

Reduction of Door-To-Balloon Time for Patients with ST-Segment Elevation Myocardial Infarction (STEMI) Undergoing Primary Percutaneous Coronary Intervention (PCI) .

Title of Project:

To achieve median door-to-balloon time to <90 minutes; and for 100% patients with ST-elevation myocardial infarction (STEMI) to receive primary percutaneous coronary (PCI) interventions, within 6 months.

Name of Project Leader:

A/Prof Tan Huay Cheem, Chief and Senior Consultant, Cardiac Dept, NUH.

Project Synopsis:

It was found that in NUH, the median door-to-balloon time from Jan to Oct 06 was 103 minutes, which is longer than the recommended 90 minutes. The team sought to identify operational and clinical processes for treating patients who have acute myocardial infarction, and to institute changes that may shorten the door-to-balloon time. Having formed a multidisciplinary team to look at the causes of delay, implementations are put in place to overcome those significant delays. By August 07, more than 90% of the patients achieved door-to-balloon time of below 90 minutes, with a median door-to-balloon time of 65 minutes. This is in sharp contrast to the period prior to project implementation, when the door-to-balloon time was in the range of 87 to 104 minutes. NUH has continued to sustain the results to maintain a median of below 70 mins 24/7 into 1 year of their change. This has placed NUH door-to-balloon time to be in world quality indicator class compared with peers worldwide.

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1. Project Background

We know that door-to-balloon time impacts directly on the heart attack patient's survival.

If immediately available, primary PCI should be performed in patients with STEMI (including true posterior MI) or MI with new or presumably new LBBB who can undergo PCI of the infarct artery within 12 hours of symptom onset, if performed in a timely fashion (*balloon inflation within 90 mins of presentation*) by persons skilled in the procedure. The longer it takes to have the artery opened up, the greater the amount of heart muscles will die. And obviously patients are not going to benefit from that.

By shortening this door-to balloon time, obvious clinical outcomes will benefit heart attack patients significantly.

2. Evidence of the Problem worth Solving

Original Article Singapore Med J 2007; 48 (2) : 131

The impact of time-to-balloon on outcomes in patients undergoing modern primary angioplasty for acute myocardial infarction

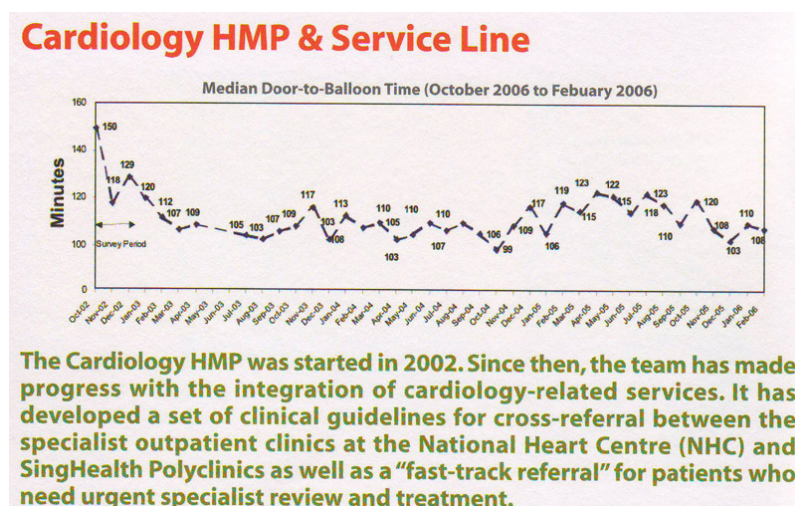
Soon C Y, Chan W X, Tan H C

June 2001 to May 2003
208 patients with consecutive STEMI undergoing Primary PCI were analysed

