Joint Meeting of Coronary Revascularisation; Busan, 12-13 December 2014.
Platelet Research Group Symposium

Antiplatelet therapy in acute coronary syndromes : The reality in South East Asia

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ASEAN – South East Asia

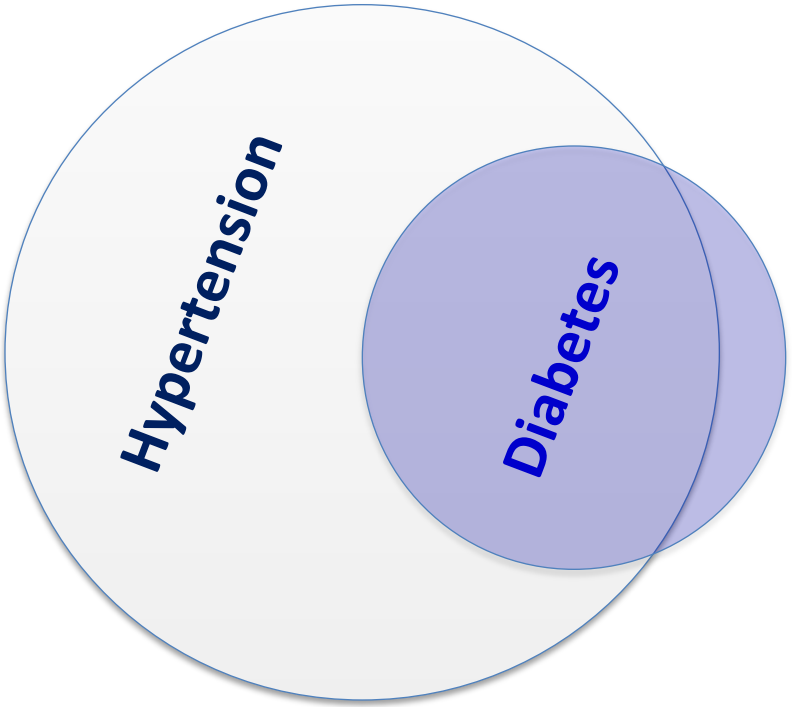
- 1967
- 10 countries
- 600 million people
- >30 ethnic groups
- 7th largest economy in the world

ASEAN FEDERATION OF CARDIOLOGY

Where we are.....

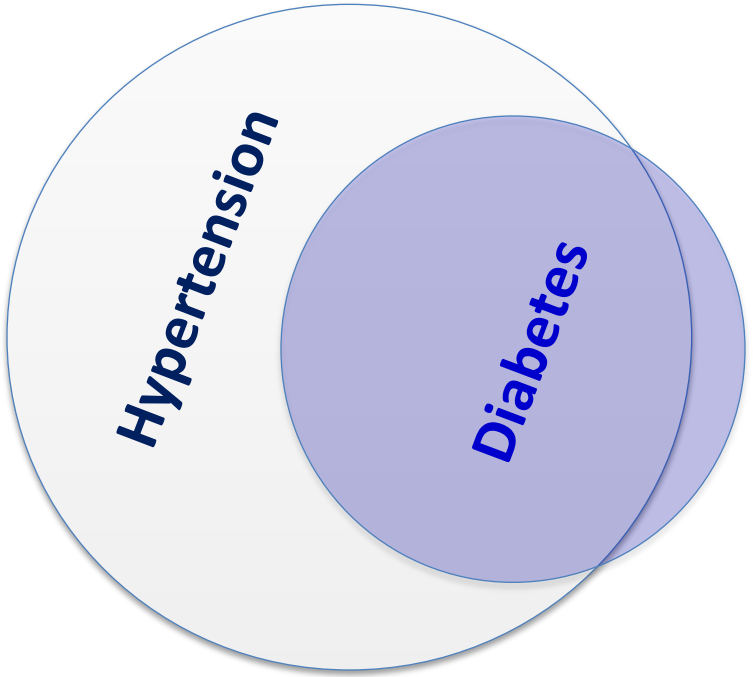

Boundary representation is not necessarily authoritative. Names in Vietnam are shown without diacritical marks.
CAMBODIA
VIETNAM
Phnom Penh
Ho Chi Minh City
Gulf of Thailand
THAILAND
South China Sea
SPRATLY ISLANDS
Palawan
PHILIPPINES
Sulu Sea
BRUNEI
Bandar Seri Begawan
Kuala Lumpur
SINGAPORE
Singapore
Borneo
Kalimantan
INDONESIA
Sumatra
Celebes Sea
Malaysia
International boundary
National capital
Railroad
Expressway
Road
0 100 200 Kilometers
0 100 200 Miles
Mercator Projection

The hypertension-diabetes link (USA/Europe vs. Malaysia)



Prevalence of hypertension in adults: ~33%[1]
Prevalence of diabetes in adults: 8.3% [1]
Proportion of diabetics with hypertension: ~70-90%[2]
Proportion of hypertensives (without CVD) with diabetes: ~15%[3]

[1]AHA 2013 Update, Circulation 2013;127:e6-e245
[2]Tarnow et al., Diabetes Care 17: 1247, 1994
[3]Weycker et al., AJH 20: 599, 2007



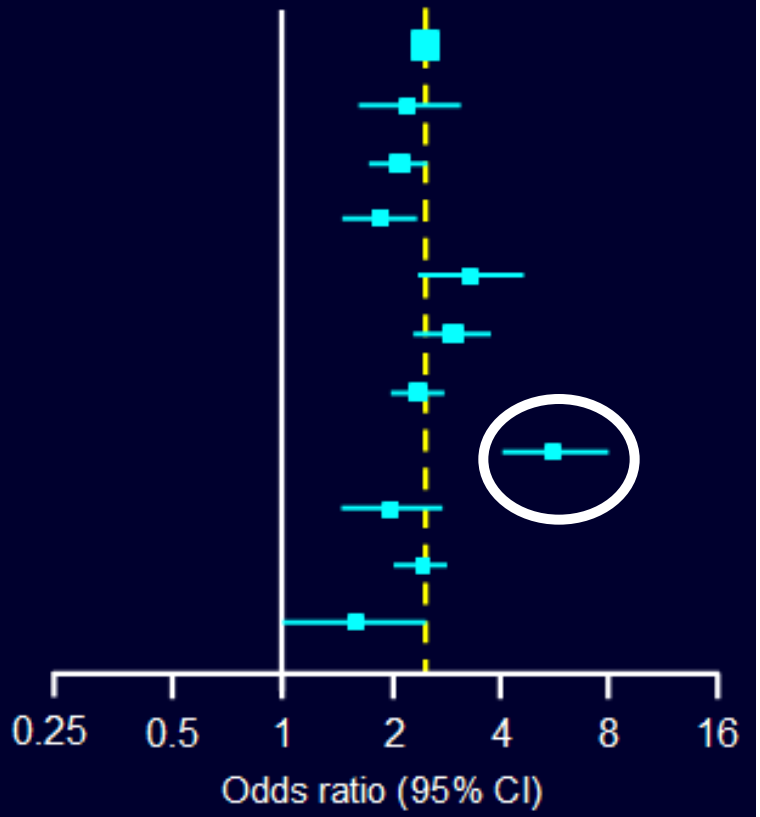
Prevalence of hypertension in adults: ~27.8%[1]
Prevalence of diabetes in adults: **~11.7%** [2]
Proportion of diabetics with hypertension: **~90%** (≥130/80 mm Hg)[2]

[1]Rampal et al., Public Health 122: 11, 2008
[2]IDF-Atlas, 5th edition, 2012 update

Unique findings..

