

# Modified shock index - a strong predictor of outcome among patients presenting ST-segment elevation myocardial infarction

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# BACKGROUND

- ✧ Cardiogenic shock (CS) remains the most **common cause of death** in ST-elevation myocardial infarction (**STEMI**) patients.<sup>1</sup>
- ✧ Although the increasing use of primary percutaneous coronary intervention (PPCI) in ST-elevation myocardial infarction (STEMI) patients has contributed to reduce the incidence of CS, **it still occurs in 5–8%** with approximately **50% mortality**.<sup>2</sup>
- ✧ In GUSTO trial, CS developed an average 12 h after enrolment into the study in STEMI patients who were not considered to have CS at the time of initial assessment.<sup>3</sup>
- ✧ **Early identification of subclinical shock** prevent the development of cardiogenic shock, allowing a more assertive strategy and approach.
- ✧ The **modified shock index** (MAP) - ratio of heart rate to mean arterial pressure on admission - has been shown in small studies to have a predictive value of mortality in medical and trauma emergency patients. A **value equal or superior to 1.3** was associated to **higher admissions on intensive unit care or death**.<sup>4</sup> To our Knowledge it was not tested in STEMI patients.

1-Giannuzzi P, Imparato A, Temporelli PL, de Vito F, Silva PL, Scapellato F, Giordano A. Doppler-derived mitral deceleration time of early filling as a strong predictor of pulmonary capillary wedge pressure in postinfarction patients with left ventricular systolic dysfunction. *J Am Coll Cardiol.* 1994;23:1630–1637.

2- Reynolds HR and Hochman JS. Cardiogenic shock: Current concepts and improving outcomes. *Circulation* 2008; 117: 686–697.

3-Hasdai D, Holmes DRJ, Califf RM, et al. Cardiogenic shock complicating acute myocardial infarction: Predictors of death. GUSTO investigators. *Global Utilization of Streptokinase and Tissue-Plasminogen Activator for Occluded Coronary Arteries Am Heart J* 1999; 138: 21–31.

4- Liu YC1, Liu JH, Fang ZA et al. Modified shock index and mortality rate of emergency patients. *World J Emerg Med.* 2012;3(2):114-7.

# PURPOSE

To **evaluate** the **modified shock index**, as a **predictor of in hospital and 6-month mortality** among patients (pts) admitted with **STEMI**.



# METHODS

**2389 pts** admitted consecutively in our coronary care unit with ACS, from **July of 2009 to June 2014**

Pts with STEMI (**n=1140**)

