapier, A. (2017). FY 2018 updates part I: ICD-10 codes and official guidelines for coding and reporting. American Hospital Association.
- Mukherjee, D. (2017, September 21). Clinical performance and quality measures for STEMI and NSTEMI. Retrieved from <http://www.acc.org/latest-in-cardiology/ten-points-to-remember/2017/09/20/16/24/2017-aha-acc-clinical-performance-and-quality-measures-for-stemi>
- Pinson, R., & Tang, C. (2017, November 17). 2018 CDI pocket guide. Middleton, MA: ACDIS.
- Saaby, L., Poulsen, T. S., Hosbond, S., Larsen, T. B., Pyndt Diederichsen, A. C., Hallas, J., ... Mickley, H. (2013). Classification of myocardial infarction: Frequency and features of type 2 myocardial infarction. *The American Journal of Medicine*, 126(9), 789–797.
- Sandoval, Y. Smith, S. W., Thordsen, S. E., & Apple, F. S. (2014). Supply/demand type 2 myocardial infarction: Should we be paying more attention? *Journal of the American College of Cardiology*, 63(20), 2079–2087.
- Simons, M. (2017). Classification of unstable angina and non-ST elevation myocardial infarction. UpToDate. Retrieved from <http://www.uptodate.com/contents/classification-of-unstable-angina-and-non-st-elevation-myocardial-infarction>
- Stein, G. Y., Herscovici, G., Korenfeld, R., Matetzky, S., Gottlieb, S., Alon, D., ... Fuchs, S. (2014). Type-II myocardial infarction-patient characteristics, management and outcomes. *PLOS One*, 9(1), e84285. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3879301>
- World Health Organization. (2017, January). The top 10 causes of death. Retrieved from [www.who.int/mediacentre/factsheets/fs310/en](http://www.who.int/mediacentre/factsheets/fs310/en)

## Acknowledgements

ACDIS would like to thank the entire CDI Practice Guidelines Committee and select members of the ACDIS Advisory Board for reviewing, editing, and offering suggestions for this paper.

Carr and Romanello would like to extend a special thanks to Sam Antonios, MD, FACP, SFHM, CPE, CCDS, for his expert clinical advice and revisions to this paper.

### WHAT IS AN ACDIS WHITE PAPER?

An ACDIS white paper discusses CDI best practice, advances new ideas, increases knowledge, or offers administrative simplification. It can be written by an ACDIS Advisory Board member or a smaller subset of the board, or written by external sources subject to board approval. It is less formal than a position paper.