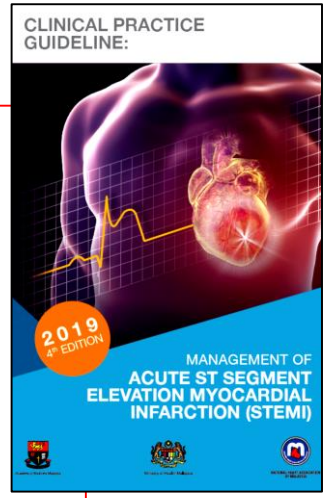
CLINICAL PRACTICE GUIDELINES

Management of ST Elevation Myocardial Infarction (STEMI) 2019

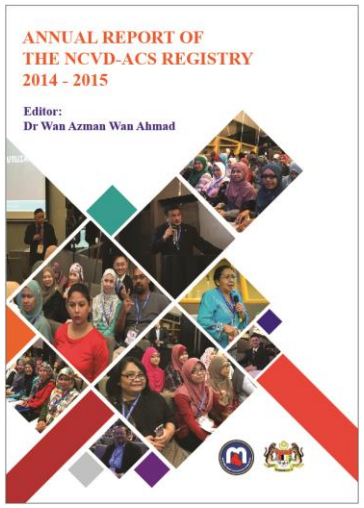
4th Edition

CPG : Management of STEMI 4th Ed, 2019



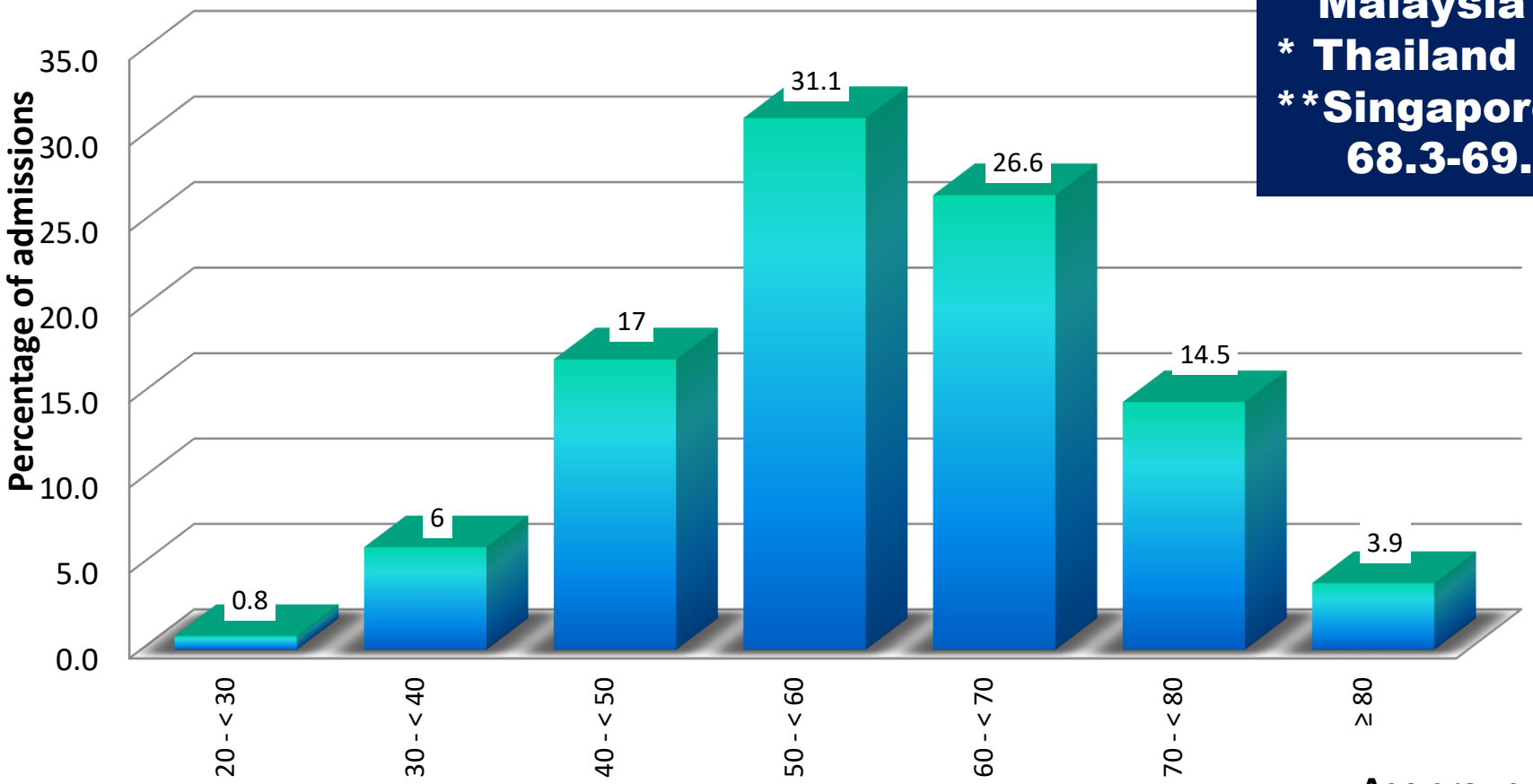
- **Rational**
- **Process**
  - **Writing Committee**
  - **External Reviewers**
  - **Target Group**
  - **Target Population**
- **Recommendations**
- **Performance Measures**
- **Implementation Strategies**

National Cardiovascular Database- Acute Coronary Syndrome (NCVD-ACS) Registry 2014- 2015



Age distribution of patients with ACS

Mean Age of ACS
Malaysia : 58.6 years
*** Thailand : 63.5 years**
****Singapore: (median: 68.3-69.2 years)**

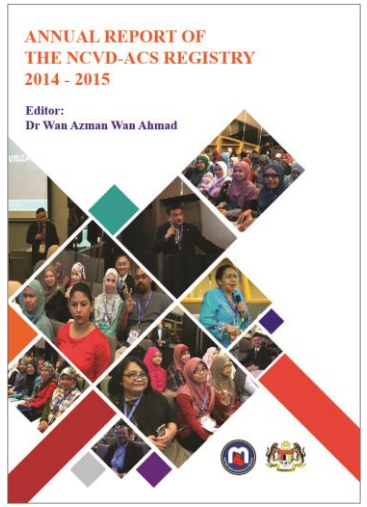


Mean age: 58.6 (12.2) years

Number of ACS admissions = 17,771

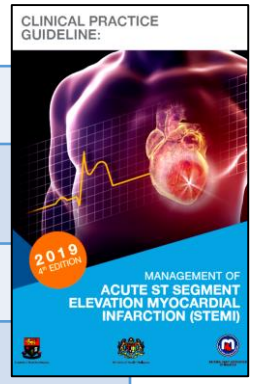
W.A. Wan Azman ,Sim KH (Ed). Annual Report of the NCVD-ACS Registry, Year 2011-2013. Kuala Lumpur, Malaysia: National Cardiovascular Disease Database, 2015.
**Thai Registry in Acute Coronary Syndrome (TRACS)--an extension of Thai Acute Coronary Syndrome registry (TACS) group: J Med Assoc Thai. 2012 Apr;95(4):508-18.*
***Singapore Myocardial Infarction Registry Report No 3:Trends in Acute Myocardial Infarction in Singapore 2007-2013. Singapore Myocardial Infarction Registry National Registry of Diseases Office Ministry of Health, Singapore*

National Cardiovascular Database-
Acute Coronary Syndrome (NCVD-ACS) Registry 2014- 2015



Year	Outcome	Outcome at discharge		30-day		1-year	
		No.	%	No.	%	No.	%
2011-2013	Alive	13,633	92.3	13,440	91.0		
	Died	1,130	7.7	1,323	9.0		
2014-2015	Alive	16,462	92.6	16,137	90.8	14,737	82.9
	Died	1,309	7.4	1,634	9.2	3,034	17.1

MEMBERS OF THE EXPERT PANEL



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Dr Amin Ariff Nuruddin	**Consultant Cardiologist, Head of Cardiology,** **Institute Jantung Negara, Kuala Lumpur**
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Dr Ong Mei Lin	**Consultant Cardiologist** **Gleneagles Penang**
Dr Saari Mohamad Yatim	**Consultant Rehabilitation Physician,** **Hospital Serdang**
Dr Sabariah Faizah Jamaluddin	**Consultant Emergency Physician** **Hospital Sungai Buloh**
Dr Wardati binti Mazlan Kepli	**Clinical Pharmacist,** **Hospital Serdang**
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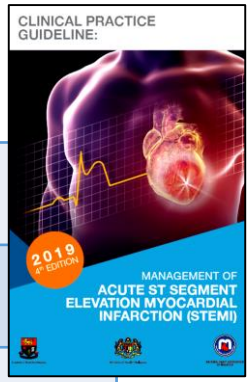
EXTERNAL REVIEWERS



Dr Anwar Suhaimi	**Rehabilitation Physician University Malaya Medical Centre**
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Dr Ridzuan Mohd Isa	**Consultant Emergency Physician Hospital Ampang**
Dr. Sahimi Bt Mohamed	**Head of Clinical Section Pharmacy Department Hospital Tunku Aminah Kuantan**

WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
Distinguishing the difference between myocardial injury and Myocardial Infarction (MI) - Recognition that all myocardial injury is not necessarily due to MI.	No clear differentiation between myocardial injury and MI	**Myocardial injury** is reflected by a level above the 99th percentile of the upper reference limit (URL) of troponin. Myocardial injury may be due to: • Ischemia • Non-ischemic causes **MI is myocardial injury due to ischemia**. STEMI is MI with ST elevation seen on the resting ECG.

WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
Pre-hospital Care /personnel	Brief statement about Pre-hospital Care/personnel	Providing a **structured format of response to an emergency call for "chest pain."** To treat STEMI promptly preferably by Primary PCI by transporting the patient directly to a PCI capable hospital. **Outlining key care processes to shorten door to balloon (device) time (DBT) and improve quality of care during transport.** **Encouraging pre-hospital thrombolysis** if transport time to a PCI capable centre is long and trained doctor/PHC personnel are available. If this is not available, for in-hospital thrombolysis at the nearest hospital. **Identifying training of PHC personnel as an important priority.**

1 IMPROVED ACUTE CORONARY SYNDROMES MANAGEMENT IN 999 AND EARLY PROVISION OF ANTIPLATELET (ASPIRIN) IN PHCAS

YOU COULD BE HAVING A HEART ATTACK! DO NOT DRIVE!

Call for Help: 999 (1 Malaysia, 1 Nombor)

Ask for Ambulance Service.

MEDICAL EMERGENCY COORDINATION CENTRE MOH

Severe angina attack?

Chest pain which is retrosternal (below your breastbone) severe, crushing, squeezing or pressing in nature, lasting more than 30 minutes, associated with:

- **profuse sweating**
- **nausea or vomiting**
- **shortness of breath**
- **Not relieved by sub-lingual GTN?**

PROTOCOL 10: CHEST PAIN

Caller Interrogation process

AMBULANCE DISPATCH

ONLINE GUIDE TO TAKE ASPIRIN

AMBULANCE AT SCENE

ASPIRIN : A 10cents wonder drug!

Assistant Medical Officer gives ASPIRIN

ACUTE CORONARY SYNDROME (ACS)

ASSESSMENT AND CARE AT SCENE

MOH CPG on STEMI/ NSTEMI recommends the early provision of Aspirin in ACS (I,A) for immediate antiplatelet effect to limit thrombosis or clot

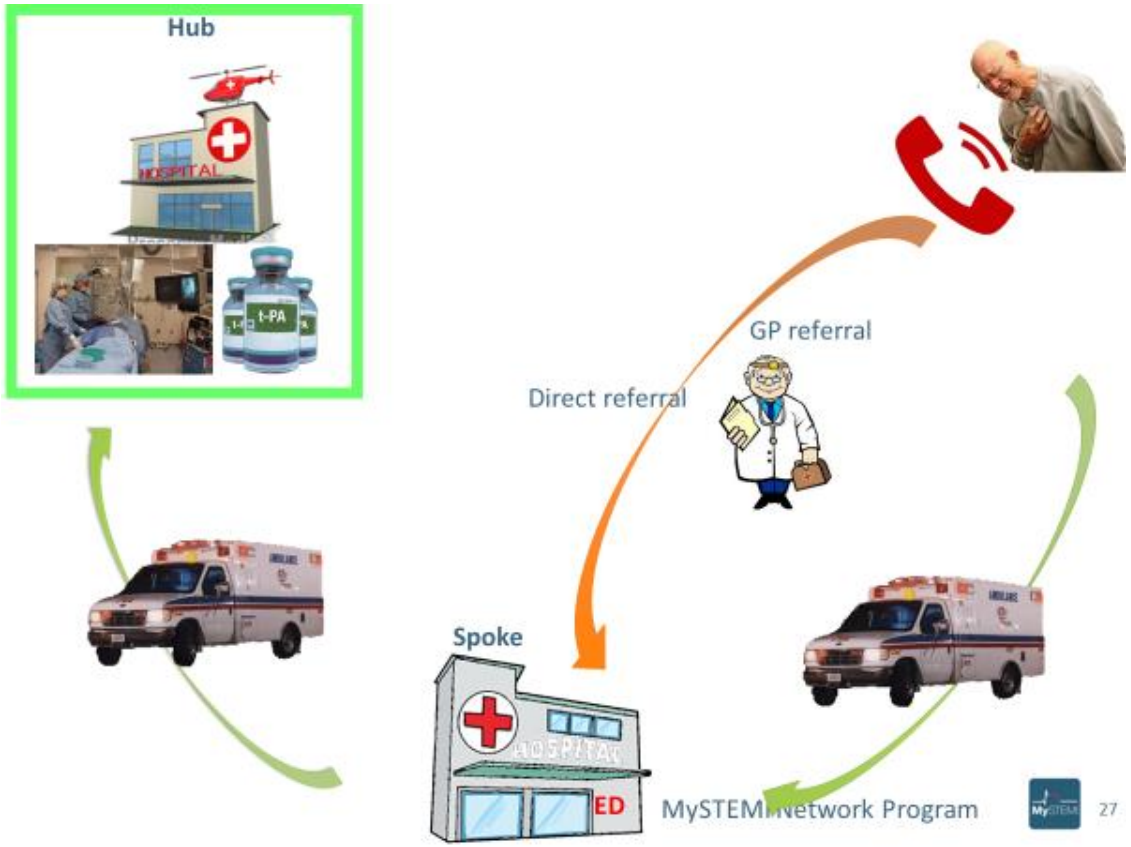
CLINICAL PATHWAY FOR STEMI IN PHCAS

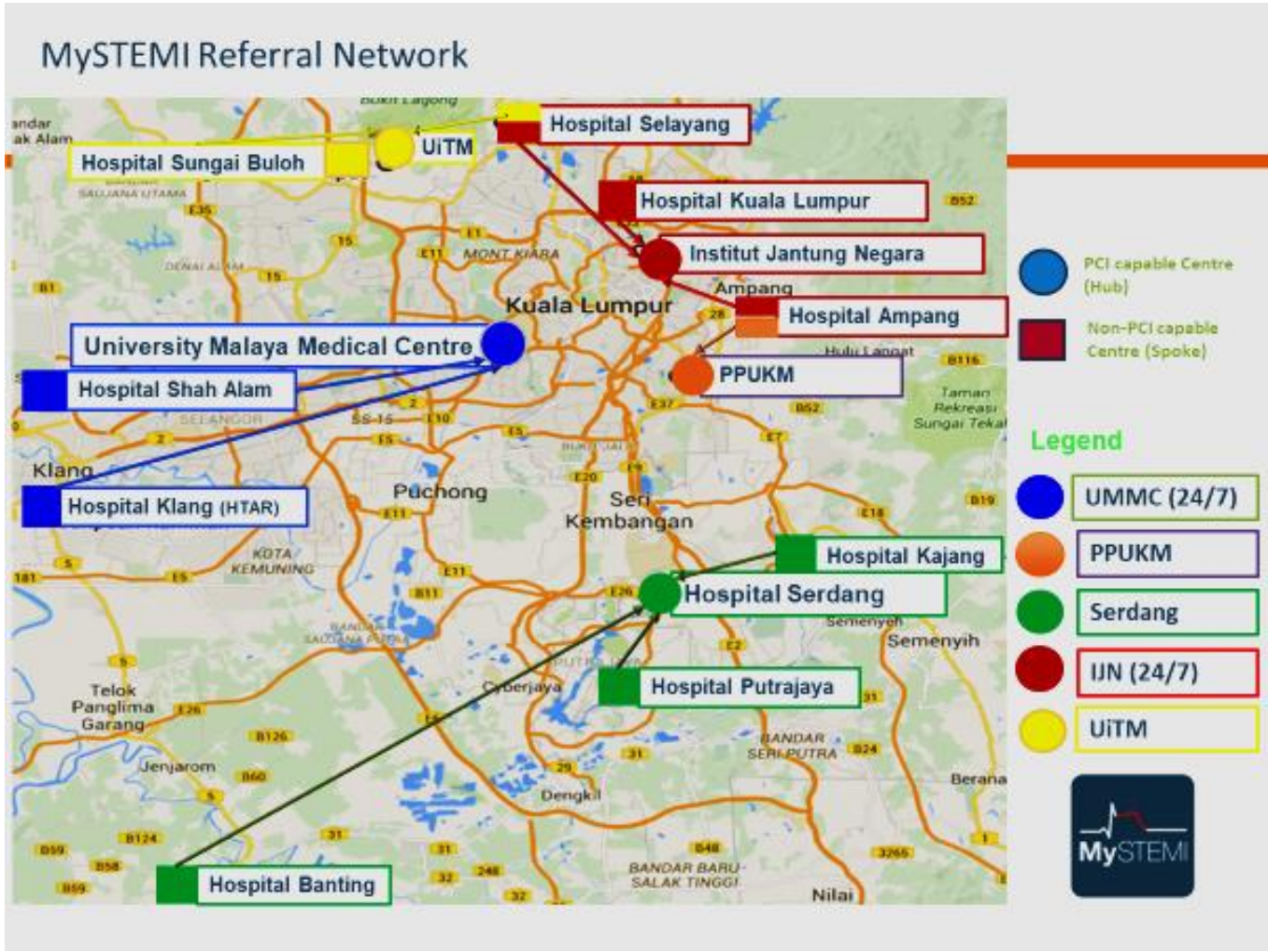
2 PEMANTAPAN PENGESANAN SERANGAN JANTUNG (S.T.E.M.I.) MELALUI PROSEDUR ELEKTROKARDIOGRAM 12 LEAD (TERMASUK TRANSMISI & TELEMETRI) DI PRAHOSPITAL DAN PEMBERIAN AGEN TROMBOLISIS UNTUK PESAKIT-PESAKIT TERTENTU

WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
STEMI Networks	No mention of STEMI networks	Identifying the key points in establishing a STEMI network. Encouraging the setting up of STEMI Networks throughout the country. Establishing time intervals to reduce total ischaemic time and achieve timely early reperfusion.