MSI = HR / MAP

**Group 1**

Pts with MSI <1.3  
n=1076, 94.4%

**Group 2**

Pts with MSI ≥1.3  
n=64, 5.6%

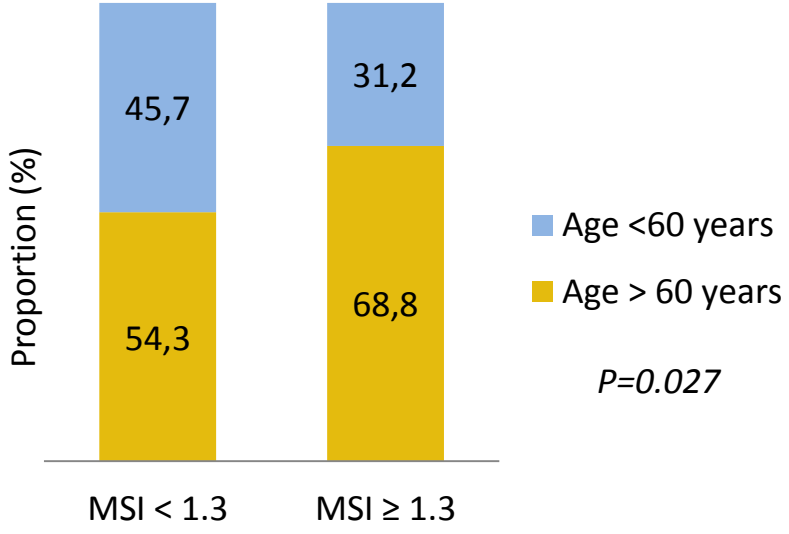
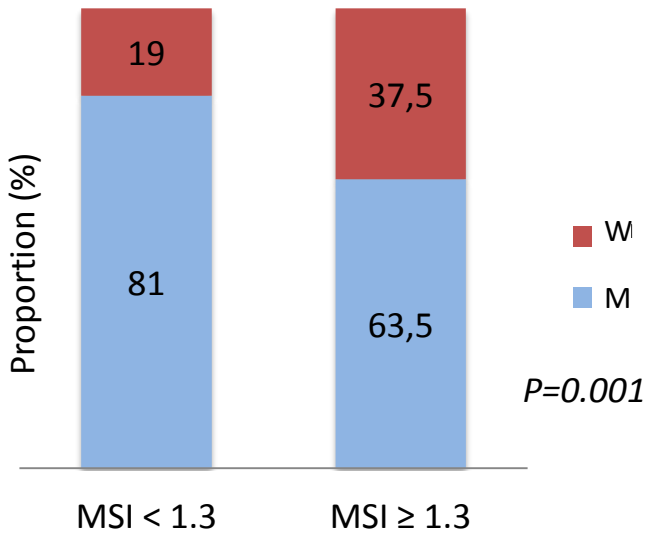
Primary endpoint was the occurrence of death at 6 months.

Follow-up was completed in 99% of patients.

# RESULTS

## 1. Baseline patients' characteristics on admission

### a. Demographic characteristics



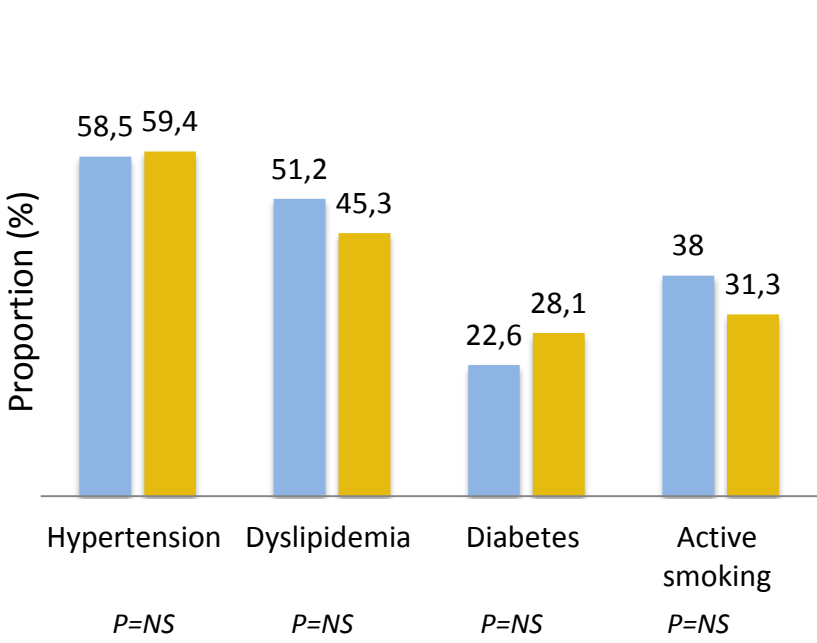
	MSI < 1.3	MSI ≥ 1.3	P value
Age (years)	62±14	<b>67±14</b>	<b>0.003</b>
BMI < 19 kg/m2 (%)	0.9	1.6	NS
BMI > 30 kg/m2 (%)	20.6	12.9	NS



