STEMI Discussion

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ESC 2005

Reperfusion therapy in STEMI is the most important component of treatment as it strongly influences short and long term outcome

The main objective of healthcare providers should be to achieve at least 70% of reperfusion therapy applied to STEMI sufferers in a timely manner, particularly within 3 hours after onset of symptoms.

Bassand J-P et al. Eur Heart Jnl 2005 (26) 2733-2741

ESC 2005

- They said another interesting thing: professional organizations have the responsibility to impart this message to the cardiology community, and inform politicians and health authorities about the best possible strategy to achieve reperfusion therapy.
- Policy document for the treatment of STEMI

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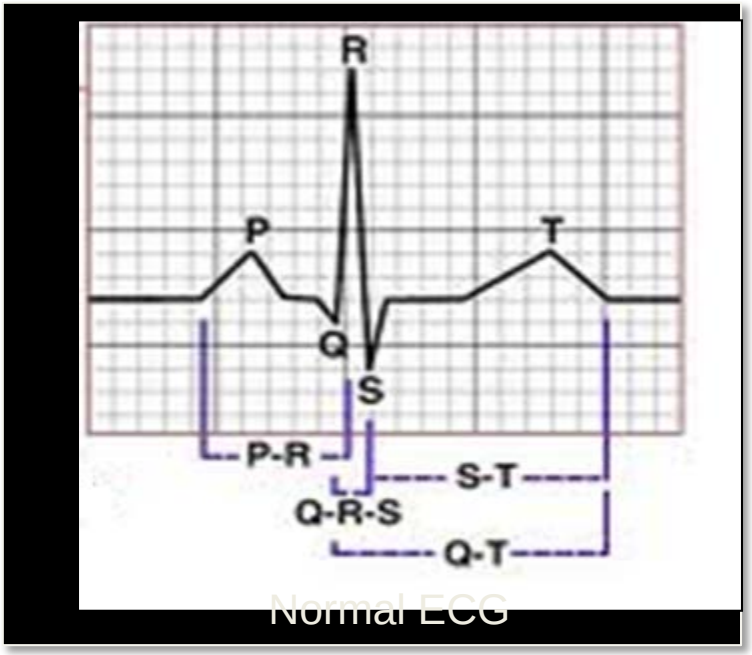
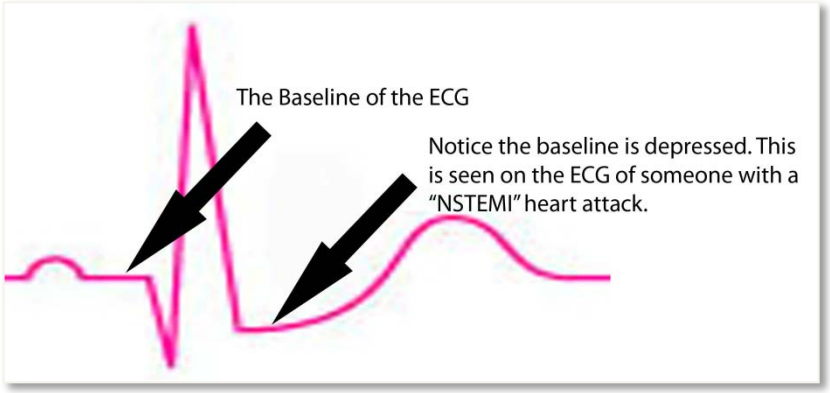
Bassand J-P et al. Eur Heart Jnl 2005 (26) 2733-2741

