

# Time delay Factors in Patients with Acute ST-segment Elevation Myocardial Infarction undergoing Primary Percutaneous Coronary Intervention.

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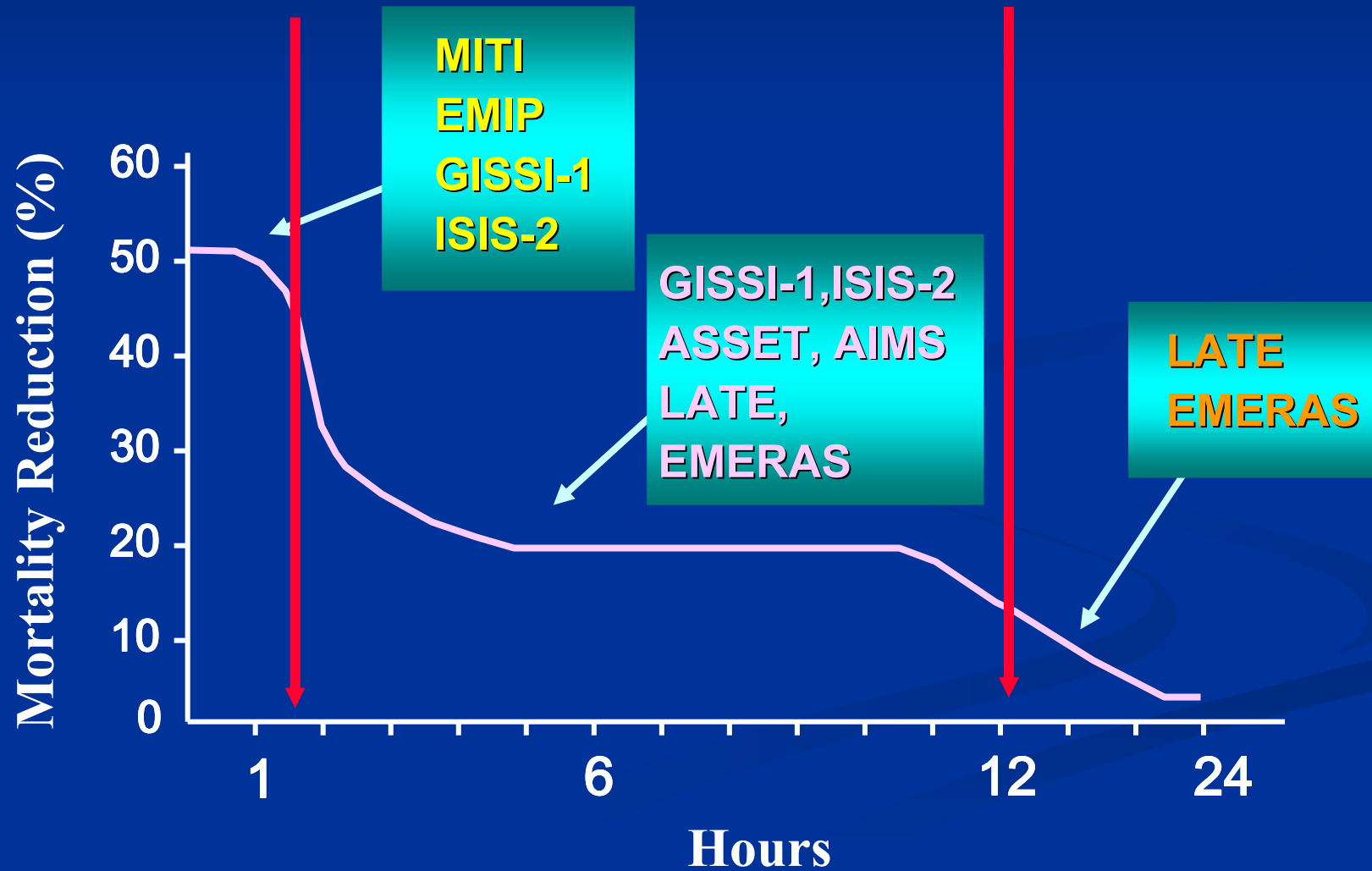
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# Backgrounds

- Reperfusion therapy in STEMI
  - Thrombolysis vs. Primary PCI
  - Primary PCI is associated with better results
  
- Reperfusion therapy should be performed as soon as possible .

