

Definition of acute coronary syndrome

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The British Cardiac Society (BCS) Working Group on the definition of acute myocardial infarction¹ presents a pragmatic and practical nomenclature for acute coronary syndromes (ACS) and sets definite cut off points for troponin T (TnT) and troponin I (TnI).

We reviewed retrospectively the relation between TnT and creatine kinase (CK) in 978 admissions to our cardiac care unit (over a three year period) who survived to discharge. Criteria for inclusion were simple—that the final discharge diagnosis be recorded, and that patients survive to discharge and had TnT and a peak CK recorded. No attempt was made to correct for sampling time. Our aim was to establish a cut off value for TnT to be equivalent to twice our upper limit of normal for CK ($2 \times 190 = 380$ IU). The mean TnT was 1.09 ng/ml and the mean CK was 433 IU. The correlation between the two, while significant, was not good enough to be clinically useful (fig 1). CK could range from 200–1000 IU for a TnT of 1 ng/ml. A TnT of 0.75 ng/ml was the best analogue of a CK of 380 IU.

Sensitivity, specificity, positive and negative predictive value, and accuracy are given across a range of CK and TnT values in table 1. Receiver operator curves were derived for the sensitivity, specificity, and accuracy for CK and TnT for the clinician discharge diagnosis of acute myocardial infarction (fig 2).

The data were re-analysed and restricted to survivors across the spectrum of chest pain, excluding conditions such as atrial fibrillation, etc. As expected the specificity of both CK and TnT fell but the best value of TnT remained 0.75 ng/ml as an analogue of a CK value of 380 IU. The cut off value for TnT for a local diagnosis of acute myocardial infarction will probably vary between units. As it is important that we have consistency we are happy to accept a TnT value of 1 ng/ml as the diagnostic cut off for acute myocardial infarction.

As a result of this analysis it became apparent that the diagnostic nomenclature that we were using was unclear to our general medical and general practitioner (GP) colleagues. Clinical coders also commented on the inconsistent terminology and struggled to code ACS with a positive troponin.

General practitioners and rehabilitation staff reported particular difficulties and were often unclear of the patient's diagnosis. GPs were unable to settle on a common Read code for ACS with positive troponin. With this in mind we have proposed the following nomenclature that attempts to link ICD-10 and Read codes, pending an official reclassification. The proposed changes take into account the mapping carried out by

NHS Information Authority Clinical Terminology Browser (v1.04).

We propose an additional term to the BCS classification—that of “ACS unspecified”. This would be in keeping with other coding systems that recognise that coding can be imprecise. We propose that the established ICD-10 code for unstable angina (I200), as well as being used for unstable angina, can be used as a code for ACS which is not otherwise specified at discharge.

We propose that the ICD-10 code I200 be expanded with the extension “TN” to code for the BCS term “ACS with unstable angina” where troponin is negative (I200TN), and with the extension “TP” for the BCS term “ACS with myocyte necrosis” where troponin is positive (I200TP). This latter code has the attraction of mapping readily to the Read term “microinfarction of the heart” (Read code G31y1) occurring in the circumstances of other acute and subacute ischaemic heart disease. The extension “AB” could be added for those acute infarcts aborted by intervention or thrombolytic therapy (I200AB) (table 2).

These codes map readily to Read codes and will allow primary care to code in a uniform manner. National returns to MINAP will have a more detailed coding system that can be mapped to any new international codes.

The BCS proposed term “ACS with clinical MI” could be regarded as a parent term equivalent and mapped to the parent ICD-10 code for acute myocardial infarction I21 and parent Read code G30 for acute myocardial infarction (table 2). More detail as to site and nature of infarct is obtained by drilling down the coding hierarchy. Note that more clinically descriptive options are provided by the Read code system. It is likely that these more accurately reflect what is described in current hospital discharge letters because of the limitation of ICD-10 codes to describe acute myocardial infarction. If a local unit wishes to code in a more detailed fashion for audit purposes it should consider using the Read terms. This does not preclude hospital coders using ICD-10 codes for central returns.