MySTEMI Network





WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
Diagnosing reinfarction- Troponins can also be used for reinfarction	In a patient with recurrent chest pain following STEMI, a ≥ 20% increase in the value of Creatine Kinase-Myocardial Band (CKMB) from the last sample suggests reinfarction.	If a patient is suspected of having a reinfarction on clinical grounds, a ≥20% increase in the value of either ***troponins or CKMB*** between 2 samples 3-6 hours apart supports the diagnosis

WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
Time Intervals	**ECG to be done preferably within 10 minutes** For Primary PCI: • Door to balloon(DBT) time < 90minutes • If transported from a non-PCI hospital: DBT < 120 minutes For fibrinolysis: • Door to needle time < 30 minutes	**FMC to ECG interpretation < 10 min** For Primary PCI: • FMC or directly transported by ambulance to PCI capable centre: DBT <90 minutes • FMC at non-PCI (spoke) hospital; DBT <120minutes ○ Door in Door Out (DIDO):< 30 minutes. ○ Transfer to PCI capable centre: <60 minutes. For fibrinolysis: • FMC to thrombolysis ≤ 30 minutes (this could be in-hospital or pre-hospital in an ambulance equipped with the necessary facilities)

Flowchart 2

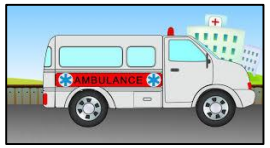
ONSET OF CHEST PAIN

First Medical Contact

PCI capable centre*

DBT:<90 mins

Ambulance



Travel time: <90 mins

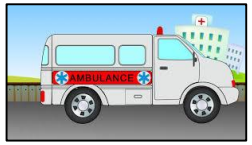
PCI capable centre*

DBT: <30 mins

Non-PCI capable centre**

DIDO ***: <30 mins

Travel time: <60 mins



PCI capable centre*

DBT: <30 mins

DBT: <120 mins

Time to wire crossing

Time to wire crossing

* PCI capable centre: Hub Hospital
** Non-PCI capable centre: Spoke Hospital
*** DIDO: Door In Door Out
DBT: Door to balloon (device) time

If time intervals/transfer times are anticipated to be longer than stated, initiate fibrinolysis first and then consider same day transfer for PCI as part of pharmaco-invasive strategy (3-24 hours post lysis) or for transfer later depending on the clinical condition of the patient and the available resources.

WHAT'S NEW IN THE CURRENT GUIDELINES

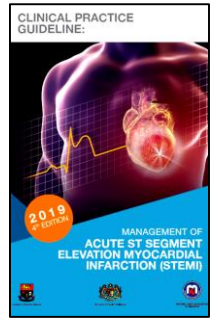
	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
Fibrinolysis		**If the time from STEMI diagnosis to wire crossing is >120 minutes, then pre-hospital or nearest in-hospital fibrinolysis is an option. Then consider transfer for a pharmaco-invasive strategy.**
		New section on Fibrinolysis in an unstable patient
PCI post-Fibrinolysis	As part of a pharmaco-invasive strategy in stable patients who have been given fibrinolytics and an elective PCI can be performed within 3 - 24 hours. **(IIa, B)**	As part of a pharmaco-invasive strategy in stable patients who have been given fibrinolytics and an elective PCI can be performed within 3 - 24 hours. **(I, A)**
	Early PCI should be considered in the following situations: • Failed reperfusion or re-occlusion after fibrinolytic therapy. **(IIa, B)** • Cardiogenic shock or acute pulmonary oedema that develops after initial presentation. **(I, B)**	Early PCI should be considered in the following situations: • Failed reperfusion or re-occlusion after fibrinolytic therapy. **(I,A)** • Cardiogenic shock or acute pulmonary oedema that develops after initial presentation. **(I,A)** • STEMI TIMI risk score of ≥ 6.0 at admission. **(I,C)** • If symptoms are completely relieved and ST segment completely normalises either spontaneously or after GTN (sublingual or spray) or anti platelet therapy.**(I,C)**

WHAT'S NEW IN THE CURRENT GUIDELINES

	Previous CPG STEMI (2014)	Current CPG STEMI (2019)
PCI	**-**	Patients presenting with ischaemic type chest pains > 30 mins and continuing to have chest pains but with a non-interpretable ST-segment on the ECG, such as those with bundle branch block (assumed new onset RBBB) or ventricular pacing, may be having a MI, and should be considered for a PCI strategy. **(IIa, A)** Radial access is recommended over femoral access if performed by an experienced radial operator**. (I,A)** Stenting is recommended (over balloon angioplasty) for primary PCI. **(I,A)** Stenting with new-generation DES is recommended over BMS for primary PCI. **(I,A)** Routine use of thrombus aspiration catheters is not recommended. **(III, A)**
Delayed angiography and PCI - Symptom onset >12h,	-	A primary PCI strategy is indicated in the presence of ongoing symptoms suggestive of ischaemia, haemodynamic instability, or life-threatening arrhythmias. **(I, B)**

KEY TAKE HOME MESSAGES

RATIONALE FOR THE UPDATE TO THE CPG



Key Message #1: -Epidemiology of STEMI

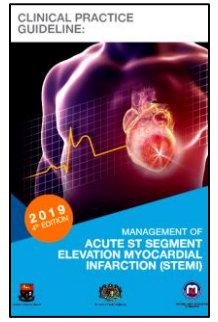
- From the latest report of the National Cardiovascular Database - Acute Coronary Syndrome (NCVD-ACS) Registry 2014-2015:

  - The **STEMI mortality in Malaysia remains high-** the in-hospital, 30-day and 1-year mortality following STEMI being 10.6%, 12.3% and 17.9% respectively.

  - **Patients receiving reperfusion (Primary PCI or fibrinolytic) had better survival compared** to patients who did not receive any reperfusion.

  - **Patients who had PCI during the index hospitalisation** (including those who underwent Primary PCI and PCI both fibrinolysis) had **better short-term and long-term survival** as compared to those who did not undergo in-hospital PCI. This data is consistent with that of other registries.

RATIONALE FOR THE UPDATE TO THE CPG



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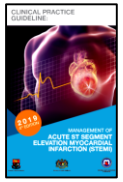
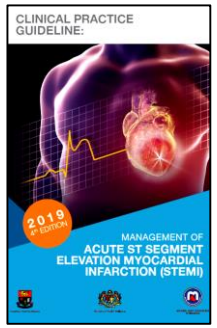


Key Message #2: - Diagnosis of STEMI

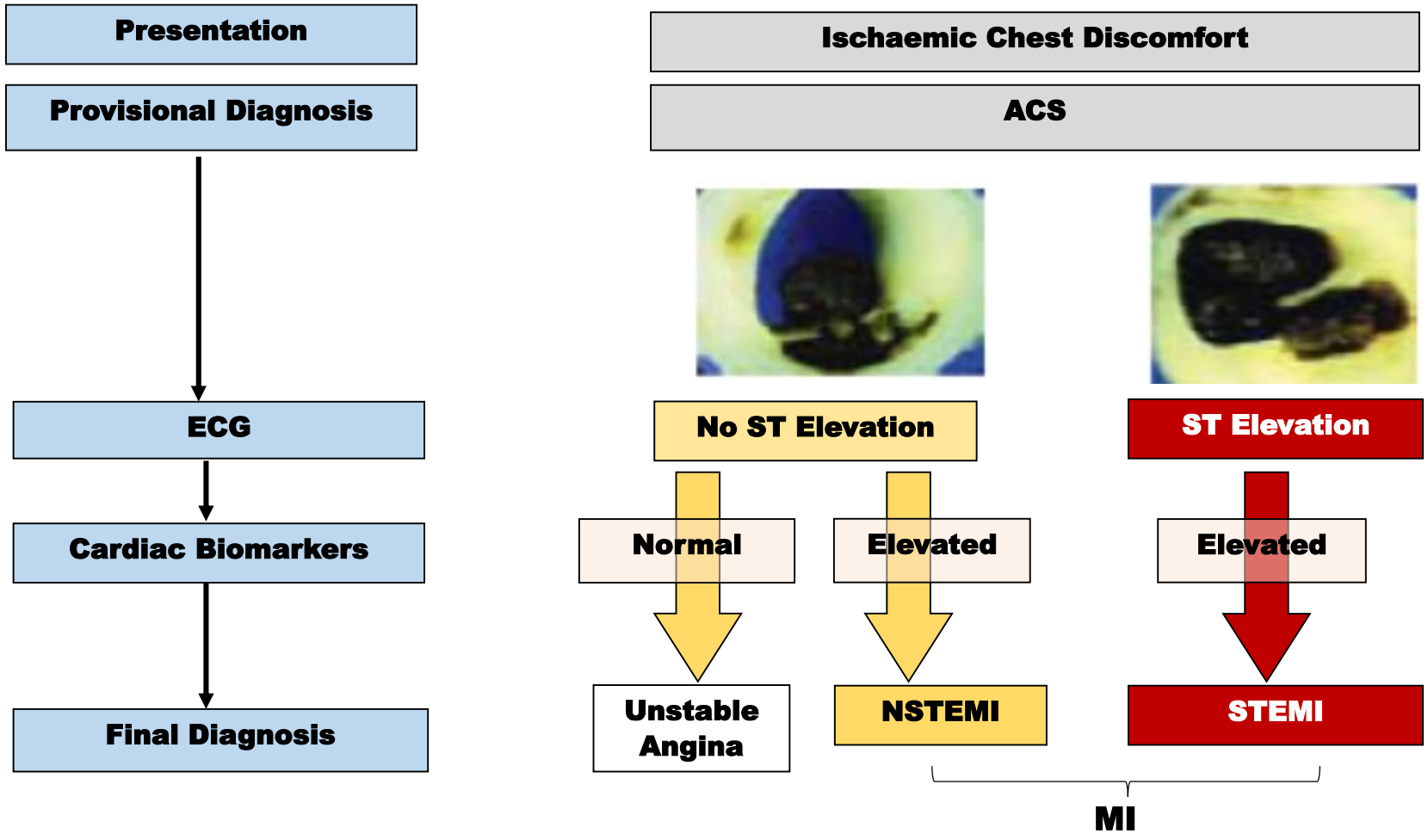
- ***Myocardial Infarction (MI)*** is defined pathologically as myocardial cell death due to prolonged ischaemia. ***Myocardial injury*** is myocardial cell death due to non ischaemic causes.

