Estrategia fármaco invasiva de reperfusión, es posible en Paraguay?

Dr. Victor Adrian ROJAS RODRIGUEZ

Repuesta: Si

SCA con ST

Objetivo: ?

Reducir el tiempo total de isquemia:

Como ?

a) Angioplastia primaria
b) Trombolíticos

} Estrategia Farmaco Invasiva

Pero, por que en Paraguay esta estrategia?

> Reperfusion is the cornerstone of MI treatment, but worldwide around 30% of patients are not reperfused, with even lower rates in LMIC. The main challenges are related to delays associated with patient education, late diagnosis and inadequate referral strategies, health infrastructure and insufficient funding.

Nascimento BR, *et al*. *Heart* 2018;**0**:1–7. doi:10.1136/heartjnl-2018-313398

- Retraso paciente.
- Diagnostico tardio
- Referencia inadecuada
- Recursos insuficientes

Alrededor del 30% de los pacientes no son reperfundidos

ESC European Society of Cardiology

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FASTTRACK CLINICAL RESEARCH
Acute coronary syndromes

16-year follow-up of the Danish Acute Myocardial Infarction 2 (DANAMI-2) trial: primary percutaneous coronary intervention vs. fibrinolysis in ST-segment elevation myocardial infarction

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Conclusion The benefit of pPCI over fibrinolysis was maintained at 16-year follow-up. pPCI reduced the composite endpoint of death or rehospitalization for MI, reduced cardiac mortality, and delayed average time to a main event by approximately 1 year.

En tiempos adecuados

Y en relacion a la estrategia Farmaco invasiva??
Es aplicable?

EDITORIAL

¡Retrasar el tratamiento equivale a negarlo!

Giuseppe De Luca

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Un reciente metaanálisis de 23 ensayos aleatorizados ha demostrado que la angioplastia primaria se asocia a una reducción significativa de la mortalidad y el reinfarto a los 30 días[1]. Estos efectos beneficiosos se explican por una mayor tasa de flujo TIMI 3 alcanzada mediante la angioplastia primaria en comparación con la trombolisis. Diversos es-

percutáneas (ICP) primarias[5]. Sin embargo, una mayor proporción de recanalizaciones mecánicas no es garantía de una reperfusión óptima. De hecho, la angioplastia primaria requiere la existencia de una red regional que funcione adecuadamente. Esto limita la aplicación precoz de la intervención a una minoría de los pacientes.

Retraso hasta la ICP y supervivencia

lisis. Analizando la base de datos del National Registry on Myocardial Infarction (NRMI)-2, Cannon et al[7] ya habían estudiado la influencia del tiempo de isquemia en la angioplastia primaria. En una población de 27.080 pacientes con IMEST y tras la corrección aplicada para los factores de confusión basales, esos autores observaron que el tiempo puerta-balón tenía una repercusión significativa en la supervivencia hospitalaria. De hecho, sería de es-

primaria. El grupo de Zwolle analizó las repercusiones del tiempo transcurrido hasta el tratamiento, analizado como función continua, en una población de 1.791 pacientes con IMEST[10]. Tras introducir una corrección para los factores de confusión basales, se observó que cada 30 min de retraso en el tratamiento conllevaba un aumento del riesgo relativo de mortalidad a 1 año del 7,5% (fig. 1A). Los datos

ción. Así, aunque la angioplastia coronaria permite restablecer el flujo TIMI 3 de manera independiente del tiempo transcurrido hasta el tratamiento, esto no permite anular los efectos nocivos que tiene el tiempo de isquemia en la necrosis y la perfusión del

llevado a cabo por Stone et al[14] (fig. 1B). En un reciente estudio realizado por Tarantini et al[15], se evaluó el efecto del tiempo transcurrido hasta el tratamiento en el tamaño del infarto estimado mediante resonancia magnética (RM). Los resultados confirman nuestras observaciones previas[12], ya que esos autores observaron un aumento significativo del tamaño del infarto por cada 30 min de retraso en la aplicación del tratamiento (fig. 1C). Así pues, y una vez más, «cada minuto de retraso cuenta». Por el

angina previa. Un tiempo puerta-balón > 120 min se asoció a más mortalidad a los 30 días. A pesar de

- AP: efectos beneficiosos
- Depende de las Redes
- > Retraso < Supervivencia
- 30’ de retraso > 7.5% mortalidad
- Restaurar el Flujo TIMI 3 depende de la rapidez con que se abra la arteria para reducir mortalidad.
- AP > 120 minutos: > mortalidad

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FASTTRACK CLINICAL RESEARCH
Acute Coronary Syndromes

Five-year outcomes following timely primary percutaneous intervention, late primary percutaneous intervention, or a pharmaco-invasive strategy in ST-segment elevation myocardial infarction: the FAST-MI programme

Nicolas Danchin [1,2]*, Batric Popovic[3], Etienne Puymirat[1,2], Patrick Goldstein[4], Loïc Belle[5], Guillaume Cayla[6], François Roubille[7], Gilles Lemesle[8,9,10,11], Jean Ferrières[12], François Schiele[13], and Tabassome Simon[14,15,16,17]; on behalf of the FAST-MI Investigators†

N:2942
< 120 ‘: 54%
>120 ‘: 28%
28% Trombolíticos

intravenous fibrinolysis. Five-year survival was higher with a pharmaco-invasive strategy (89.8%) compared with late pPCI [79.5%; adjusted hazard ratio (HR) 1.51; 1.13–2.02] and similar to timely pPCI (88.2%, adjusted HR 1.02; 0.75–1.38). Concordant results were observed in propensity score-matched cohorts and for event-free survival.

reperfusion strategy and timing of pPCI, using Cox multivariable analyses and propensity score matching. Among those, 1288 (54%) patients had timely pPCI (≤120 min from ECG), 830 (28%) late pPCI (>120 min), and 824 (28%) intravenous fibrinolysis. Five-year survival was higher with a pharmaco-invasive strategy (89.8%) compared with late

pPCI [79.5%; adjusted hazard ratio (HR) 1.51; 1.13–2.02] and similar to timely pPCI (88.2%, adjusted HR 1.02;

Conclusion A substantial proportion of patients have pPCI beyond recommended timelines. As foreseen by the guidelines, these patients have poorer 5-year outcomes, compared with a pharmaco-invasive strategy.

- ➢ > 75 , Diabéticos ,IAM previos, Strokes previos, parada cardiaca extra hosp.
- ➢ Mejor flujo TIMI en EFI vs angio tardia.
- ➢ Mas complicaciones mecanicas en el grupo de angio tardia.

