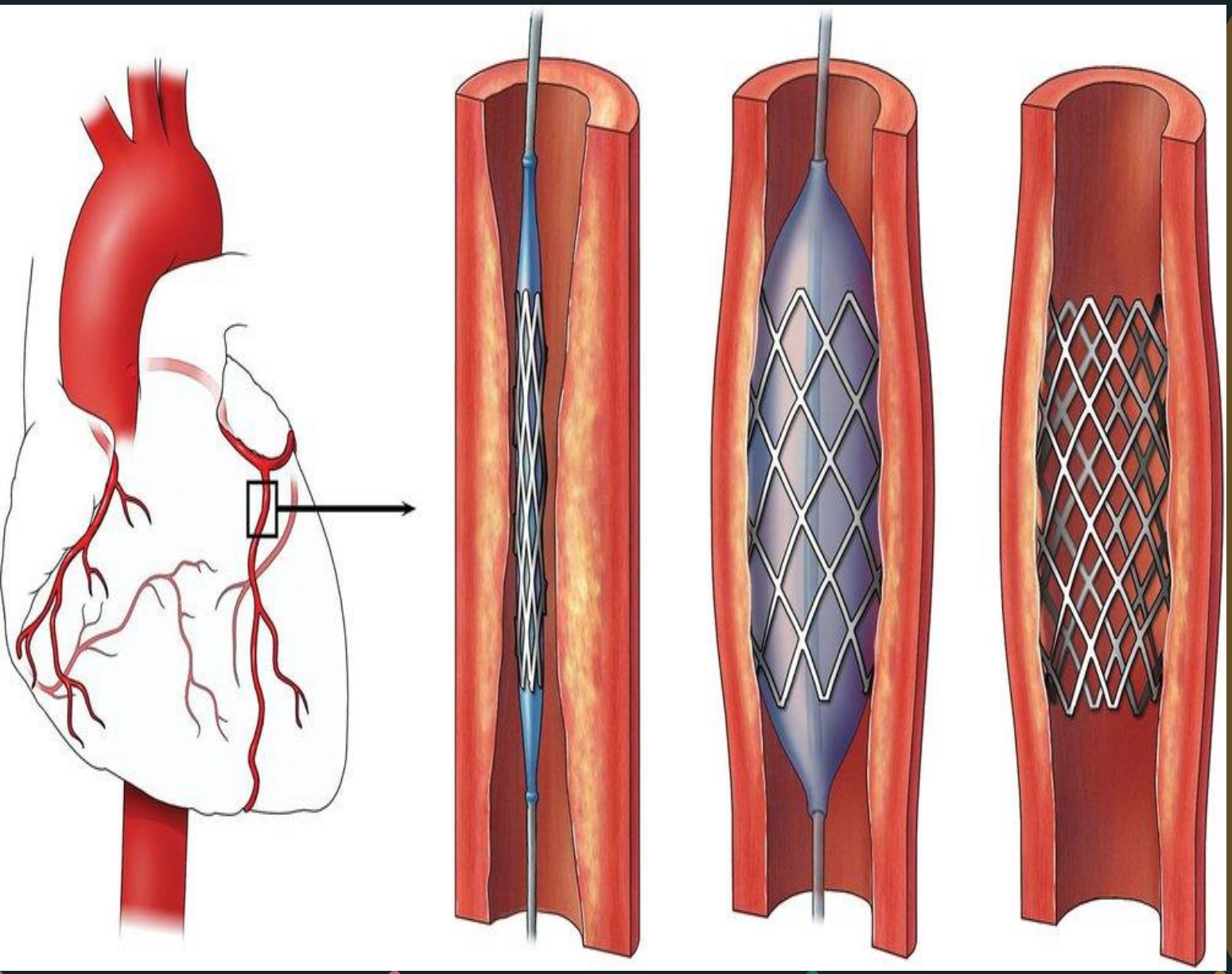


Percutaneous coronary intervention

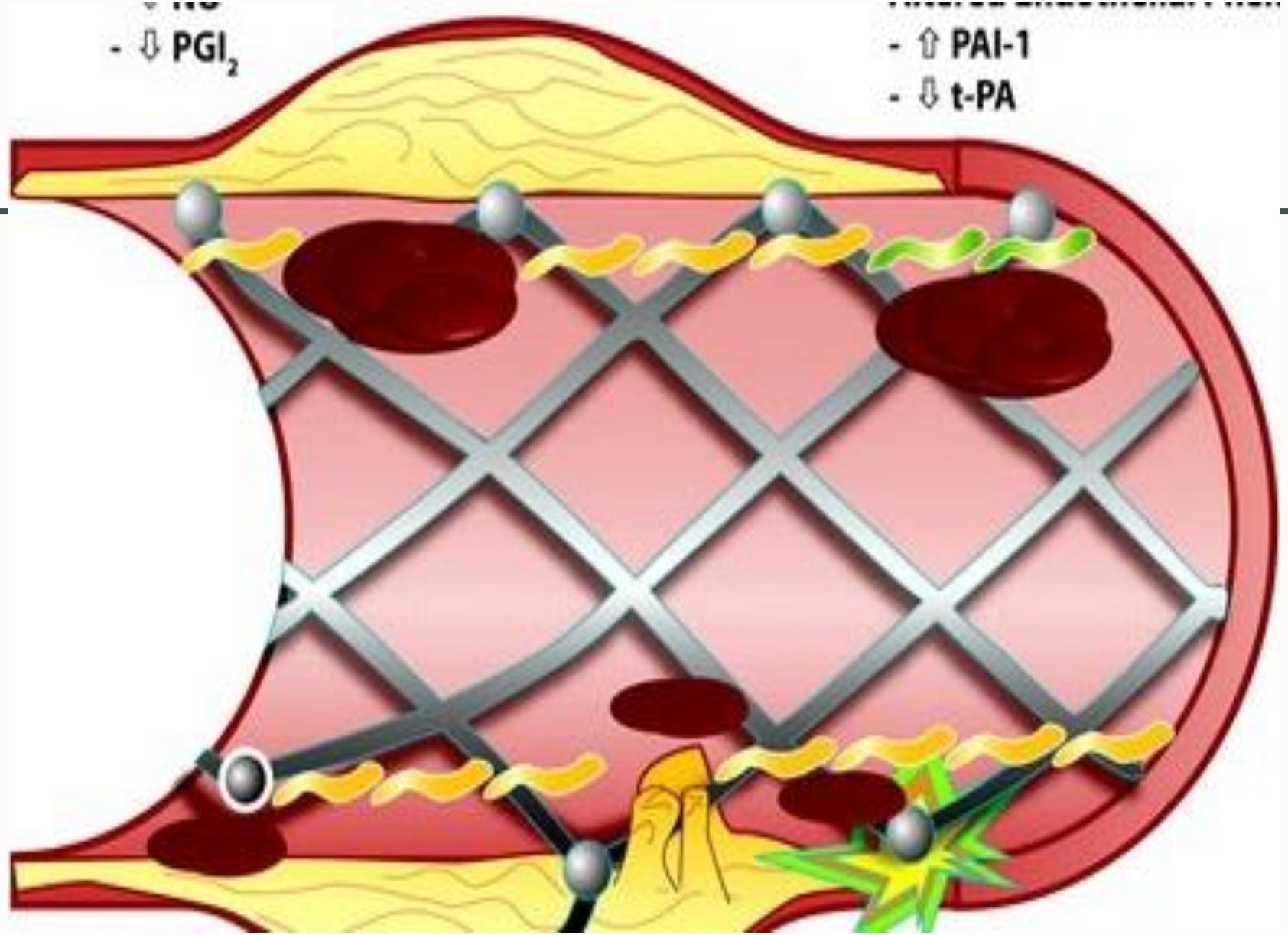
Produced by :