INTERHEART: Significant association of MI risk with hypertension

Region	n
Overall	26,916
Western Europe	1425
Central and Eastern Europe	3636
Middle East Crescent	3404
Africa	1355
South Asia	3881
China/Hong Kong	6075
Southeast Asia	2141
Australia and New Zealand	1269
South America	3100
North America	630



Adjusted for age, sex, smoking
Note: odds ratio plotted on a doubling scale

Yusuf S et al. *Lancet*. 2004;364:937-52.

Other than Singapore….

- Developing countries challenges…
- Rural-urban migration….
- Infrastructure (much still in) development….

An update on cardiovascular disease epidemiology in South East Asia. Rationale and design of the LIFE course study in CARdiovascular disease Epidemiology (LIFECARE)

E Shyong Tai [a,b,*], Richie Poulton [c], Julian Thumboo [d], Rody Sy [e], Nina Castillo-Carandang [f], Piyamitr Sritara [g], John M.F. Adam [h], Kui Hian Sim [i,j], Alan Fong [k], Hwee Lin Wee [l,d], Mark Woodward [m]

[a] Center for Molecular Epidemiology, National University of Singapore, C/O Department of Community, Occupational and Family Medicine, 16 Medical Drive, Singapore 117597, Singapore
[b] Office of Research, Singapore Health Services, Singapore
[c] Dunedin Multidisciplinary Health and Development Research Unit, Department of Preventive & Social Medicine, Dunedin School of Medicine, National Centre for Lifecourse Research, University of Otago, New Zealand
[d] Singapore General Hospital, Department of Rheumatology & Immunology, Singapore
[e] College of Medicine, University of the Philippines, Philippines
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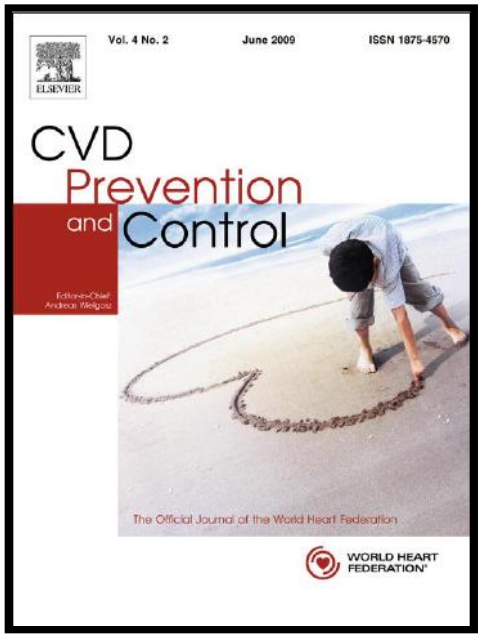
[i] Clinical Research Centre (CRC), Department of Cardiology, Sarawak General Hospital, Malaysia
[j] Faculty of Medicine & Health Sciences, University Malaysia Sarawak (UNIMAS), Malaysia
[k] Department of Cardiology, and Clinical Research Centre, Sarawak General Hospital, Malaysia
[l] Department of Pharmacy, National University of Singapore, Singapore
[m] Mount Sinai School of Medicine, New York University, NY, USA



CVD Prevention and Control (2009) 4, 93–102

Pioneering Registry in Malaysia

What about Confidentiality?

Current legislation allows doctors to release their patients' data to persons demonstrating a need, which is essential to public health and safety. The NCVD meets this requirement.

The NCVD has also developed strict policies and procedures to maintain confidentiality of data collected by it as well as in disclosure of data.

For further information, the NCVD is also published electronically on website at:

http://www.acrm.org.my/ncvd

We look forward to the continued support and collaboration from all parties that will enable the National Cardiovascular Disease Database (NCVD) to develop and contribute significantly to the control of cardiovascular disease in this country.

NCVD REGISTRATION FORM

☐ Yes! I want to participate in the National Cardiovascular Disease Database (NCVD). Please register my centre.

Details

Name: _____
(Title) (Name)

Designation: _____

Institution: _____

Sector (Check only one):

☐ MOH ☐ University ☐ NGO
☐ Private ☐ Armed Forces ☐ Others, specify_____

Address (office): _____

_____

Postal Code: _____ City/Town: _____

State: _____

Tel: (__) _____

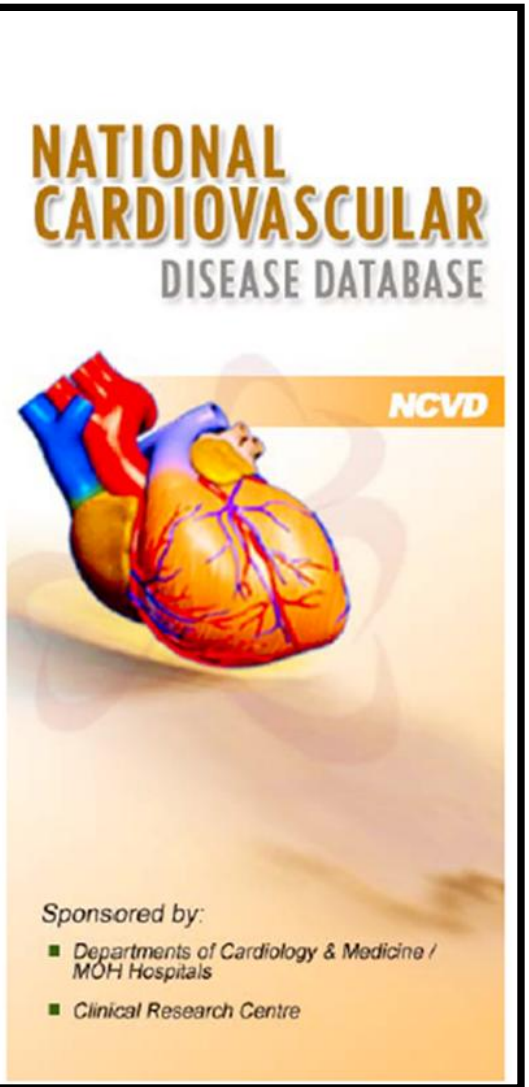
Fax: (__) _____

Handphone: (__) _____

E-Mail: _____

Please mail or fax to:

Manager,
National Cardiovascular Disease Database
c/o Clinical Research Centre
3rd Floor, Dermatology Block,
Hospital Kuala Lumpur,
Jalan Pahang,
50586 Kuala Lumpur
Tel: 03 - 2692 4249 / 03 -2698 0310
Fax: 03 - 2691 1682
Email: ncvd@acrm.org.my