Table 1 Baseline characteristics according to type of reperfusion strategy and timing of primary percutaneous coronary intervention

	Timely primary PCI (n = 1288)	Late primary PCI (n = 830)	Pharmaco-invasive (n = 824)	P-value
Demography, risk factors, and medical history				
Age (years), mean ± SD	61 ± 13	64 ± 15	60 ± 13	<0.001
Age ≥75 years	244 (18.9)	212 (25.5)	125 (15.2)	<0.001
Women	282 (21.9)	250 (30.1)	173 (21.0)	<0.001
BMI ≥30 Kg/m^2	245 (20.1) (n = 1220)	170 (21.9) (n = 778)	163 (21.2) (n = 770)	0.621
Diabetes	213 (16.5)	195 (23.5)	142 (17.2)	<0.001
Hypertension	552 (42.9)	423 (51.0)	347 (42.7)	<0.001
Current smoking	[illegible]	[illegible]	391 (47.5)	0.001
Hypercholesterolaemia	[illegible]	[illegible]	[illegible]	[illegible]
Family history of CAD	346 (26.9)	210 (25.3)	259 (31.4)	0.014
Prior AMI	136 (10.6)	[illegible]	[illegible]	[illegible]
Prior PCI	139 (10.8)	80 (9.6)	53 (6.4)	0.003
Prior stroke/TIA	53 (4.1)	40 (4.8)	12 (1.5)	<0.001
Peripheral artery disease	[illegible]	[illegible]	[illegible]	[illegible]
History of heart failure	16 (1.2)	25 (3.0)	3 (0.4)	<0.001
Chronic kidney disease	30 (2.3)	16 (1.9)	12 (1.5)	0.368
Chronic obstructive lung disease	71 (5.5)	34 (4.1)	22 (2.7)	0.007
History of cancer	88 (6.8)	67 (8.1)	39 (4.7)	0.021
Initial management				
Time from onset to first call (min), median (IQR)	60 (30–150)	70 (30–210)	50 (20–105)	<0.001
EMS as first contact	784 (60.9)	329 (39.6)	497 (60.3)	<0.001
Transfer to catheterization laboratory	99 (7.7)	272 (32.2)	267 (32.4)	<0.001
Initial presentation				
Anterior infarction	527 (40.9)	350 (42.2)	297 (36.0)	0.024
GRACE risk score	141 ± 32 (n = 1241)	147 ± 35 (n = 778)	141 ± 31 (n = 770)	<0.001
Killip class ≥2	135 (10.6)	140 (17.1)	94 (11.5)	<0.001
Out-of-hospital cardiac arrest	29 (2.3)	16 (1.9)	23 (2.8)	0.496

AMI, acute myocardial infarction; BMI, body mass index; CAD, coronary artery disease; EMS, emergency medical services; IQR, interquartile range; SD, standard deviation; TIA, transient ischaemic attack.

Table 2 Early management and in-hospital events

	Timely primary PCI (n = 1288)	Late primary PCI (n = 830)	Pharmaco-invasive (n = 824)	P-value
Early management				
Pre-hospital vs. in-hospital lysis	—	—	522 (63.3)/302 (36.7)	—
Time from onset to needle (min), median (IQR)	—	—	120 (80–189)	—
Aspirin	1263 (98.1)	813 (98.0)	806 (97.8)	0.928
Clopidogrel	1056 (82.0)	748 (90.1)	761 (92.4)	<0.001
Prasugrel	422 (32.8)	169 (20.4)	107 (13.0)	<0.001
Glycoprotein IIb/IIIa inhibitors	477 (53.8)	232 (46.8)	38 (11.5)	<0.001
Unfractionated heparin	836 (64.9)	492 (59.3)	537 (65.2)	0.015
LMWH	838 (65.1)	534 (64.3)	556 (67.5)	0.363
Fondaparinux	121 (9.4)	86 (10.4)	37 (4.5)	<0.001
Bivalirudin	64 (5.0)	28 (3.4)	3 (0.4)	<0.001
ACE-inhibitor or ARB	[illegible]	[illegible]	[illegible]	[illegible]
Diuretic	264 (20.5)	230 (27.7)	144 (17.5)	<0.001
Beta-blocker	[illegible]	664 (80.0)	671 (81.4)	0.514
Statin	[illegible]	739 (89.0)	720 (87.4)	0.236
Pre-PCI TIMI Flow 2 or 3	369 (30.4) (n = 1214)	246 (31.6) (n = 779)	455 (59.8) (n = 761)	<0.001
Post-PCI TIMI Flow 3	[illegible]	[illegible]	[illegible] (89.6) (n = 684)	<0.001
Rescue PCI	—	—	256 (34.4) (n = 745)	—
In-hospital complications				
Recurrent AMI	10 (0.8)	9 (1.1)	19 (2.3)	0.08
Stroke	5 (0.4)	5 (0.6)	9 (1.1)	0.141
Intracranial bleeding	1 (0.1)	1 (0.1)	4 (0.5)	0.105
TIMI major bleeding	17 (1.3)	23 (2.8)	16 (1.9)	0.058
TIMI minor bleeding	34 (2.6)	17 (2.0)	20 (2.4)	0.687
Blood transfusion	41 (3.2)	32 (3.9)	27 (3.3)	0.688
Third degree atrioventricular block	19 (1.5)	27 (3.3)	12 (1.5)	0.007
Atrial fibrillation	97 (7.5)	97 (11.7)	73 (8.9)	0.005
Secondary cardiogenic shock	24 (1.9)	28 (3.4)	19 (2.3)	0.084
LVEF ≤40%	207 (17.7) (n = 1170)	161 (21.3) (n = 757)	118 (15.9) (n = 742)	0.022
In-hospital death	27 (2.1)	36 (4.3)	25 (3.0)	0.013
30-day death	32 (2.5)	36 (4.3)	27 (3.3)	0.062

ACE, angiotensin-converting enzyme; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; IQR, interquartile range; LMWH, low molecular weight heparin; LVEF, left ventricular ejection fraction; TIMI, thrombolysis in myocardial infarction.