Ali Izadi Amoli , MD , fellowship of interventional cardiology

Introduction

- Percutaneous Coronary Intervention is a minimally invasive nonsurgical procedure performed to improve blood flow in one or more segments of the coronary circulation.
- The first percutaneous coronary angioplasty was performed by the German Cardiologist Andreas Gruentzig on 1977 , but the first angioplasty in lower limb arteries was done with Dr. Dotter on 1964.
- Coronary revascularization with PCI primarily involves the use of balloon angioplasty and intracoronary stenting with DES or BMS.

- The first coronary angioplasty with a drug delivery stent system was performed in Buenos Aires in 1999.
- DES reduced the rate of restenosis and target lesion revascularization compared with BMS
- DES : 1. metallic alloy 2.polymer coating (durable or bioabsorbable) 3.antirestenotic drug


- ⇩ PGI_2
- ⇧ PAI-1
- ⇩ t-PA

- Benefit of Stenting : prevent recoil & negative remodeling
- DES reduced local neointimal hyperplasia.
- DES significantly lower the rate of target lesion revascularization compared BMS.

Type of DES

First generation DES	Second generation DES
Sirolimus-eluting stents Cypher® Stent (Medtronic, Inc, Minneapolis, MN)	Zotarolimus-eluting stents Endeavor®
Paclitaxel-eluting stents Taxus®	Everolimus-eluting stents Xience V® Everolimus Eluting Coronary Stent (Abbott Laboratories, Abbott Park, IL) Promus® Everolimus-Eluting Coronary Stent System (Boston Scientific Corporation, Natick, MA)

TABLE 1
Evolution of drug-eluting stents

First generation
Nonbiodegradable (ie, durable) polymer-based thick strut Sirolimus- or paclitaxel-eluting stents
Second generation
Nonbiodegradable (ie, durable) polymer-based thin strut "Limus"-eluting stent (eliminated paclitaxel)
Third generation
Biodegradable polymer-based thick or thin strut "Limus"-eluting stent
Third generation "B"
Polymer-free strut "Limus"-eluting stents
Fourth generation
Bioresorbable, thick/thin strut "Limus"-eluting vascular scaffolds (PLLA or magnesium)

"Limus" drugs: biolimus, everolimus, myolimus, novolimus, sirolimus, zotarolimus.