ACS in Malaysia exacts a terrible toll

Table 5.8 Overall outcomes for patients with ACS by ACS stratum, NCVD-ACS Registry, 2006-2008

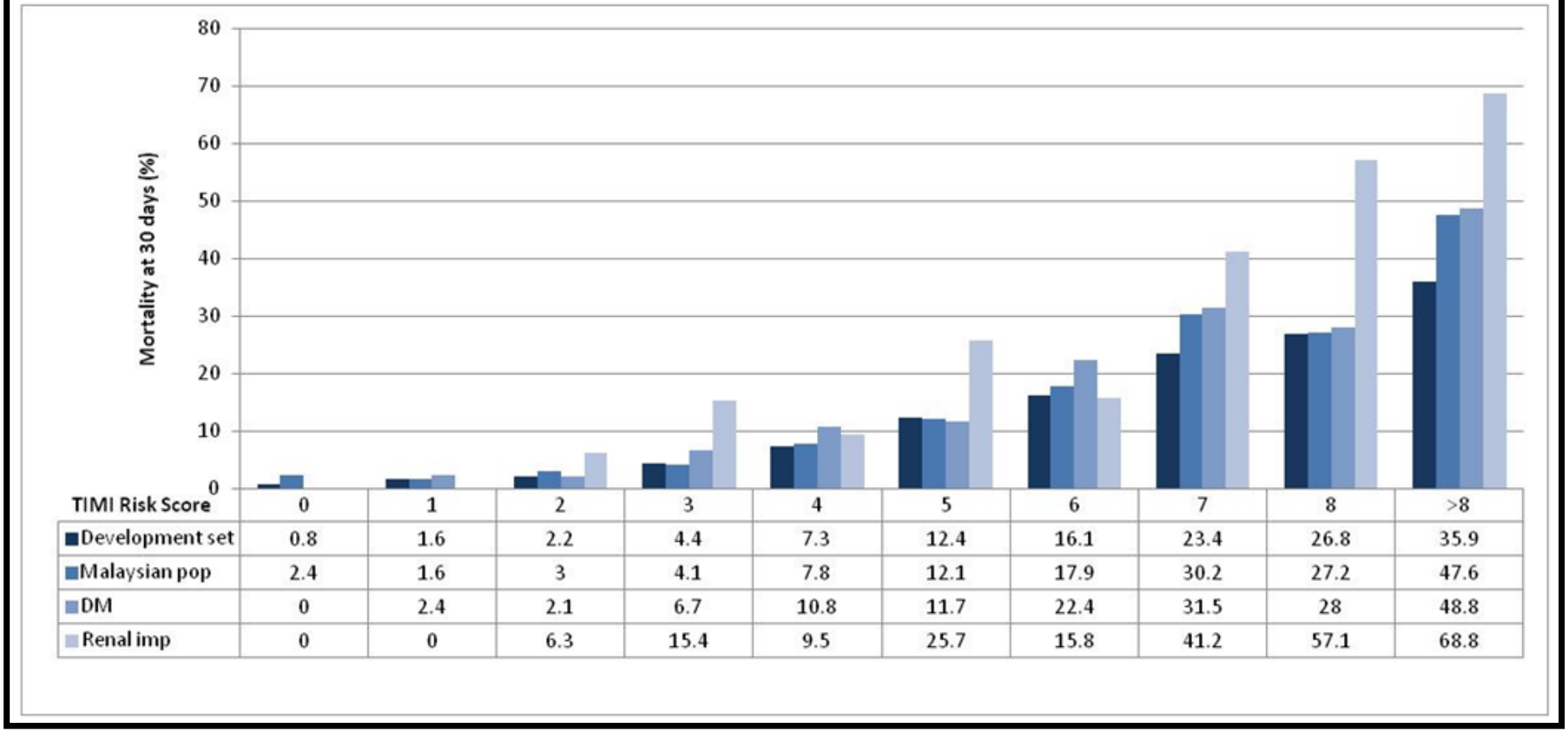
	+Outcome	In-hospital						30-day*					
		STEMI		NSTEMI		UA		STEMI		NSTEMI		UA	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2006	Alive	1309	91	1048	93	812	96	1135	79	804	71	676	80
	Died	136	9	84	7	33	4	310	21	328	29	169	20
2007	Alive	1513	90	907	91	935	98	1373	81	745	74	802	84
	Died	174	10	94	9	23	2	314	19	256	26	156	16
2008	Alive	1388	90	598	90	635	97	1307	85	537	81	591	90
	Died	146	10	64	10	20	3	227	15	125	19	64	10
Overall	Alive	4210	90	2553	91	2382	97	3815	82	2086	75	2069	84
	Died	456	10	242	9	76	3	851	18	709	25	389	16

+ The outcome data is derived based on data matching with the National Death Register

**Includes patients who died in-hospital*

STEMI: comparison between NCVD and TIMI developmental dataset

Figure 2. Mortality rate at 30 days for TIMI risk score development and Malaysian STEMI population



TIMI Risk Score	0	1	2	3	4	5	6	7	8	>8
Development set	0.8	1.6	2.2	4.4	7.3	12.4	16.1	23.4	26.8	35.9
Malaysian pop	2.4	1.6	3	4.1	7.8	12.1	17.9	30.2	27.2	47.6
DM	0	2.4	2.1	6.7	10.8	11.7	22.4	31.5	28	48.8
Renal imp	0	0	6.3	15.4	9.5	25.7	15.8	41.2	57.1	68.8

An Asian Validation of the TIMI risk score for ST-Segment Elevation Myocardial Infarction: Results and Implications for Cardiac Care in a Developing Country. Sharmini Selvarajah, Alan Fong Yean Yip, Gunavathy Selvaraj, Jamaiyah Haniff, Cuno S.P.M. Uiterwaal, Michiel L. Bots, PLoS One 2012;7(7):e40249

A recent hit…. with global implications

Am J Cardiol. 2013 Feb 14. pii: S0002-9149(13)00333-0. doi: 10.1016/j.amjcard.2013.01.271. [Epub ahead of print]

Impact of Cardiac Care Variation on ST-Elevation Myocardial Infarction Outcomes in Malaysia.

Selvarajah S, Fong AY, Selvaraj G, Haniff J, Hairi NN, Bulgiba A, Bots ML.

Clinical Research Centre, Kuala Lumpur Hospital, Kuala Lumpur, Malaysia; Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, The Netherlands; Julius Centre University of Malaya, Department of Social and Preventive Medicine, University of Malaya, Kuala Lumpur, Malaysia. Electronic address: sharm@crc.gov.my.