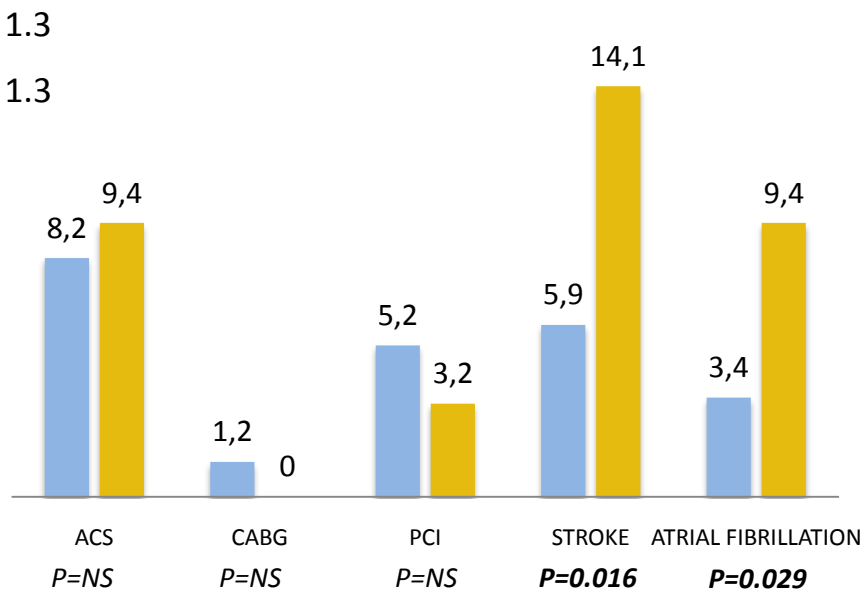
# RESULTS

## 1. Baseline patients' characteristics on admission

b. Previous Cardiovascular risk factors



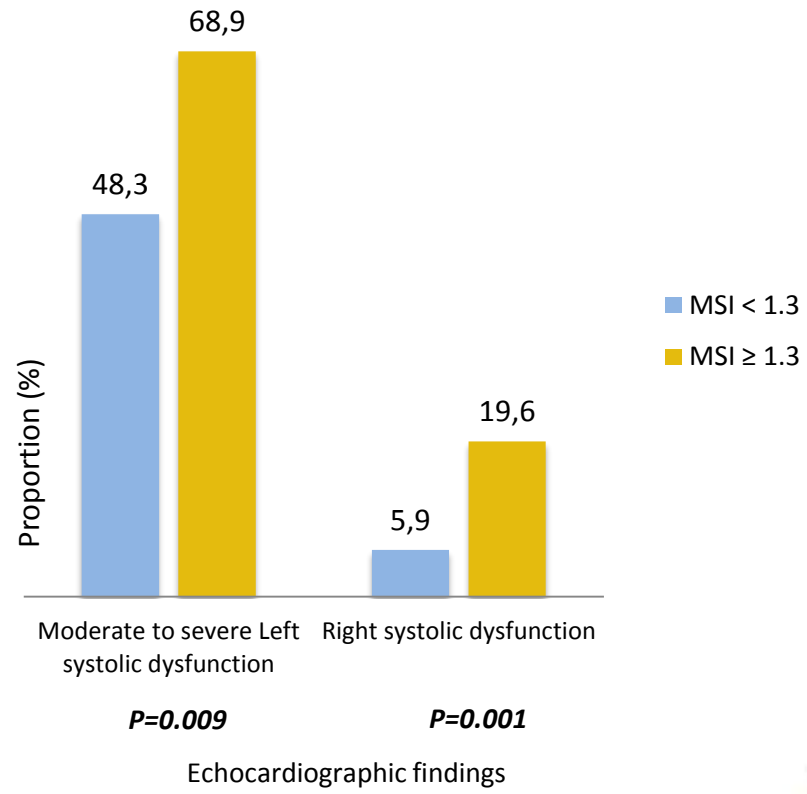
c. Previous Cardiovascular History



# RESULTS

## 2. Clinical Presentation

	MSI < 1.3	MSI ≥ 1.3	P value
SBP (mmHg)	129±27	93±19	<0.001
DBP (mmHg)	79±16	60±13	<0.001
MAP (mmHg)	96±18	71±14	<0.001
HR (BPM)	76±17	108±19	<0.001
Killip > 1 (%)	18.0	56.3	<0.001
Killip = 4 (%)	2.9	28.1	<0.001
Anaemia (%)	20.9	48.4	<0.001
Renal Insufficiency (%) eGFR<60 ml/min	21.8	42.6	<0.001
Left Main disease or 3 vessels disease (%)	16.3	31.3	0.005