# Mortality Reduction

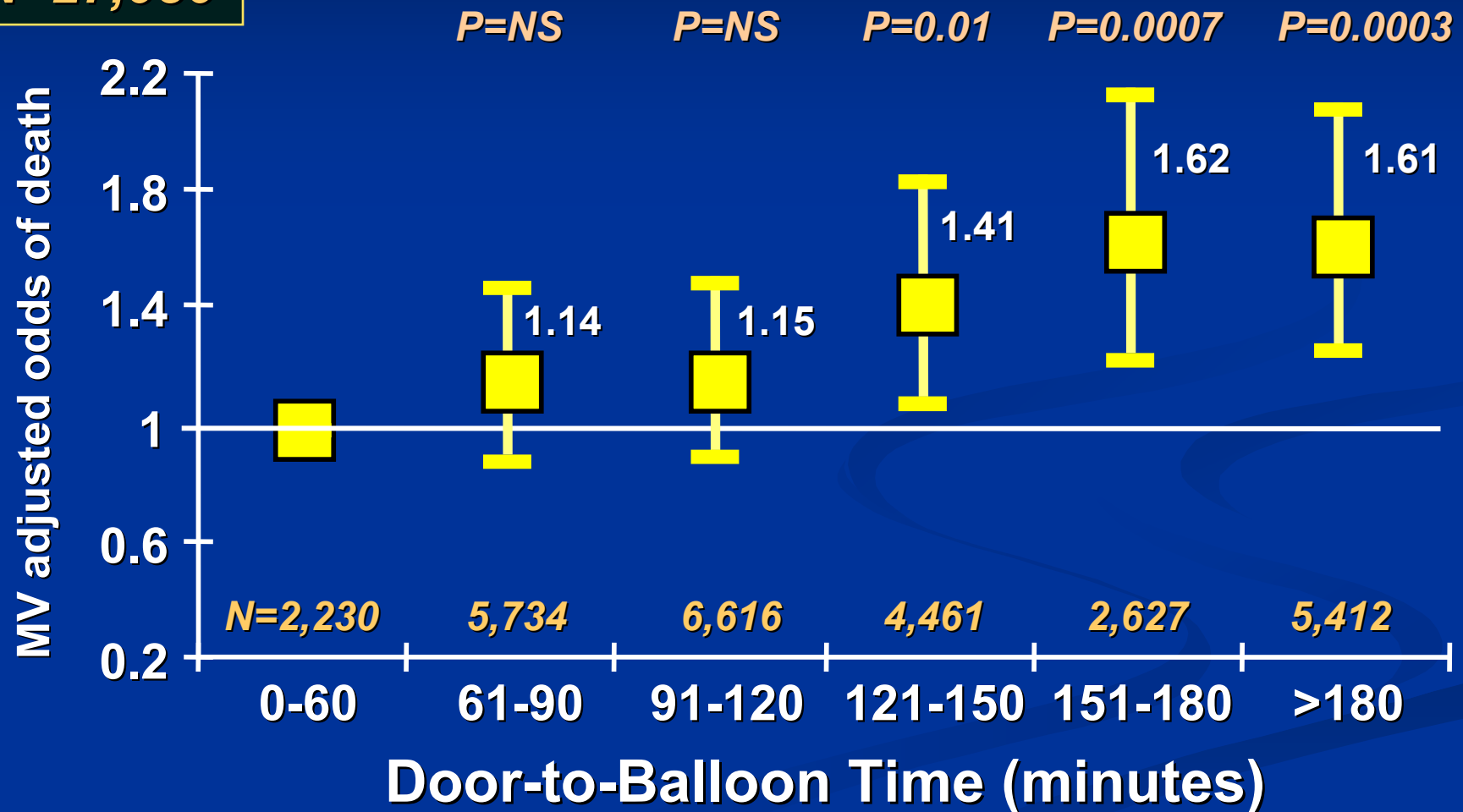
*Depending on Thrombolysis Time*



# Mortality Reduction

*Depending on Door-to-Balloon Time*

**N=27,080**



**NRMI-2 Primary PCI**

Cannon C et al.  
JAMA 2000; 283:2941

# Three Major Components of Treatment Delay

## Current

Onset of MI      Patient response      Door Data Decision      Drug started      Flow restored