- MI is diagnosed by the rise and/or fall in cardiac troponins, with at least one value above the 99th percentile of the upper reference limits (URL), and accompanied with ***at least one*** of the following:
  - Clinical history consistent with chest pain of ischaemic origin.
  - ECG changes
  - Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.
  - Identification of an intracoronary (IC) thrombus by angiography or autopsy.

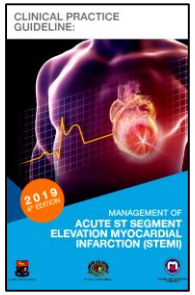
- **MI** may be **STEMI *or* Non STEMI**



Clinical spectrum of ACS.*



*****Adapted from Amsterdam EA, Wenger N, Brindis RG et al. "2014 ACC/AHA Guidelines for the management of patients with Non ST Elevation Acute Coronary Syndromes" Circulation. 2014;130:e344-e426.*



Clinical spectrum of ACS.*

Presentation

Provisional Diagnosis

ECG

Cardiac Biomarkers

Final Diagnosis

Ischaemic Chest Discomfort

ACS

No ST Elevation

ST Elevation

Normal

Elevated

Elevated

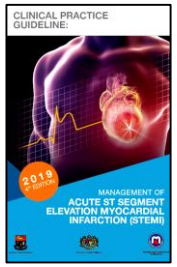
Unstable Angina

NSTEMI

STEMI

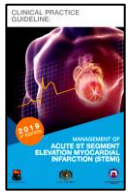
MI

*Adapted from Amsterdam EA, Wenger N, Brindis RG et al. "2014 ACC/AHA Guidelines for the management of patients with Non ST Elevation Acute Coronary Syndromes" Circulation. 2014;130:e344-e426.



Key Message #2: - Diagnosis of STEMI

- **STEMI** is diagnosed when there is:
  - **ST elevation of ≥1 mm in 2 contiguous leads *or***
  - **a new onset LBBB** in the resting ECG in a patient **with**
  - **ischaemic type chest pains of > 30 minutes** and **accompanied by**
  - **a rise and fall in cardiac biomarkers.**



Key Message #2: - Diagnosis of STEMI

- **New onset Right Bundle Branch Block** with ST elevation of ≥1 mm in 2 contiguous leads does not interfere with the diagnosis of STEMI.

- Patients having prolonged ischaemic type chest pain of > 30 minutes and having:
  - a normal ECG or ST segment depression may be having either **Unstable angina (UA) or Non- ST Elevation MI (NSTEMI).**

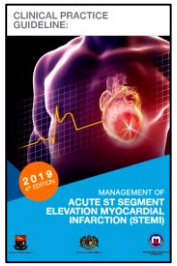
  - a **non-interpretable resting ECG** (eg paced rhythm, RBBB etc) may be having an **NSTEMI.** If pain persists, they should be considered for early Percutaneous Coronary Intervention (PCI) if facilities are available. Fibrinolysis is not advisable.

- There are separate guidelines for UA/NSTEMI.

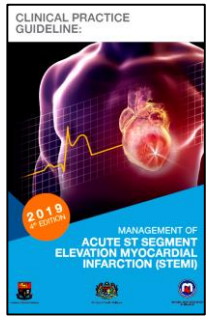
ECG patterns of various STEMI locations and the diagnostic cut off points (in the absence of LVH or LBBB)

Location	Leads	ECG findings
Anteroseptal	V1 – V3	• ST elevation in leads V2-3: ≥ 0.25 mV (in males < 40 years), ≥ 0.2 mV (in males ≥ 40 years) ≥ 0.15 mV in females, • Q wave
Extensive anterior	V1 – V6	• ST elevation of ≥ 0.1 mV in all leads except leads V2-V3. In leads V2-3 : ≥ 0.25 mV (in males < 40 years), ≥ 0.2 mV (in males ≥ 40 years) ≥ 0.15 mV in females, • Q wave
Posterior	V7 – V8	• ST elevation≥ 0.05 mV (≥ 0.1 mV in men < 40 years), • Q wave
Posterior	V1 – V2	• ST depression, Tall R wave
Anterolateral	I, AVL, V5 – V6	• ST elevation ST elevation of ≥ 0.1 mV, Q wave
Inferior	II, III, AVF	• ST elevation ST elevation of ≥ 0.1 mV, Q wave
Right Ventricular (RV)	V4R	• ST elevation≥ 0.5 mm (≥ 1 mm in men < 30 years old).

Key Message #3: - Clinical Presentation and Pitfalls in Diagnosis

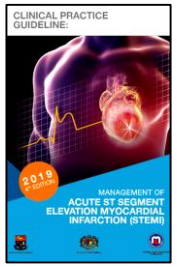


- Atypical presentations can occur in the elderly, women and in diabetic persons.
- **If the initial ECG is non-diagnostic, it may need to be repeated at frequent intervals to detect evolving changes of STEMI. Additional chest leads (V 7-9) and right ventricular leads may also be helpful.**
- Too early a measurement of the cardiac biomarkers can sometimes result in misleadingly low levels.



Key Message #4: - Pre-Hospital Management:

- The public and Pre-hospital Care (PHC) personnel should be educated on the importance of early diagnosis and the benefits of early treatment.
- Patients with suspected STEMI should be given soluble or chewable 300mg aspirin and 300 mg clopidogrel.
- These patients should be ***rapidly transported*** to the hospital for early initiation of reperfusion strategies.
- **DO NOT GO TO A CLINIC.**



Key Message #5:- STEMI Network:

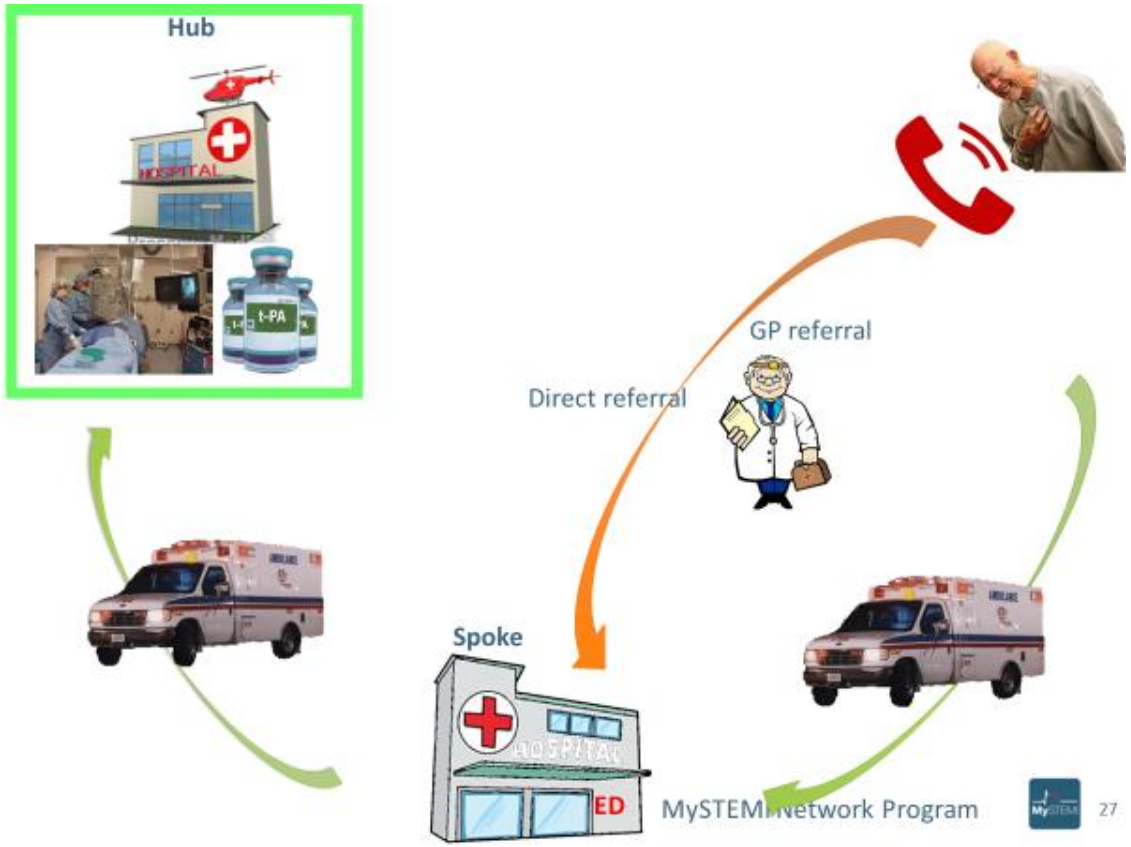
- The **objective** of a STEMI network is to link non-PCI-capable centres to PCI-capable centres with the aim of providing PCI services in a timely manner for patients:

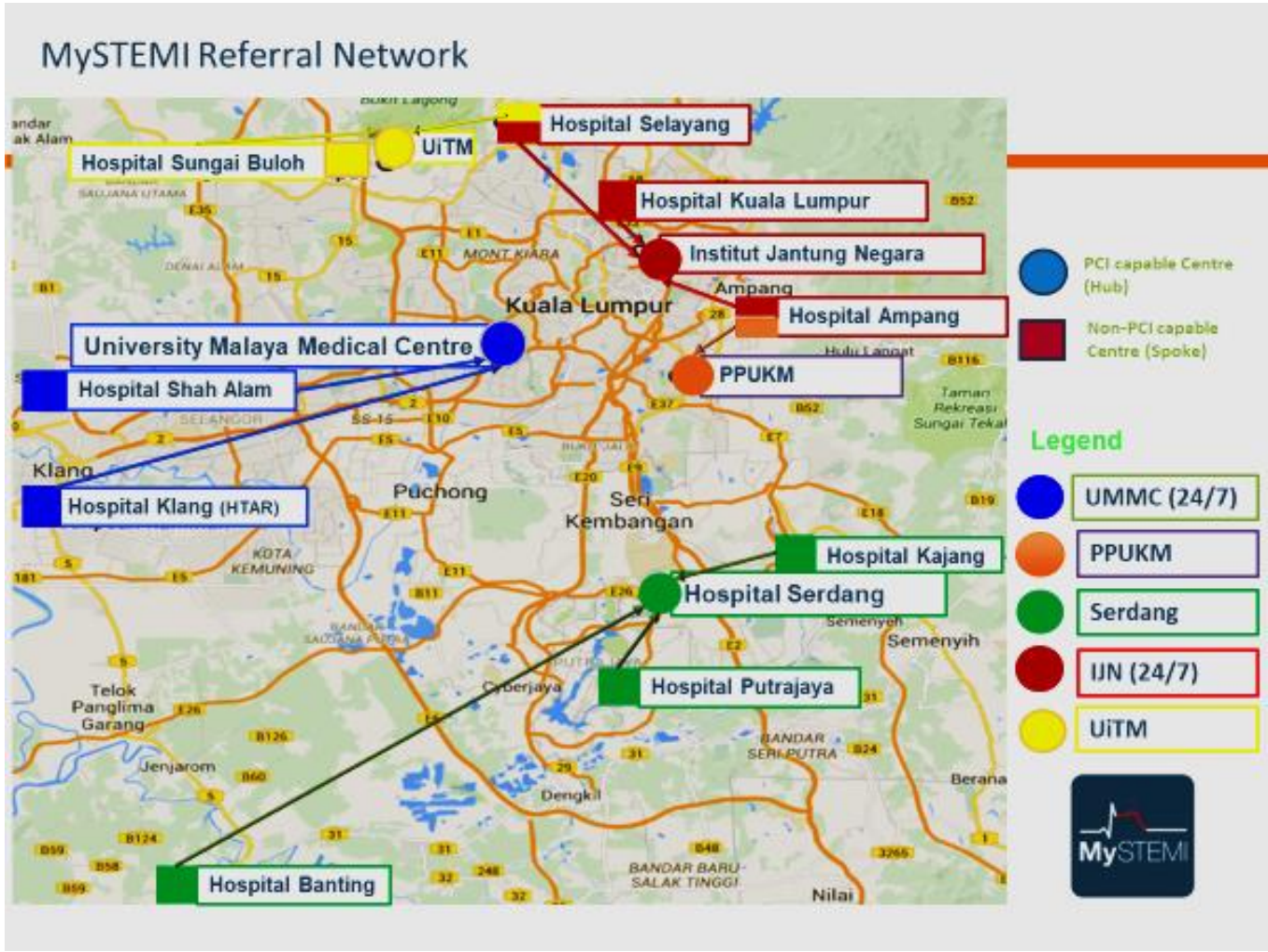
  - **With STEMI**

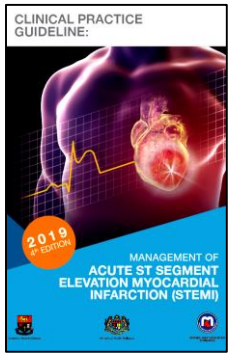
  - **Who have been given fibrinolytic therapy and:**
    - **have failed reperfusion, or;**
    - **as part of a pharmaco-invasive strategy, or;**
    - **have high-risk features requiring early intervention.**

- The optimal treatment of these patients should be based on the implementation of networks between hospitals (‘hub’ and ‘spoke’) and linked by an efficient ambulance service.

MySTEMI Network

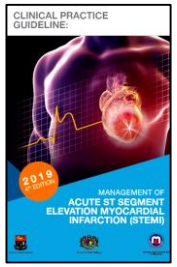






Key Message #6: - Initial Management

- Early management of STEMI is directed at:
  - Pain relief.
  - Establishing early reperfusion.
  - Treatment of complications.



Flow Chart 1: Management of patients presenting with STEMI

Flowchart 1

Electrocardiography
Cardiac Biomarkers

Concomitant initial management includes:

CHEST PAIN / CHEST PAIN EQUIVALENT

Continuous ECG monitoring
Sublingual glyceryl trinitrate (GTN) (if no contraindication)
Aspirin +
Clopidogrel #
Analgesia
Oxygen [if oxygen saturation (SpO_2) < 95%

Assessment for reperfusion:

Onset of symptoms:

< 3 hours	**3-12 hours**	**> 12 hours**

Preferred option:

Primary PCI** or Fibrinolytic Therapy	Primary PCI**	Medical Therapy ± Antithrombotics

Second option:

Fibrinolytics	**Primary PCI ***

Subsequent management:

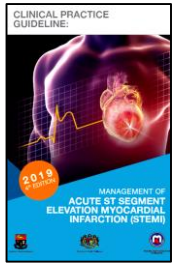
Consider PCI within 3-24 hours if fibrinolytics are administered as part of the pharmaco-invasive strategy	PCI if ongoing ischaemia or haemodynamic instability

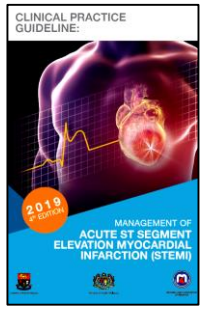
Concomitant Therapy:

Anti-platelet Therapy
(DAPT)
Statin
β-blockers
ACE-Is/ ARBs
MRA

* When clinically indicated
** Preferred option in:
- high-risk patients
- presence of contraindications to fibrinolytic therapy and/or
- if the anticipated time intervals/transport times are within that stated in Flow Chart 2.

or ticagrelor or prasugrel (after angiogram)

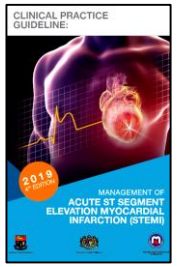




Key Message #7: - Reperfusion Strategies

"Time is muscle"

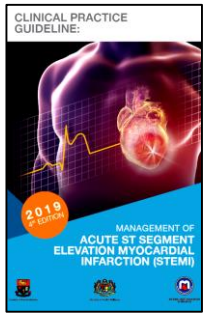
Every patient with STEMI should have the occluded artery reopened (reperfusion therapy) as soon as possible after the onset of symptoms.



Key Message #7: - Reperfusion Strategies

- Reperfusion therapy is indicated in all patients with symptoms of ischaemia of <12hours duration and persistent ST-segment elevation.

- **Primary PCI is superior to fibrinolysis for STEMI when performed in a timely manner at experienced centres**. (see Flow Chart 2)



Flow Chart 2:

Time intervals to determine choice of reperfusion strategy

Flowchart 2

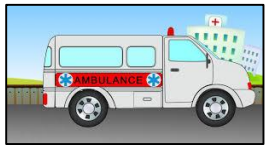
ONSET OF CHEST PAIN

First Medical Contact

PCI capable centre*

DBT:<90 mins

Ambulance



Travel time: <90 mins

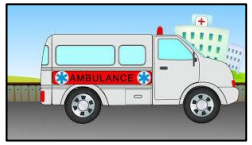
PCI capable centre*

DBT: <30 mins

Non-PCI capable centre**

DIDO ***: <30 mins

Travel time: <60 mins



PCI capable centre*

DBT: <30 mins

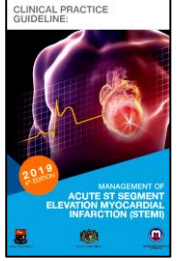
DBT: <120 mins

Time to wire crossing

Time to wire crossing

* PCI capable centre: Hub Hospital
** Non-PCI capable centre: Spoke Hospital
*** DIDO: Door In Door Out
DBT: Door to balloon (device) time

If time intervals/transfer times are anticipated to be longer than stated, initiate fibrinolysis first and then consider same day transfer for PCI as part of pharmaco-invasive strategy (3-24 hours post lysis) or for transfer later depending on the clinical condition of the patient and the available resources.