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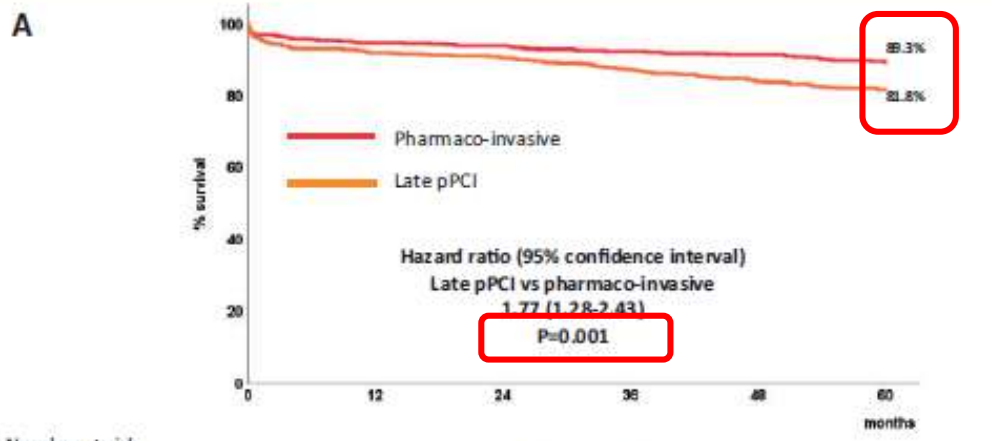
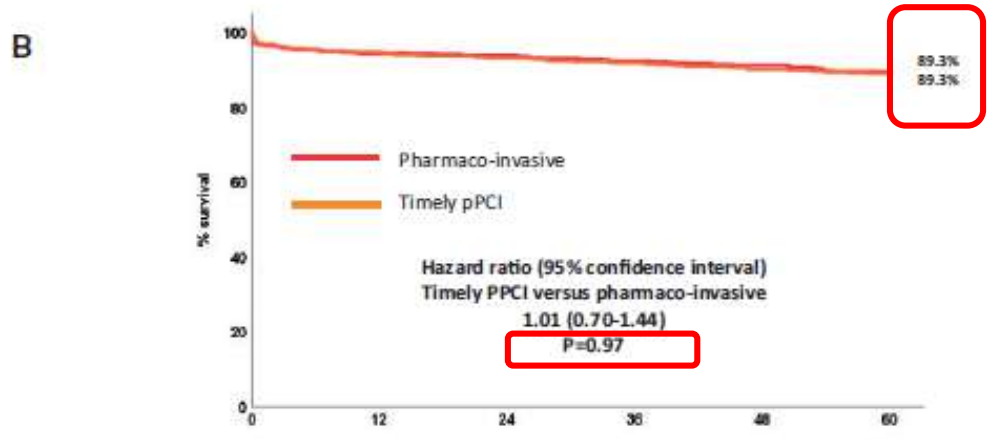
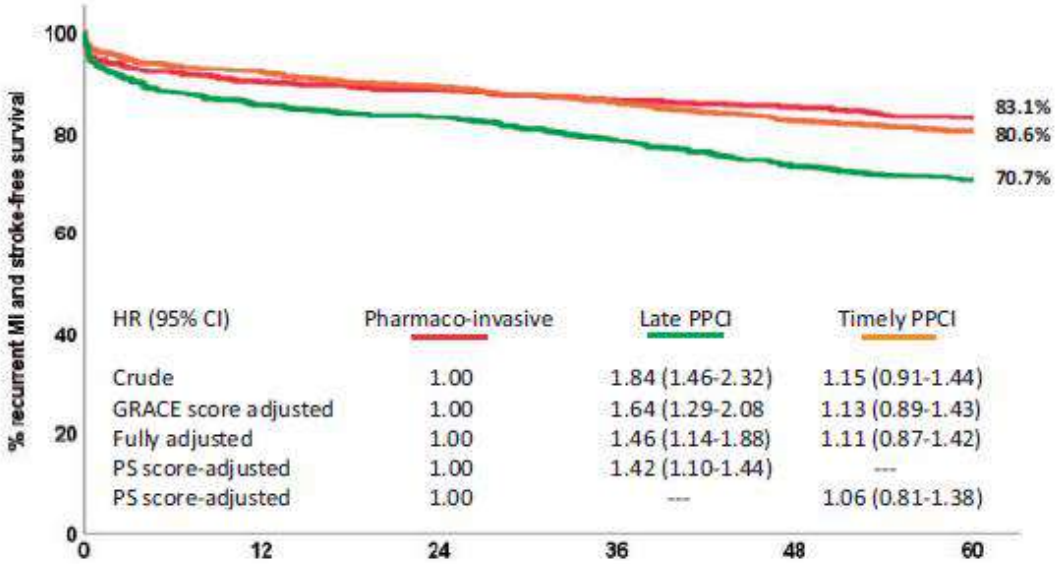


Number at risk						
Pharmaco-invasive	549	519	509	499	491	478
Late PPCI	549	504	490	466	445	429



Number at risk						
Pharmaco-invasive	562	531	522	511	500	486
Late PPCI	562	528	516	505	490	478

Figure 1 Five-year survival in propensity score-matched populations. (*A*) pharmaco-invasive strategy versus late primary percutaneous coronary intervention (pPCI); (*B*) pharmaco-invasive strategy versus timely pPCI. PPI, primary percutaneous coronary intervention.



Take home figure Five-year acute myocardial infarction-free and stroke-free survival according to type of reperfusion strategy and timing of primary percutaneous coronary intervention. CI, confidence interval; HR, hazard ratio; PPCI, primary percutaneous coronary intervention.

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FASTTRACK CLINICAL RESEARCH
Acute Coronary Syndromes

the FAST-MI programme

Nicolas Danchin [1,2]*, Batric Popovic[3], Etienne Puymirat[1,2], Patrick Goldstein[4], Loïc Belle[5], Guillaume Cayla[6], François Roubille[7], Gilles Lemesle[8,9,10,11], Jean Ferrières[12], François Schiele[13], and Tabassome Simon[14,15,16,17]; on behalf of the FAST-MI Investigators†

Conclusion

Too many STEMI patients still undergo primary PCI later than recommended. Efforts should be made to ensure that primary PCI is performed within 120 min of diagnostic ECG, and as early as possible after symptom onset. If these timelines cannot be achieved, a pharmaco-invasive strategy should be instituted, as it may increase long-term survival and event-free survival, compared to a late primary PCI strategy, therefore, lending support to current guidelines. The current results should be an incentive for cardiologists and emergency physician to realistically assess the expected times to performance of primary PCI, in order to choose alternative strategies when the recommended timelines are unlikely to be met.

- Muchos pacientes fuera de tiempo.
- Recomendar EFI sin no se cumplen tiempos

REC Interv Cardiol. 2020;2:175-182

Estrategia farmacoinvasiva como tratamiento de reperfusión en áreas sin disponibilidad de angioplastia primaria

Pharmacoinvasive strategy as reperfusion treatment in non-capable primary percutaneous coronary intervention areas

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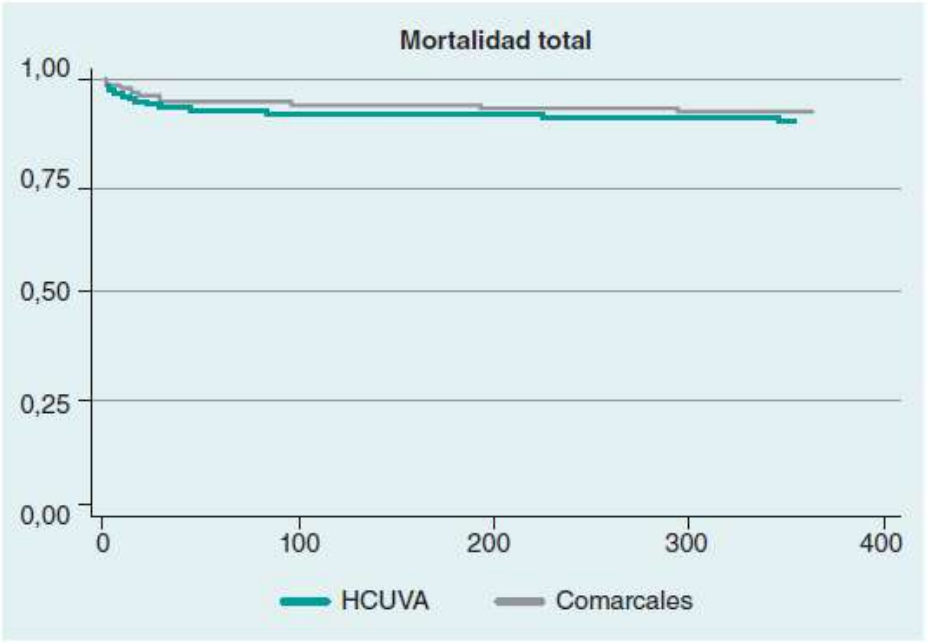
Conclusiones: A pesar de la menor accesibilidad a la ICPp en las áreas sanitarias más alejadas, la red asistencial regional de Murcia permite unos resultados comparables a los de las áreas sanitarias con disponibilidad de ICPp.

Introducción y objetivos: El tratamiento de reperfusión en un síndrome coronario agudo con elevación del segmento ST (SCACEST) se puede realizar con agentes fibrinolíticos o con angioplastia primaria (ICPp). La ICPp es la estrategia de elección, pero muchos de los pacientes con SCACEST acuden inicialmente a hospitales sin ICPp. Se han desarrollado programas de asistencia al SCACEST en los que se integran ambos tratamientos, utilizando la trombolisis en casos indicados, seguida de un estudio angiográfico (estrategia farmacoinvasiva). El objetivo del estudio es analizar los resultados del tratamiento del SCACEST según sea diagnosticado en áreas de salud con o sin disponibilidad de ICPp inmediata.