Seeing the difference on the ECG

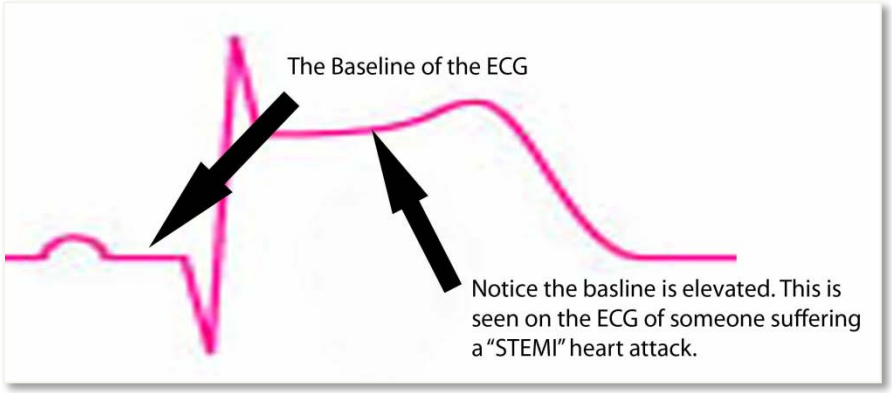


Normal ECG

Only a 12 lead ECG may be used to make a diagnosis

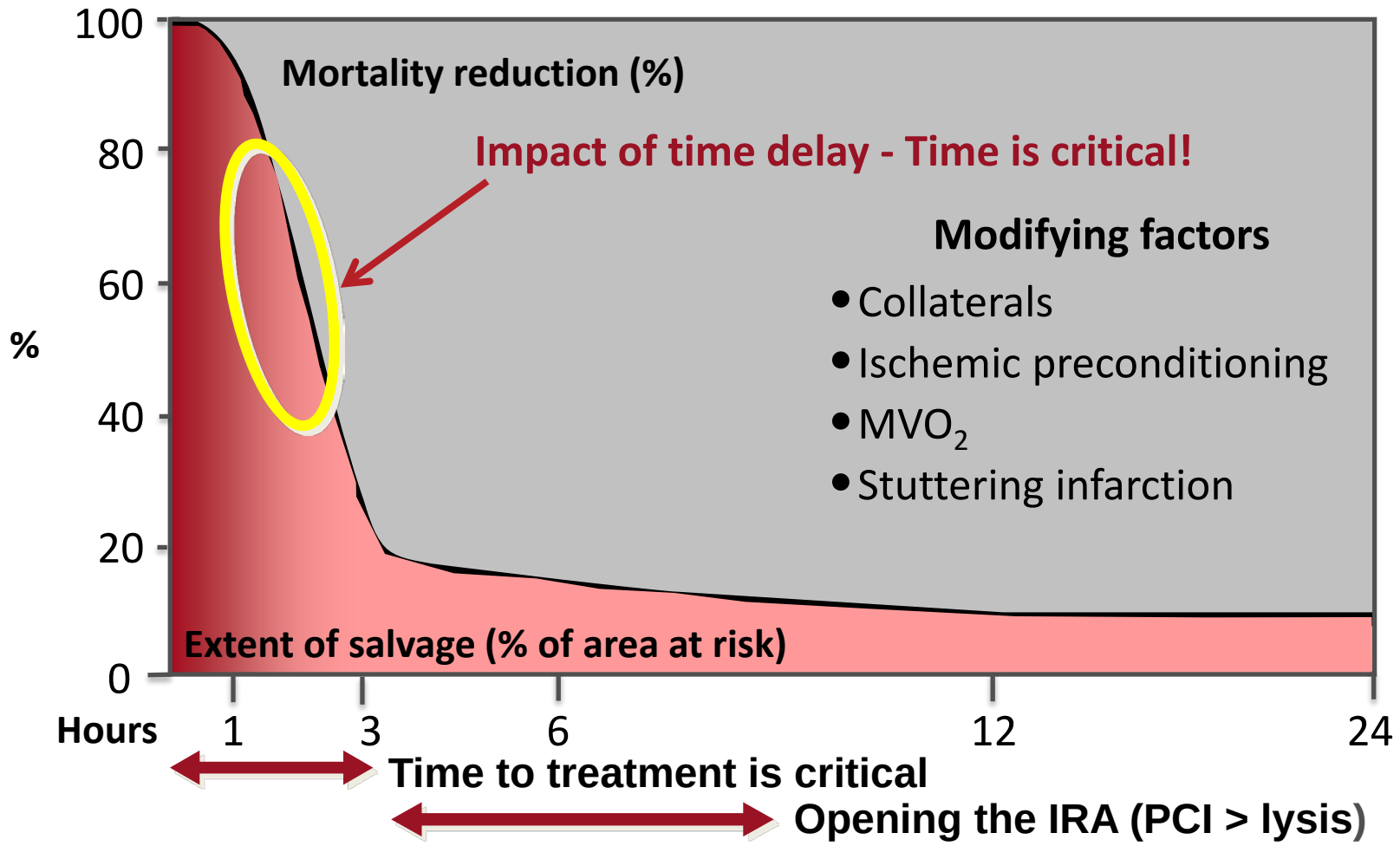


N STEMI



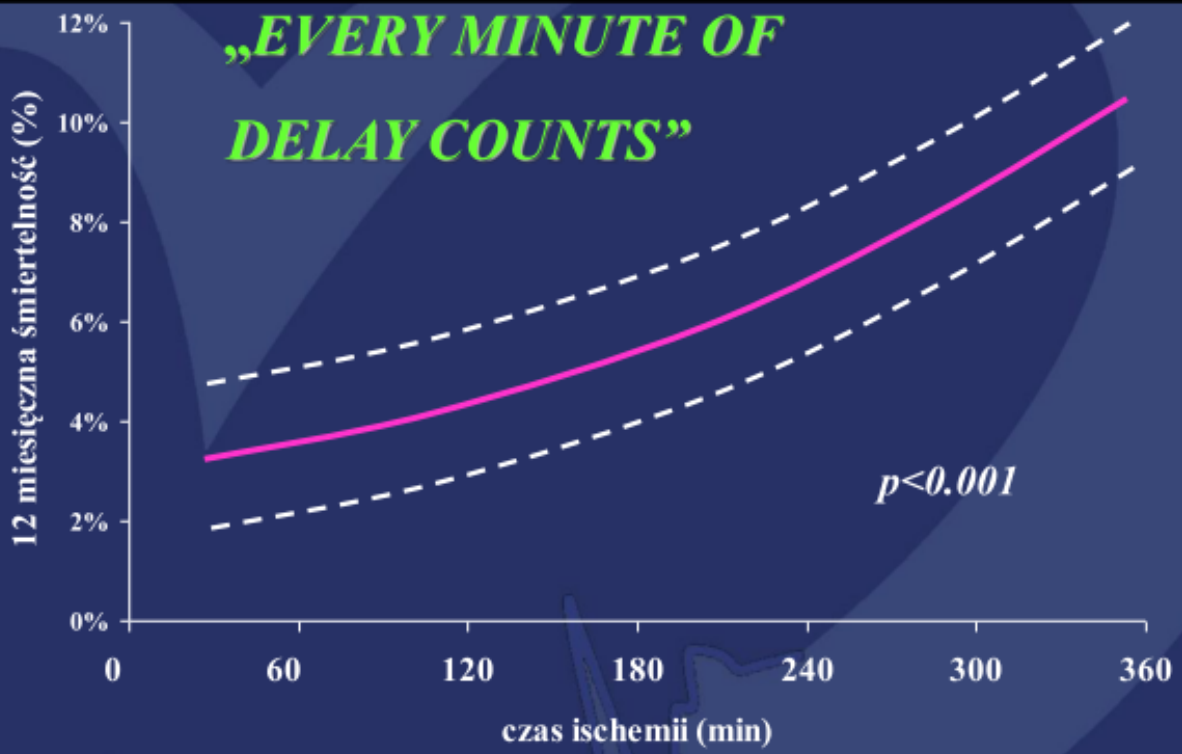
STEMI

Relationship Between Mortality Reduction and Extent of Salvage



Gersh: JAMA, 2005

Time from Symptom Onset to Treatment Predicts 1-year Mortality after Primary PCI



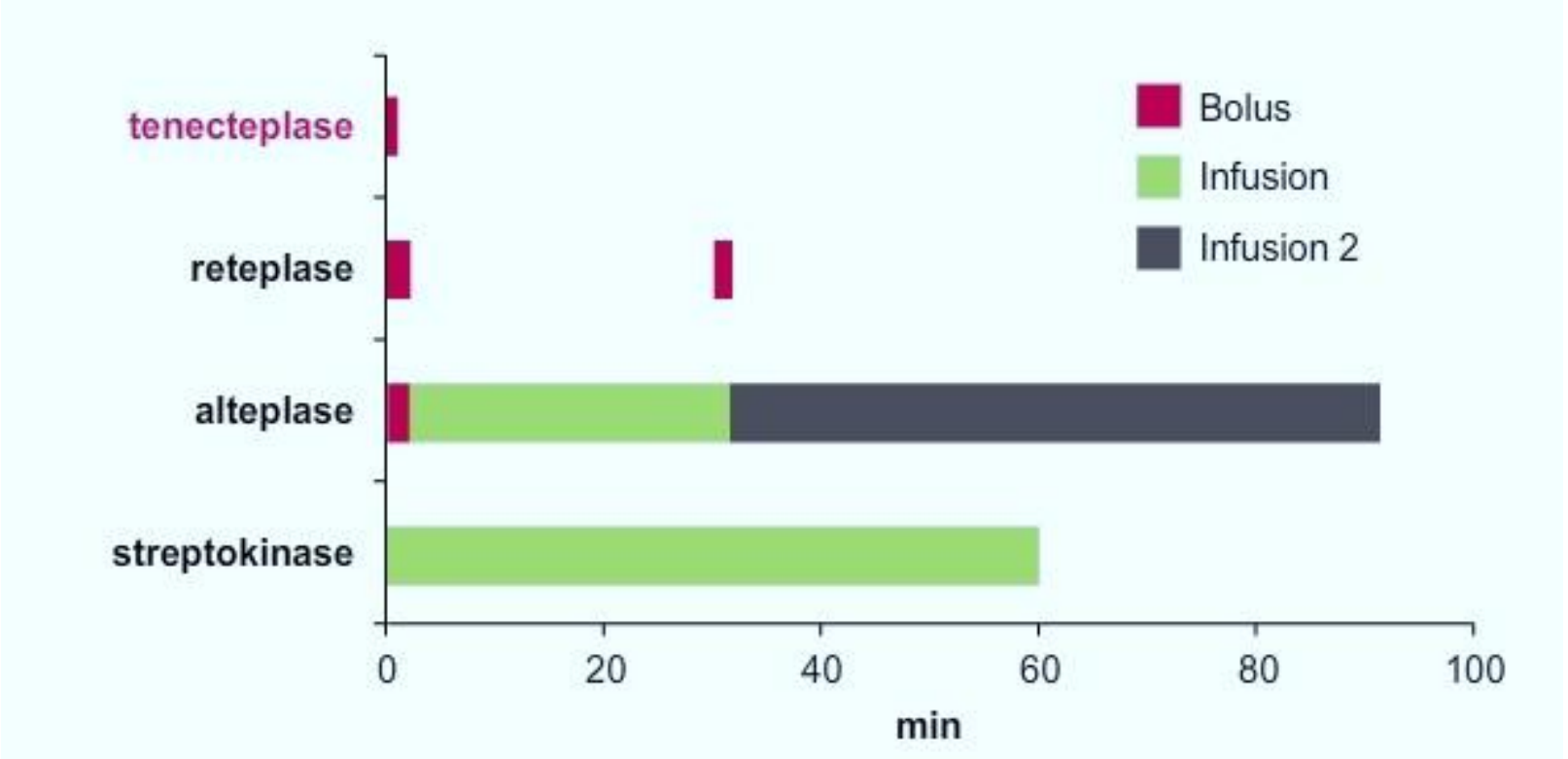
The relative risk of 1-year mortality increases by 7.5% for each 30-minute delay

G. De Luca, Circulation 2004

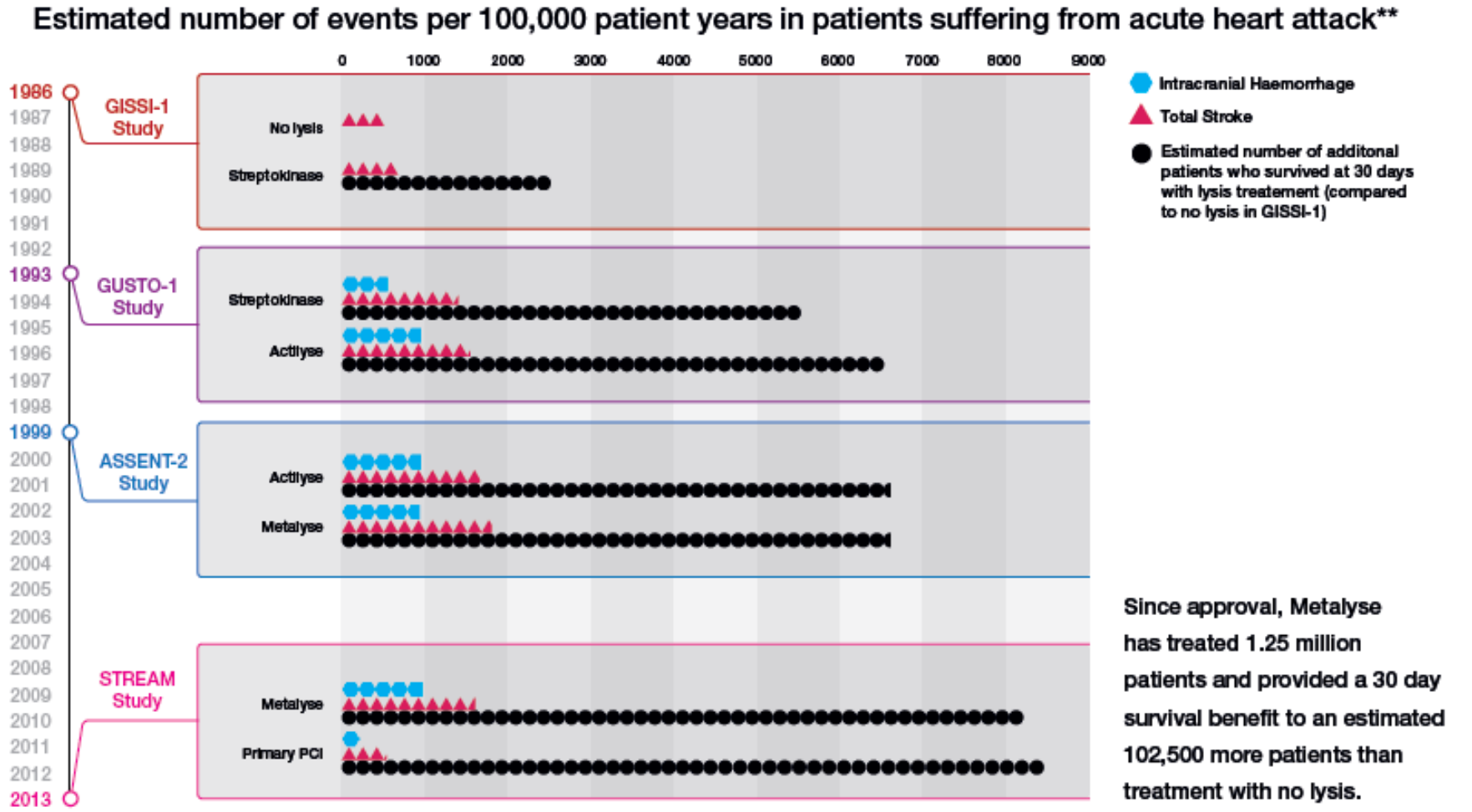
TIME TO TREAT = DEGREE OF MYOCARDIAL SALVAGE!

Single Bolus: Convenience

- TNK first thrombolytic agent that can be administered over **5-10 seconds in a single dose**



Wealth of evidence to support TNK efficacy



Since approval, Metalyse has treated 1.25 million patients and provided a 30 day survival benefit to an estimated 102,500 more patients than treatment with no lysis.