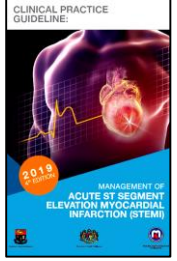


Key Message #7: - Reperfusion Strategies

- If the patient **presents at a PCI centre**, then the time from FMC to wire crossing should be less than **≤ 90 minutes.**

- If transferred from **a centre with no PCI facilities**, the time from FMC to wire crossing should be less than **≤ 120 minutes** (including transfer delay). This is made up of:
  - door-in-door-out (DIDO) of non–PCI-capable hospital (spoke): **≤30 minutes.**
  - Transport time to PCI -capable centre (hub): **≤ 60 minutes**.
  - Door of PCI capable centre to wire crossing: **≤ 30 minutes.**

- If the time delay to primary PCI is longer than **>120minutes**, the **best option is to give fibrinolytic therapy** and make arrangements to transfer the patient to a PCI capable centre for a **pharmaco-invasive strategy.**



Key Message #7: - Reperfusion Strategies

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  - door-in-door-out (DIDO) of non–PCI-capable hospital (spoke): **≤30 minutes.**
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  - Door of PCI capable centre to wire crossing: **≤ 30 minutes.**

- If the time delay to primary PCI is longer than **>120minutes**, the **best option is to give fibrinolytic therapy** and make arrangements to transfer the patient to a PCI capable centre for a **pharmaco-invasive strategy.**

Flowchart 2

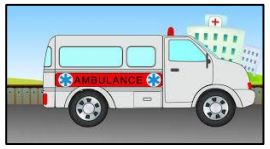
ONSET OF CHEST PAIN

First Medical Contact

PCI capable centre*

DBT:<90 mins

Ambulance



Travel time: <90 mins

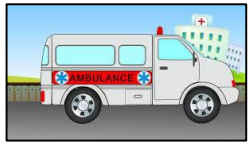
PCI capable centre*

DBT: <30 mins

Non-PCI capable centre**

DIDO ***: <30 mins

Travel time: <60 mins



PCI capable centre*

DBT: <30 mins

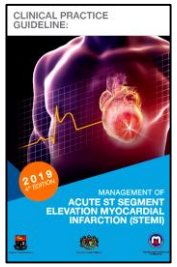
DBT: <120 mins

Time to wire crossing

Time to wire crossing

* PCI capable centre: Hub Hospital
** Non-PCI capable centre: Spoke Hospital
*** DIDO: Door In Door Out
DBT: Door to balloon (device) time

If time intervals/transfer times are anticipated to be longer than stated, initiate fibrinolysis first and then consider same day transfer for PCI as part of pharmaco-invasive strategy (3-24 hours post lysis) or for transfer later depending on the clinical condition of the patient and the available resources.



Key Message #7: - Reperfusion Strategies

- When fibrinolytic therapy is administered, the Door to Needle time (DNT) should be < 30 minutes.

- **Whenever possible, patients given fibrinolytic therapy should be considered for a pharmaco-invasive approach (elective angiogram within 3-24 hours post fibrinolysis).**

Flowchart 1

Electrocardiography
Cardiac Biomarkers

Concomitant initial management includes:

CHEST PAIN / CHEST PAIN EQUIVALENT

Continuous ECG monitoring
Sublingual glyceryl trinitrate (GTN) (if no contraindication)
Aspirin +
Clopidogrel ***or*** ticagrelor
Analgesia
Oxygen [if oxygen saturation (SpO_2) < 95%

Assessment for reperfusion:

	< 3 hours	**3-12 hours**	**> 12 hours**
Onset of symptoms:			
Preferred option:	Primary PCI** or Fibrinolytic Therapy	Primary PCI**	Medical Therapy ± Antithrombotics
Second option:	**Fibrinolytics**	**Primary PCI ***	
Subsequent management:	Consider PCI within 3-24 hours if fibrinolytics are administered as part of the pharmaco-invasive strategy	PCI if ongoing ischaemia or haemodynamic instability	

* When clinically indicated
** Preferred option in:
- high-risk patients
- presence of contraindications to fibrinolytic therapy and/or
- if the anticipated time intervals/transport times are within that stated in Flow Chart 2.

Concomitant Therapy:

Anti-platelet Therapy (DAPT)
Statin
β-blockers
ACE-Is/ ARBs
MRA

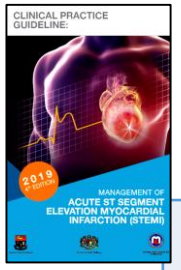


Table 2: Level of evidence and grade of recommendation for acute therapy of STEMI

INTERVENTION	GRADE OF RECOMMENDATION	LEVEL OF EVIDENCE
REPERFUSION THERAPY		
Recommendation 1: ***Primary PCI: Strategy of choice if:** • **Done within the time intervals stated in Flow chart 1 and 2.** • **There are contraindications to fibrinolysis.** • **High-risk patients.**	 I I I	 A A A
Recommendation 2: ***Fibrinolytic therapy: Strategy of choice if:** • **DBT > 90 minutes if FMC in a PCI centre and > 120 min if transferred from non-PCI centre.** • **No contraindications to fibrinolysis.**	 I I	 A A

**Please refer to Flow Chart 1 & 2 for details*

INTERVENTION	GRADE OF RECOMMENDATION	LEVEL OF EVIDENCE
CONCOMITANT PHARMACOTHERAPY		
Recommendation 3: **Aspirin: Loading dose of 300 mg followed by maintenance dose of 75 mg – 150 mg daily.** ***+ (PLUS)*** **Clopidogrel: Loading dose of 300 mg followed by maintenance dose of 75 mg daily (for at least 1 month).** ***OR*** **Ticagrelor: Loading dose of 180 mg followed by maintenance dose of 90 mg twice daily (bd) to be administered to patients undergoing primary PCI.** ***OR*** **Prasugrel: Loading dose of 60 mg followed by maintenance dose of 10 mg (to be administered only prior to primary PCI).**	I I I I	A A B B
Recommendation 4: **Antithrombotics to be given to patients:** • **Who received fibrinolytic therapy and did not undergo PCI.** ➢ **Enoxaparin** ➢ **Heparin** ➢ **Fondaparinux** • **Underwent PCI and have atrial fibrillation (AF).** ➢ **Warfarin + DAPT or DOAC + DAPT** • **With mural thrombus.**	 I I IIa IIa I	 A B B B C

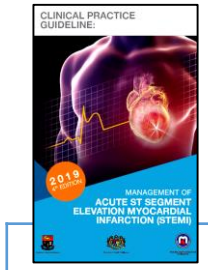


Table 2: Level of evidence and grade of recommendation for acute therapy of STEMI

INTERVENTION	GRADE OF RECOMMENDATION	LEVEL OF EVIDENCE
CONCOMITANT PHARMACOTHERAPY		
Recommendation 5: **β-blockers: For all patients if no contraindications**	I	A
Recommendation 6: **ACE-Is: For all patients with no contraindications.**	I	A
Recommendation 7: **High dose Statins: For all patients if no contraindications.**	I	A

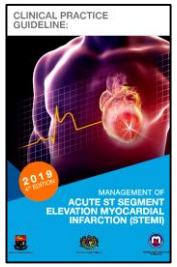
Table 3: Level of evidence and grade of recommendation for *secondary prevention* post-STEMI

INTERVENTION	GRADE OF RECOMMENDATION	LEVEL OF EVIDENCE	COMMENTS
Recommendation 8: **Smoking Cessation**	I	B	
Exercise	I	B	At least 30-60 minutes most days of the week.
Recommendation 9:	**CONCOMITANT PHARMACOTHERAPY**		
Aspirin	I	A	Maintenance dose: 75-150 mg daily.
+ Clopidogrel **OR**	I	A	Maintenance dose 75 mg daily to be given for at least 1 month, preferably 1 year, following fibrinolytic therapy and for up to 1-year post- primary PCI*.
+Ticagrelor **OR**	I	B	Maintenance dose 90 mg twice daily for up to 1-year post- primary PCI*
+ Prasugrel	I	B	Maintenance dose 10 mg daily for up to 1-year post- primary PCI*

* Duration of therapy will depend on Bleeding risks vs ischemic risk

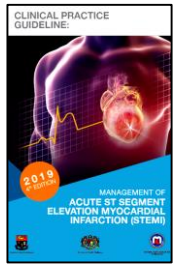
Table 3: Level of evidence and grade of recommendation for *secondary prevention* post-STEMI

INTERVENTION	GRADE OF RECOMMENDATION	LEVEL OF EVIDENCE	COMMENTS
Recommendation 9: CONCOMITANT PHARMACOTHERAPY			
+ β-blockers	I	A	Consider long-term therapy (>1 year) for patients with LVEF <40%.
	IIb	**B**	**Routine administration > 1 year post STEMI in all patients with no angina /ischemia and normal LV function**
+ ACE-Is	I	A	Started on first day and continued long-term (>1 year) for patients with LVEF <40%, anterior infarcts and diabetes.
	IIb	**B**	**Routine administration in all patients post STEMI > 1 year**
+ ARBs	I	B	Started on first day and continued long-term for patients with LVEF <40%, anterior infarcts and diabetes.
	IIb	**B**	**Routine administration in all patients post STEMI > 1 year**
+ Statins	I	A	Aim for low density lipoprotein-cholesterol (LDL-C) <1.8 mmol/L)or a 50% reduction from baseline- the Lower the LDL-C the better.