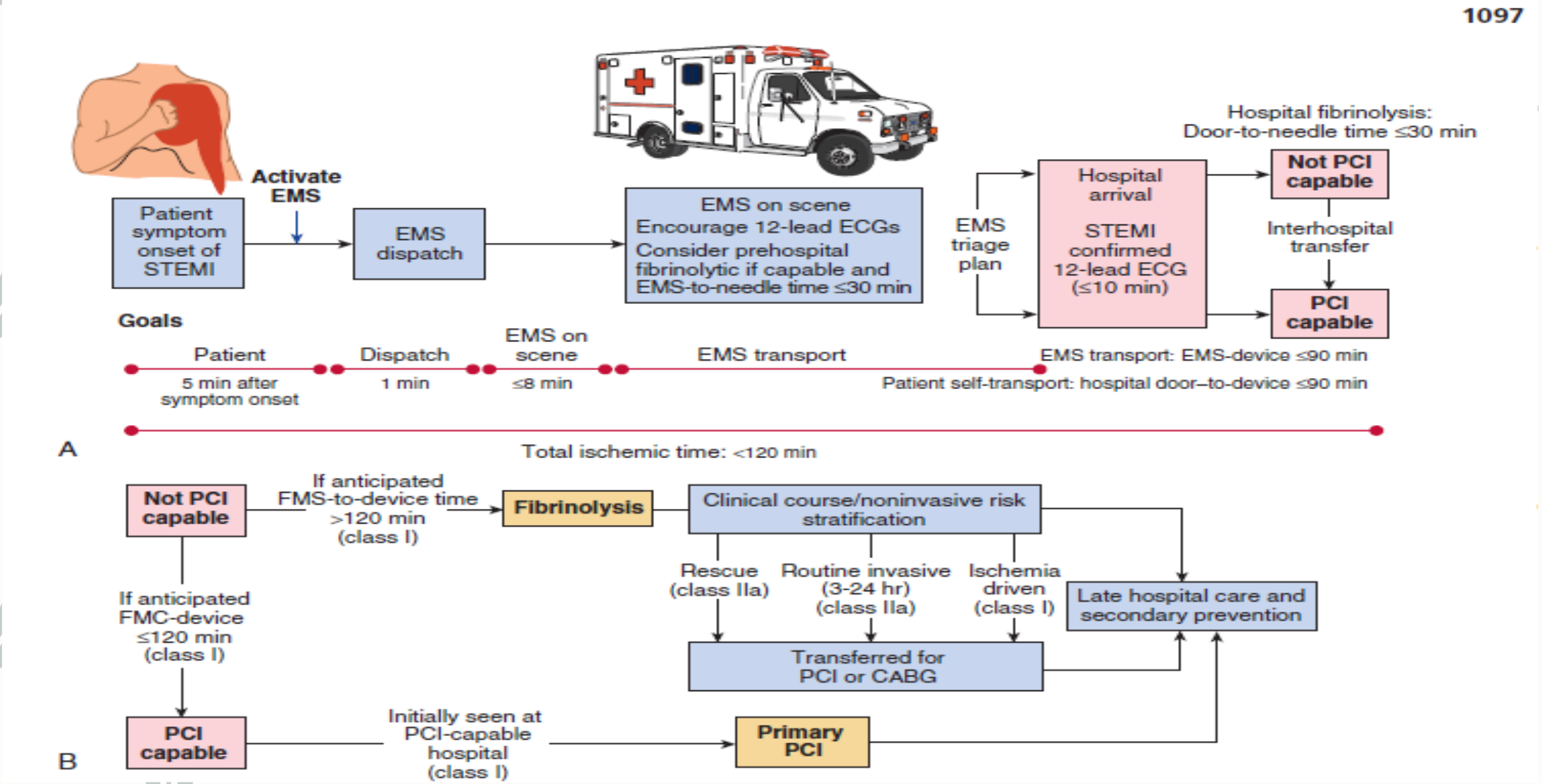
PLLA = poly-L-lactic acid

Primary PCI

- STEMI is defined by symptoms of myocardial ischemia associated with persistent electrocardiographic evidence of ST elevation and subsequent elevation of biologic markers of myocardial necrosis.
- ST elevation in the absence of either left bundle branch block (LBBB) or left ventricular (LV) hypertrophy is defined as new ST elevation of at least 2 mm in men or 1.5 mm in women in at least two contiguous leads.
- STEMI is inexorably linked to sudden cardiac death. Indeed, some 70% of deaths attributable to coronary heart disease occur with out of-hospital arrest.

- Primary PCI is generally preferable to fibrinolytic therapy.
- Primary PCI, when successful, also results in early hospital discharge and return to activities.
- Potential adverse effects of primary PCI include arterial access site complications and contrast agent– and antithrombotic-related complications.

Primary PCI


1097
Activate EMS
Patient symptom onset of STEMI
EMS dispatch
EMS on scene
Encourage 12-lead ECGs
Consider prehospital fibrinolytic if capable and EMS-to-needle time ≤30 min
EMS triage plan
Hospital arrival
STEMI confirmed 12-lead ECG (≤10 min)
Hospital fibrinolysis: Door-to-needle time ≤30 min
Not PCI capable
Interhospital transfer
PCI capable
Goals
Patient
5 min after symptom onset
Dispatch
1 min
EMS on scene
≤8 min
EMS transport
EMS transport: EMS-device ≤90 min
Patient self-transport: hospital door–to-device ≤90 min
A
Total ischemic time: <120 min
Not PCI capable
If anticipated FMS-to-device time >120 min (class I)
Fibrinolysis
Clinical course/noninvasive risk stratification
Rescue (class IIa)
Routine invasive (3-24 hr) (class IIa)
Ischemia driven (class I)
Late hospital care and secondary prevention
Transferred for PCI or CABG
If anticipated FMC-device ≤120 min (class I)
PCI capable
Initially seen at PCI-capable hospital (class I)
Primary PCI
B