Métodos: Estudio retrospectivo de una cohorte de pacientes diagnosticados de SCACEST en 3 áreas de salud de Murcia: área I con ICPp (Hospital Clínico Universitario Virgen de la Arrixaca) y áreas IV y V sin ICPp (Hospital Comarcal del Noroeste, Caravaca de la Cruz y Virgen del Castillo, Yecla).

Resultados: Entre 2006 y 2010 se atendió por SCACEST a 679 pacientes de las áreas I, IV y V de Murcia. De los 494 pacientes del área I, recibieron tratamiento con ICPp el 97,6% (482) y trombolisis el 2,4% (12). En los pacientes de las áreas sanitarias IV y V se realizó trombolisis al 73% (135) e ICPp al resto 27% (50). De los pacientes sometidos a trombolisis, el 34% (46) precisaron angioplastia de rescate y al 58,5% (79) se les realizó coronariografía programada (estrategia farmacoinvasiva). No hubo diferencias en la mortalidad total a 30 días (8,3% en el área I y 6% en las áreas IV y V; p = 0,31) ni al año (11,3 frente a 8,2%; p = 0,23); tampoco en la mortalidad por causa cardiaca.

Conclusiones: A pesar de la menor accesibilidad a la ICPp en las áreas sanitarias más alejadas, la red asistencial regional de Murcia permite unos resultados comparables a los de las áreas sanitarias con disponibilidad de ICPp.



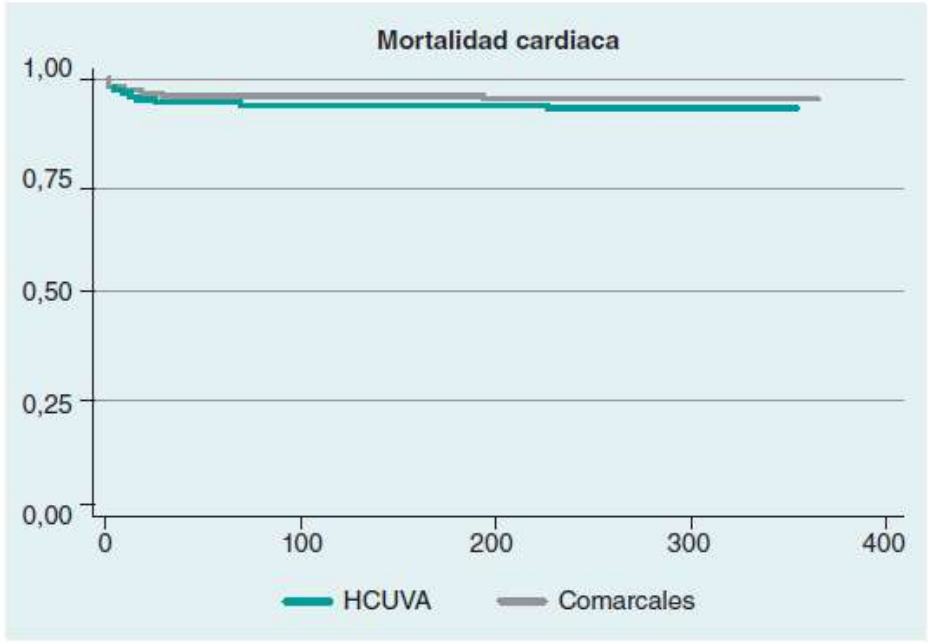


Figura 2. Curvas de supervivencia. Mortalidad, mortalidad cardiaca, ACV y IAM en el seguimiento. ACV: accidente cerebrovascular; HCUVA: Hospital Clínico Universitario Virgen de la Arrixaca; IAM: infarto agudo de miocardio.

Pharmacoinvasive Strategy Versus Primary Percutaneous Coronary Intervention in Patients With ST-Segment–Elevation Myocardial Infarction

A Propensity Score–Matched Analysis

Doo Sun Sim, MD, PhD; Myung Ho Jeong, MD, PhD; Youngkeun Ahn, MD, PhD; Young Jo Kim, MD, PhD; Shung Chull Chae, MD, PhD; Taek Jong Hong, MD, PhD; In Whan Seong, MD, PhD; Jei Keon Chae, MD, PhD; Chong Jin Kim, MD, PhD; Myeong Chan Cho, MD, PhD; Seung-Woon Rha, MD, PhD; Jang Ho Bae, MD, PhD; Ki Bae Seung, MD, PhD; Seung Jung Park, MD, PhD; on behalf of the Korea Acute Myocardial Infarction Registry (KAMIR) Investigators

Background—The Strategic Reperfusion Early After Myocardial Infarction trial and the French Registry of Acute ST-

similar between pharmacoinvasive strategy and PPCI: 4.4% versus 4.1% and 7.5% versus 7.8%, respectively. Equipoise between pharmacoinvasive strategy and PPCI for 12-month major adverse cardiac events occurred when percutaneous coronary intervention–related delay was ≈100 minutes.

infarction patients receiving either pharmacoinvasive strategy defined as fibrinolysis followed by percutaneous coronary intervention (rescue/urgent or routine elective; n=708) or PPCI (n=8878). Patients receiving facilitated percutaneous

Conclusions—ST-segment–elevation myocardial infarction patients receiving pharmacoinvasive treatment, compared with PPCI, had shorter time to reperfusion, higher culprit-vessel patency, and similar 12-month clinical outcome. (*Circ Cardiovasc Interv*. 2016;9:e003508. DOI: 10.1161/CIRCINTERVENTIONS.115.003508.)

during hospitalization were not different. Twelve-month rates of death and major adverse cardiac events (composite of death, recurrent myocardial infarction, target-vessel revascularization, and coronary artery bypass graft surgery) were similar between pharmacoinvasive strategy and PPCI: 4.4% versus 4.1% and 7.5% versus 7.8%, respectively. Equipoise between pharmacoinvasive strategy and PPCI for 12-month major adverse cardiac events occurred when percutaneous coronary intervention–related delay was ≈100 minutes.

Conclusions—ST-segment–elevation myocardial infarction patients receiving pharmacoinvasive treatment, compared with PPCI, had shorter time to reperfusion, higher culprit-vessel patency, and similar 12-month clinical outcome. (*Circ Cardiovasc Interv*. 2016;9:e003508. DOI: 10.1161/CIRCINTERVENTIONS.115.003508.)

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ORIGINAL RESEARCH

Pharmacoinvasive strategy versus primary angioplasty in patients with acute ST-segment elevation myocardial infarction

Estrategia farmacoinvasiva versus angioplastia primaria en pacientes con infarto agudo al miocardio con elevación del segmento ST

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ABSTRACT

Background: Primary percutaneous coronary intervention (PPCI) is the treatment of choice for acute ST-elevation myocardial infarction (STEMI). The delays associated with PPCI reduce the benefits of this therapy. To minimize these delays, the pharmacoinvasive strategy (PS) was developed, consisting of applying thrombolytic therapy followed by coronary angioplasty 2 to 24 hours after. **Objective:** To compare the safety and efficiency of PPCI vs PS in STEMI. **Methods:** We included patients with STEMI who had emergency PCI. The primary endpoint was combined major adverse cardiac events (MACE), death, reinfarction, stroke, target vessel revascularization (TVR) during hospitalization. The secondary endpoints were the individual components of MACE, and major bleeding (Bleeding Academic Research Consortium: BARC ≥ 3). **Results:** A total of 400 patients, 263 (65.8%) for PPCI group, 114 (28.5%) for PS group and 23 (5.75%) for diagnostic group. The PS group, 79 (69.3%) were then categorized as systematic angioplasty having had a successful thrombolysis, and 35 (30.7%) were rescue angioplasty because they had a failed thrombolysis. There were no differences in MACE: 13 (9.5%) patients in PS and 27 (10.3%) patients in the PPCI (p = 0.806), there were no differences in the individual components of MACE. The rate of major bleeding was the same, 5 (3.6%) and 4 (1.5%) respectively (p = 0.173). The multivariate analysis did not show a relationship between MACE and the reperfusion strategy. **Conclusions:** The pharmacoinvasive strategy when compared to PPCI has a similar rate of primary and secondary endpoints. There is no increase in major bleeding therefore, it is an important strategy that offers a reperfusion therapy for patients with STEMI in a non-PCI capable hospital.