*Primary Percutaneous Coronary Intervention **treated within 6 hours after onset of symptoms

The GUSTO Investigators. *N Engl J Med* 1993; 329:673-682. Werf F van de Lancet. 1999;354(9180):716-22. Armstrong *N Engl J Med*. 2013;369(15):1379-87. Gruppo Italiano per lo Studio della Streptochinasi nell'Infarto Miocardico (GISSI). *Lancet*. 1986;327(8478):397-458

Boehringer Ingelheim

Fibrinolysis or Primary PCI in ST-segment elevation myocardial infarction

STEMI Trial

Armstrong et al 2013. NEJM;368:1379-87

STREAM: Aim of study

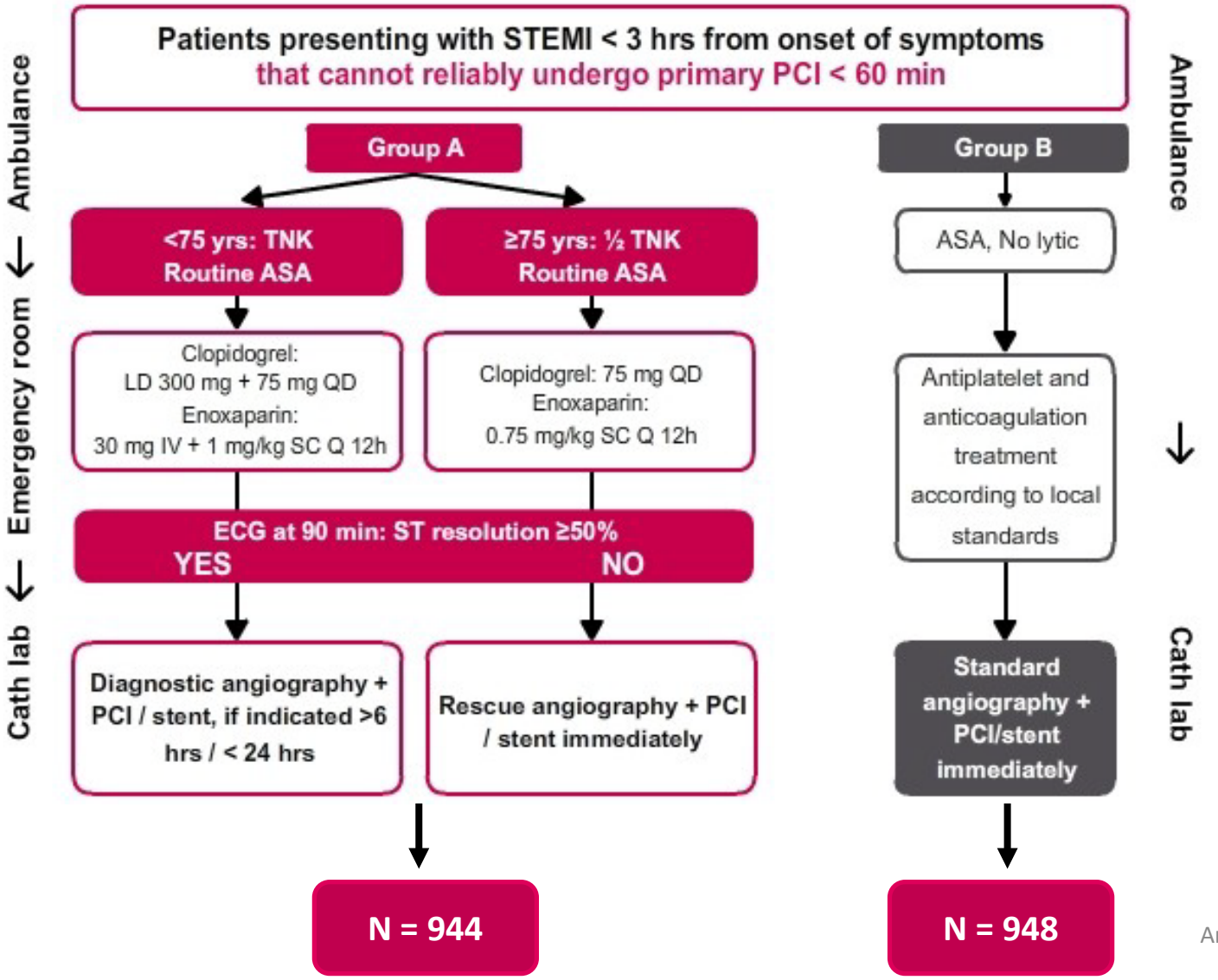
- Are there other therapies we can use in STEMI patients who cannot receive a primary PCI < 1 hr?

- Therefore the STREAM investigators asked:

How does early thrombolysis with anti-platelet and anticoagulant therapy compare to primary PCI in STEMI patients who present <3 hours of symptom onset?

Armstrong et al 2013. NEJM 2013;368:1379-87

Study design



Armstrong et al 2013. N
2013;368:1379-87

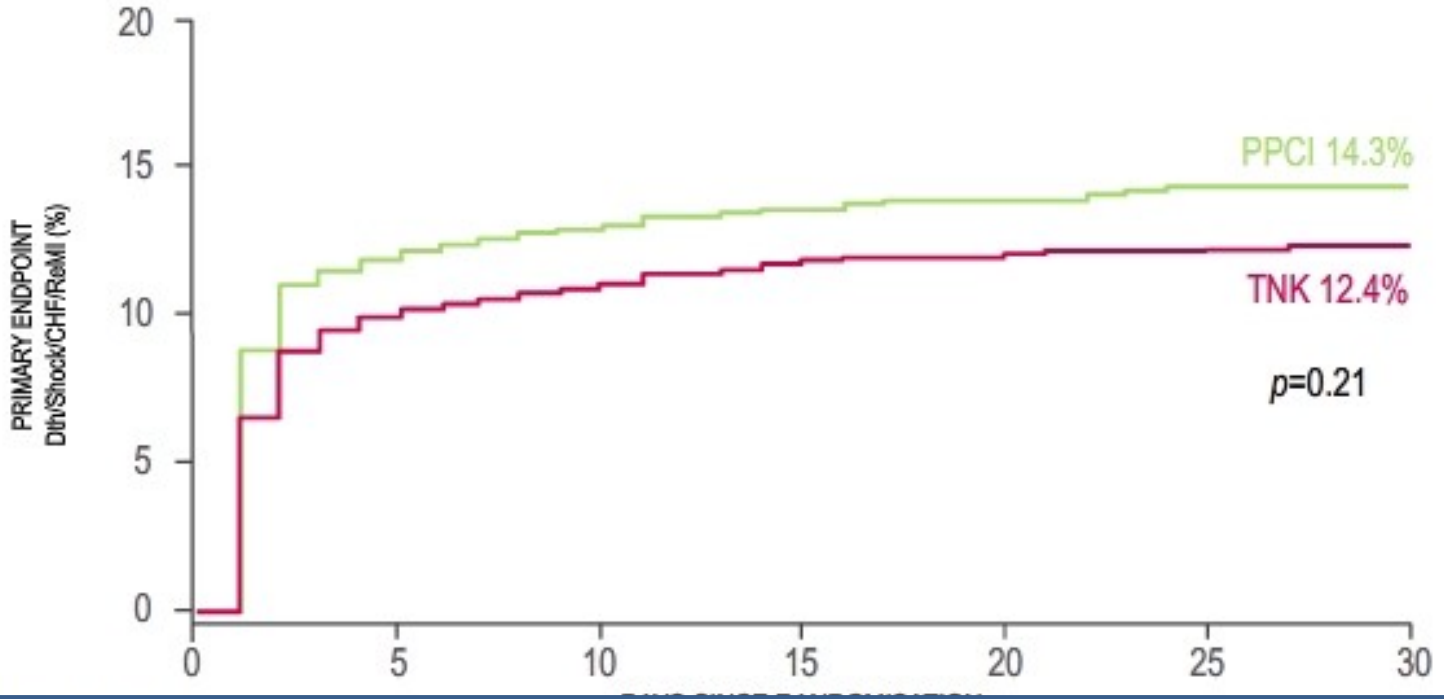
End points

- Primary end point (30 day composite):
  - Death from any cause, shock, congestive HF, or re-infarction

- Single efficacy or safety end points included:
  - Ischaemic stroke
  - ICH
  - Non-intracranial bleeding

Armstrong et al 2013. NEJM 2013;368:1379-87

Primary end point at 30 days



Mortality and morbidity the same between the two groups

Armstrong et al 2013. NEJM 2013;368:1379-87

Important “take home” points

- Fibrinolysis provides clinicians with additional time BUT 80% of patients will still require a PCI
- A greater incidence of ICH was seen in patients before the protocol was amended, after which there was no significant difference between groups
- Blood pressure, age, gender, diabetes etc does not influence impact of fibrinolysis on primary outcome

Armstrong et al 2013. NEJM 2013;368:1379-87

What does this mean?

- Clinicians can “buy time” by administering tenecteplase to STEMI patients if primary PCI cannot be performed within 1 hour.