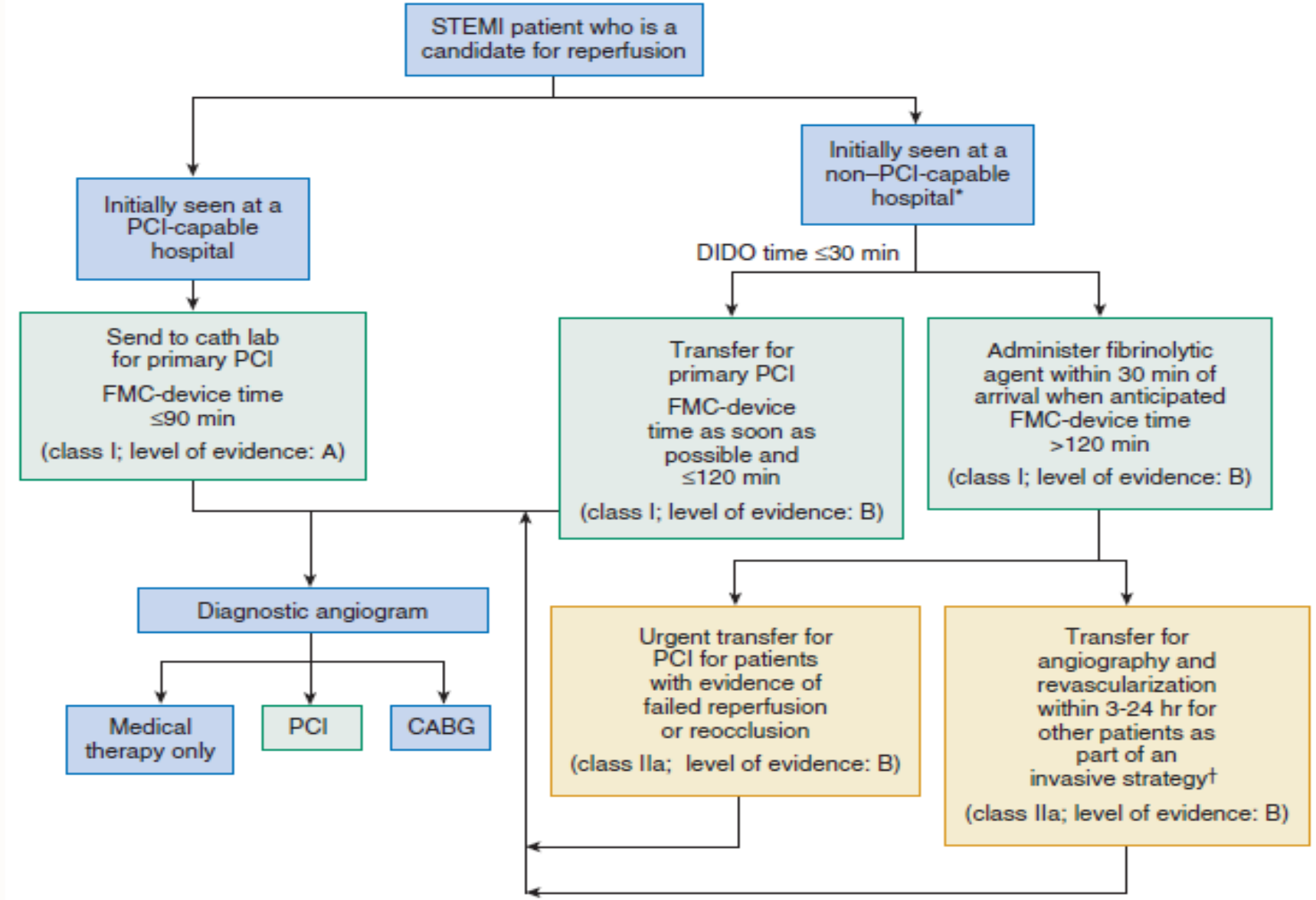

STEMI patient who is a candidate for reperfusion
Initially seen at a PCI-capable hospital
Initially seen at a non–PCI-capable hospital*
DIDO time ≤30 min
Send to cath lab for primary PCI
FMC-device time ≤90 min
(class I; level of evidence: A)
Transfer for primary PCI
FMC-device time as soon as possible and ≤120 min
(class I; level of evidence: B)
Administer fibrinolytic agent within 30 min of arrival when anticipated FMC-device time >120 min
(class I; level of evidence: B)
Diagnostic angiogram
Medical therapy only
PCI
CABG
Urgent transfer for PCI for patients with evidence of failed reperfusion or reocclusion
(class IIa; level of evidence: B)
Transfer for angiography and revascularization within 3-24 hr for other patients as part of an invasive strategy†
(class IIa; level of evidence: B)

TABLE 52G-1 Primary Percutaneous Coronary Intervention for ST-Elevation Myocardial Infarction

	COR	LEVEL OF EVIDENCE
Ischemic symptoms <12 hr	I	A
Ischemic symptoms <12 hr and contraindications to fibrinolytic therapy irrespective of delay in time after FMC	I	B
Cardiogenic shock or acute severe HF irrespective of delay in time after the onset of MI	I	B
Evidence of ongoing ischemia 12-24 hr after the onset of symptoms	IIa	B

Absolute Contraindications

Any previous intracranial hemorrhage
Known structural cerebral vascular lesion
Known malignant intracranial neoplasm
Ischemic stroke within 3 months (except ischemic stroke within 4.5 hours)
Suspected aortic dissection
Active bleeding or bleeding diathesis
Significant closed-head or facial trauma within 3 months
Intracranial or intraspinal surgery within 2 months
Severe uncontrolled hypertension (not responsive to emergency therapy)
For streptokinase, previous treatment within 6 months

Relative Contraindications

History of chronic, severe, poorly controlled hypertension
Significant hypertension at initial evaluation (systolic blood pressure >180 mm Hg, diastolic blood pressure >110 mm Hg)
History of ischemic stroke >3 months
Dementia
Known intracranial pathology not covered in Absolute Contraindications
Traumatic or prolonged cardiopulmonary resuscitation (>10 minutes)
Major surgery within 3 weeks
Recent internal bleeding (within 2-4 weeks)
Noncompressible vascular puncture
Pregnancy
Active peptic ulcer
Oral anticoagulant therapy

TABLE 52G-6 Indications for Transfer for Angiography after Fibrinolytic Therapy

	COR	LEVEL OF EVIDENCE
Cardiogenic shock or acute severe heart failure that develops after initial evaluation	I	B
Intermediate- or high-risk findings on predischarge noninvasive ischemia testing	I	B
Spontaneous or easily provoked myocardial ischemia	I	C
Failed reperfusion or reocclusion after fibrinolytic therapy	IIa	B
Stable* patients after successful fibrinolysis, before discharge and ideally between 3 and 24 hr	IIa	B