RESUMEN

Antecedentes: *La intervención coronaria percutánea primaria (ICPP) es el tratamiento de elección en infarto agudo al miocardio con elevación del ST (IAMCEST). El retraso relacionado con ICPP disminuye el beneficio. Buscando una reperfusión oportuna se implementa la estrategia farmacoinvasiva (EFI), que consiste en realizar trombólisis seguido de ICP entre 2 a 24 horas después.* ***Objetivo:*** *Comparar la seguridad y eficacia en pacientes sometidos a ICPP contra EFI en IAMCEST.* ***Métodos:*** *Se incluyeron pacientes con IAMCEST sometidos a ICP emergente. El punto final primario son eventos cardiacos adversos mayores (ECAM), muerte, reinfarto, evento vascular cerebral y revascularización del vaso tratado, durante la hospitalización. Los puntos finales secundarios son la presencia de los componentes individuales del ECAM, y el sangrado mayor (BARC ≥ 3).* ***Resultados:*** *Se estudiaron 400 pacientes, 263 (65.8%) de ICPP, 114 (28.5%) a EFI y 23 (5.75%) angiografía diagnóstica. Del grupo EFI, 79 (69.3%) fueron angioplastia sistemática por trombólisis exitosa y 35 (30.7%) por angioplastia de rescate por trombólisis fallida. No se observó diferencia en la frecuencia de ECAM: EFI 13 (9.5%) contra ICPP 27 (10.3%) respectivamente (p = 0.806), tampoco hubo diferencia en los componentes individuales. No se observó diferencia en sangrado mayor, 5 (3.6%) vs 4 (1.5%), (p = 0.173). El análisis multivariado no relacionó la estrategia de reperfusión con los ECAM.* ***Conclusiones:*** *La EFI comparada con ICPP demuestra una tasa similar de ECAM, así como de sus componentes individuales. No se asocia con aumento de hemorragia mayor, concluyendo que ofrece el beneficio de una reperfusión oportuna sin aumento del riesgo en los hospitales que no tienen la capacidad para realizar ICPP.*

400 pacientes.
263 Angioplastia primaria
114 a EFI.
69.3% trombolisis exitosa.
30.7 % angioplastia de rescate.
ECAM: sin diferencia.
No diferencias en sangrados.
Concluyen:
EFI demuestra tasa similar de ECAM en angioplastia primaria

Implementing myocardial infarction systems of care in low/middle-income countries

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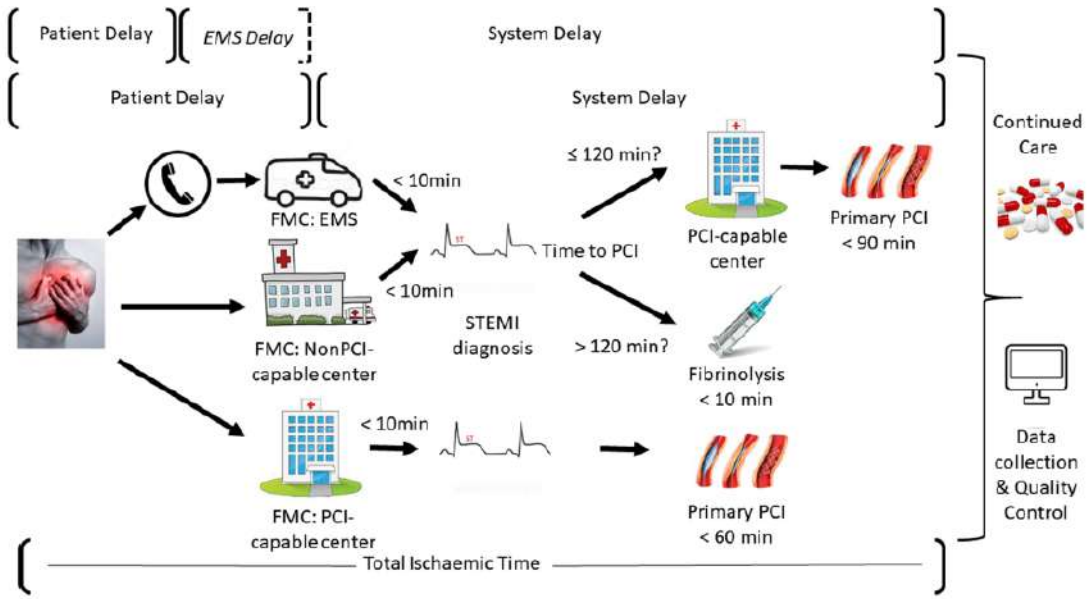
ABSTRACT

Ischaemic heart disease is the leading cause of death worldwide, with an increasing trend from 6.1 million deaths in 1990 to 9.5 million in 2016, markedly driven by rates observed in low/middle-income countries (LMIC). Improvements in myocardial infarction (MI) care are crucial for reducing premature mortality. We aimed to evaluate the main challenges for adequate MI care in LMIC, and possible strategies to overcome these existing barriers.

Reperfusion is the cornerstone of MI treatment, but worldwide around 30% of patients are not reperfused, with even lower rates in LMIC. The main challenges are related to delays associated with patient education, late diagnosis and inadequate referral strategies, health infrastructure and insufficient funding. The implementation of regional MI systems of care in LMIC, systematising timely reperfusion strategies, access to intensive care, risk stratification and use of adjunctive medications have shown some successful strategies. Telemedicine support for remote ECG, diagnosis and organisation of referrals has proven to be useful, improving access to reperfusion even in prehospital settings. Organisation of transport and referral hubs based on anticipated delays and development of MI excellence centres have also resulted in better equality of care. Also, education of healthcare staff and task shifting may potentially widen access to optimal therapy.

In conclusion, efforts have been made for the implementation of MI systems of care in LMIC, aiming to address particularities of the health systems. However, the increasing impact of MI in these countries urges the development of further strategies to improve reperfusion and reduce system delays.