# RESULTS

## 3. In-hospital Treatment

### a. Pharmacological Treatment

	MSI < 1.3	MSI ≥ 1.3	P value
Aspirin (%)	99.1	99.8	NS
Clopidogrel (%)	99.1	98.4	NS
Beta Blockers (%)	86.7	62.5	<0.001
IIb IIIa glycoprotein inhibitors (%)	20.4	29.7	0.08
ACE-Inhibitors/RA blockers (%)	87.5	64.1	<0.001
Diuretics	32.0	58.7	<0.001
Statins (%)	98.7	91	0.001
LMWH (%)	32.5	34.4	NS
UFH (%)	72.7	78.1	NS
Inotropics (%)	7.4	50	<0.001



# RESULTS

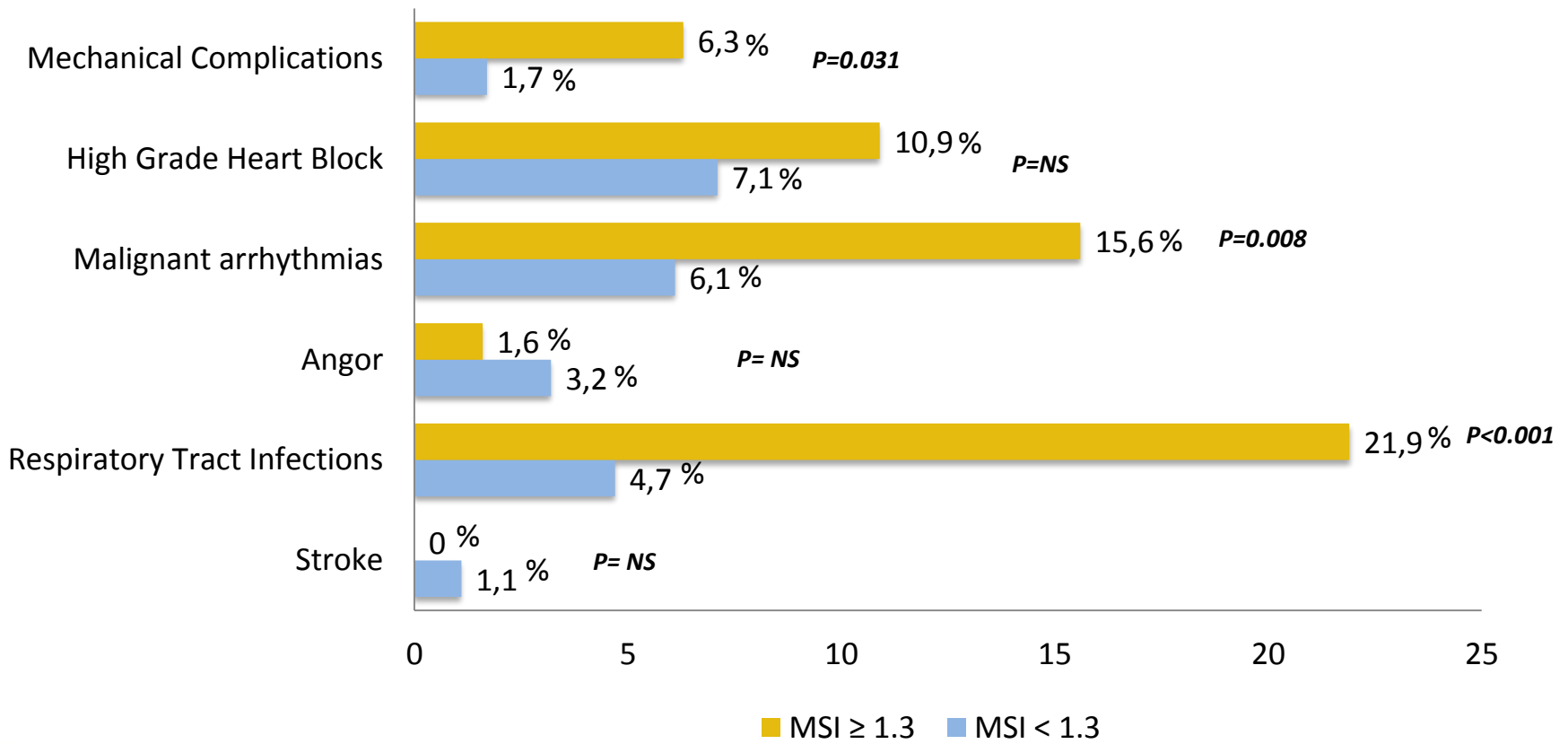
## 3. In-hospital Treatment

### b. Procedures

	MSI < 1.3	MSI ≥ 1.3	P value
Revascularization (PPCI or CABG)	97.8	94.8	NS
Time door to balloon (h:min)	5	5h:15	NS
CABG	6.0	4.5	NS
Thrombolysis	1.1	0	NS
Non-invasive ventilation	2.5	21.7	<0.001
Mechanical ventilation	2.6	17.4	<0.001
Intra-aortic balloon pump	2.9	38.3	<0.001