- Of importance in SSA setting:
  - Traffic, patients living in outlying areas
  - Not all hospitals have PCI facilities

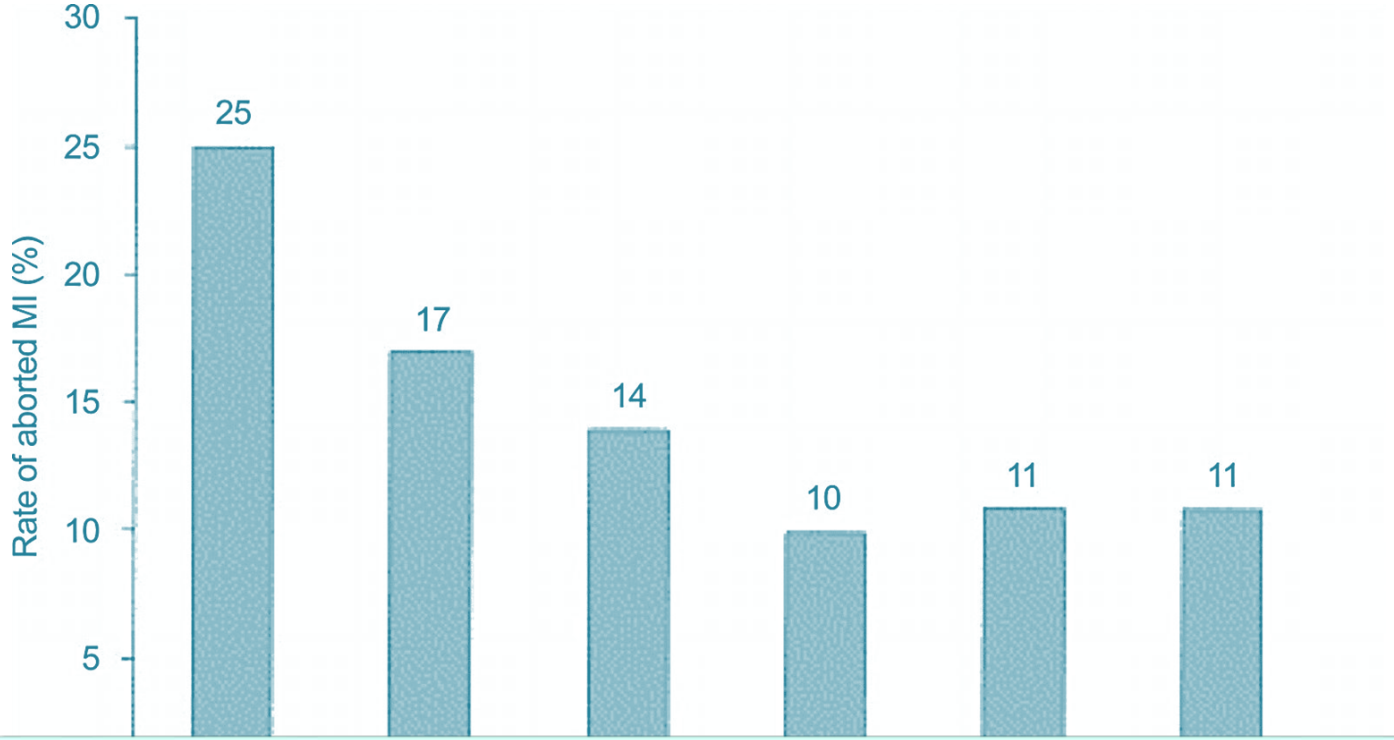
- Provide additional time for patient to receive PCI with similar outcomes

Armstrong et al 2013. NEJM 2013;368:1379-87

Aborted MI in STEMI: Insights from STREAM

Maleki et al. Heart 2014

Higher incidence of aborted MIs with earlier reperfusion

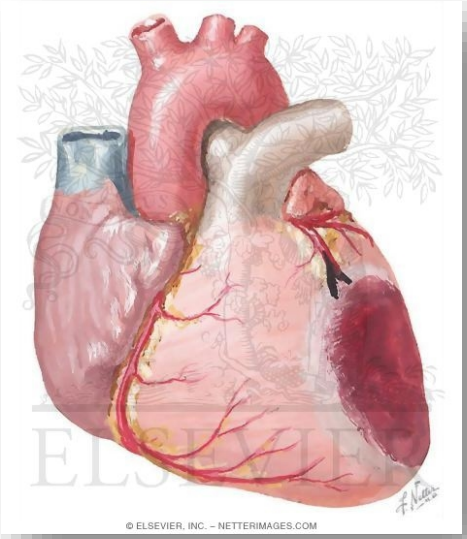


Aborted MIs occurs in 25% of patients who received fibrinolysis within 1 hour of symptom onset

Verheugt et al. European Heart Journal 2006; 27:901-904

Implications of an aborted MI

- Associated with smaller infarct sizes – i.e. less potential damage of myocardial tissue
- Improved outcomes vs non AbMI patients



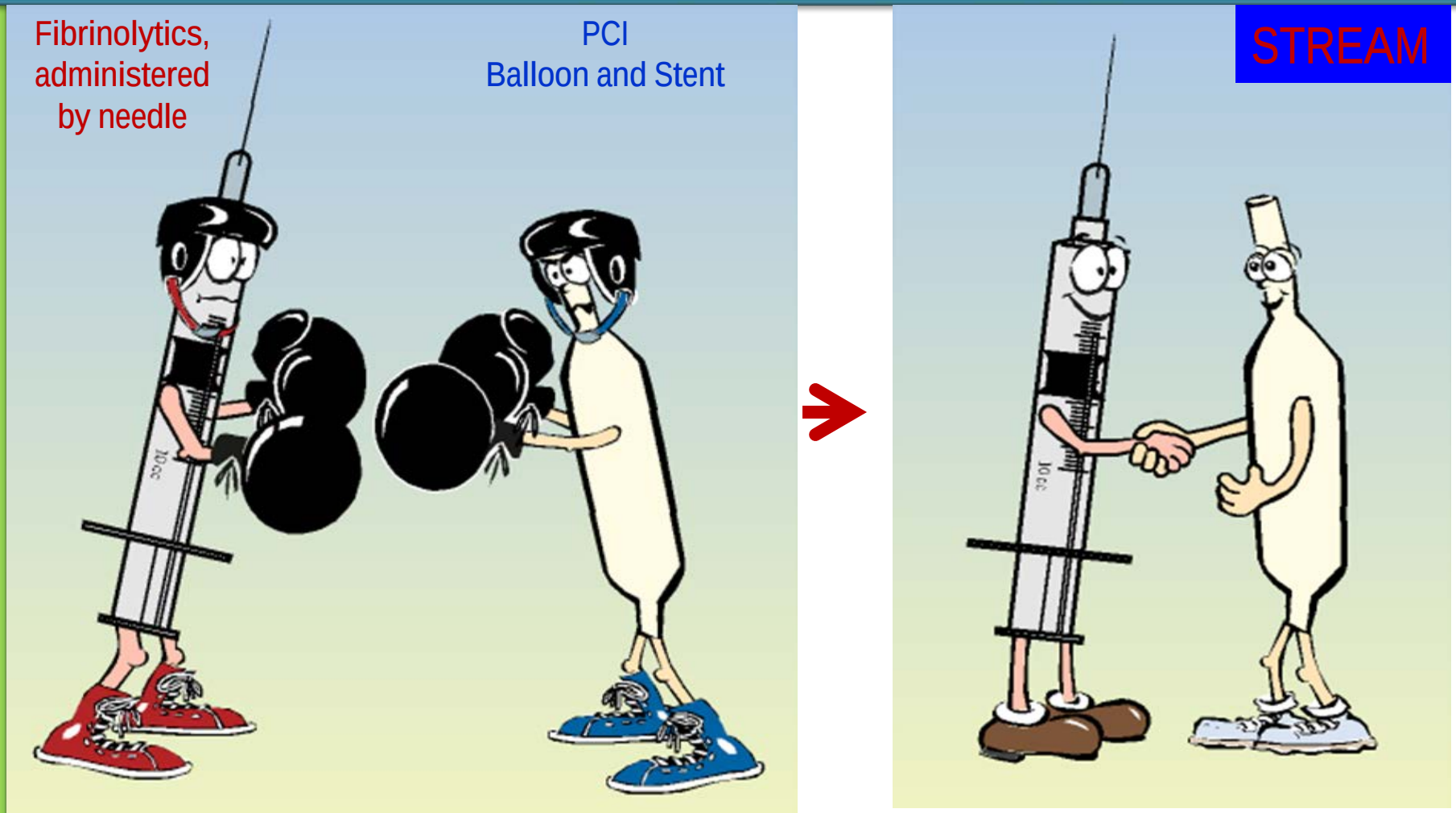
Incidence of AbMI between treatment arms

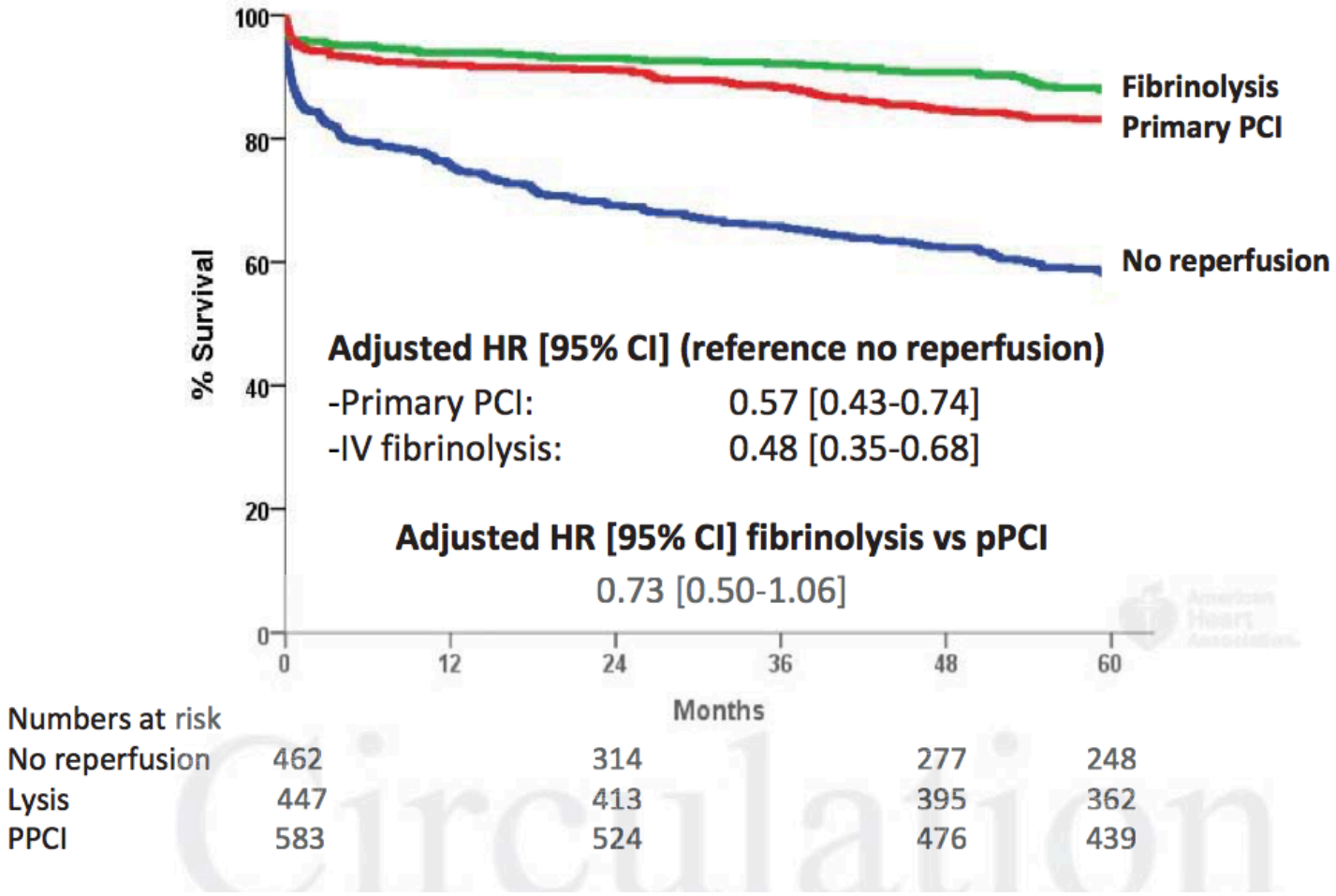
Treatment arm	Incidence of AbMI
Primary PCI arm	6.9%
Fibrinolysis arm	**11.1%**
	P< 0.0001