Abstract

Developing countries face challenges in providing the best reperfusion strategy for patients with ST-segment elevation myocardial infarction because of limited resources. This causes wide variation in the provision of cardiac care. The aim of this study was to assess the impact of variation in cardiac care provision and reperfusion strategies on patient outcomes in Malaysia. Data from a prospective national registry of acute coronary syndromes were used. Thirty-day all-cause mortality in 4,562 patients with ST-segment elevation myocardial infarctions was assessed by (1) cardiac care provision (specialist vs nonspecialist centers), and (2) primary reperfusion therapy (thrombolysis or primary percutaneous coronary intervention [P-PCI]). All patients were risk adjusted by Thrombolysis In Myocardial Infarction (TIMI) risk score. Thrombolytic therapy was administered to 75% of patients with ST-segment elevation myocardial infarctions (12% prehospital and 63% in-hospital fibrinolytics), 7.6% underwent P-PCI, and the remainder received conservative management. In-hospital acute reperfusion therapy was administered to 68% and 73% of patients at specialist and nonspecialist cardiac care facilities, respectively. Timely reperfusion was low, at 24% versus 31%, respectively, for in-hospital fibrinolysis and 28% for P-PCI. Specialist centers had statistically significantly higher use of evidence-based treatments. The adjusted 30-day mortality rates for in-hospital fibrinolytics and P-PCI were 7% (95% confidence interval 5% to 9%) and 7% (95% confidence interval 3% to 11%), respectively (p = 0.75). In conclusion, variation in cardiac care provision and reperfusion strategy did not adversely affect patient outcomes. However, to further improve cardiac care, increased use of evidence-based resources, improvement in the quality of P-PCI care, and reduction in door-to-reperfusion times should be achieved.

3rd Malaysian CPG for STEMI

Flow chart 1: Management of patients presenting with STEMI

CHEST PAIN/CHEST PAIN EQUIVALENT

Electrocardiographic (ECG) Cardiac Biomarkers

Concomitant initial management includes:

Continuous ECG monitoring
Sublingual glyceryl trinitrate (GTN) (if no contraindication)
Aspirin
Clopidogrel
Analgesia
Oxygen(if 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*

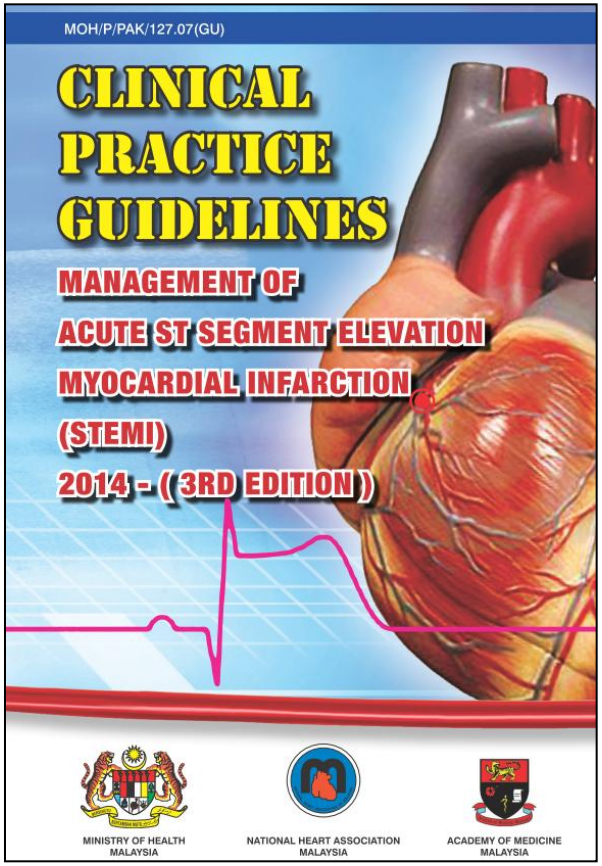
Subsequent management:

Consider PCI within 3-24 hours
If fibrinolytic is administered as part of pharmacoinvasive strategy

PCI if ongoing ischaemia or haemodynamic instability

Concomitant Therapy:

Antithrombotics*
β-blockers
Angiotensin converting enzyme inhibitors (ACE-I)/ Angiotensin II receptor blockers (ARB)
Statins
Nitrates*
Calcium antagonists*



CLINICAL PRACTICE GUIDELINES

Asean Heart Journal, Special Edition June 2014

Malaysia CPG for STEMI

Expert Panel: Robaayah Zambahari[1] (Chairperson), Jeyamalar Rajadurai[2] (Secretary), Alan Fong[3], Aris Chandran[4], Choo Gim Hooi[5], Nurul Aida Salleh[6], Omar Ismail[7], Oteh Maskon[8], Rahal Yusoff[9], Rosli Mohd Ali[10], Wan Azman Wan Ahmad[11]

[1]*Senior Consultant Cardiologist, Institute Jantung Negara, Kuala Lumpur*
[2]*Consultant Cardiologist, Subang Jaya Medical Centre, Selangor*
[3]*Consultant Cardiologist, Hospital Umum Sarawak, Kuching*

Non-ST Elevation ACS: the SMARTACS study

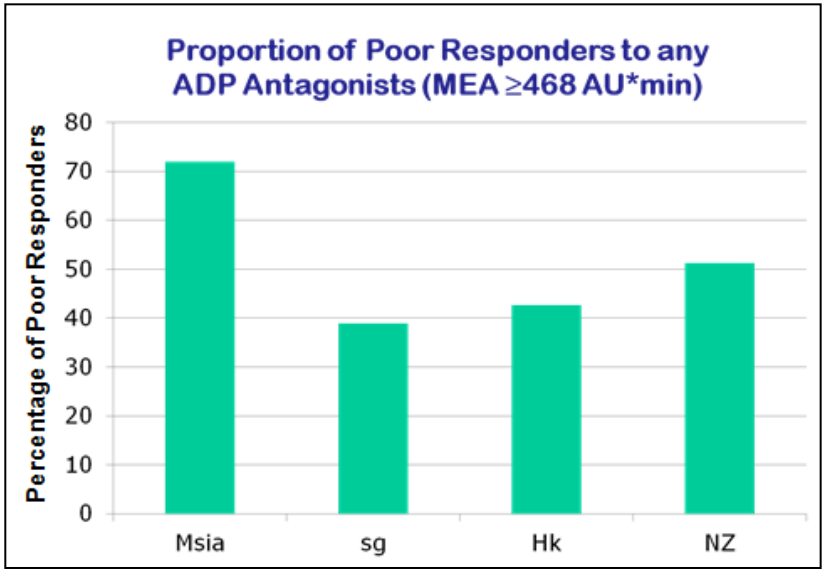
Method

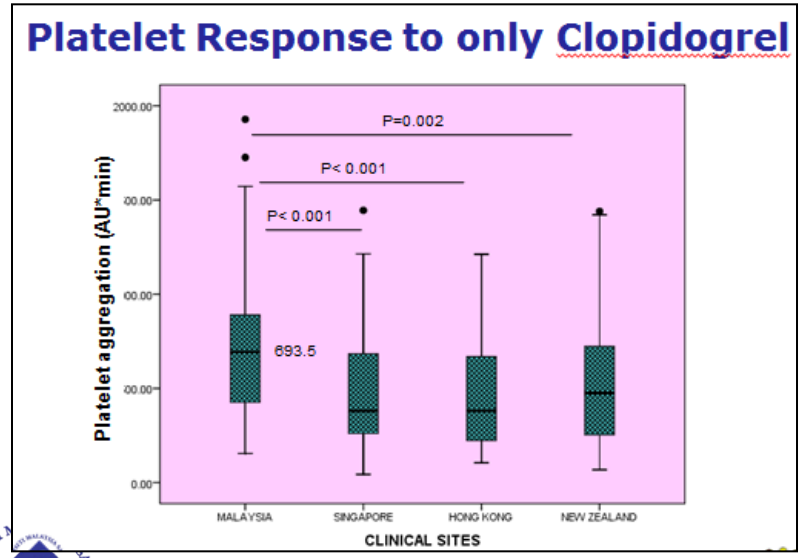
10-08-2011 and 01-12-2012
5 clinical sites in 4 different Asia-Pacific countries