Soon CY et al ESC 2004 & Singapore Med J 2007; 48: 131-136

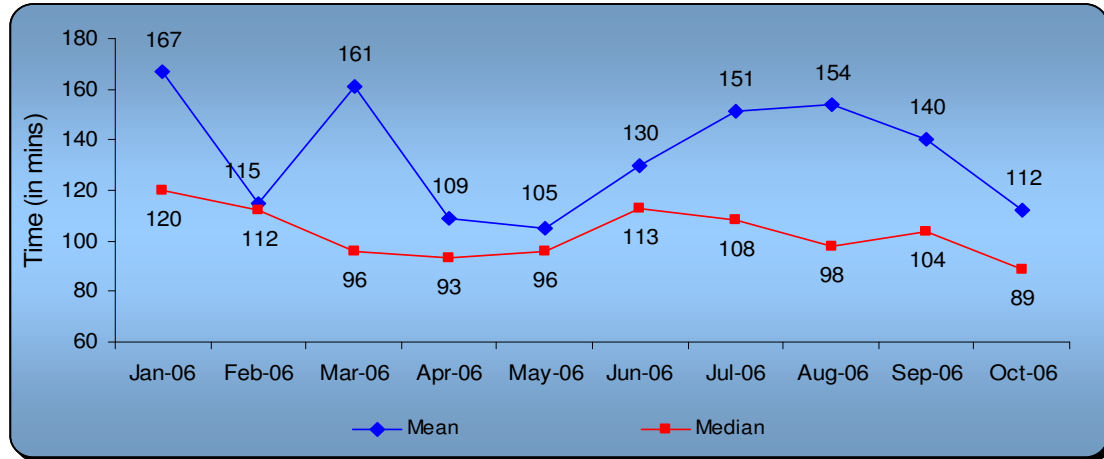
2.1 Studies have shown in Singapore, that for every hour of delay of our patient's presentation to the ER dept with chest pains, there is an increase in mortality by 3 %.

2.2 Comparison with Peers



2.3 NUH Door-to-balloon time (Pre-Intervention)

From Jan to Oct 2006, it was found that in NUH, the median door-to-balloon time for patients was 103 minutes, which is longer than the recommended 90 minutes.



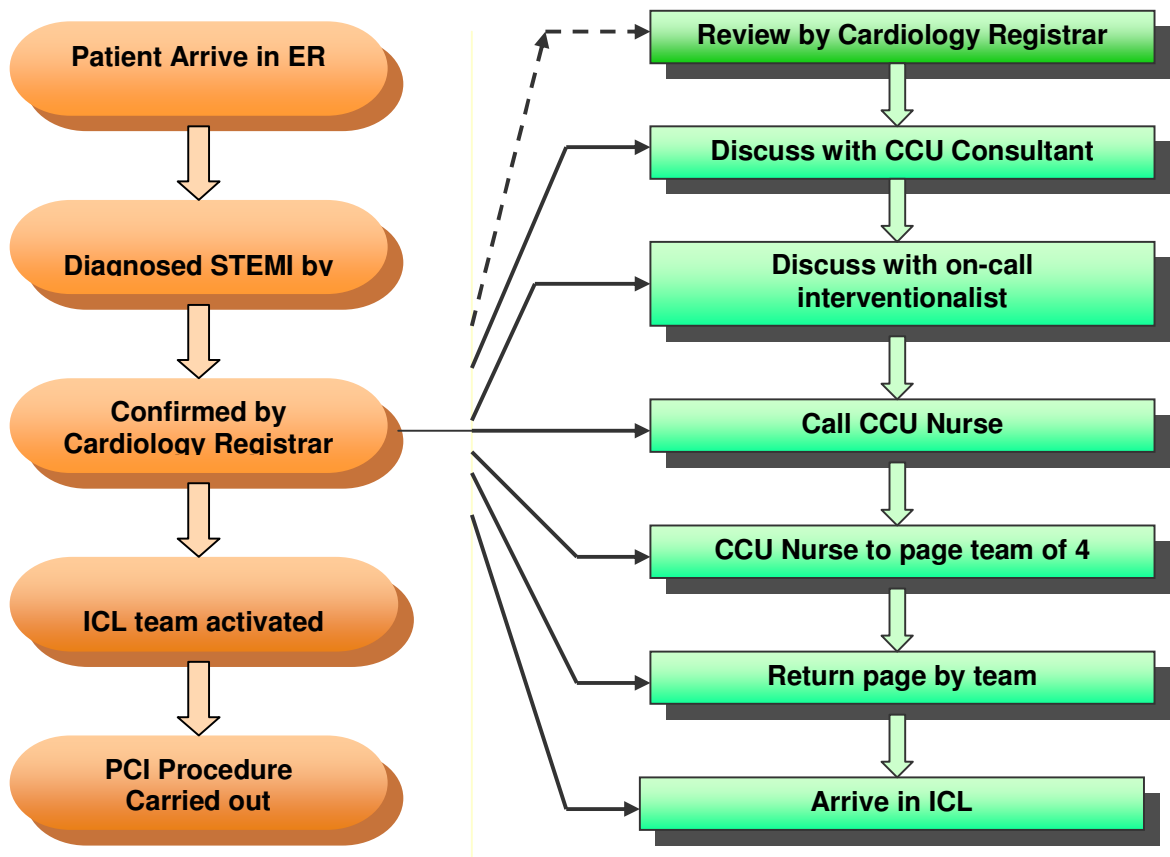
NUH: Mean and Median door-to-balloon times (in minutes) from Jan to Oct 2006