Higher incidence of aborted Mis in the patients receiving fibrinolysis

Maleki et al. Heart 2014;DOI 10.1136

New approaches to STEMI treatment





FAST-AMI cohort ,Danchin et al. DOI: 10.1161/CIRCULATIONAHA.113.005874

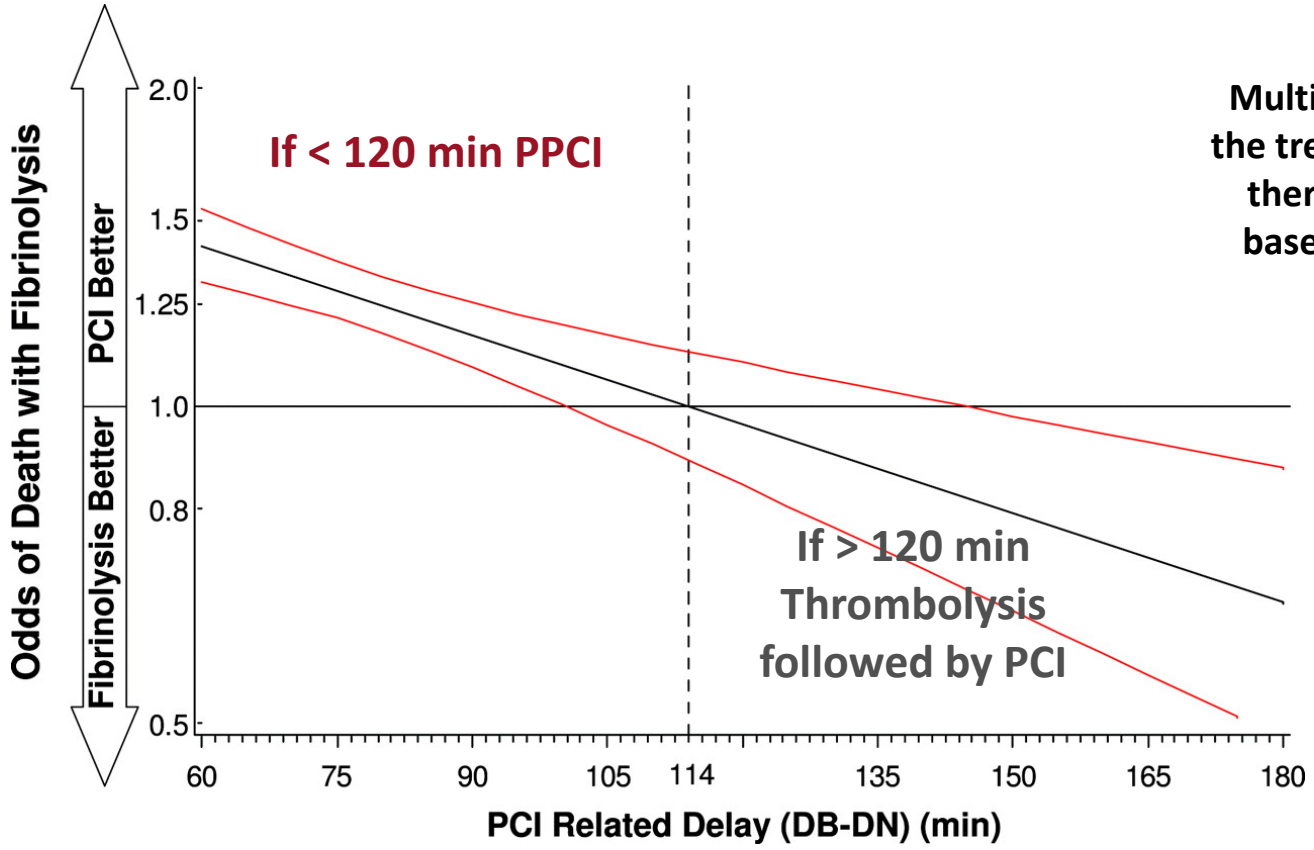
What do I do?

- Reperfuse now!
  - Immediate PCI (< 120 mins)

    OR
  - Thrombolysis (> 120 mins)
- Reperfuse how?
  - Ship immediately to closest cathlab (< 120 mins)

    OR
  - Drip and then ship to closest cathlab (> 120 mins)
- Reperfuse where?
  - Closest cathlab location

Reperfusion choice depends on time to treatment

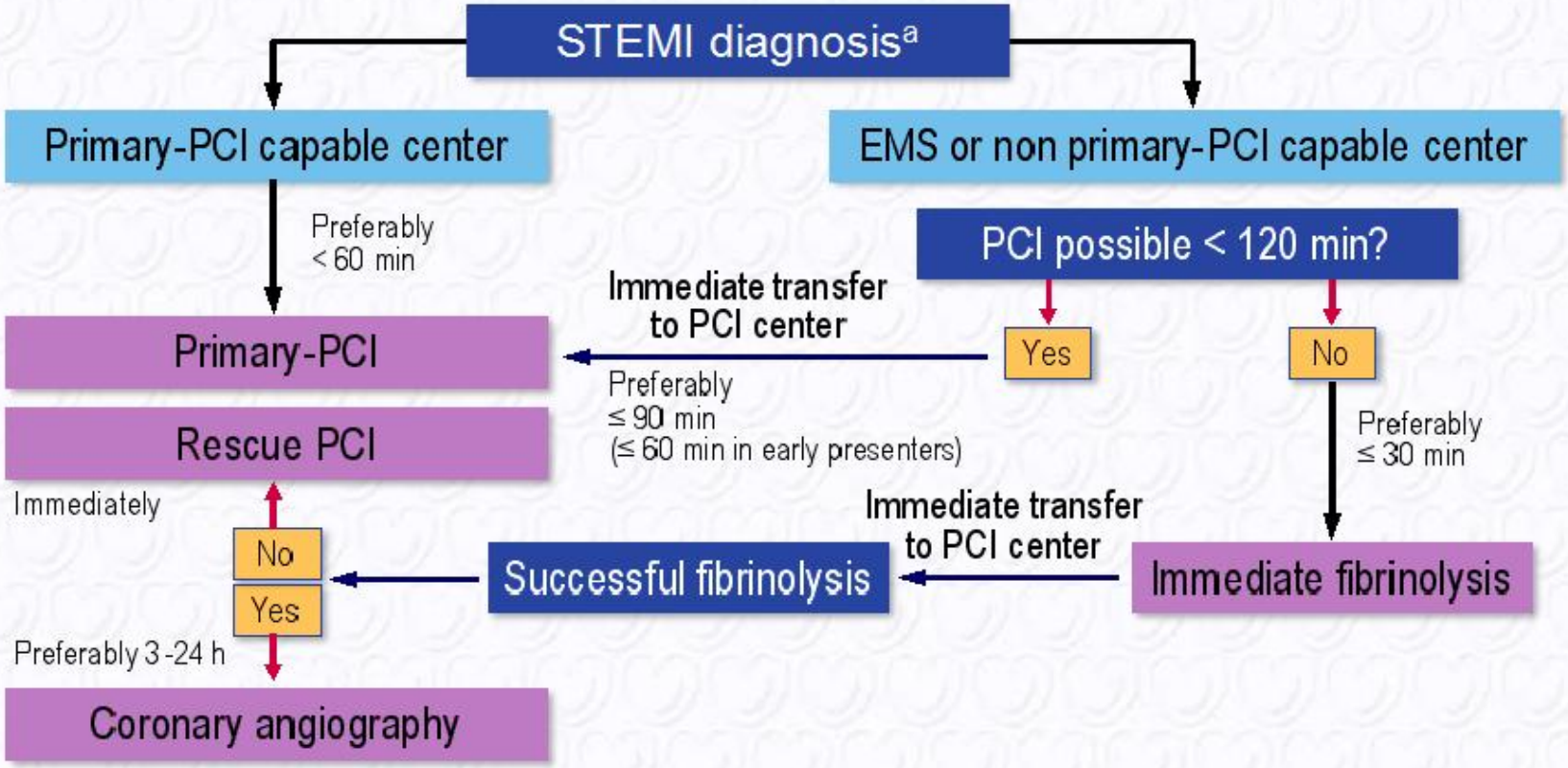


Multivariable analysis estimating the treatment effect of reperfusion therapy with PCI or fibrinolysis based on increasing PCI-related delay.

Pinto D S et al. Circulation 2006;114:2019-2025

N= 192 509 pts from 645 National Registry of Myocardial Infarction Hospitals

Prehospital and in-hospital management, and reperfusion strategies within 24 h of FMC



European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

What do I do?