Patients with **Non-ST ACS**
undergoing coronary angiogram within 7 days

MALAYSIA n=84	SINGAPORE n=108	HONG KONG n=61	NEW ZEALAND n=76
81 on Clopidogrel 3 on Prasugrel	107 on Clopidogrel 1 on Prasugrel	57 on Clopidogrel 1 on Prasugrel 3 on Ticagrelor	32 on Clopidogrel 43 on Ticagrelor 1 on Ticlopidine

Multiplate multiple electrode aggregometry (MEA) from whole blood taken prior to angiography

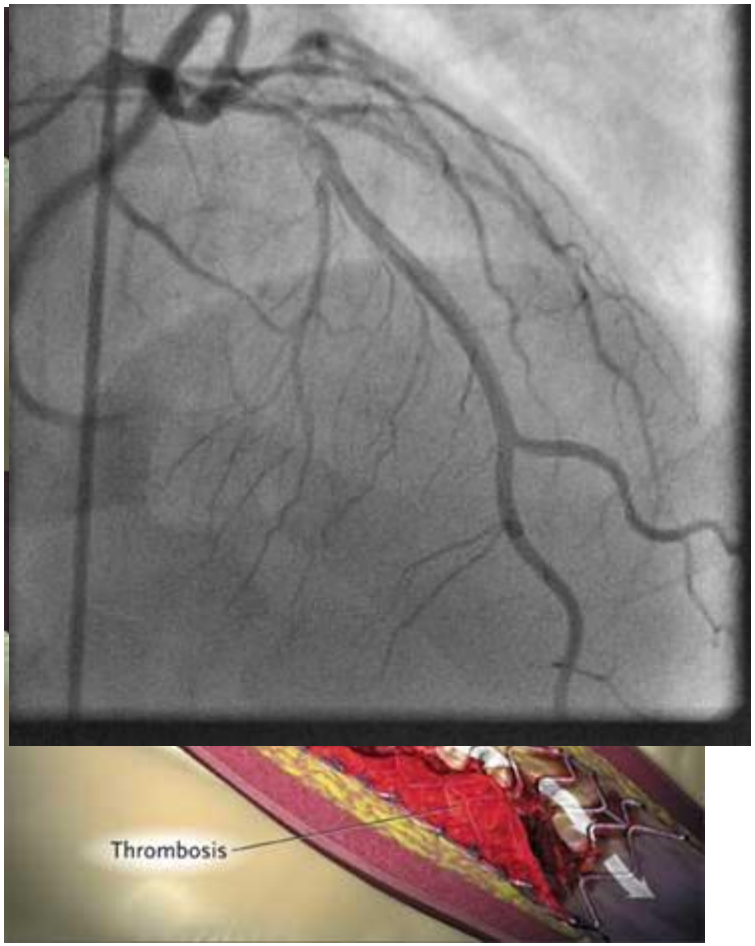




>70% non-responder to Clopidogrel, at time of Coronary angiography!

Kong KL, Chan MY, Fong AY, et al. Oral Presentations, NHAM ASM 2013

Devil and the deep blue sea



http://www.chainonline.org/content.cfm?content_id=1185

But majority of stent thrombosis occurs....

Table 1. Risk of Early Stent Thrombosis According to Clinical Presentation

	Stable Angina	UA/NSTEMI	STEMI
Bare-metal stents, %	0–0.5	1.4–1.6	0–2.9
Drug-eluting stents, %	0.3–0.4	1.2–1.9	0–3.1

UA indicates unstable angina; NSTEMI, non–ST segment elevation myocardial infarction.

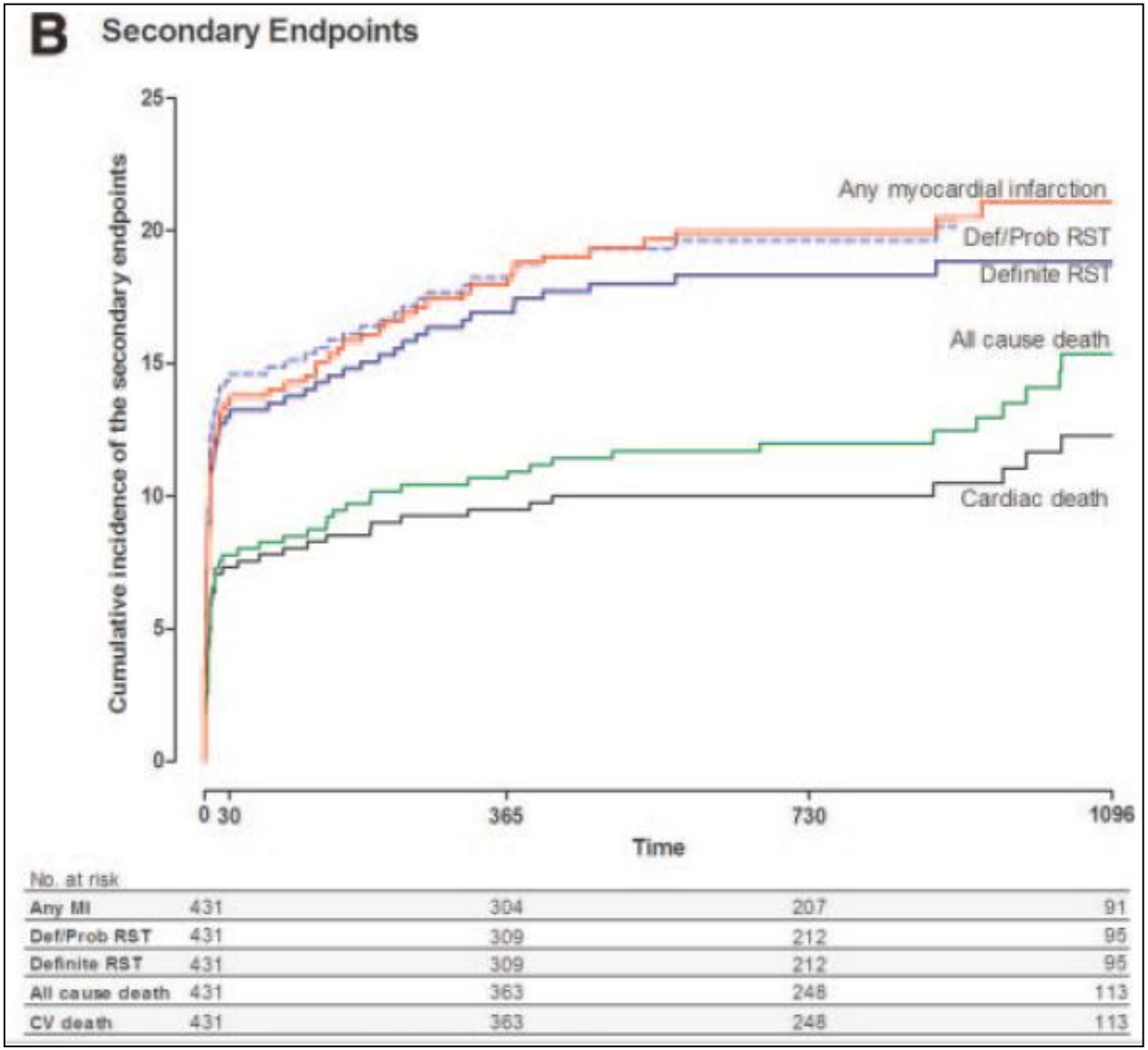
Table 3. Details of the First Stent Thrombosis