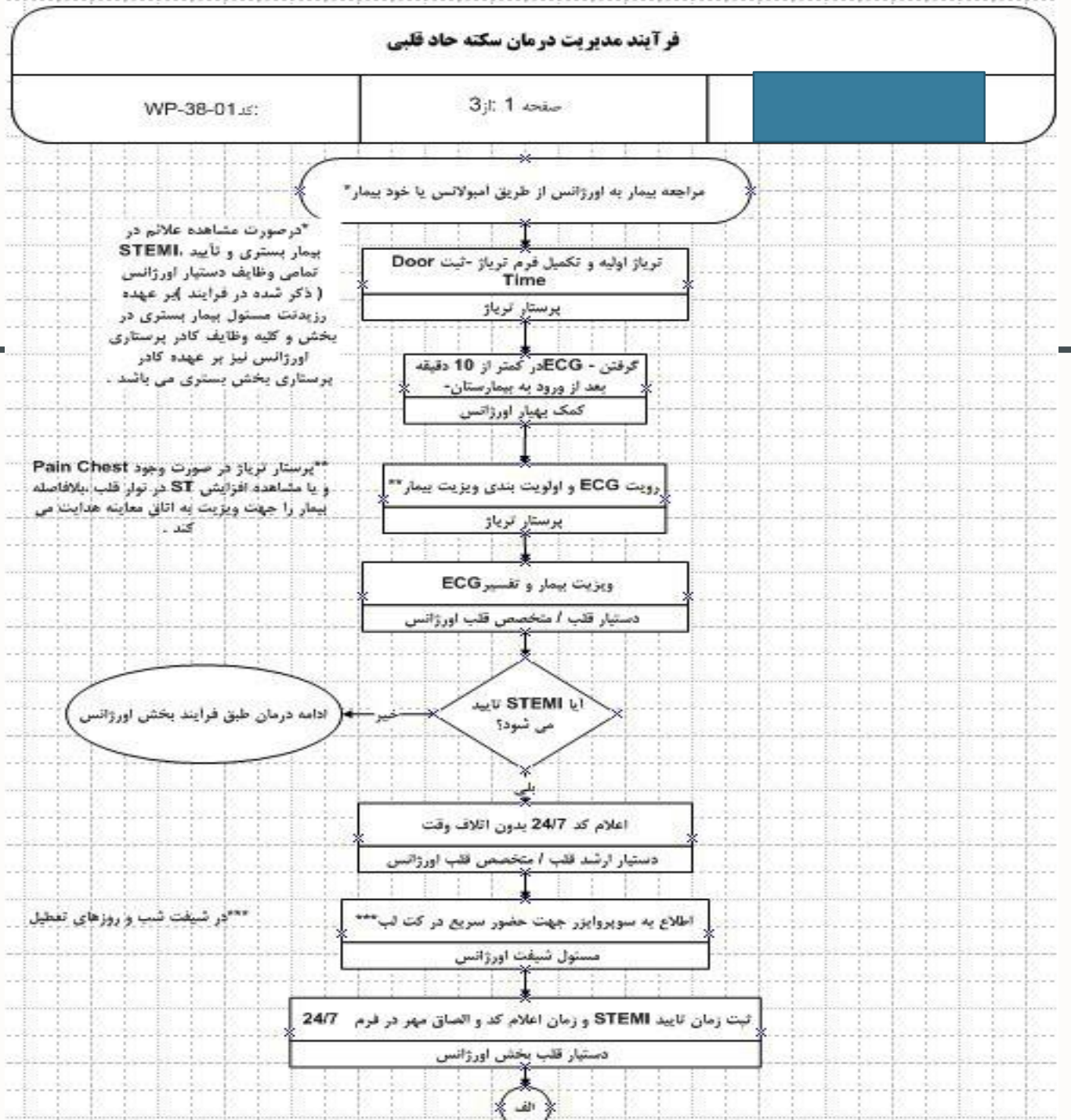
Rescue PCI & Elective PCI

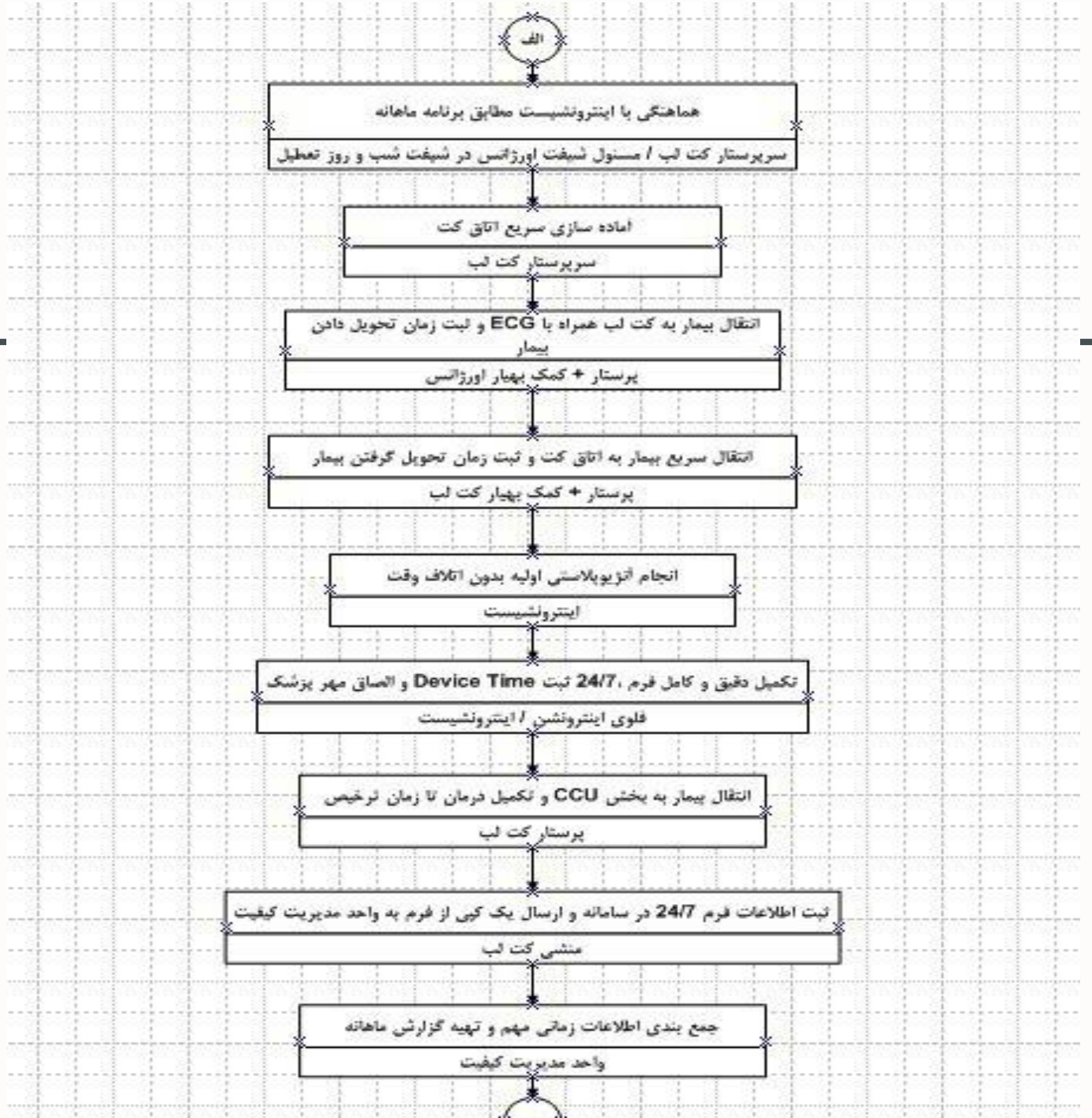
TABLE 52G-7 Indications for Percutaneous Coronary Intervention on an Infarct Artery In Patients Who Were Managed with Fibrinolytic Therapy or Who Did Not Receive Reperfusion Therapy