Thrombolysis

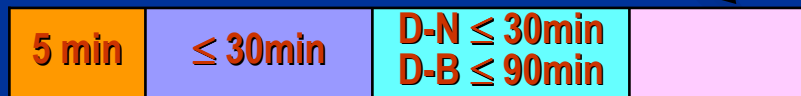


Primary PCI



Cath PCI

## Goal



## Speeding

Media campaign  
Patient education

Greater use of ambulance  
1° physician education  
Prehospital care

MI protocol  
CP, QI

Bolus lytics  
Dedicated PCI team



# Aims

- To analyze the incidence of delayed treatment in STEMI patients
- To analyze factors associated with treatment delay

# Definition of Acute STEMI

- Typical chest pain persisting for >30 min
- Elevation of serum cardiac biomarkers to >2 times than reference limit
- Presence of T waves/ST change indicating myocardial damage, new Q waves, or satisfying both in ECG

# Methods

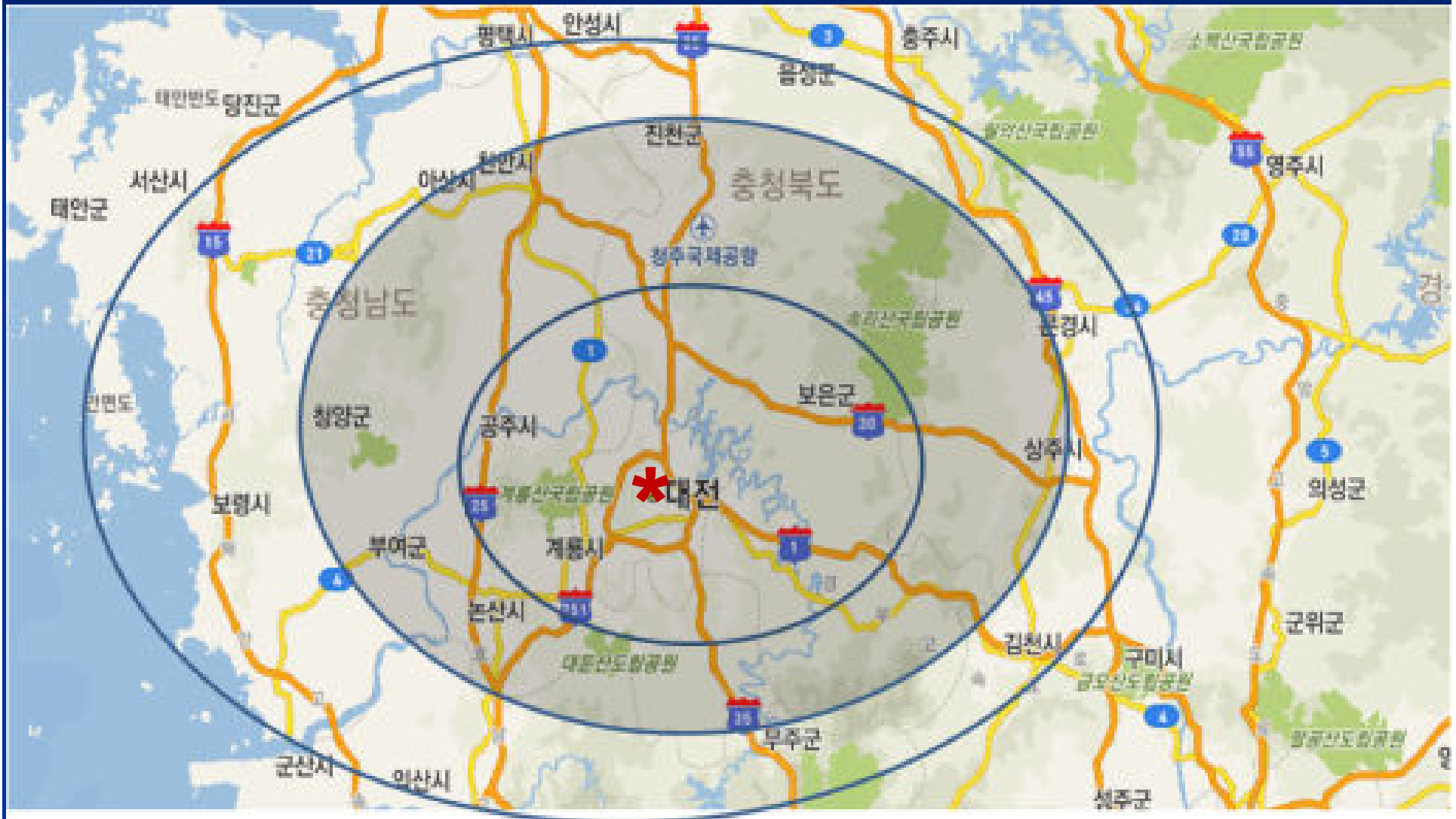
- Prospective observational study
- January 1<sup>st</sup> 2005 ~ December 31<sup>st</sup> 2007
- STEMI patients with symptom to door time less than 12 hrs
  - Primary PCI