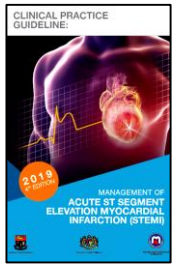
Key Message #8: - Complications post STEMI

- Important complications following STEMI are arrhythmias and heart failure.
- Heart failure may be due to extensive myocardial damage or mechanical complications.
- Chest pain post STEMI may be due to:
  - Reinfarction/Recurrent MI
  - Post infarct angina
  - Pericarditis
  - Non cardiac causes such as Gastritis



Key Message #9: - Risk Stratification Post STEMI

- All patients post-STEMI should be risk-stratified either clinically or by using the STEMI TIMI and/or GRACE risk scores.
- High-risk patients should be referred to cardiology centres for early coronary angiography and revascularisation.



Key Message #9: - Risk Stratification Post STEMI

- Patients who present initially to non PCI-capable hospitals should be referred for early coronary angiography with a view to revascularisation in the presence of any of the following:

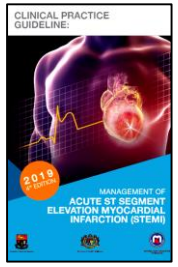
  - Post-infarct angina,
  - Inducible ischaemia
  - Late ventricular arrhythmias
  - In the presence of a depressed LV function (LVEF $\leq$ 35%) and significant regional wall motion abnormalities
  - STEMI TIMI risk score $\geq$ 6.0
  - If symptoms are completely relieved and ST segment completely normalises either spontaneously or after GTN (sublingual or spray) or anti platelet therapy

STEMI TIMI RISK SCORE FOR PREDICTING 30 DAY MORTALITY

Categories	Options	Points
Age (years)	< 65 65 - 74 ≥ 75	0 2 3
Weight < 67 kg	Yes No	1 0
SBP < 100 mmHg	Yes No	3 0
Heart rate > 100 bpm	Yes No	2 0
Killip Class II-IV	Yes No	2 0
Anterior ST segment elevation or LBBB	Yes No	1 0
Diabetes, history of hypertension, history of angina	Yes No	1 0
Time to treatment > 4 hours	Yes No	1 0

TIMI Risk Score for <u>30 day mortality:</u>
0 – 14 plausible points
Low and moderate risk:
5 points and below (< 12%)
High-risk:
6 points and above (16-36.0%)

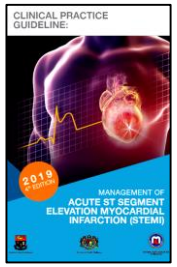
Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI risk score for ST-elevation myocardial infarction: A convenient, bedside, clinical score for risk assessment at presentation: An intravenous nPA for treatment of infarcting myocardium early II trial substudy. *Circulation*. 2000;102(17):2031-7.



Key message # 10 : Secondary Prevention Post STEMI

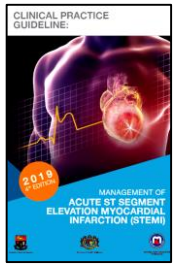
Secondary prevention interventions can reduce mortality and cardiovascular event rate post-STEMI. This includes:

- smoking cessation and other lifestyle changes
- regular exercise
- control of CV risk factors- hypertension, diabetes, smoking, dyslipidaemia
- drug therapy;
  - anti-platelet agents
  - statins therapy
  - β -blockers:
    - < 1 year in all patients
    - >1 year in the presence of LVEF < 40%),
  - ACE-I/ARB:
    - < 1 year in all patients
    - >1 year in the presence of LVEF < 40%, anterior infarct and diabetes)



Key message # 10 : Secondary Prevention Post STEMI

- Healthcare providers should provide patient education and encourage compliance.
- Cardiac rehabilitation is an integral component of secondary prevention.



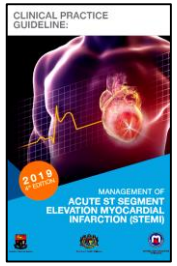
Key message # 11 : STEMI in special groups

- Diagnosis of STEMI in the **elderly, diabetics and women** is difficult and a high index of suspicion is important.

- Treatment is the same although the elderly and women tend to have higher bleeding risk.

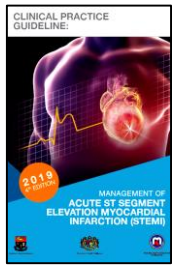
- **In patients with** Chronic Kidney Disease (CKD):
  - Treatment of STEMI should be individualised.
  - Primary PCI is the preferred reperfusion strategy but morbidity and mortality are high.
  - In view of bleeding risks, the dosages of anti-platelet agents and anti-thrombotics need to be adjusted accordingly.
  - β- blockers, ACE-I and statins are beneficial in patients with mild to moderate CKD. In patients on dialysis, only β- blockers remain beneficial.

Key message # 12 : Fitness for commercial air Travel Post STEMI



Functional Status		Guidance
RISK STATUS	**DESCRIPTION**	
Low risk:	▪ age < 65years, ▪ first event, ▪ successful reperfusion, ▪ LVEF > 45%, ▪ no complications, ▪ no planned investigations or interventions	Fly after 3 days
Medium risk	▪ LVEF > 40%, ▪ no symptoms of heart failure, ▪ no evidence of inducible ischaemia or arrhythmia, ▪ no planned investigations or interventions	Fly after 10 days
High risk:	▪ LVEF $\leq$ 40%, ▪ signs and symptoms of heart failure, ▪ those pending further investigation, revascularisation or device therapy	Defer until condition is stable

Key message # 12 : Resumption of driving Post STEMI



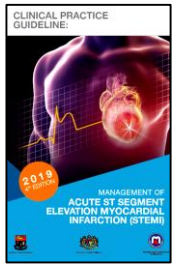
No unanimous consensus as when to resume driving after STEMI.
In general, for:

Private drivers:

- If no Complications and LVEF >35%. ---- 1 month

- In the presence of complications:
  - LVEF ≤35%,
  - acute decompensated heart failure,
  - arrhythmias etc

  - it may be longer.



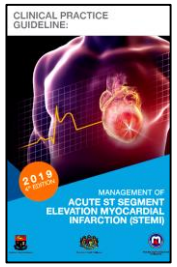
Key message # 12 : Resumption of driving Post STEMI

No unanimous consensus as when to resume driving after STEMI.
In general, for:

Commercial Drivers: 3 months if :

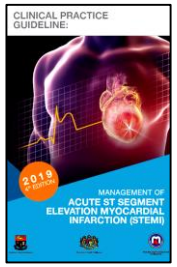
- LVEF ≥ 40%. +

- Exercise Stress ECG :
  - Complete Stage 3 of Bruce protocol
  - At the most ST segment depression of 2 mm



Key message # 13 : Performance Measures

Indicators for STEMI at presentation	Targets
ECG done within 10 minutes of FMC	90%
FMC to Device time ≤ 90 minutes if in same hospital	60%
FMC to Device time ≤ 120 minutes if transferred from another hospital	60%
FMC to needle time < 30 minutes	75%
Medications at discharge:	
• Aspirin	90%
• P2 Y_{12} inhibitors	90%
• High intensity statins	90%
If LVEF < 40%)	
• ACE-I/ARB	70%
• β - blocker	70%
• MRA	70%
Cardiac rehabilitation	50%



Key message # 12 : Performance Measures

Outcome Measures indicators include:

- In hospital mortality < 10%
- 30-day mortality < 14%
- 1-year mortality < 18%

M/68 years

Smokes 10 cig a day
Sudden onset “indigestion” like feeling
SOB++
Sweating++
Known Diabetes

1030 hours

Call Ambulance

1 IMPROVED ACUTE CORONARY SYNDROMES MANAGEMENT IN 999 AND EARLY PROVISION OF ANTIPLATELET (ASPIRIN) IN PHCAS

YOU COULD BE HAVING A HEART ATTACK! DO NOT DRIVE!

Call for Help: 999 (1 Malaysia, 1 Nombor)

Ask for Ambulance Service.

MEDICAL EMERGENCY COORDINATION CENTRE MOH

Caller Interrogation process

Severe angina attack?

Chest pain which is retrosternal (below your breastbone) severe, crushing, squeezing or pressing in nature, lasting more than 30 minutes, associated with:

- **profuse sweating**
- **nausea or vomiting**
- **shortness of breath**
- **Not relieved by sub-lingual GTN?**

PROTOCOL 10: CHEST PAIN

ONLINE GUIDE TO TAKE ASPIRIN

AMBULANCE DISPATCH

AMBULANCE AT SCENE

ASPIRIN : A 10cents wonder drug!