Nascimento BR, *et al*. *Heart* 2018;**0**:1–7. doi:10.1136/heartjnl-2018-313398

Table 1 Main barriers and possible solutions for myocardial systems of care in low/middle-income countries

Main barriers	Possible solutions
Patient delay in seeking medical attention	► Provide regional educational programmes about AMI and how to react to its early symptoms. ► Provide patients with information of how to access EMS.
Lack of appropriate EMS and prehospital ECG	► Provide EMS with sufficient personnel and resources to ensure that a prehospital 12-lead ECG can be done in all patients with suspected AMI. ► Determine the best approach to use the prehospital ECG (interpreted in the field or transmitted by telemetry system). ► Especially in remote areas, organise a tele-ECG system and prehospital fibrinolysis. ► Provide specific training for emergency prehospital care personnel.
Lack of organised emergency department for AMI care in emergency units	► Provide the development of a dedicated AMI management protocols with particular attention to: 1. Fast 12-lead ECG at patient admission (<10 min). 2. Appropriate flow charts (which include timely primary PCI if in a capable centre or deciding whether to use lytics or transfer to a PCI-capable centre). 3. Appropriate administrative infrastructure support and uncomplicated administrative protocols within the ED. ► Provide continuing education on STEMI to ED constituents.
Lack of hospital infrastructure for AMI care	► For PCI-capable hospitals, provide devices and sufficient personnel to perform 24/7 PPCI. ► For non-PCI-capable hospitals, provide fibrinolytic drugs (especially the newer ones) and a network to transfer to a PCI-capable centre. ► Provide routine adjunctive medical therapies recommended for MI guidelines (antiplatelets, anticoagulant, other long-term cardiac therapies). ► Implement a coronary care unit.
Lack of AMI quality improvement programmes	► Implement an AMI quality programme to include providers in improving adherence to guidelines and to oversee the continuum of AMI patient care.
Lack of continuing care and rehabilitation	► Develop programmes to engage local primary care providers in care of patients after discharge from AMI-receiving hospital.
Lack of funding	► Evaluate resources by country, state and region, and determine individualised strategies to develop cost-effective programmes for AMI.

AMI, acute myocardial infarction; ED, emergency department; EMS, emergency medical system; MI, myocardial infarction; PCI, percutaneous coronary intervention; PPCI, primary PCI; STEMI, ST-elevation myocardial infarction.

Table 2 Successful strategies applied to improve myocardial infarction care in low/middle-income countries

Programme	Successful strategies to improve MI care
MI system of care in the metropolitan area of Belo Horizonte, Brazil	▶ Education of healthcare staff in prehospital EDs, provided by the university. ▶ Prepayment for 24/7 availability of ICU beds. ▶ Remote ECG interpretation by telemedicine in cardiac intensive care units. ▶ Redefinition of transportation rules, defining MI as a priority. ▶ Implementation of new cardiac intensive care units in PCI-capable hospitals. ▶ Flow chart: PPCI, with fibrinolysis followed by pharmacoinvasive strategy when ICU beds were not available or when delays were anticipated. Urgent PCI for cases with unfavourable presentation or failed fibrinolysis. ▶ Funding by a specific budget from the State Board of Health.
MI system of care in the metropolitan area of Montes Claros, Brazil	▶ Detailed preimplementation needs assessment and data collection. ▶ Training of healthcare staff in hospitals and prehospital EDs, provided by the university. ▶ Tablet-based digital ECG with central interpretation by telemedicine. ▶ Provision of drug therapy, with wide availability of prehospital thrombolytics (bolus drugs). ▶ Flow chart focused on prehospital fibrinolysis (remote areas), with PPCI when <2 hour delays were anticipated. ▶ Funding by a specific project from the State Board of Health.
Latin America Telemedicine Infarct Network (LATIN) in Brazil and Colombia, and the *Rajasthan Heart Attack Treatment* (RHAT) in India	▶ Based on hub-and-spoke strategy. ▶ Complex telemedicine network, with central hubs for ECG diagnosis and local sites for coordination of referrals. ▶ Dedicated, integrated software platform, with linkage to mobile applications. ▶ Vast coverage of very remote areas and jungle regions, in three countries. ▶ Spokes: inclusion of small clinics and primary health centres, besides small community hospitals. ▶ Ambulance arrangements. ▶ Flow chart focused on PPCI, with fibrinolysis and pharmacoinvasive strategy when delays are anticipated. ▶ Funding by healthcare companies.
MI system of care in the metropolitan area of Salvador, Brazil	▶ Education of healthcare staff in prehospital EDs, provided by the university. ▶ Remote interpretation of ECG in a central 24/7 centre, with email and text alerts to the Alert Team. ▶ Regional STEMI Alert Team serving as a communication link with the EMS regulation centre and PPCI labs, for coordinating referrals. ▶ Arrangement for 24/7 availability of ICU beds. ▶ Ambulance arrangements. ▶ Continuous tracking of MI cases by an established research group. ▶ Funding by the City and State Boards of Health.
MI system of care in Tamil-Nadu, India, and the Framework of the National STEMI Program, India	▶ Based on hub-and-spoke strategy. ▶ Preimplementation needs assessment and data collection. ▶ Public education programmes about MI symptoms. ▶ Provision of government-sponsored social insurance coverage for healthcare among those below the poverty line, involving fibrinolysis and PPCI. ▶ Involvement of national physicians and cardiology societies. ▶ Ambulance system through a public-private partnership with a non-profit entity. ▶ Implementation of new telemedicine technologies for transmission of real-time clinical data and ECGs across the system of care by healthcare staff. ▶ Prehospital ECG transmitted by ambulances. ▶ Flow chart focused on prehospital fibrinolysis (remote areas), with PPCI when delays were anticipated. ▶ Geographic mapping and development of state project management. ▶ Funding by the Ministry of Health with public-private partnerships.
Brazilian Intervention to Increase Evidence Usage in Acute Coronary Syndromes (BRIDGE-ACS) trial in Brazil	▶ Educational curriculum and systematisation of in-hospital procedures deployed to public hospitals (MI-receiving centres). ▶ Multifaceted quality improvement interventions including educational materials for clinicians, reminders, algorithms and case manager training. ▶ Flow chart focused on in-hospital compliance with optimal drug therapy and quality of care. ▶ Funding by a research budget of the Ministry of Health.
MI system of care in São Paulo, Brazil	▶ Education of healthcare staff in hospitals, prehospital EDs and ambulances. ▶ Prehospital ECG transmitted by ambulances through mobile applications, fixed phones or internet. ▶ Remote interpretation of ECG in a central 24/7 centre. ▶ ECG reports sent to a mobile phone in the ambulance or ED. ▶ Provision of prehospital thrombolytics (bolus drugs). ▶ Flow chart focused on PPCI in a single reference hospital, with fibrinolysis and pharmacoinvasive strategy when delays were anticipated.
National Cardiovascular Center Harapan Kita, Indonesia	▶ Provision of a hospital PCI package free of charge for poor people, improving access to specialised care and PPCI. ▶ Development of a PCI-capable national cardiovascular centre, previous unavailable in Jakarta. ▶ Joint involvement of Ministry of Health, stakeholders and directors of all hospitals in the city.

ED, emergency department; EMS, emergency medical system; ICU, intensive care unit; MI, myocardial infarction; PCI, percutaneous coronary intervention; PPCI, primary PCI; STEMI, ST-elevation myocardial infarction.

CONCLUSION

Many efforts have been made for the implementation of MI systems of care in LMICs, aiming to address individual characteristics and issues of the health systems. However, the growing burden of IHD and the increasing impact of MI in these countries—especially in the lowest income regions—urge the development of further strategies to improve reperfusion and reduce system delays involving governments, health authorities, funding agencies, universities and civil society organisations. As no solution solves all barriers, MI systems of care in LMICs must be customised to diverse realities, based on detailed assessment of local needs. Previous successful experiences may be examples for others, and successful solutions in LMICs, such as telemedicine and task shifting, can be applied to HIC.

No hay solucion unica.