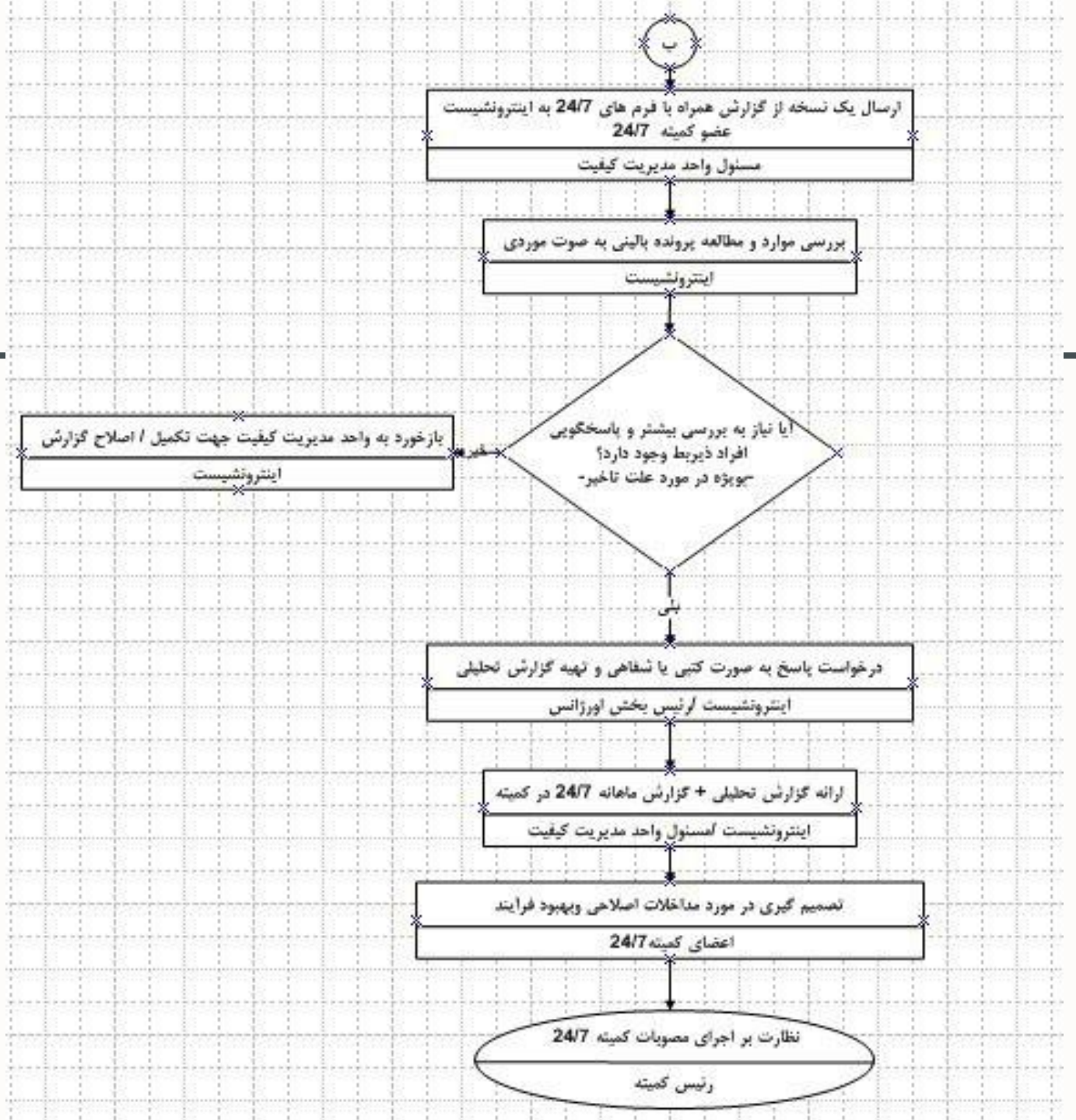
	COR	LEVEL OF EVIDENCE
Cardiogenic shock or acute severe heart failure	I	B
Intermediate- or high-risk findings on predischarge noninvasive ischemia testing	I	C
Spontaneous or easily provoked myocardial ischemia	I	C
Patients with evidence of failed reperfusion or with reocclusion after fibrinolytic therapy (as soon as possible)	IIa	B
Stable* patients after successful fibrinolysis, ideally between 3 and 24 hr	IIa	B
Stable* patients >24 hr after successful fibrinolysis	IIb	B
Delayed PCI on a totally occluded infarct artery >24 h after STEMI in stable patients	III: No benefit	B