# Results

# Baseline Characteristics

Variables	All (n=364)
Age	63±12
Sex(M/F)	251/113
Smoking(current)	173 (48.0%)
HTN	178 (49.0%)
Hyperlipidemia	20 (5.0%)
DM	96 (26.0%)
Family history	48 (13.0%)
Previous angina	14 (4.0%)
Previous CVA	14 (4.0%)
<b>City residence</b>	<b>215 (59.0%)</b>

# City Residence



# Time Analysis between Onset of Symptoms to Reperfusion

Variables	Total (%)
Pain to decision (median value)	101.4±10.6min (median 50min)
Referred patients	268 (74.0%)
Referral hospital (general hospital/ private clinic)	179/89 (67.0%/3.0%)
Transfer time	95.4±5.1min (median 70min)
Pain to door (CNUH ER, median)	221±12.4min (median 172min)
Door to balloon	89±6 (median 65min)
Pain to balloon	311±14min (median 250min)

# Time delay according to residence

Variables	Pain to balloon time		p-value
	≤3 hr (n=117)	>3hr (n=247)	
Age	61±11	64±12	ns
Sex(M/F)	86	165	ns
Smoking(current)	61 (52.0%)	112 (45.0%)	ns
HTN	56 (48.0%)	122 (49.0%)	ns
Hyperlipidemia	6 (5.0%)	14 (6.0%)	ns
DM	31 (26.0%)	65 (26.0%)	ns
Family history	19 (16.0%)	29 (12.0%)	ns
Previous angina	7 (6.0%)	7 (3.0%)	ns
Previous CVA	3 (3.0%)	11 (4.0%)	ns
<b>City residence</b>	<b>88 (75.0%)</b>	<b>127 (51.0%)</b>	<b>&lt;0.001</b>

# Comparison of time analysis Between Onset of Symptoms to Reperfusion

Variables	Pain to balloon time		p-value
	≤3 hr (n=117)	>3hr (n=247)	
Pain to decision	20.4±1.6min (10min)	139.7±14.9min (230min)	<0.001
Direct admission to my hospital	51 (44.0%)	45 (18.0%)	<0.001
Transferred hospital (Secondary/Primary)	43(37.0%)	136 (55.0%)	ns
Transferred time	30.6±2.8min (30min)	126.2±6.5min (115min)	<0.001
Pain to door time	69.7±2.8min (65min)	294.3±16.3min (230min)	<0.001
Door to balloon time	62.5±2.1min (60min)	101.5±8.7min (68min)	0.002

# Causes for Admittance

Variables	n=364
<b>Major symptoms</b>	
Chest pain /discomfort	261 (71.0%)
Other symptoms	103 (28.0%)
Nausea, Vomiting	44 (11.9%)
Radiation pain (Neck, Arm)	23 (6.2%)
Loss of consiousness	16 (3.5%)
Others	21 (5.7%)
<b>Patient Self-diagnosed Problem</b>	
Cardiac origin	297 (80.3%)
Unknown	44 (11.9%)
Gastrointestinal symptoms	27 (7.3%)
Others	2 (0.5%)