- **Educacion de la comunidad**
- **Educacion del personal medico y paramedico**
- **Numero unico de emergencias**
- **Estrategia farmaco invasiva.**
- **Unidad de cuidados cardiovasculares.**
- **Politicas publicas en favor de la comunidad**

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WHITE PAPER

Resource and Infrastructure-Appropriate Management of ST-Segment Elevation Myocardial Infarction in Low- and Middle-Income Countries

Endorsed by Indian Council of Medical Research (ICMR), Public Health Foundation of India (PHFI), Population Health Research Institute (PHRI), Latin America Telemedicine Infarct Network (LATIN), Pan-African Society of Cardiology (PASCAR), South Africa Society of Cardiovascular Intervention (SASCI), and STEMI-India Task Force Writing Committee for Management of ST-Elevation MI in LMIC

ABSTRACT: The 143 low- and middle-income countries (LMICs) of the world constitute 80% of the world's population or roughly 5.86 billion people with much variation in geography, culture, literacy, financial resources, access to health care, insurance penetration, and healthcare regulation. Unfortunately, their burden of cardiovascular disease in general and acute ST-segment–elevation myocardial infarction (STEMI) in particular is increasing at an unprecedented rate. Compounding the problem, outcomes remain suboptimal because of a lack of awareness and a severe paucity of resources. Guideline-based treatment has dramatically improved the outcomes of STEMI in high-income countries. However, no such focused recommendations exist for LMICs, and the unique challenges in LMICs make directly implementing Western guidelines unfeasible. Thus, structured solutions tailored to their individual, local needs, and resources are a vital need. With this in mind, a multicountry collaboration of investigators interested in LMIC STEMI care have tried to create a consensus document that extracts transferable elements from Western guidelines and couples them with local realities gathered from expert experience. It outlines general operating principles for LMICs focused best practices and is intended to create the broad outlines of implementable, resource-appropriate paradigms for management of STEMI in LMICs. Although this document is focused primarily on governments and organizations involved with improvement in STEMI care in LMICs, it also provides some specific targeted information for the frontline clinicians to allow standardized care pathways and improved outcomes.

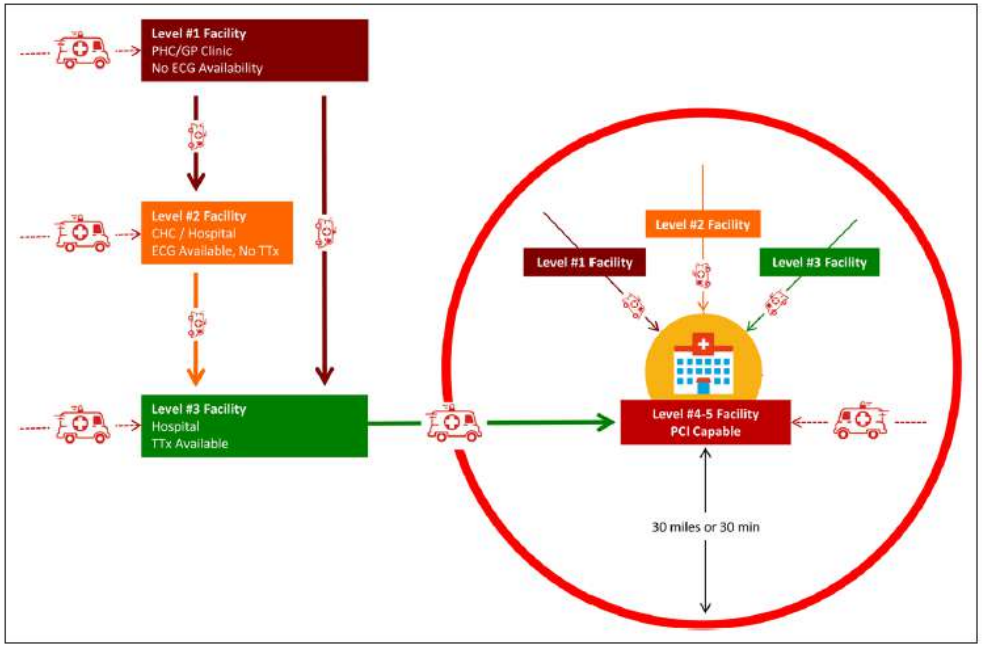


Figure 1. ST-segment–elevation myocardial infarction care model.
CHC indicates community health center; PCI, percutaneous coronary intervention; PHC/GP, primary health center/general practitioner; and TTx, thrombolytic treatment.