فرآیند مدیریت درمان سکته حاد قلبی

کد: WP-38-01	صفحه 1 از: 3	




الف
هماهنگی با اینترونشیست مطابق برنامه ماهانه
سرپرستار کت لب / مسئول شیفت اورژانس در شیفت شب و روز تعطیل
آماده سازی سریع اتاق کت
سرپرستار کت لب
انتقال بیمار به کت لب همراه با ECG و ثبت زمان تحویل دادن بیمار
پرستار + کمک بهیار اورژانس
انتقال سریع بیمار به اتاق کت و ثبت زمان تحویل گرفتن بیمار
پرستار + کمک بهیار کت لب
انجام آنژیوپلاستی اولیه بدون اتلاف وقت
اینترونشیست
تکمیل دقیق و کامل فرم ،24/7 ثبت Device Time و الصاق مهر پزشک
فلوی اینترونشن / اینترونشیست
انتقال بیمار به بخش CCU و تکمیل درمان تا زمان ترخیص
پرستار کت لب
ثبت اطلاعات فرم 24/7 در سامانه و ارسال یک کپی از فرم به واحد مدیریت کیفیت
منشی کت لب
جمع بندی اطلاعات زمانی مهم و تهیه گزارش ماهانه
واحد مدیریت کیفیت


ب
ارسال یک نسخه از گزارش همراه با فرم های 24/7 به اینترونشیست
عضو کمیته 24/7
مسئول واحد مدیریت کیفیت
بررسی موارد و مطالعه پرونده بالینی به صورت موردی
اینترونشیست
آیا نیاز به بررسی بیشتر و پاسخگویی افراد ذیربط وجود دارد؟ -جویژه در مورد علت تاخیر-
خیر
بازخورد به واحد مدیریت کیفیت جهت تکمیل / اصلاح گزارش
اینترونشیست
بلی
درخواست پاسخ به صورت کتبی یا شفاهی و تهیه گزارش تحلیلی
اینترونشیست /رئیس بخش اورژانس
ارائه گزارش تحلیلی + گزارش ماهانه 24/7 در کمیته
اینترونشیست /مسئول واحد مدیریت کیفیت
تصمیم گیری در مورد مداخلات اصلاحی وبهبود فرایند
اعضای کمیته24/7
نظارت بر اجرای مصوبات کمیته 24/7
رئیس کمیته

[redacted]

کد: F- 18-19
ویرایش : 02
تاریخ ویرایش: دی ۹۸

STEMI Management Registry

[redacted]

کد ملی/ (شماره گذرنامه در خصوص اتباع خارجی) : ..... سال تولد: ..... ☐ Iranian ☐ Not Iranian

نام: ..... نام خانوادگی : ..... جنس: ☐ مرد ☐ زن تاریخ تولد: ...../...../..... ۱۳

Demographic Data

نحوه مراجعه بیمار:
☐ انتقال به اورژانس بیمارستان توسط EMS ☐ ارجاع از بیمارستان بدون قابلیت PPCI
☐ مراجعه مستقیم بیمار ☐ بیمار بستری در بیمارستان

شماره پرونده : .....

Time Intervals

Onset of Symptoms	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
First Medical Contact	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
Admission Time (Door Time)	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
Device Time	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
STEMI ECG :	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
247 Code Time :	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....
Arrival at Cath lab :	(yyyy/mm/dd) ...../...../.....	(hh/mm) ...../.....

Cath Lab Data

- Initial Reperfusion Therapy :
  - ○ Primary PCI
  - ○ Rescue PCI
  - ○ Urgent CABG
  - ○ Medical Treatment
  - ○ Unsuccessful P.PCI

Infarct related artery (IRA) : ☐ LM ☐ LAD ☐ LCX ☐ RCA
☐ Graft ☐ Diagonal ☐ Ramus ☐ OM ☐ PDA ☐ PLB

Initial TIMI flow grade in IRA ☐ 0 ☐ 1 ☐ 2 ☐ 3
Final TIMI flow grade in IRA ☐ 0 ☐ 1 ☐ 2 ☐ 3

Condition at Discharge from Hospital

Condition at discharge: ☐ Alive ☐ Dead

Ejection fraction at discharge: ☐ Not performed ☐ Good (> %55) ☐ Mild (%45- %55)
☐ Moderate (%30-%45) ☐ Severe (< %30)

مهر و امضاء پزشک اورژانس | مهر و امضاء فلوشیپ اینتروونشن | مهر و امضاء پزشک معالج

	COR	LEVEL OF EVIDENCE
Antiplatelet Therapy		
Aspirin		
• 162- to 325-mg loading dose before the procedure	I	B
• 81- to 325-mg daily maintenance dose (indefinite)*	I	A
• 81 mg daily is the preferred maintenance dose*	IIa	B

$P2Y_{12}$ Inhibitors		
Loading Doses		
• Clopidogrel: 600 mg as early as possible or at the time of PCI	I	B
• Prasugrel: 60 mg as early as possible or at the time of PCI	I	B
• Ticagrelor: 180 mg as early as possible or at the time of PCI	I	B
Maintenance Doses and Duration of Therapy		
DES placed: Continue therapy for 1 year with		
• Clopidogrel: 75 mg daily	I	B
• Prasugrel: 10 mg daily	I	B
• Ticagrelor: 90 mg twice a day*	I	B
BMS[†] placed: Continue therapy for 1 year with		
• Clopidogrel: 75 mg daily	I	B
• Prasugrel: 10 mg daily	I	B
• Ticagrelor: 90 mg twice a day*	I	B
DES placed:		
• Clopidogrel, prasugrel, or ticagrelor* continued beyond 1 year	IIb	C
• Patients with STEMI and previous stroke or TIA: prasugrel	III: Harm	B

	COR	LEVEL OF EVIDENCE
Anticoagulant Therapy		
• UFH		
• With a GP IIb/IIIa receptor antagonist planned: 50- to 70-unit/kg IV bolus to achieve therapeutic ACT‡	I	C
• With no GP IIb/IIIa receptor antagonist planned: 70- to 100-unit/kg bolus to achieve a therapeutic ACT‡	I	C
• Bivalirudin: 0.75-mg/kg IV bolus, then 1.75-mg/kg/hr infusion with or without previous treatment with UFH. An additional bolus of 0.3 mg/kg may be given if needed	I	B
• Reduce the infusion to 1 mg/kg/hr with estimated an CrCl <30 mL/min		
• Preferred over UFH with a GP IIb/IIIa receptor antagonist in patients at high risk for bleeding	IIa	B
• Fondaparinux: not recommended as the sole anticoagulant for primary PCI	III: Harm	B