	Overall (n=431)	Event-Free (n=320)	With Event (n=111)	*P*
Category of first stent thrombosis at time of inclusion, n (%)				
Acute	140 (32.5)	114 (35.6)	26 (23.4)	Reference
Subacute	177 (41.0)	124 (38.8)	53 (47.7)	0.02
Late	57 (13.2)	41 (12.8)	16 (14.4)	0.12
Very late	57 (13.2)	41 (12.8)	16 (14.4)	0.16
"Double-trouble" stent thrombosis, n (%)	14 (3.2)	10 (3.1)	4 (3.6)	0.71

>70%!

Circulation. 2009; 119: 657-659; Circulation. 2009; 119: 828-834

Likely a 'double jeopardy' on the horizon…



No. at risk				
Any MI	431	304	207	91
Def/Prob RST	431	309	212	95
Definite RST	431	309	212	95
All cause death	431	363	248	113
CV death	431	363	248	113

Point of care: Platelet function testing

Do you DARE to guess:
1. Cholesterol level?
2. Blood pressure level?
3. Diabetes control?

Point of care: Genotyping

Findings

After randomisation, 187 patients completed follow-up (91 rapid genotyping group, 96 standard treatment). 23 individuals in each group carried at least one *CYP2C19*2* allele. None of the 23 carriers in the rapid genotyping group had a PRU value of more than 234 at day 7, compared with seven (30%) given standard treatment (p=0·0092). The point-of-care genetic test had a sensitivity of 100% (95% CI 92·3—100) and a specificity of 99·3% (96·3—100).

Interpretation

Point-of-care genetic testing after PCI can be done effectively at the bedside and treatment of identified *CYP2C19*2* carriers with prasugrel can reduce high on-treatment platelet reactivity.

The Lancet, Volume 379, Issue 9827, Pages 1705 - 1711, 5 May 2012

Point-of-care genetic testing for personalisation of antiplatelet treatment (RAPID GENE): a prospective, randomised, proof-of-concept trial

The Platelet-PCI Study: Loading patterns of clopidogrel at SGH

Table 2: Platelet inhibition profiles of Clopidogrel

	DAPT (Clopidogrel + Aspirin)			p Value
	Clopidogrel 75 mg daily ≤ 3 days (n = 20)	Clopidogrel 75 mg daily ≥ 4 days (n = 118)	Clopidogrel 300 mg ± 75 mg daily (n = 12)	
ADP-induced platelet aggregation (AU*min)	376.3 ± 153.7	288.9 ± 159.4	347.3 ± 195.7	0.056
Clopidogrel resistance, n (%)	5 (25.0)	15 (12.7)	2 (16.7)	< 0.001
CYP2C19 *2 or *3 carrier, n (%)	17 (85.0)	65 (55.1)	6 (50.0)	0.340

ORIGINAL ARTICLE

Trends of Platelet Inhibition in Different Clopidogrel Pretreatment Patterns in Malaysian Patients Undergoing Elective Percutaneous Coronary Intervention

Wen Ni Tiong, MSc, Melissa Mejin, M.Pharm, Alan Yeon Yip Yeon Yip Fong, MRCP, Ching Ching Wee, MSc, Lana Yin Hui Lai, B.Pharm, Siaw San Hwang, PhD, Mohamad Adam Bin Bujang, BSc, Lee Len Tiong, B.Pharm, Tiong Kiam Ong, FRCP

Clinical Research Centre, Clinical Research Centre, Sarawak General Hospital, Sarawak General Hospital, Jalan Tun Ahmad Zaidi Adruce, Kuching, Sarawak 93586, Malaysia

Tiong WN, Tiong LL, Fong AY, et cl. MJM 2013: 68(4) 326-331

Platelet-PCI study: Genotype considerations

Table 2 Prevalence of CYP2C19 genotypes (n = 118)

CYP2C19 genotype	Number of patients (%)			
	Chinese (n = 57)	Malay (n = 29)	Iban (n = 24)	Other (n = 8)
Normal metaboliser				
*1/*1	18 (31.6)	10 (34.5)	12 (50)	3 (37.5)
*2/*17	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)
Poor metaboliser				
*1/*2	25 (43.9)	9 (31.0)	6 (25.0)	1 (12.5)
*1/*3	2 (3.5)	5 (17.2)	3 (12.5)	1 (12.5)
*2/*2	8 (14.0)	3 (10.3)	0 (0.0)	0 (0.0)
*2/*3	1 (1.8)	1 (3.4)	2 (8.3)	0 (0.0)
Extensive metaboliser				
*1/*17	2 (3.5)	1 (3.4)	1 (4.2)	2 (25.0)
*17/*17	0 (0.0)	0 (0.0)	0 (0.0)	1 (12.5)

Int J Clin Pharm
DOI 10.1007/s11096-013-9783-y

RESEARCH ARTICLE

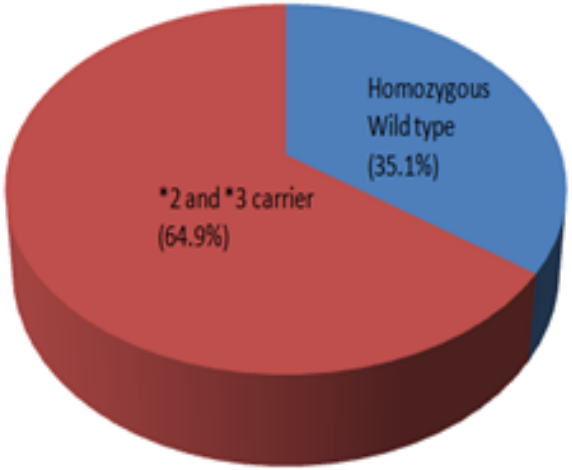
CYP2C19 genotypes and their impact on clopidogrel responsiveness in percutaneous coronary intervention

Melissa Mejin · Wen Ni Tiong · Lana Yin Hui Lai · Lee Len Tiong · Adam Mohamad Bujang · Siaw San Hwang · Tiong Kiam Ong · Alan Yean Yip Fong