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Abbreviations: ACS, acute coronary syndrome; BCS, British Cardiac Society; CK, creatine kinase; MINAP, Myocardial Infarction National Audit Project; TnI, troponin I; TnT, troponin T

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Table 1 Sensitivity, specificity, positive and negative predictive value, and accuracy across a range of CK and TnT values

CK (IU)	Sens (%)	Spec (%)	PPV (%)	NPV (%)	Acc (%)	TnT (ng/ml)	Sens (%)	Spec (%)	PPV (%)	NPV (%)	Acc (%)
100	97	55	46	98	67	0.05	99	76	61	99	82
120	96	65	52	98	74	0.1	98	81	67	99	86
140	95	72	57	97	78	0.15	96	84	70	98	87
160	94	77	61	97	82	0.2	95	86	73	98	89
180	92	80	64	96	83	0.25	93	88	74	97	89
200	91	83	68	96	85	0.3	89	90	77	96	90
220	90	85	71	96	87	0.35	89	91	79	96	90
240	88	88	74	95	88	0.4	87	91	79	95	90
260	86	90	77	94	89	0.45	86	92	81	94	90
280	84	92	80	94	90	0.5	86	92	81	94	90
300	83	92	81	93	90	0.55	83	93	83	93	90
320	82	93	83	93	90	0.6	81	94	83	93	90
340	79	94	84	92	90	0.65	80	94	84	92	90
360	78	94	84	91	90	0.7	77	95	86	91	90
380	76	95	85	91	90	0.75	77	95	87	91	90
400	75	95	86	91	89	0.8	76	96	87	91	90
420	73	95	86	90	89	0.85	75	96	88	91	90
440	72	95	86	90	89	0.9	73	96	88	90	90
460	69	96	86	89	88	0.95	72	96	88	90	89
480	68	96	87	88	88	1	71	97	89	90	89
500	65	96	87	88	87	1.25	63	97	90	87	88
						1.5	60	98	91	86	87
						1.75	55	98	93	85	86
						2	46	99	93	82	84

Acc, accuracy; CK, creatine kinase; NPV, negative predictive value; PPV, positive predictive value; Sens, sensitivity; Spec, specificity; TnT, troponin T.

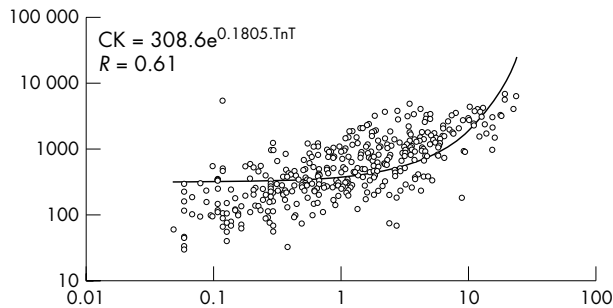


Figure 1 Creatine kinase (CK) versus troponin T (TnT) plotted on a log scale.

REFERENCE

- 1 Fox KAA, Birkhead J, Wilcox R, et al. British Cardiac Society Working Group on the definition of myocardial infarction. *Heart* 2004;**90**:603–9.