Aggregate Median time for Jan to Oct 06: 103 mins

3. Project Team Members

A/Prof Tan Huay Cheem	Leader Chief, Cardiac Department
Dr Ronald Lee Chi Hang	Co-leader Director, ICL Lab
A/Prof Shirley Ooi	Member Chief, A& E Department
Dr Edgar Tay	Member Cardiac Registrar
Ms Lim, Irene AM	Member Nursing Officer, ICL
Ms Susan Lam	Member Nursing Officer, CCU
Mr Anand Kailasam	Member Technologist, ICL
Mr Kok Chee Wai	Member Radiographer
Dr Sandhya	Member Manager, Medical Affairs

4. Flow chart of current process

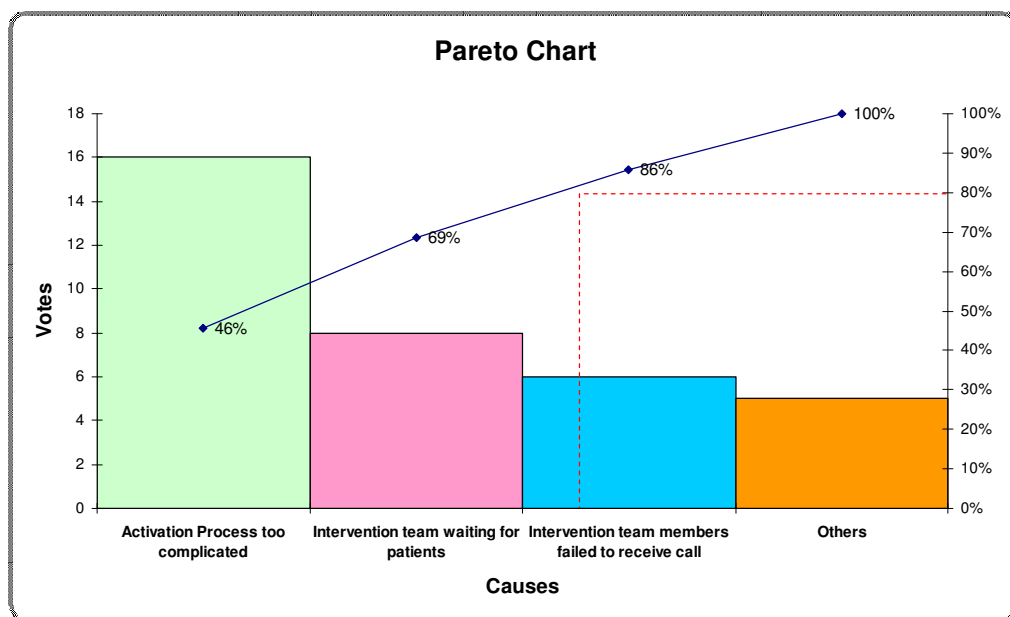


5. Diagnostic Journey & Findings

The inter-dept team convened together and found the below to be the main causes of reasons on the delay in the door-to-balloon time in NUH for patients undergoing STE-MI and requiring cardiac intervention. The delay at different levels were identified :

- 1. Emergency Dept**
 - Delayed diagnosis (patient missed, ECG not done, inexperienced doctor)
 - Uncertain diagnosis (non-diagnostic ECG)
 - Delayed activation of cardiology registrar
- 2. Cardiac Registrar**
 - Held up by other work / busy
 - Uncertain diagnosis
 - Need to contact many people (CCU consultant, interventionalist, CCU nurse)
 - Need to call several people (CCU consultant, interventionist etc)
- 3. CCU Nurse**
 - Not free to page
 - Unable to get through to ICL team
 - Does not know roster location
 - Forget to activate certain members of team
- 4. ICL Team**
 - Delayed return (far from hospital)
 - Pager did not work
- 5. Patient**
 - Delayed consent
 - Unstable hemodynamics requiring stabilization
 - Difficult vascular access
- 6. Transfer from ER to ICL**
 - No facilities for transfer (eg monitor, defibrillator, oxygen tank)
 - No porter
 - No nurse