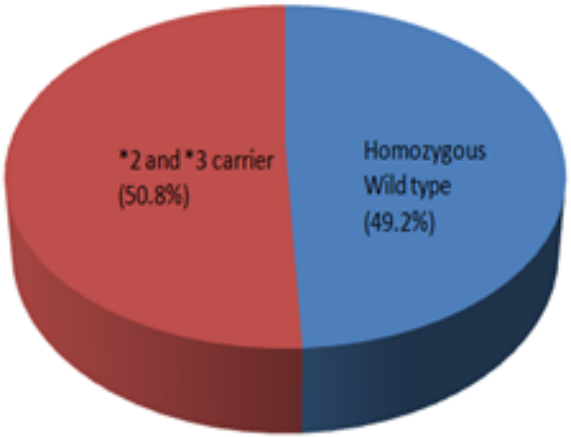
Poor Metabolisers: 63%! 62%! 46% 25%
(per ethnic group)

Mejin M, Tiong WN, Fong AY, et al. IJCP 2013

The Chinese equation…



Group	ADP Platelet aggregation (AU*min)	P – value
Wild type	234.7 ± 138.3	< 0.05
*2, *3 carrier	324.4 ± 176.3	



Group	ADP Platelet aggregation (AU*min)	P – value
Wild type	276.0 ± 161.4	0.90 (N.S.)
*2, *3 carrier	281.2 ± 151.8	

Chinese patients

Non-Chinese patients

Tiong WN, Hwang SS, Fong AY, et al. Oral Presentation. ICC 2012 Hong Kong

Genotype-PCI study

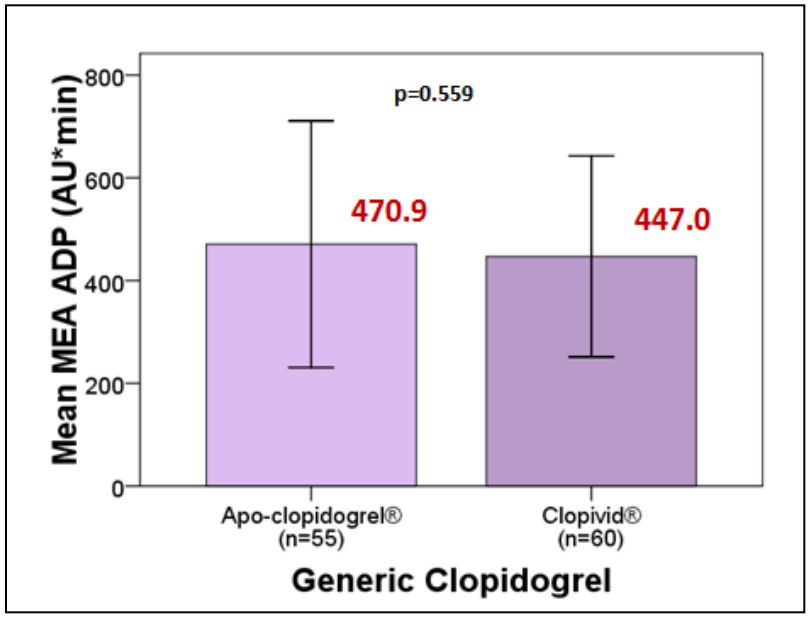
- ≥4 days of Clopidogrel
- ≥1 DES implanted
- Planned 12 month DAPT initially

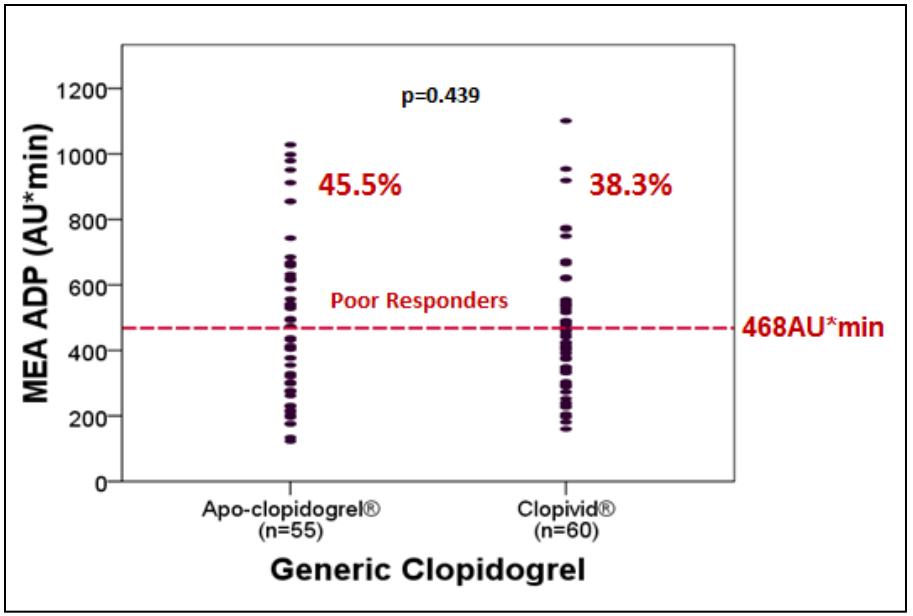
- Multiplate for Aspirin and Clopidogrel response
- Spartan CYP2C19*2 POC Genotyping

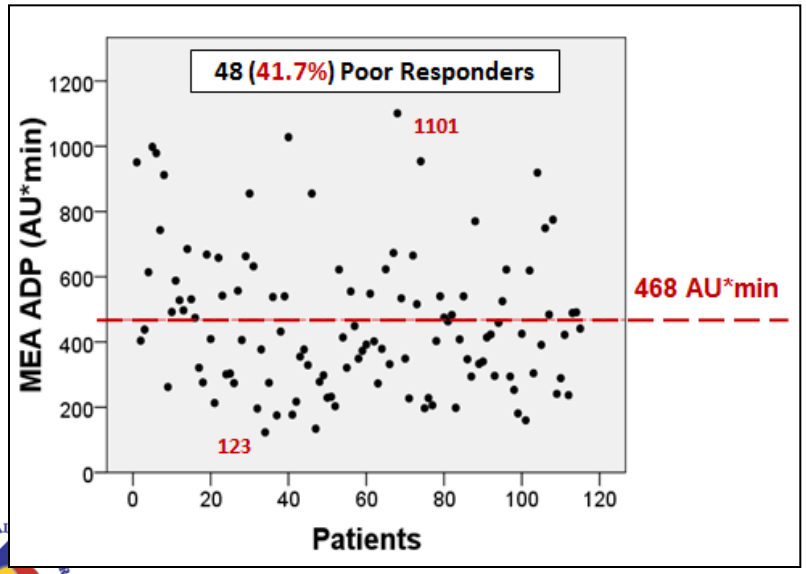
- Primary outcome mortality at 1 year (ITT)

- 271 (300) patients recruited to date.

Data on generic clopidogrel…







Mejin M, Ong TK, Fong AYY ,et al. YIA Presentations. NCCR 2013, KL

ACS !!!