- Reperfuse now!
  - Immediate PCI (< 120 mins) 1st
  - ***OR***
  - Thrombolysis (> 120 mins)
- Reperfuse how?
  - Ship immediately to closest cathlab (< 120 mins) 1st
  - ***OR***
  - Drip and then ship to closest cathlab (> 120 mins)
- Reperfuse where?
  - Closest cathlab location

Difference: thrombolysis and pPCI based strategies

Lytic strategy

- Diagnosis based on ECG
- 2/3 eligible
- Not effective in shock
- Of those eligible 50% reach TIMI 3 flow
- Ischaemia and reinfarction common
- Stroke is an important complication
- Cheaper start-up costs
- Easier to organize a service
- Needs support of a rescue pPCI service
- Longer hospital stay for patients
- Definitive care delivered by generalists

pPCI strategy

- Diagnosis based on coronary angiogram
- No absolute contraindications
- Reduces mortality by half in shock
- 95% achieve TIMI 3 flow
- Further ischaemia and reinfarction uncommon
- Stroke very rare
- Cost effective in the long-term
- Harder to organize a service
- No rescue pPCI service needed
- Shorter hospital stay for patients
- Definitive care delivered by specialists

Source: courtesy of Prof Rothman and Dr De Palma

What is PPCI?

- PPCI is a mechanical technique used to open up blocked coronary blood vessels that may or may not use stent(s) or other devices
- Procedure is performed under x-ray guidance and requires specialised skills and team-members
- **More effective in reopening occluded arteries than thrombolysis**
- For both AHA and ESC Primary PCI is a **class 1A indication for Acute STEMI if it can be performed *within 120min* of first medical contact** (90 minutes if presenting early with a large infarct and low risk of bleeding complications)

Benefits of PPCI vs Thrombolysis

- Lower in-hospital mortality
- Less complications
- Fewer ambulance journeys
- Reduced unscheduled revascularisation
- Shorter length of stay
- More cost-effective for the healthcare economy

Where is my nearest cathlab in Nairobi/?

What do I do?

- Reperfuse now!
  - Immediate PCI (< 120 mins)

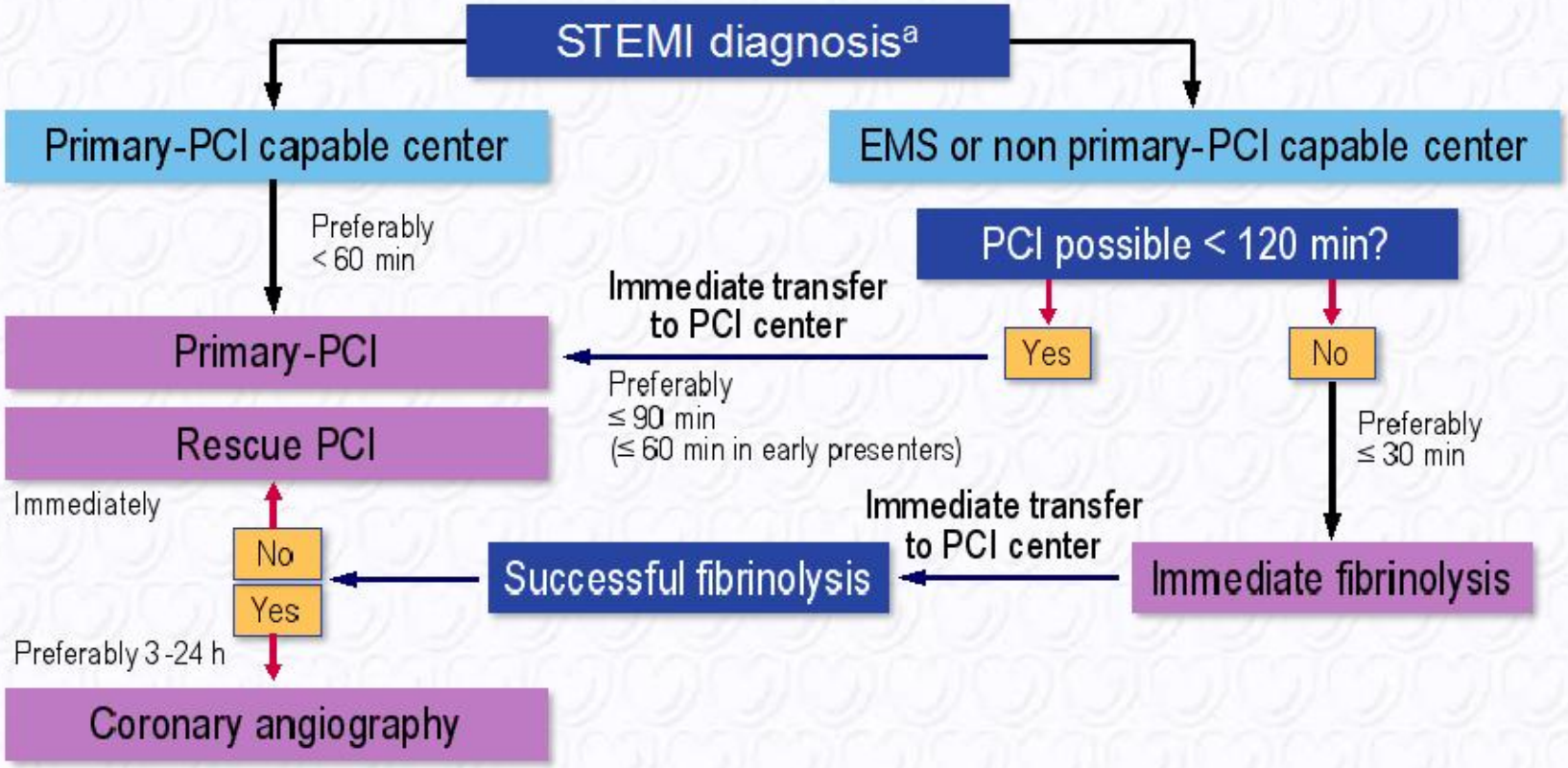
OR

  - Thrombolysis (> 120 mins) — 2nd
- Reperfuse how?
  - Ship immediately to closest cathlab (< 120 mins)

OR

  - Drip and then ship to closest cathlab (> 120 mins) — 2nd
- Reperfuse where?
  - Closest cathlab location

Prehospital and in-hospital management, and reperfusion strategies within 24 h of FMC



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Contraindications to fibrinolytic therapy

Absolute
Previous intracranial haemorrhage or stroke of unknown origin at any time.
Ischaemic stroke in the preceding 6 months.
Central nervous system damage or neoplasms or atrioventricular malformation.
Recent major trauma/surgery/head injury (within the preceding 3 weeks).
Gastrointestinal bleeding within the past month.
Known bleeding disorder (excluding menses).
Aortic dissection.
Non-compressible punctures in the past 24 h (e.g. liver biopsy, lumbar puncture).

European Heart Journal (2012) 33, 2569–2619
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Contraindications to fibrinolytic therapy

Relative
Transient ischaemic attack in the preceding 6 months.
Oral anticoagulant therapy.
Pregnancy or within 1 week postpartum.
Refractory hypertension (systolic blood pressure > 180 mmHg and/or diastolic blood pressure > 110 mmHg).
Advanced liver disease.
Infective endocarditis.
Active peptic ulcer.
Prolonged or traumatic resuscitation.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Fibrinolytic therapy

Recommendations	Class	Level
Fibrinolytic therapy is recommended within 12 h of symptom onset in patients without contraindications if primary PCI cannot be performed by an experienced team within 120 min of FMC.	I	A
In patients presenting early (< 2 h after symptom onset) with a large infarct and low bleeding risk, fibrinolysis should be considered if time from FMC to balloon inflation is > 90 min.	IIa	B
If possible, fibrinolysis should start in the prehospital setting.	IIa	A
A fibrin-specific agent (tenecteplase, alteplase, reteplase) is recommended (over non-fibrin specific agents).	I	B
Oral or i.v. aspirin must be administered.	I	B
Clopidogrel is indicated in addition to aspirin.	I	A

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Fibrinolytic therapy, *con't*

Recommendations	Class	Level
Antithrombin co-therapy with fibrinolysis		
Anticoagulation is recommended in STEMI patients treated with lytics until revascularization (if performed) or for the duration of hospital stay up to 8 days. The anticoagulant can be:	I	A
• Enoxaparin i.v followed by s.c. (using the regimen described below) (preferred over UFH).	I	A
• UFH given as a weight-adjusted i.v. bolus and infusion.	I	C
In patients treated with streptokinase, fondaparinux i.v. bolus followed by s.c. dose 24 h later.	IIa	B

UFH = unfractionated heparin.