Intravenous Glycoprotein IIb/IIIa Receptor Antagonists in Conjunction with Unfractionated Heparin or Bivalirudin in Selected Patients		
• Abciximab: 0.25-mg/kg IV bolus, then 0.125 µg/kg/min (maximum, 10 µg/min)	IIa	A
• Tirofiban (high bolus dose): 25-µg/kg IV bolus, then 0.15 µg/kg/min	IIa	B
• In patients with CrCl <30 mL/min, reduce the infusion by 50%		
• Eptifibatide (double bolus): 180-µg/kg IV bolus, then 2 µg/kg/min; a second 180-µg/kg bolus is administered 10 min after the first bolus	IIa	B
• In patients with CrCl < 50 mL/min, reduce the infusion by 50%		
• Avoid in patients on hemodialysis		
• Pre–catheterization laboratory administration of IV GP IIb/IIIa receptor antagonist	IIb	B
• Intracoronary abciximab: 0.25-mg/kg bolus	IIb	B

Vascular Access

- Femoral & radial
- In femoral access → INR < 1.8
- In Radial Access → INR < 2.2

Rival Trial

	FEMORAL (N = 3514)	RADIAL (N = 3507)	*P* VALUE
Composite of death, MI, stroke, or non-CABG–related major bleeding at 30 days*	4.0%	3.7%	0.50
Death at 30 days	1.5%	1.3%	0.47
MI at 30 days	1.9%	1.7%	0.65
Stroke at 30 days	0.4%	0.6%	0.30
PCI success	95.2%	95.4%	0.83
Access site crossover	2.0%	7.6%	<0.0001
Major vascular complications	3.7%	1.4%	<0.0001
Access site major bleeding	0.3%	0.2%	Not provided
Symptomatic radial occlusion	NA	0.2%	NA
Procedure time (min)	35	34	0.62
Fluoroscopy time (min)	8.0	9.3	<0.0001
Contrast volume (mL)	180	181	0.87
Patient prefers radial access for next procedure	50.7%	90.2%	<0.0001

Vascular Access Complications

- Vascular access site complications occur after 3% to 7% of femoral PCIs and lead to significantly increased length of hospital stay, total cost, and morbidity and mortality. Complications range from relatively minor access site hematomas, to life-threatening retroperitoneal bleeding requiring emergency blood transfusion, to damage to the vasculature necessitating prompt surgical intervention

- Predisposing factor :

older age, female sex, larger vascular sheath size, low body mass index, renal insufficiency, and degree of anticoagulation during the procedure

COMPLICATION	SCAI REGISTRY RISK (%)
Mortality	0.11
Myocardial infarction	0.05
Cerebrovascular accident	0.07
Arrhythmias	0.38
Vascular complications	0.43
Contrast agent reaction	0.37
Hemodynamic complications	0.26
Perforation of heart chamber	0.03
Other complications	0.28
Total of major complications	1.70

- In femoral access , sheath removal is done when ACT < 180
- In radial access , sheath removal is done after procedure and TR band is used
- Cardiac monitoring
- ECG
- Evaluation for complication after PCI like hematoma , bleeding from access site , retroperitoneal hemorrhage , stroke , chest pain , arrhythmia
- After Primary PCI → CBR until 12 h except in unstable homodynamic
- NPO or clear liquid diet until 4 – 12 h then Po low salt low fat

Post PCI Care

- Chest pain after PCI is relatively common.

- Chest pain after PCI , may occur as a result of acute or subacute stent thrombosis, residual dissections, plaque prolapse, side branch occlusion, or thrombus at the treatment site

TABLE 55G-5 ACC/AHA Postprocedure Recommendations for Antiplatelet Therapy in Patients Undergoing Percutaneous Coronary Intervention[3]

INDICATION	CLASS	RECOMMENDATION	LOE
Aspirin	Class I	After PCI, use of aspirin should be continued indefinitely	A
	Class IIa	After PCI, it is reasonable to use ASA, 81 mg/day, in preference to higher maintenance doses	B
$P2Y_{12}$ inhibitors: STEMI and unstable angina/NSTEMI	Class I	In patients receiving a stent during PCI for ACS, $P2Y_{12}$ inhibitor therapy should be given for at least 12 months. Options include clopidogrel, 75 mg/day; prasugrel, 10 mg/day; or ticagrelor, 90 mg twice daily	B
	Class I	In patients receiving a DES during PCI for a non-ACS indication, clopidogrel, 75 mg/day, should be given for at least 12 months if not at high risk for bleeding	B
		In patients receiving a BMS during PCI for a non-ACS indication, clopidogrel, 75 mg/day, should be given for a minimum of 1 month and ideally up to 12 months (unless the patient is at increased risk for bleeding, in which case it should be given for a minimum of 2 weeks)	C
		PPIs should be used in patients with a history of previous GI bleeding who require DAPT	C
	Class IIa	If the risk for morbidity from bleeding outweighs the anticipated benefit afforded by a recommended duration of $P2Y_{12}$ inhibitor therapy after stent implantation, earlier discontinuation (e.g., <12 months) of $P2Y_{12}$ inhibitor therapy is reasonable	C
		Use of PPIs is reasonable in patients with an increased risk for GI bleeding who require DAPT	C
	Class IIb	Continuation of clopidogrel, prasugrel, or ticagrelor beyond 12 months may be considered in patients undergoing placement of a DES	C
	Class III no benefit	Routine use of a PPI is not recommended for patients at low risk for GI bleeding	C

- Primary PCI without on site surgery → class IIa
- Elective PCI without on site surgery → Class IIb

Thanks for your attention