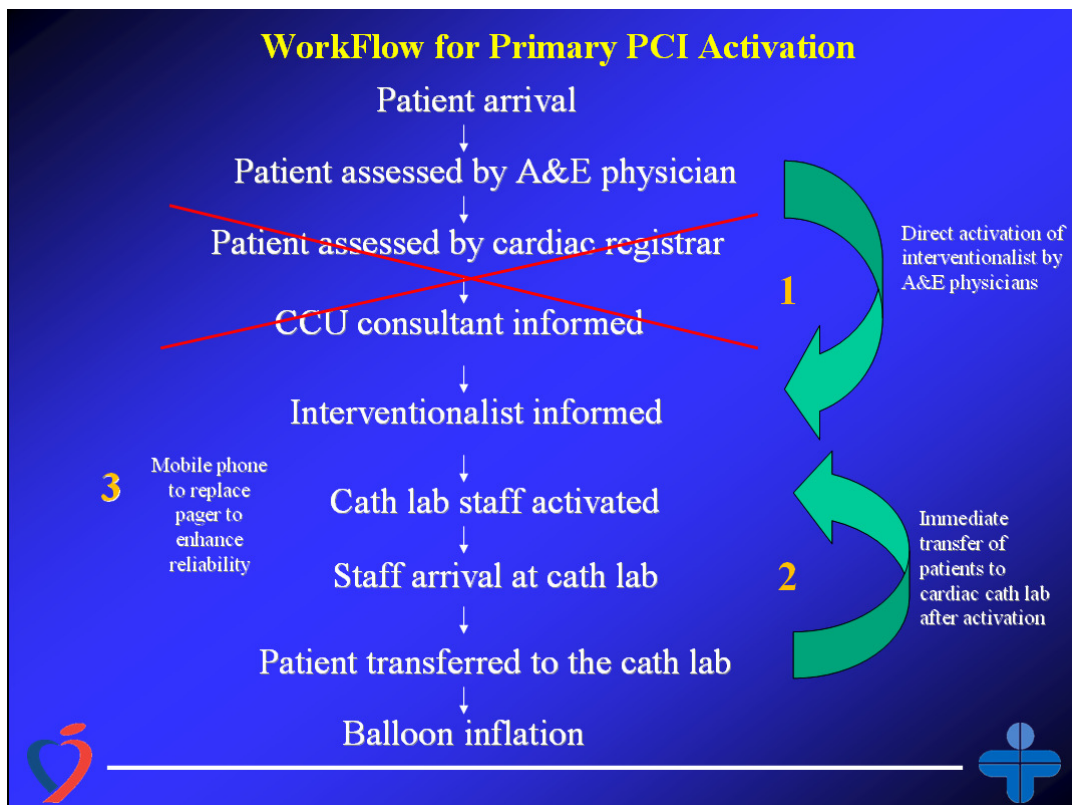
The team voted on what they felt was the top most causes that resulted in delays:



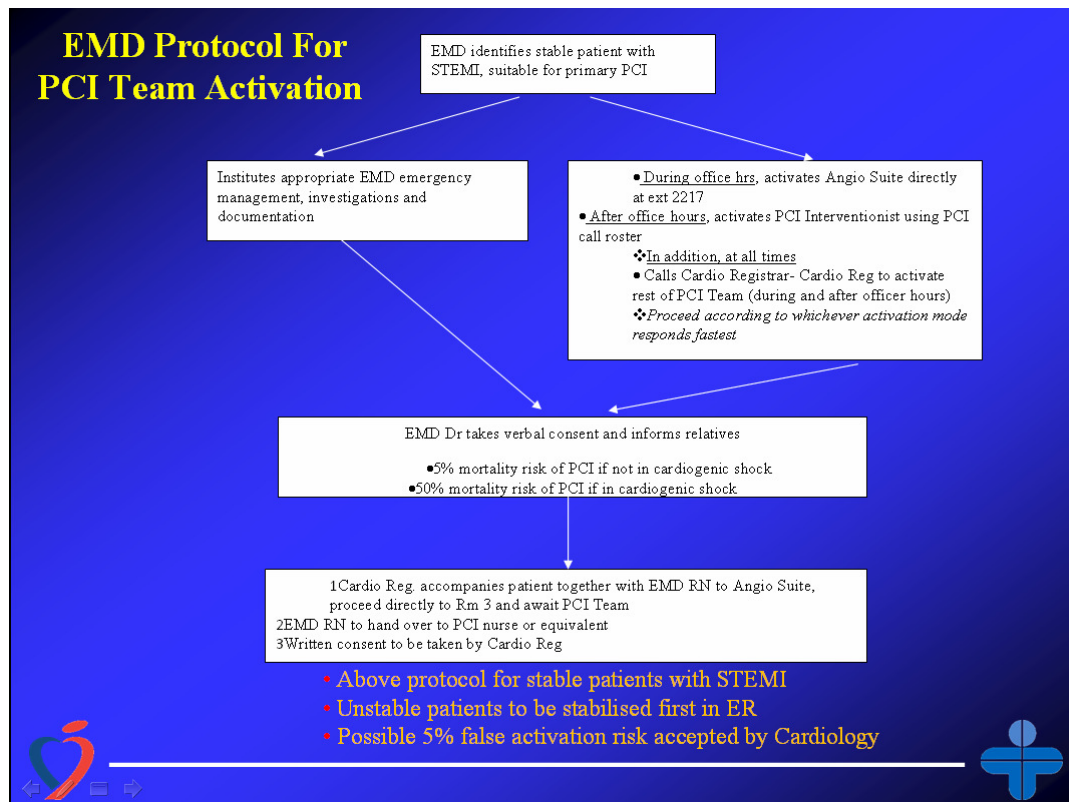
6. Interventions

6.1 The workflow for Primary PCI activation was changed on the below :

- Intervention 1. Direct activation of interventionalist by the A&E physicians
(the role of cardiac registrar to assess the patient and activate cath lab team is removed)
- Intervention 2. Immediate transfer of patients to cardiac cath lab after activation done
- Intervention 3. Mobile phones to replace pagers to enhance reliability



6.2 A Protocol was implemented in place for PCI team to be activated by ED:

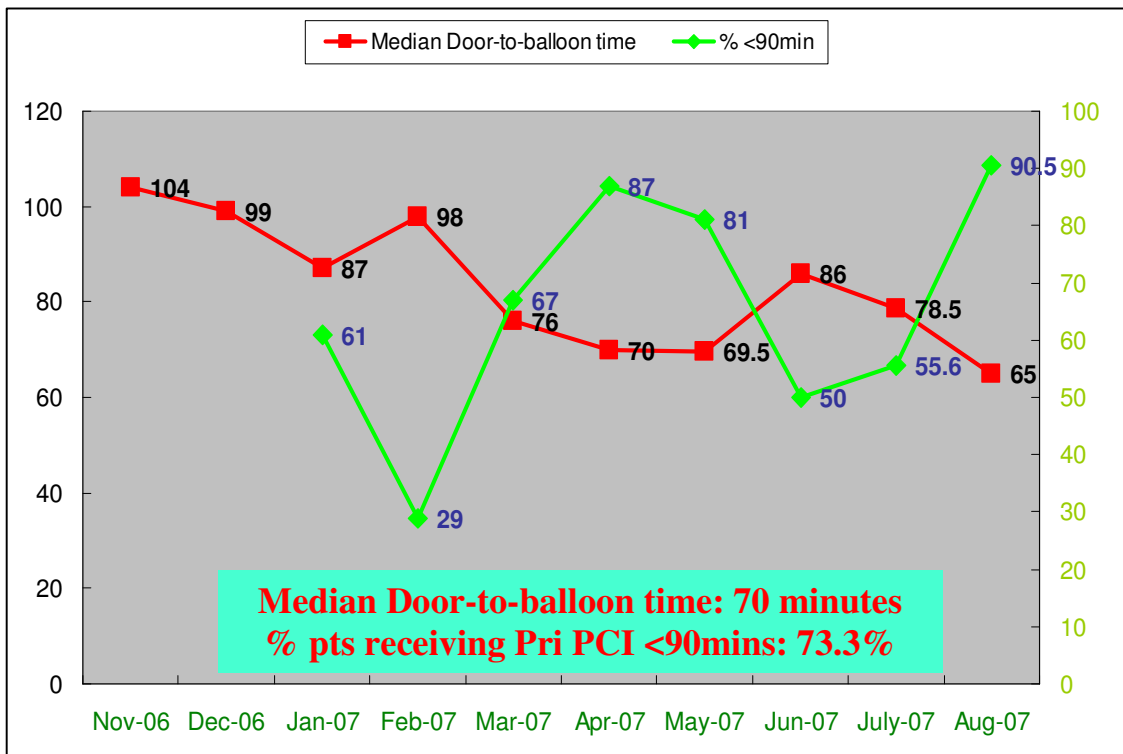


6.3 Action Plan for the above interventions

- Dissemination to all personnel concerned (eg interventionists, Cardiac/ER Dept informed)
- Standardised complication rate for primary PCI for non CS STEMI pts (5% death, 1% emerg op)
- Progress chart in ICL, handphones etc
- Roster in CCU
- Begin 12 Feb 2007 (Monday),
Completion of mission 11 Aug 2007
Audit (follow-up review) 12 May 2007

7. Results of interventions

CPIP Results (n=105)



8. *Lessons Learnt*

- Changing mindset and conventional practice method has resistance!
- Repetitive persuasion and convincing, ‘buy-in’
- Leadership will needed to remove obstacles