European Heart Journal (2012) 33, 2569–2619
doi:10.1093/eurheartj/ehs215

Fibrinolytic therapy, *con't*

Recommendations	Class	Level
Transfer to a PCI-capable centre following fibrinolysis		
Is indicated in all patients after fibrinolysis	I	A
Interventions following fibrinolysis		
Rescue PCI is indicated immediately when fibrinolysis has failed (< 50 % ST-segment resolution at 60 min).	I	A
Emergency PCI is indicated in the case of recurrent ischaemia or evidence of reocclusion after initial successful fibrinolysis.	I	B

European Heart Journal (2012) 33, 2569–2619
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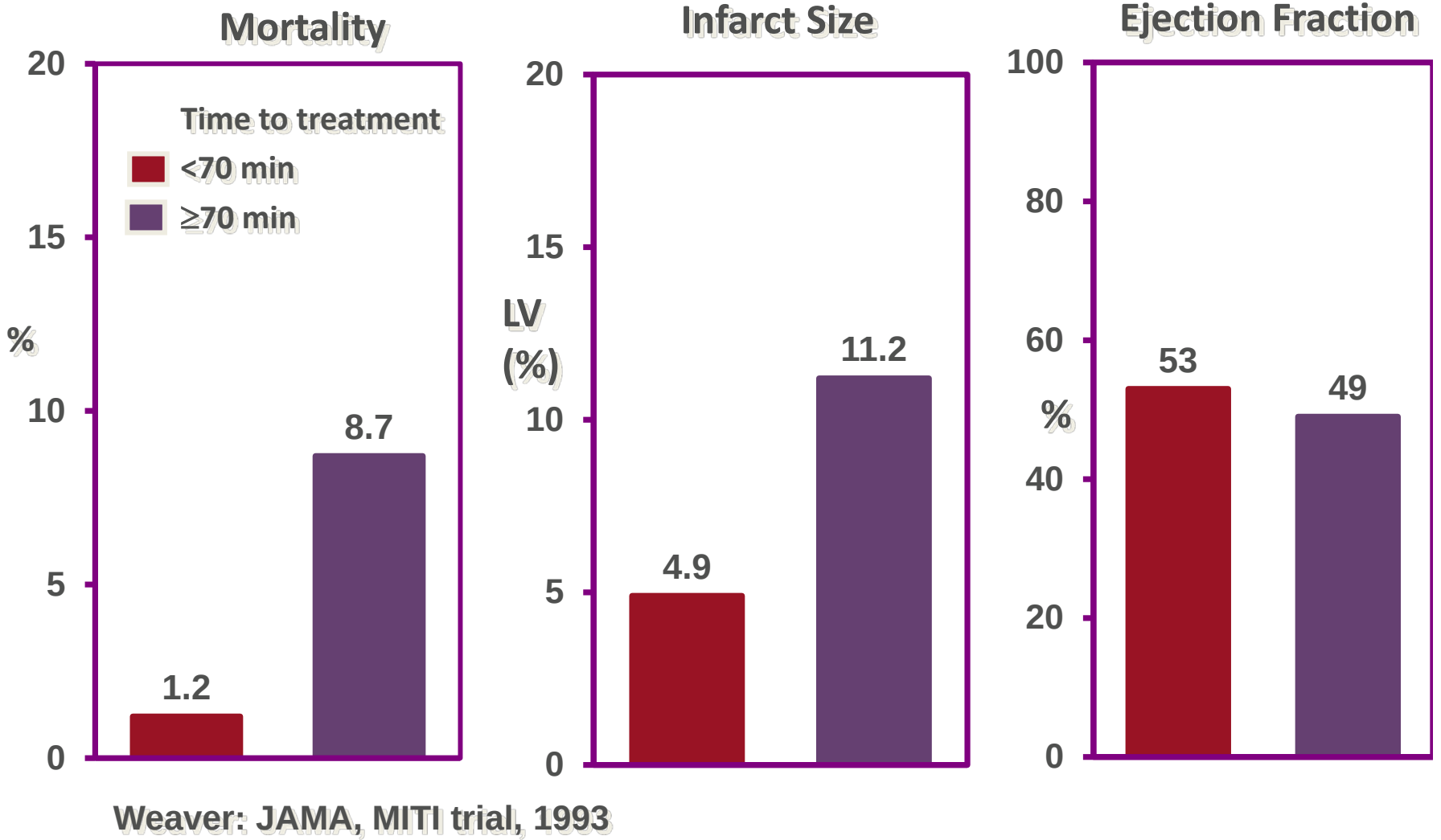
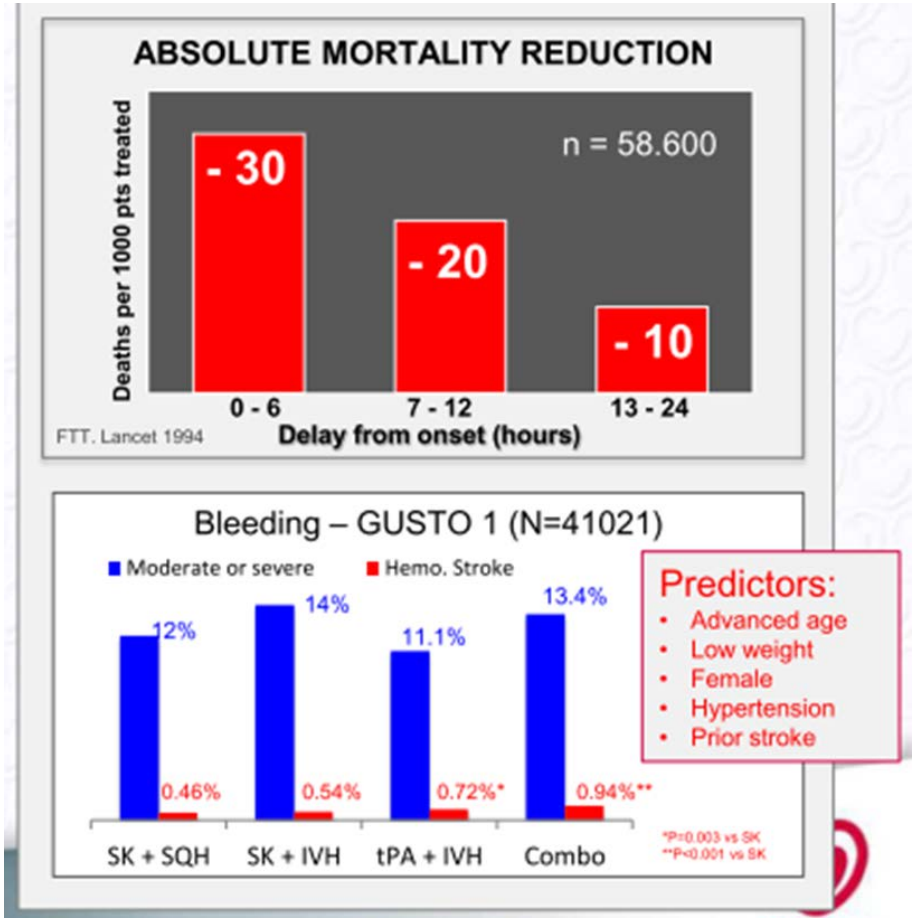
Does early thrombolytic therapy affect rate of survival?



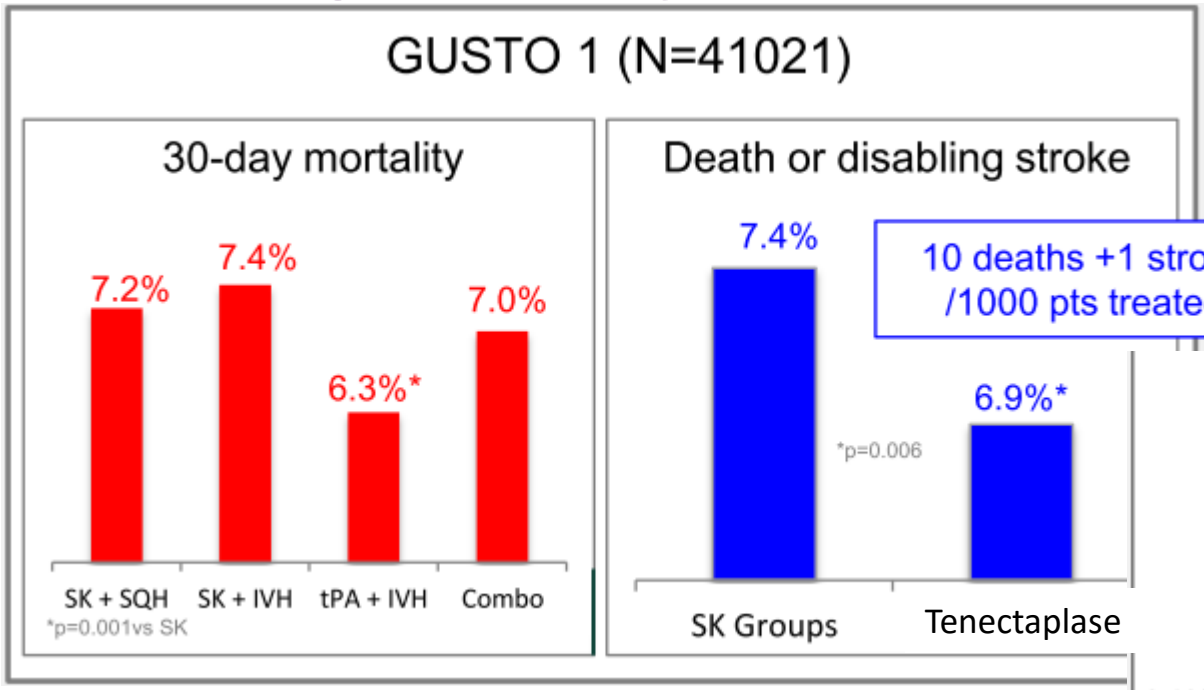
Weaver: JAMA, MITI trial, 1993

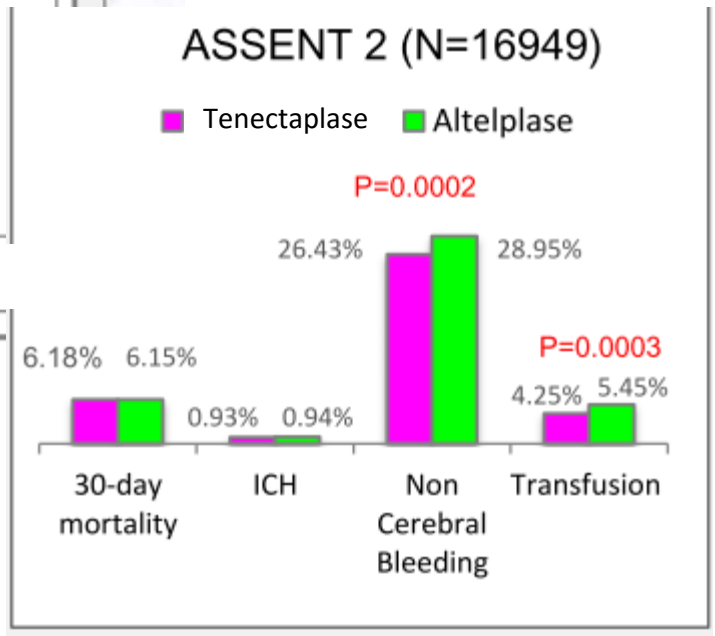
But what about the risks associated with thrombolysis?