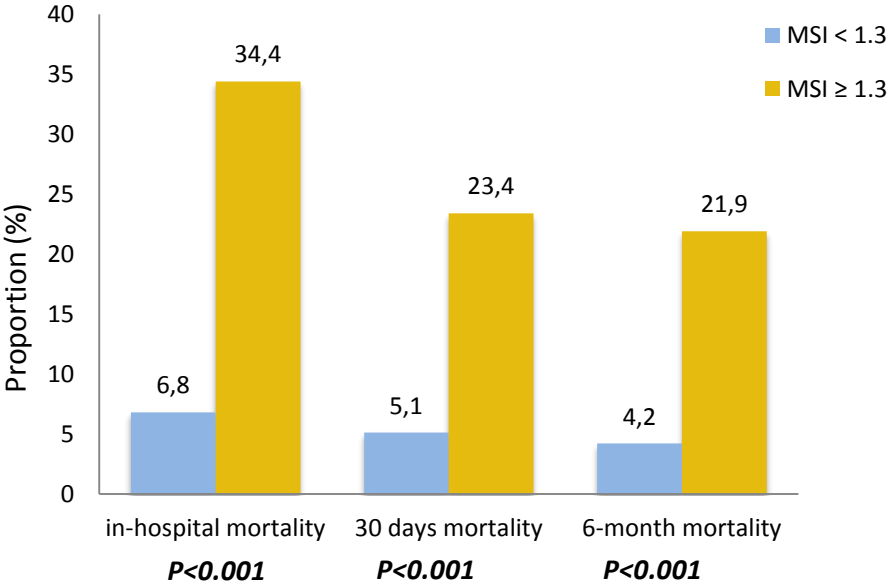
# RESULTS

## 4. In-hospital events



# RESULTS

## 5. Mortality events



### Univariate analysis

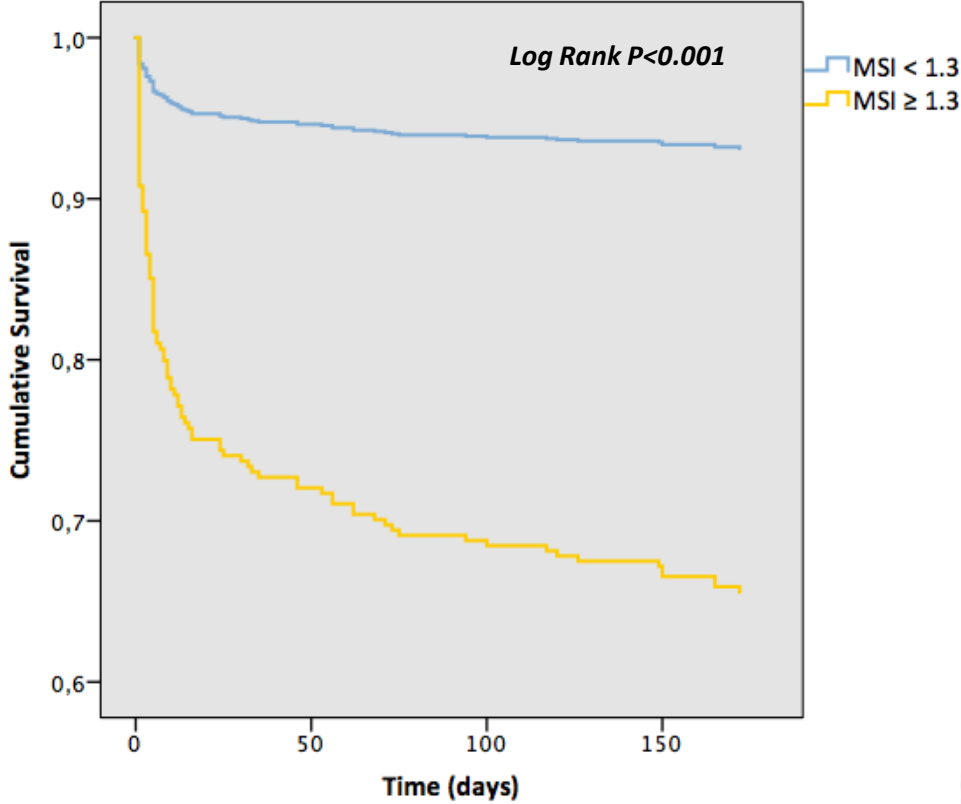
Variable	OR	95% CI		P value
		Inferior	Superior	
In-Hospital mortality	6.40	3.30	12.43	<0.001
30 days mortality	5.67	2.99	10.74	<0.001
6-month mortality	7.18	4.07	12.67	<0.001

# RESULTS

## 6. Independent Predictors of Mortality

Independent Predictors of mortality, by Cox Regression.

Variable	OR	95% CI		P value
		Inferior	Superior	
Age	1.0 5	1.02	1.09	0.004
eGFR < 60 ml/min (CCG)	5.7 8	2.51	13.30	<0.001
KK > 1	1.7 6	1.001	3.07	0.05
LV systolic dysfunction	1.5 7	0.83	2.94	NS
Anaemia	1.2 6	0.43	4.00	NS
Gender	1.0 0	0.56	2.23	NS
<b>MSI ≥ 1.3</b>	<b>3.8 1</b>	1.81	8.03	<b>&lt;0.001</b>



Survival analysis by Kaplan-Meier survival curves.

# CONCLUSION

- ✧ STEMI patients with high heart rate and low MAP are at risk of developing cardiogenic shock and have a higher mortality.
- ✧ In our sample, **MSI  $\geq$  1.3 was a strong predictor of in hospital and 6-month mortality** among patients with **STEMI**.
- ✧ MSI is an **easily accessible tool**, which can be used to signalize more critical patients.
- ✧ It can be used to prevent iatrogenic CS by avoiding some therapies in the early management of high risk patients with relative hypotension and tachycardia.
- ✧ By signaling patients with worse prognosis, it can help us to monitor them more closely.
- ✧ A large scale study should be performed to validate and compare it with current existing validated indices.

## Limitations of study:

- ★ This is a single centre, retrospective study with all potential drawbacks of such design including unadjusted data.
- ★ We only have information on all-cause mortality and not cardiovascular mortality.