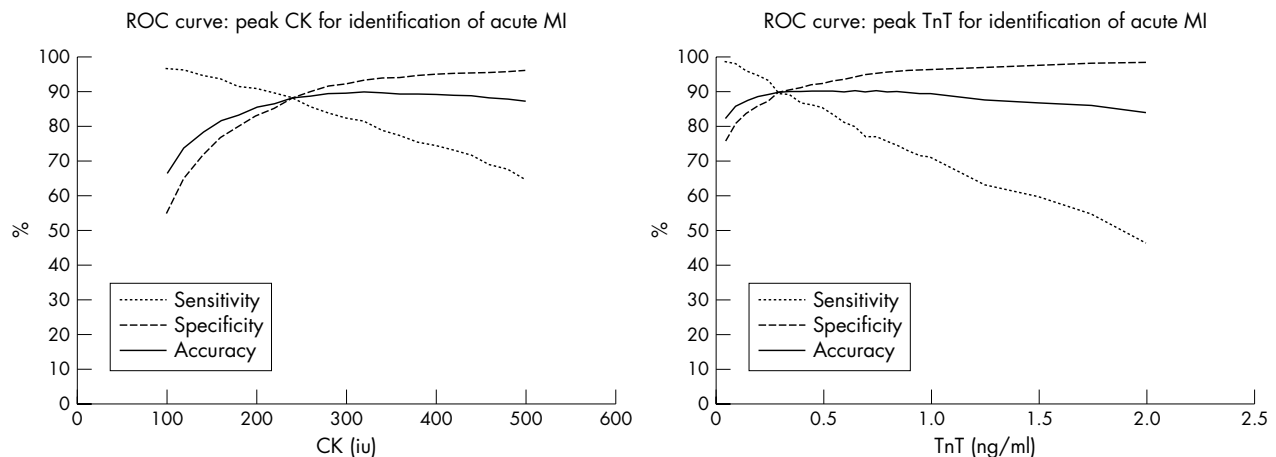


Figure 2 Receiver operator curves (ROC) for CK and TnT for the identification of acute myocardial infarction as define by the discharging clinician.

Table 2 A proposed terminology and mapping for acute coronary syndromes

Proposed BCS terminology	Maps to	ICD-10 code	ICD-10 term equivalent	Maps to	Read code	Read code term equivalent
ACS unspecified		I200	Unstable angina		G3111	Unstable angina
ACS with unstable angina (troponin -ve)		I200TN	Unstable angina: troponin -ve		G3111	Unstable angina
ACS with myocyte necrosis (troponin +ve)		I200TP	Unstable angina: troponin +ve		G31Y1	Microinfarction of heart
ACS aborted MI		I200AB	No equivalent ICD10 term		G3110	MI aborted
ACS with clinical MI			Parent ICD10 code covering AMI	Maps to	G30	Parent read code covering AMI
Acute ST elevation MI of anterior wall	Maps to	I21	Acute transmural MI of anterior wall		G301z	Anterior MI NOS
		I210	Acute transmural MI of anterior wall		G300	Acute anterolateral infarction
			Acute transmural MI of anterior wall		G301	Other specified anterior MI
			Acute transmural MI of anterior wall		G3010	Acute anteroapical infarction
			Acute transmural MI of anterior wall		G3011	Acute anteroseptal infarction
			Acute transmural MI of anterior wall		G380	Postoperative transmural MI of anterior wall
Acute ST elevation MI of inferior wall		I211	Acute transmural MI of inferior wall		G308	Inferior MI NOS
			Acute transmural MI of inferior wall		G302	Acute inferolateral infarction
			Acute transmural MI of inferior wall		G303	Acute inferoposterior infarction
			Acute transmural MI of inferior wall		G30yz	Other acute MI NOS
Acute ST elevation MI of other sites		I212	Acute transmural MI of inferior wall		G381	Postoperative transmural MI of inferior wall
			Acute transmural MI of other sites		G304	Posterior MI NOS
			Acute transmural MI of other sites		G305	Lateral MI NOS
			Acute transmural MI of other sites		G306	True posterior MI
			Acute transmural MI of other sites		G30y2	Acute septal infarction
			Acute transmural MI of other sites		G382	Postoperative transmural MI of other sites
Acute ST elevation MI of unspecified site		I213	Acute transmural MI of unspecified site		G30X0	AcuteST segment elevation MI
			Acute transmural MI of unspecified site		Gyu34	[X]Acute transmural MI of unspecified site
Acute non-ST elevation MI		I214	Acute subendocardial MI		G3071	Acute non-ST segment elevation MI
		I214	Acute subendocardial MI		G307	Acute subendocardial infarction
		I214	Acute subendocardial MI		G3070	Acute non-Q wave infarction
		I214	Acute subendocardial MI		G30y1	Acute papillary muscle infarction
		I214	Acute subendocardial MI		G384	Postoperative subendocardial MI
Acute MI unspecified		I219	Acute MI unspecified		G30y	Other acute MI
		I219	Acute MI unspecified		G30z	Acute MI NOS

ACS, acute coronary syndrome; AMI, acute myocardial infarction; BCS, British Cardiac Society; MI, myocardial infarction, NOS, not otherwise specified.