Assistant Medical Officer gives ASPIRIN

ACUTE CORONARY SYNDROME (ACS)

ASSESSMENT AND CARE AT SCENE

MOH CPG on STEMI/ NSTEMI recommends the early provision of Aspirin in ACS (I,A) for immediate antiplatelet effect to limit thrombosis or clot

CLINICAL PATHWAY FOR STEMI IN PHCAS

2 PEMANTAPAN PENGESANAN SERANGAN JANTUNG (S.T.E.M.I.) MELALUI PROSEDUR ELEKTROKARDIOGRAM 12 LEAD (TERMASUK TRANSMISI & TELEMETRI) DI PRAHOSPITAL DAN PEMBERIAN AGEN TROMBOLISIS UNTUK PESAKIT-PESAKIT TERTENTU

M/44 years
Smokes 10 cig a day
Sudden onset “indigestion” like feeling
SOB++
Sweating++

Lives in Teluk Intan

1030 hours

Call Ambulance

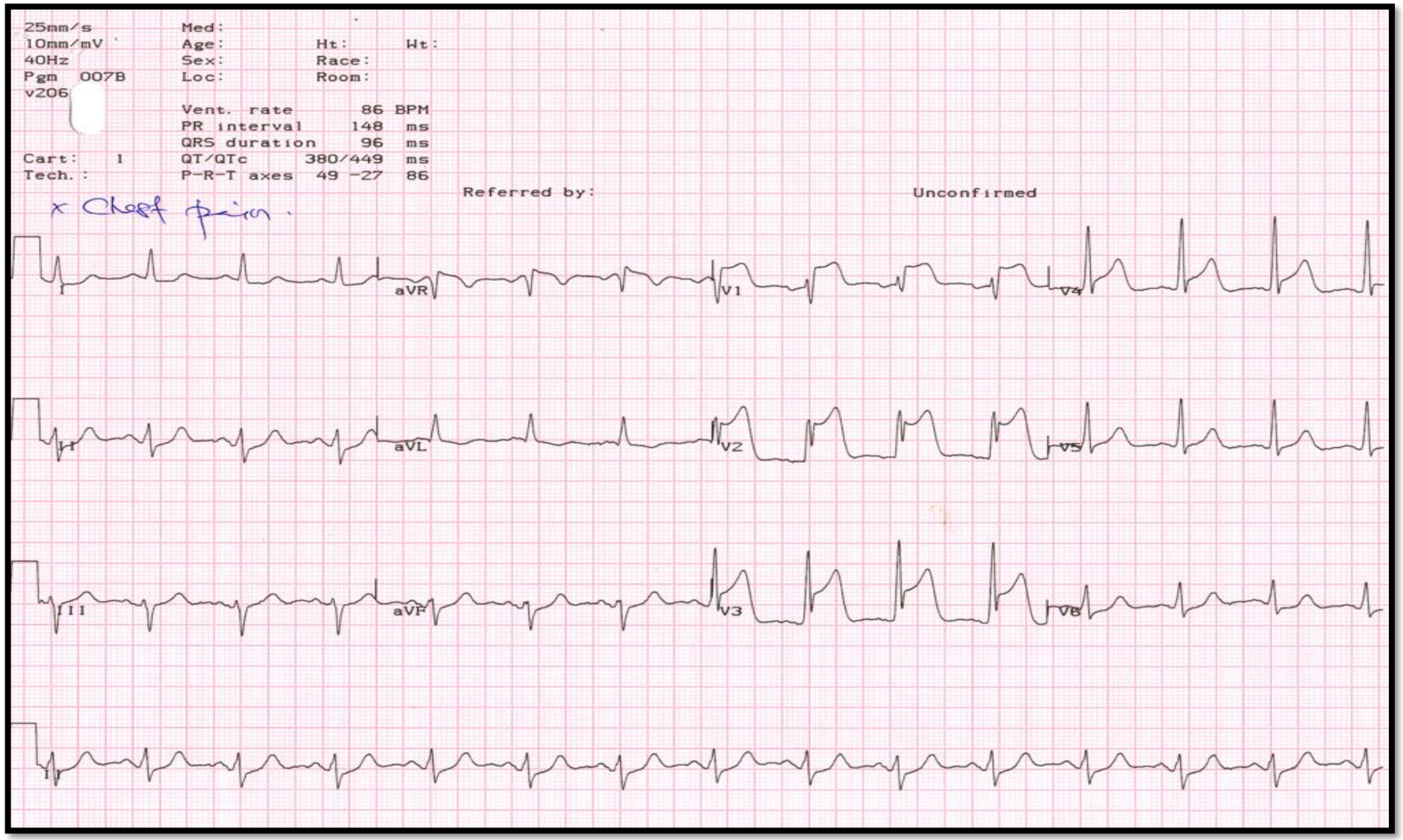
After 10 mins of “ding – dong”

1040 hours

“Friends put him in the car and take to the nearest clinic”

1050 hours

GP Clinic


25mm/s
10mm/mV
40Hz
Pgm 007B
v206
Med:
Age:
Ht:
Wt:
Sex:
Race:
Loc:
Room:
Vent. rate 86 BPM
PR interval 148 ms
QRS duration 96 ms
Cart: 1
QT/QTc 380/449 ms
Tech. :
P-R-T axes 49 -27 86
Referred by:
Unconfirmed
x Chest pain.
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
II

Chest pain started at 1030

1130 hours

Taken to Nearest Hospital - Non PCI
Teluk Intan

(Nearest PCI capable Hospital 90 mins by ambulance)

Flowchart 2

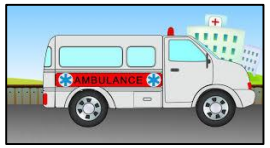
ONSET OF CHEST PAIN

First Medical Contact

PCI capable centre*

DBT:<90 mins

Ambulance



Travel time: <90 mins

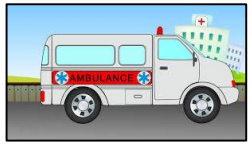
PCI capable centre*

DBT: <30 mins

Non-PCI capable centre**

DIDO ***: <30 mins

Travel time: < 60 mins



PCI capable centre*

DBT: <30 mins

DBT: <120 mins

Time to wire crossing

Time to wire crossing

* PCI capable centre: Hub Hospital
** Non-PCI capable centre: Spoke Hospital
*** DIDO: Door In Door Out
DBT: Door to balloon (device) time

If time intervals/transfer times are anticipated to be longer than stated, initiate fibrinolysis first and then consider same day transfer for PCI as part of pharmaco-invasive strategy (3-24 hours post lysis) or for transfer later depending on the clinical condition of the patient and the available resources.

Chest pain started at 1030

Taken to Nearest Hospital - Non PCI

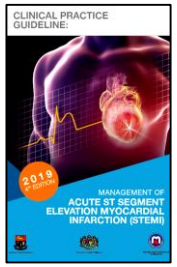
1130 hours

(Nearest PCI capable Hospital 90 mins by ambulance)

Given Streptokinase
(after quick checklist)

Post Fibrinolysis :Risk assessment

- Pain Free
- BP: 95/70mmHG; HR: 110/min
- ECG – ST still slightly up and developed Q Waves V1-5
- Bedside echo : LVEF:30%
- STEMI TIMI Risk Score



Key Message #9: - Risk Stratification Post STEMI

- Patients who present initially to non PCI-capable hospitals should be referred for early coronary angiography with a view to revascularisation in the presence of any of the following:

  - Post-infarct angina,
  - Inducible ischaemia
  - Late ventricular arrhythmias
  - In the presence of a depressed LV function (LVEF $\leq$ 35%) and significant regional wall motion abnormalities
  - STEMI TIMI risk score $\geq$ 6.0
  - If symptoms are completely relieved and ST segment completely normalises either spontaneously or after GTN (sublingual or spray) or anti platelet therapy

STEMI TIMI RISK SCORE FOR PREDICTING 30 DAY MORTALITY

Categories	Options	Points
Age (years)	< 65 65 - 74 ≥ 75	0 2 3
Weight < 67 kg	Yes No	1 0
SBP < 100 mmHg	Yes No	3 0
Heart rate > 100 bpm	Yes No	2 0
Killip Class II-IV	Yes No	2 0
Anterior ST segment elevation or LBBB	Yes No	1 0
Diabetes, history of hypertension, history of angina	Yes No	1 0
Time to treatment > 4 hours	Yes No	1 0

TIMI Risk Score for <u>30 day mortality:</u>
0 – 14 plausible points
Low and moderate risk:
5 points and below (< 12%)
High-risk:
6 points and above (16-36.0%)

Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI risk score for ST-elevation myocardial infarction: A convenient, bedside, clinical score for risk assessment at presentation: An intravenous nPA for treatment of infarcting myocardium early II trial substudy. *Circulation*. 2000;102(17):2031-7.

STEMI TIMI RISK SCORE FOR PREDICTING 30 DAY MORTALITY

Categories	Options	Points
Age (years)	< 65	0
	65 - 74	2
	≥ 75	3
Weight < 67 kg	Yes	1
	No	0
SBP < 100 mmHg	Yes	3
	No	0
Heart rate > 100 bpm	Yes	2
	No	0
Killip Class II-IV	Yes	2
	No	0
Anterior ST segment elevation or LBBB	Yes	1
	No	0
Diabetes, history of hypertension, history of angina	Yes	1
	No	0
Time to treatment > 4 hours	Yes	1
	No	0

TIMI Risk Score for <u>30 day mortality:</u>
0 – 14 plausible points
Low and moderate risk:
5 points and below (< 12%)
High-risk:
6 points and above (16-36.0%)

STEMI risk score : 10

Morrow DA, Antman EM, Charlesworth A, Cairns R, Murphy SA, de Lemos JA, et al. TIMI risk score for ST-elevation myocardial infarction: A convenient, bedside, clinical score for risk assessment at presentation: An intravenous nPA for treatment of infarcting myocardium early II trial substudy. *Circulation*. 2000;102(17):2031-7.

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- Bedside echo : LVEF:30%
- STEMI TIMI Risk Score

SHOULD BE TRANSFERED ON THE SAME DAY FOR PHARMACO – INVASIVE PCI

Had PCI and Stenting to LAD

Medications At Discharge :

- Aspirin 100 mg daily
- Clopidogrel 75 mg daily
- Perindopril 2 mg daily
- Bisoprolol 1.25 mg daily
- Spironolactone 25 mg daily
- Atorvastatin 40 mg daily
- Metformin 500 mg bid

CLINICAL PRACTICE GUIDELINES

Management of ST Elevation Myocardial Infarction (STEMI) 2019

4th Edition

THANK YOU