# Comparison of Symptoms

Variables	Pain to balloon time		p-value
	≤ 3 hours (n=117)	> 3 hours (n=247)	
<b>Major symptoms</b>			
Chest pain	89 (76%)	172 (70%)	
Other symptoms	28 (24%)	75 (30%)	
Nausea/vomiting	11	33	ns
Radiation pain	3	19	
Dizziness/LOC	6	10	
Others	8	13	
<b>Awareness of AMI (Yes/No)</b>	<b>100/17 (85%/15%)</b>	<b>191/56 (77%/23%)</b>	<b>0.064</b>
Living with family (Yes/No)	111/6 (95%/5%)	239/8 (97%/3%)	ns
ER arrival time (day: 8am-6pm)	73 (62%)	159 (64%)	ns
ER arrival time (week days)	90 (77%)	184 (74%)	ns

# Transport Vehicles of Admittance

Variables	n=364	≤3 hours (n=117)	> 3 hours (n=247)	p-value
<b>Ambulance</b>	<b>79 (22%)</b>	<b>37 (32%)</b>	<b>42 (17%)</b>	
Others	285 (78%)	80 (68%)	205 (83%)	
Private car	120 (33%)	42	78	
Private car to Ambulance	118 (32%)	27	91	0.003
Taxi	12 (3%)	5	7	
Others	37 (10%)	6	29	

# Comparison of In-hospital Clinical Characteristics

Variables	Pain to balloon time		p-value
	≤ 3 hours (n=117)	> 3 hours (n=247)	
Systolic BP (mmHg)	156.4±16.7	141.1±8.0	ns
Diastolic BP (mmHg)	1513.4±17.4	95.2±8.4	ns
Heart rate (/min)	88±11.3	85±6.5	ns
<b>CK base (U/L)</b>	<b>237.5±48.2</b>	<b>663.1±73.6</b>	<b>&lt;0.001</b>
CK-MB base (ng/mL)	76.0±45.0	73.9±9.5	ns
<b>CK peak (U/L)</b>	<b>1930.6±173.4</b>	<b>2603.4±163.9</b>	<b>0.012</b>
<b>CK-MB peak (ng/mL)</b>	<b>188.2±14.0</b>	<b>265.7±15.1</b>	<b>0.002</b>
CK peak time (hour)	10.3±0.64	25.5±13.0	ns
<b>Troponin I (ng/mL)</b>	<b>44.9±6.7</b>	<b>103.6±20.2</b>	<b>0.049</b>
NT-pro BNP (pg/mL)	2006.8±483	2965±591	ns
<b>LV EF (%)</b>	<b>53.68±1.0</b>	<b>49.7±0.7</b>	<b>0.002</b>

# Comparison of In-hospital Clinical Characteristic

Variables	Pain to balloon time		p-value
	≤ 3 hours (n=117)	> 3 hours (n=247)	
Killip class I	100 (85%)	222 (90%)	ns
II	9 (8%)	13 (5%)	
III	3 (2%)	7 (3%)	
IV	5 (5%)	5 (2%)	
Culprit vessels(LAD/others)	53/64 (45%)	116/131( 47%)	ns
Ventricular tachycardia/fibrillation	12/105( 10%)	16/231 (6%)	ns
Complete AV block	14/103 (12%)	20/227 (8%)	ns
Sinus arrest	15/102 (13%)	17/230 (7%)	ns
Admission duration (days)	4.35±0.3	4.89±0.2	ns

# Multivariate Linear Regression Analysis of Time delay

Variables	Unstandardized Coefficients		Standardized Coefficients	p-value
	B	Standard error	Beta	
Age (years)	1.732	1.217	0.081	0.156
Gender	-17.079	31.824	-0.031	0.592
Previous history of AMI	72.483	76.565	0.050	0.344
Previous history of IHD	58.869	70.564	0.044	0.405
Resistance	11.746	17.083	0.036	0.492
<b>First visiting hospital*</b>	37.847	18.957	0.108	<b>0.047</b>
Awareness of AMI	17.773	20.999	0.048	0.398
Major symptom	-13.119	8.831	-0.086	0.138