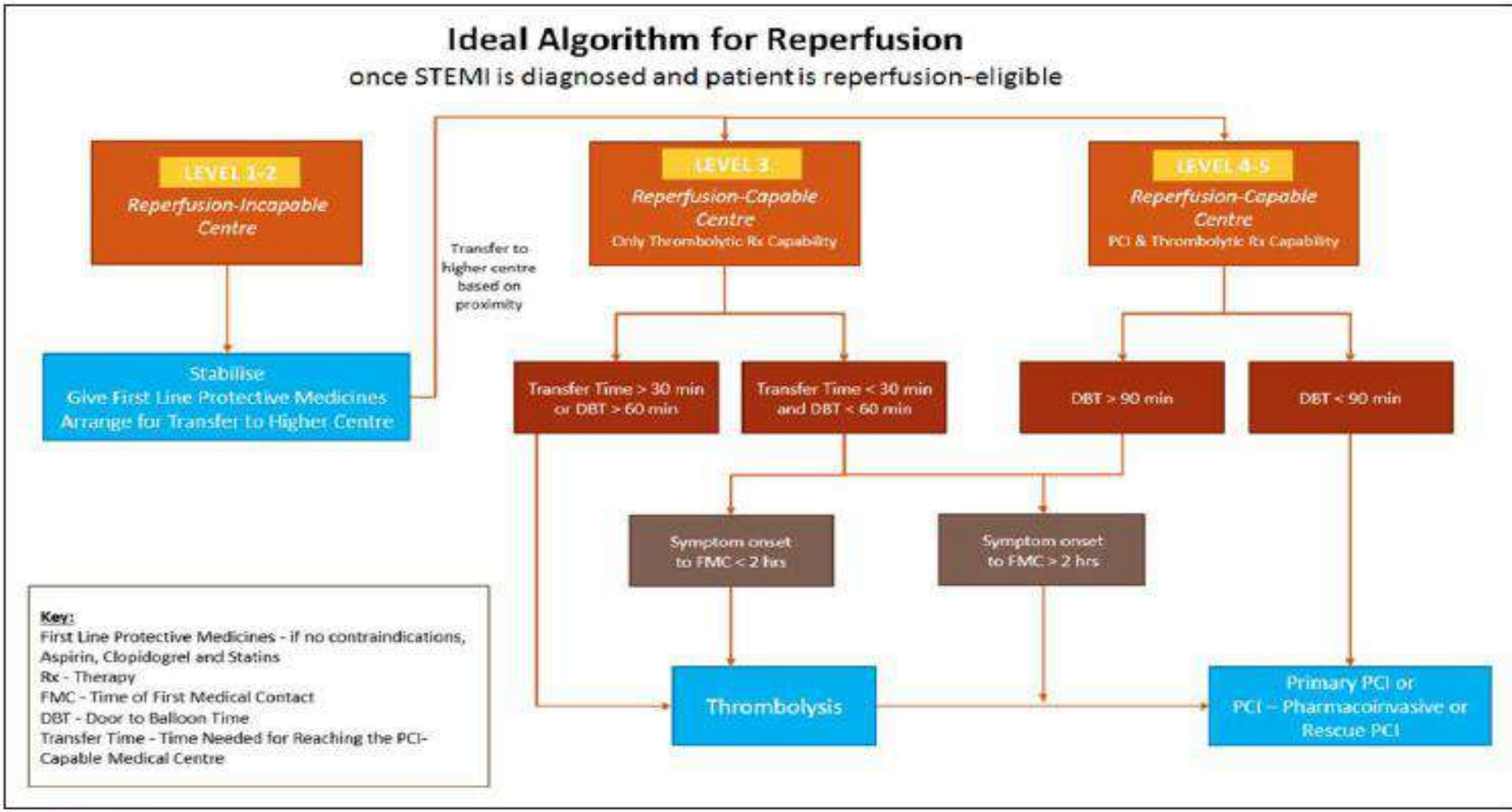
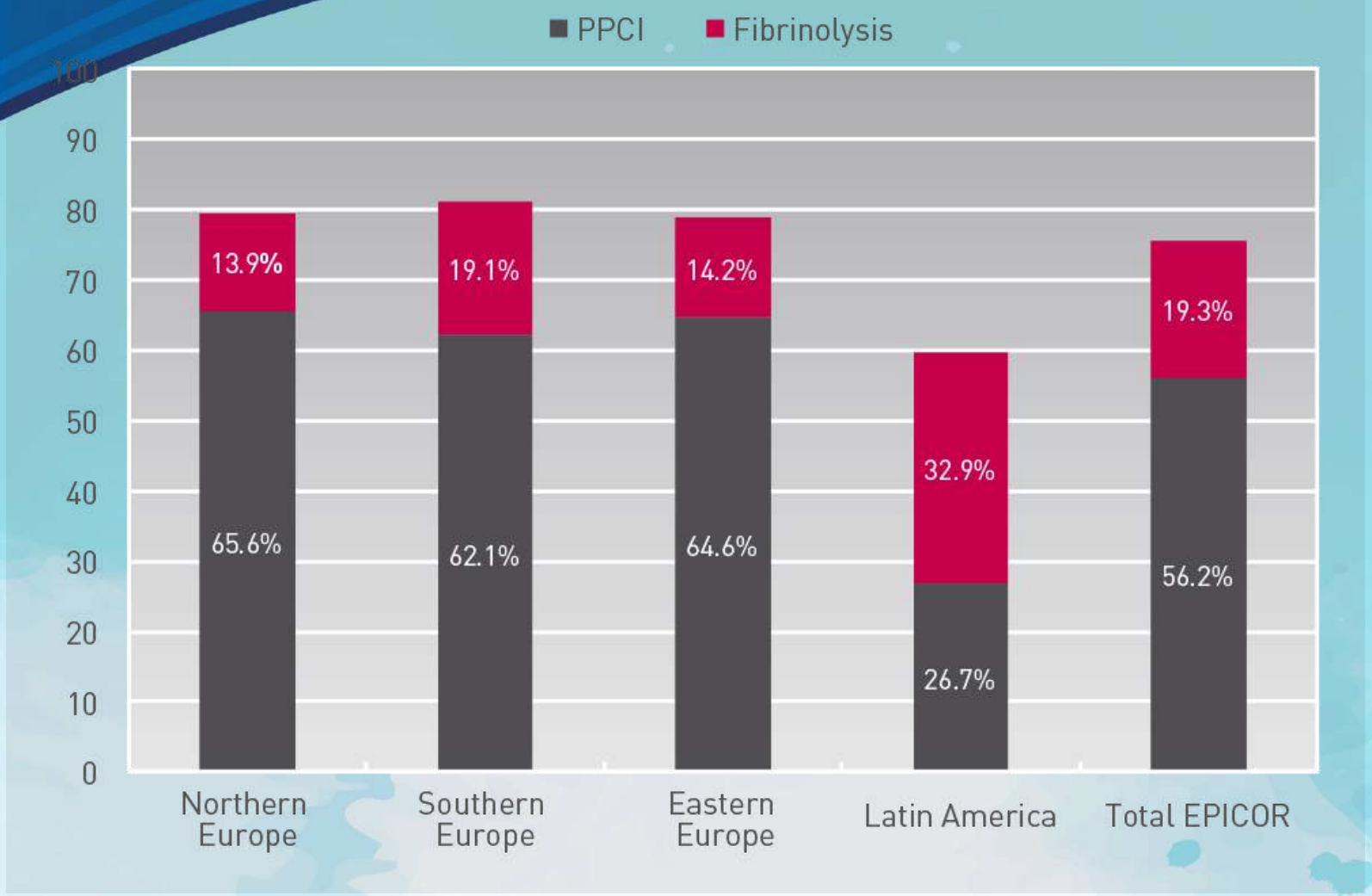


Figure 2. Choice of reperfusion therapy.
PCI indicates percutaneous coronary intervention; and STEMI, ST-segment–elevation myocardial infarction.



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US STEMI

Drive time (minutes)	First DTB time ≤120 min (% of patients)	Fibrinolysis (% of patients)
≤30	67.1	6.4
31-45	52.8	22.5
46-60	43.9	31.7
>60	29.6	52.7

Adapted from Vora et al. *JAMA Intern Med* 2015;175(2):207-215.

Conclusions

In the USA, neither fibrinolysis nor PPCI is being optimally used to achieve guideline-recommended reperfusion targets.

Pre-transfer fibrinolysis, followed by early transfer for angiography should be considered as a reperfusion option for patients unlikely to receive timely PPCI when the potential benefits of timely reperfusion outweigh bleeding risk.

References:

1. Vora AN, et al. Fibrinolysis use among patients requiring inter-hospital transfer for ST-segment elevation myocardial infarction. JAMA Intern Med 2015;175(2):207-215.

Pre-hospital thrombolysis vs. PPCI – a regional Australian experience

The Hunter New England Local Health District developed a system of care for STEMI patients based on their individual estimated travel time to the nearest cath. lab. If the total travel time was more than 60 minutes, pre-hospital thrombolysis was administered. If the travel time was thought to be shorter than 60 minutes, or if fibrinolysis was contraindicated, PPCI was the reperfusion therapy of choice.

There were no significant differences in mortality at 12 months between the two types of reperfusion therapies. 6.7% (10/150) of the pre-hospital thrombolysis patients and 7.2% (24/334) of the PPCI patients died within 12 months (RR, 0.93; 95% CI: 0.45-1.9; p=0.84). 1.3% of patients in the pre-hospital thrombolysis group had a major bleeding event. No patients in the PPCI group had a major bleed.

Using a time-based approach to make a choice regarding type of reperfusion therapy has been shown to be safe and effective.

References:

1. Khan AA, et al. Pre-hospital thrombolysis in ST-segment elevation myocardial infarction: a regional Australian experience. *Med J Australia* 2016;205(3):121-125.

Conclusiones

Estrategia fármaco invasiva de reperfusión, es valida en nuestro sistema? (fragmentado)

SI

Bien aplicada tiene resultados comparables a la angioplastia primaria en tiempo.

Bien aplicada tiene mejores resultados que la angioplastia primaria fuera de tiempo.

Elementos clave para mejorar reperfusion:

- Campañas publicas de educacion.
- NUMERO unico de dolor de pecho.
- Reducir los intervinientes para la reperfusion: PCM y « Reperfusor »
- Estimular el habito de trombolíticos y traslado inmediato a un centro con capacidad de hemodinamia 24/7.

Dr. Victor Adrian ROJAS RDORIGUEZ