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**EXPERT CONSENSUS DOCUMENT**

## Fourth universal definition of myocardial infarction (2018)

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patients with increased cTn values, clinicians must distinguish whether patients have suffered a non-ischaemic myocardial injury or one of the MI subtypes. If there is no evidence to support the presence of myocardial ischaemia, a diagnosis of myocardial injury should be made. This diagnosis can be changed if subsequent evaluation indicates criteria for MI. The current **Fourth Universal Definition of Myocardial Infarction** Consensus Document reflects these considerations through adhering to the clinical approach of the definition of MI.

#### Clinical criteria for MI

The clinical definition of MI denotes the presence of acute myocardial injury detected by abnormal cardiac biomarkers in the setting of evidence of acute myocardial ischaemia.

### 4 Pathological characteristics of myocardial ischaemia and infarction

MI is defined pathologically as myocardial cell death due to prolonged ischaemia. Diminished cellular glycogen, and relaxed myofibrils and sarcolemmal disruption, are the first ultrastructural changes and are seen as early as 10–15 min after the onset of ischaemia.<sup>16</sup> Mitochondrial abnormalities are observed as early as 10 min after

reported to occur following injury to non-cardiac tissues. The situation is more complex for cTnT. Biochemical data indicate that injured skeletal muscle expresses proteins that are detected by the cTnT assay, leading to some situations where elevations of cTnT could emanate from skeletal muscle.<sup>23–27</sup> Recent data suggest that the frequency of such elevations in the absence of ischaemic heart disease may be higher than originally thought.<sup>28,29</sup> cTnI and cTnT are the preferred biomarkers for the evaluation of myocardial injury,<sup>12,21,22,30</sup> and high-sensitivity (hs)-cTn assays are recommended for routine clinical use.<sup>22</sup> Other biomarkers, e.g. creatine kinase MB isoform (CK-MB), are less sensitive and less specific.<sup>31</sup> Myocardial injury is defined as being present when blood levels of cTn are increased above the 99th percentile upper reference limit (URL).<sup>12,21,22,30</sup> The injury may be acute, as evidenced by a newly detected dynamic rising and/or falling pattern of cTn values above the 99th percentile URL,

#### Criteria for myocardial injury

Detection of an elevated cTn value above the 99th percentile URL is defined as myocardial injury. The injury is considered acute if there is a rise and/or fall of cTn values.

or chronic, in the setting of persistently elevated cTn levels.

Although elevated cTn values reflect injury to myocardial cells, they do not indicate the underlying pathophysiological mechanisms, and can arise following preload-induced mechanical stretch or phys-