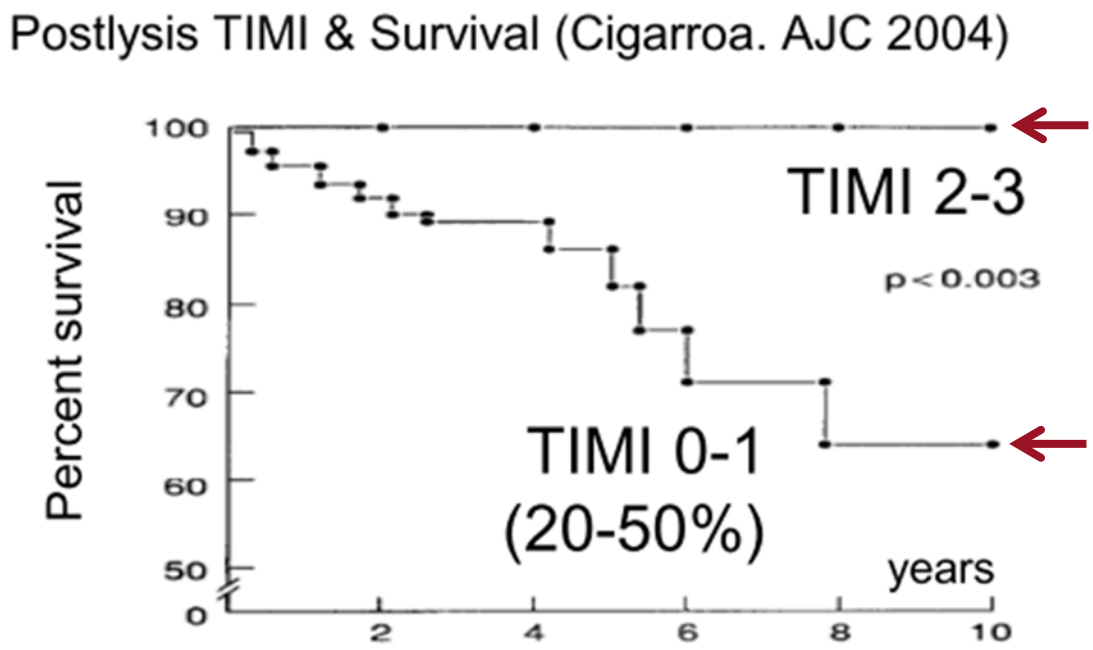
Thrombolysis is highly effective but there is 1% chance of intracranial bleeding

Tenectaplase has a lower rate of non cerebral bleeding and easy administration





How does success of thrombolysis affect survival rates?



Blocked vessel has been opened

Blocked vessel has only been *partially* opened

So do I wait to check on the success of thrombolysis?

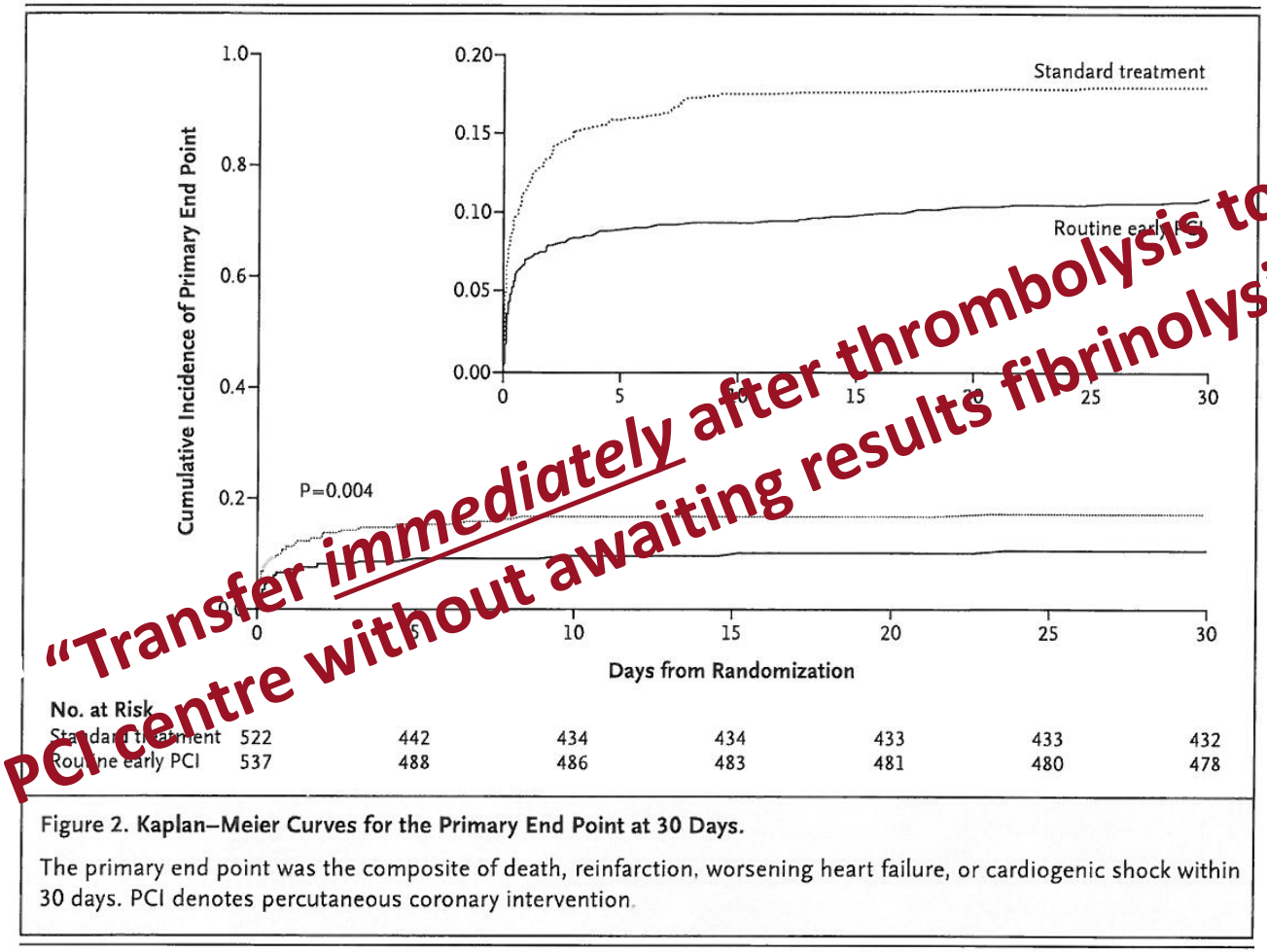


Figure 2. Kaplan–Meier Curves for the Primary End Point at 30 Days.

The primary end point was the composite of death, reinfarction, worsening heart failure, or cardiogenic shock within 30 days. PCI denotes percutaneous coronary intervention.

"Transfer *immediately* after thrombolysis to PCI centre without awaiting results fibrinolysis"

Routine transfer and PCI within 6 hours after lysis

OR

Transfer after 24 hours and elective cath within 2 weeks or urgent transfer for failed lysis (rescue PCI)

(Cantor et al., STREAM study, NEJM 2009)

STREAM Study Conclusions

- Fibrinolysis with bolus tenecteplase and contemporary antithrombotic therapy given before transport to a PCI-capable hospital:
  - Circumvents the need for urgent PCI in about two thirds of fibrinolytic treated STEMI patients
  - Is associated with small increased risk of intracranial bleeding
  - Is as effective as PPCI in STEMI patients within 3 hours symptom onset who cannot undergo PCI within 1 hour of first medical contact

(Cantor et al., STREAM study, NEJM 2009)

What do I do?

- Reperfuse now!
  - Immediate PCI (< 120 mins)

OR

  - Thrombolysis (> 120 mins) — 2nd
- Reperfuse how?
  - Ship immediately to closest cathlab (< 120 mins)

OR

  - Drip and then ship to closest cathlab (> 120 mins) — 2nd
- Reperfuse where?
  - Closest cathlab location

Treatment Choice Conclusions

- During first 2-3 hours after symptom-onset, time to treatment is critical
- After 3 hours, PPCI is preferred if it can be done within 2 hours of first medical contact.
- If not, then a pharmacoinvasive strategy with thrombolysis followed by immediate transfer for PCI within next 3-24 hours may improve myocardial salvage and survival.
- Immediate or ‘rescue’ PCI for failed thrombolysis

Summary of common pitfalls

- Not obtaining a history of cardiac chest pain
- Not performing immediate ECG on all patients triaged as possible cardiac chest pain
- Not performing serial ECG when appropriate
- Repeated ECGs when diagnosis is clear
- Lack of knowledge regarding closest cathlab
- Administering drugs before activating EMS
- Rotating and temporary staff unaware of protocol
- Thrombolytics not being carried on board ambulance
- Lack of beds available at hospital with a cathlab (call to check!)
- Possible medical aid authorisation delays

What can you do to help?

- Know where all your local cathlabs are
- Find out who the cardiologists are
- If you think the patient might have had an MI, perform an ECG
- Take a picture of the ECG with your mobile phone and send it ahead to the cardiologist
- Carry and administer thrombolysis according to the guidelines
- Ask questions if you are unsure
- Do not delay getting your patient to a cathlab

Action steps?

Start noticing delays

Educate medical students, ensure graduates can identify STEMI

In your hospital: insist on a competent ER doctor

In your practice: have and use an ECG machine

Look for the STEMI protocol when you visit ER.

Drive audit processes: build teams that measure outcomes

Engage with SA STEMI Reperfusion project who can help you in your hospital

If all else fails (including reperfusion)

CAST study: flecainide and encainide post MI

Non cardiac factors affecting survival:

Pet ownership: owners vs non-owners had 3.9 vs 6.5% mortality

Dog owners particular benefit: 1.2 vs 7.2% mortality

“unexpectedly cat owners had a greater mortality than those who did not have cats, though the difference was small, 7.3 vs 5.5%”

Tell your patient to get a dog!