# Clinical Characteristics of In-Hospital Deaths

Variables	Survivor (n=345)	In-Hospital Death (n= 19)	p-value
<b>Sex</b>			<b>0.01</b>
Male	243(96.8%)	8 (3.2%)	
Female	102(90.2%)	11 (9.8%)	
<b>Age</b>	<b>63.0±12.0</b>	<b>73.4±10.4</b>	<b>&lt;0.001</b>
DM	91 (26.3%)	7 (36.8%)	0.26
Hypertension	171 (49.5%)	9 (47.3%)	0.46
<b>Loss of consciousness</b>	<b>21 (6.0%)</b>	<b>8 (42.0%)</b>	<b>&lt;0.001</b>
<b>Killip class</b>			
I	318 (92.2%)	5 (26.3%)	<b>&lt;0.001</b>
II	19 (5.5%)	3 (15.7%)	0.107
III	7 (2.0%)	3 (15.7%)	<b>0.013</b>
IV	1 (0.3%)	8 (42.3%)	<b>&lt;0.001</b>

# Clinical Characteristics of In-Hospital Deaths

Variables	Survivors (n=345)	In-Hospital Deaths (n= 19)	p-value
Defibrillation	24(6.9%)	10(50.0%)	<0.001
Complete AV block	25 (7.2%)	9 (47.3%)	<0.001
Sinus arrest	19(5.5%)	13 (68.4%)	<0.001
LAD infarction	161 (46.6%)	10 (52.6%)	0.82
RCA infarction	147 (42.6%)	6 (31.5%)	0.36
Pain to decision	102±142	278±694	0.001
Pain to ER	212±180	380±670	0.002
Pain to reperfusion therapy	300±210	487±681	0.002
Systolic BP (mmHg)	122±27	85±38	<0.001
Diastolic BP (mmHg)	76±17	52±20	<0.001
Heart rate	75±53	121±208	0.004

# Prognostic Factors of In-Hospital Deaths Using Multivariate Analysis

Variables	Odd ratio	95% CI	p-value
Male	0.746	0.150-3.712	0.720
<b>Age</b>	<b>1.160</b>	<b>1.038-1.297</b>	<b>0.009</b>
Loss of Consciousness Before Reperfusion	1.175	0.053-26.258	0.919
Killip class			
I	0.197	0.018-2.193	0.186
IV	32.41	0.926-1134.379	0.055

# Prognostic Factors of In-Hospital Death Using Multivariate Analysis

Variables	Odd ratio	95% CI	p-value
Defibrillation	0.110	0.005-2.554	0.169
Complete AV block	4.739	0.560-40.071	0.153
<b>Sinus arrest</b>	<b>25.167</b>	<b>1.172-540.244</b>	<b>0.039</b>
Pain to decision	0.996	0.991-1.001	0.134
<b>Pain to ER</b>	<b>1.006</b>	<b>1.001-1.011</b>	<b>0.027</b>
Pain to reperfusion therapy	1.004	1.000-1.008	0.084
Systolic BP, mmHg	1.022	0.982-1.063	0.283
Diastolic BP, mmHg	0.949	0.892-1.011	0.103
Heart rate	0.999	0.985-1.014	0.940

# Summary

- Among patients who were treated with primary coronary intervention for STEMI, 74% was **transferred from other hospitals** during pain to door time.
- One of the most critical factors of delay in pain to reperfusion time was **delay in pain to door time, especially transfer time delay.**

# Summary

- Significant factors increasing in-hospital mortality are **old age, development of sinus arrest, and delay in pain to door time**

# Conclusion

- Time delay is associated with increased in-hospital mortality in patients with AMI undergoing primary PCI
- To reduce delay in pain to door time
  - Increase insight of chest pain with prompt and regular public education about chest discomfort
  - Recommend use of ambulance direct to the tertiary hospital where is possible primary PCI in cases of typical chest pain.
  - Activation of regional cardiovascular center might reduce transfer time delay.

***Thank you for your  
attention !!***

