Lack of diagnostic accuracy of acute myocardial infarction discharge codes by Italian national agency:insight from a quality improvement initiative in a tertiary care hospital

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Background: In Italy, the authority tasked by the Ministry of Health to monitor and profile hospital-level quality of care is the National Agency for Regional Health Services – AGE.NA.S, which uses discharge diagnosis code defined by the International Classification of Diseases (ICD). While most western countries use the ICD-10 system (introduced in the US in 1999), in Italy the current version is still the ICD-9. Limitations of ICD-9 compared to ICD-10 in patients with acute myocardial infarction (AMI) include the presence of obsolete codes (such as 411.1 "intermediate coronary syndrome") and inability to discriminate primary AMI – the only that should be included as main discharge diagnosis – from secondary AMI.

Purpose: To assess the diagnostic accuracy of AGE.NA.S. AMI criteria using a gold standard AMI diagnosis and explore reasons for suboptimal accuracy in a large tertiary care Italian hospital.

Methods: Every year, AGE.NA.S. publishes online eligibility criteria to produce overall and hospital-specific disease-related outcome data for major diagnostic categories, including AMI. For 2016, AGE.NA.S. reported online 547 AMI patients for our Institution. Using AGE.NA.S. published criteria (eg. exclusion of AMI patients transferred from another institution) and after extracting patient-level ICD code in our hospital, we obtained a population almost identical, 546 patients (AGE.NA.S.-reproduced population).
As part of a quality improvement initiative conducted in consecutive patients with acute coronary syndrome (ACS) in our Institution, two physicians (with one expert in AMI adjudication) independently adjudicated the presence and type of AMI according to the Third Universal MI definition in all patients with suspected ACS -- Adjudicated AMI patients.

Results: Of the 573 patients with an adjudicated AMI admitted to our Institution in the index period, 525 (91.6%) were identified by AGE.NA.S. criteria (Figure, Upper Panel). On the other hand, 21 of the 546 (3.8%) AGE.NA.S. patients did not have a confirmed AMI. Therefore AGE.NA.S. criteria provided a diagnostic sensitivity for AMI of 91.6%, a positive predictive value of 96.1% and a global diagnostic accuracy of 88.4%.
Of the 48 patients discharged with an adjudicated AMI and not identified by AGE.NA.S. (ie false negative patients) the most common diagnostic (n=34, 71%) code was 411.1. Notably 9% of patients (n=53) had a secondary (type 2) AMI according to the Universal MI Classification, which was included as main diagnostic code (Figure, Lower Panel)

Conclusion: AGE.NA.S. criteria showed modest diagnostic accuracy for AMI diagnosis, mostly due to obsolete and non-discriminating ICD-9 diagnostic codes. This lack of diagnostic accuracy may limit the reliability of epidemiology of AMI diagnosis and may have important implications to interpret quality of AMI care in Italy.

		AMI identified by AGE.NA.S. criteria		Total
		NO	YES	
AMI Adjudicated	NO	0	21	21
	YES	48	525	573
		48	546	594

$$\text{Sensitivity} = \frac{525*100}{573} = 91.6\%$$

$$\text{Positive Pred. Value} = \frac{525*100}{546} = 96.1\%$$

$$\text{Diagnostic Accuracy} = \frac{525*100}{594} = 88.4\%$$

Frequency of AMI types according to the Third Universal Definition

- AMI not adjudicated - 3,5%
- Type 1 - 79,1%
- Type 2 - 8,9%
- Type 3 - 0,7%
- Type 4a - 0,2%
- Type 4b - 5,1%
- Type 4c - 2,5%