Table 5.1 Outcomes for patients with ACS by year, NCVD-ACS Registry, 2006-2008

	+Outcome	Overall outcome			
		Outcome at discharge		30-day**	
		No.	%	No.	%
2006	Alive	3169	93	2615	76
	Death	253	7	807	24
2007	Alive	3355	92	2920	80
	Death	291	8	726	20
2008	Alive	2621	92	2435	85
	Death	230	8	416	15
Overall	Alive	9145	92	7970	80
	Death	774	8	1949	20

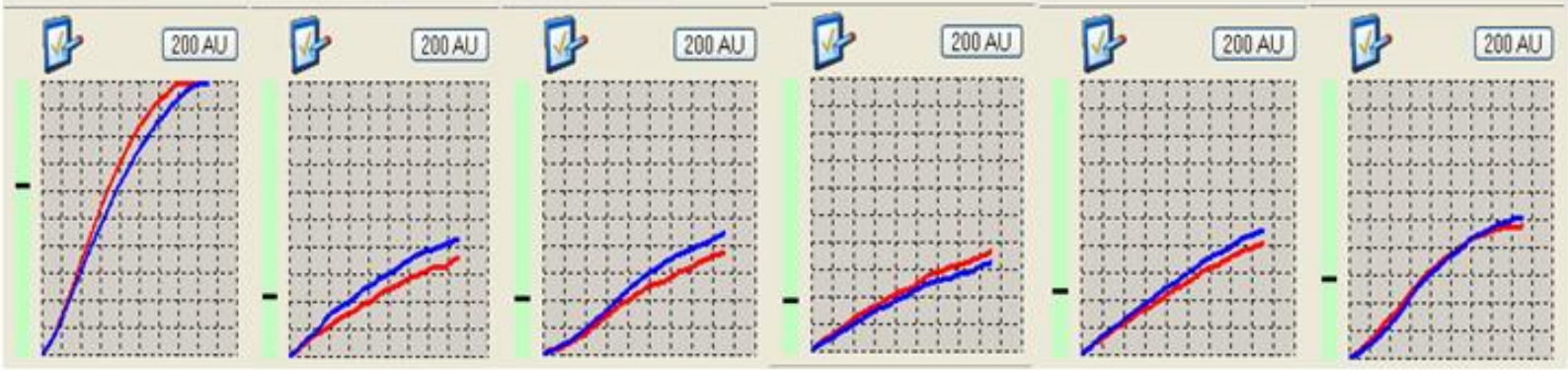
+ The outcome data is derived based on data matching with the National Death Register

**Includes patients who died in-hospital*

ANNUAL REPORT OF THE NCVD-ACS REGISTRY 2007 & 2008

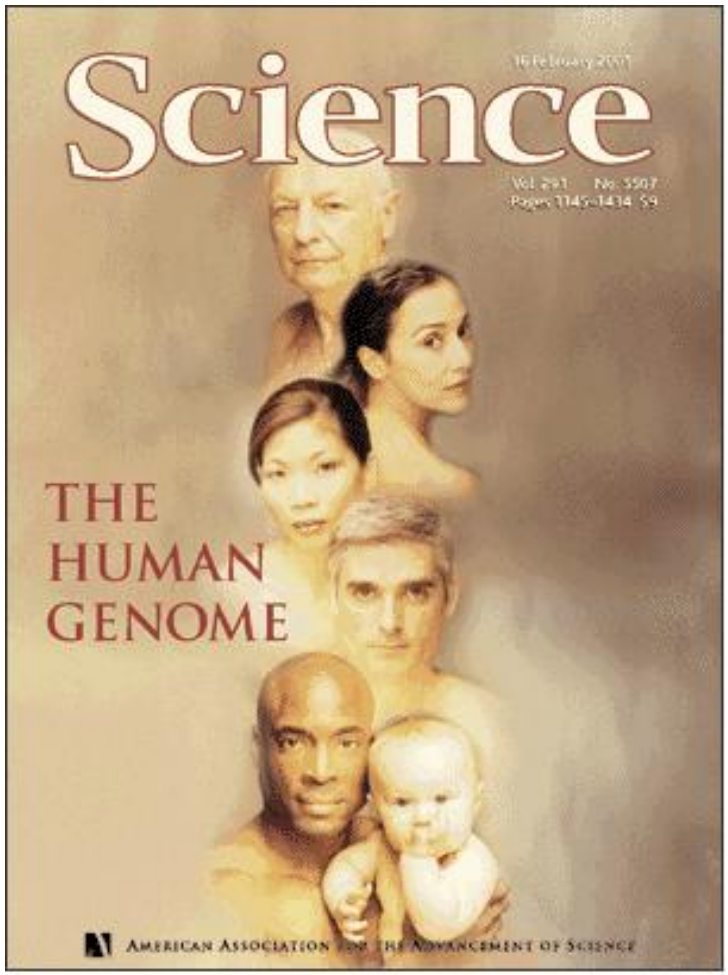
Pharmacodynamics: Prasugrel site experience

Baseline	2 hours after loading dose (60mg)	4 after hours loading dose (60mg)	8 hours after loading dose (60mg)	12 hours after loading dose (60mg)	24 hours after loading dose (60mg)
1125 AU/min	**402 AU/min**	**383 AU/min**	**345 AU/min**	**420 AU/min**	**519 AU/min**
Patient ID :	Patient ID :	Patient ID :	Patient ID :	Patient ID :	Patient ID :
Test name :	**Test name :**	**Test name :**	**Test name :**	**Test name :**	**Test name :**
ADPtest (Hirudin blood), V1	ADPtest (Hirudin blood), V1	ADPtest (Hirudin blood), V1	ADPtest (Hirudin blood), V1	ADPtest (Hirudin blood), V1	ADPtest (Hirudin blood), V1
Start : / Runtime :	Start : / Runtime :	Start : / Runtime :	Start : / Runtime :	Start : / Runtime :	Start : / Runtime :
24. Jun. 2013, 10:16 / 6'00"	24. Jun. 2013, 12:13 / 6'00"	24. Jun. 2013, 14:26 / 6'00"	24. Jun. 2013, 17:50 / 6'00"	24. Jun. 2013, 21:46 / 6'00"	25. Jun. 2013, 10:21 / 6'00"
Area under the curve :	**Area under the curve :**	**Area under the curve :**	**Area under the curve :**	**Area under the curve :**	**Area under the curve :**
1125 AU*min.	**402 AU*min.**	**383 AU*min.**	**345 AU*min.**	**420 AU*min.**	**519 AU*min.**
Aggregation :	Aggregation :	Aggregation :	Aggregation :	Aggregation :	Aggregation :
RUO: 209.3 AU	RUO: 78.0 AU	RUO: 81.0 AU	RUO: 68.3 AU	RUO: 85.5 AU	RUO: 98.3 AU
Velocity :	Velocity :	Velocity :	Velocity :	Velocity :	Velocity :
RUO: 22.0 AU/min.	RUO: 9.4 AU/min.	RUO: 8.1 AU/min.	RUO: 6.9 AU/min.	RUO: 7.6 AU/min.	RUO: 12.0 AU/min.
CC=0.999, DIF=4.487%	CC=0.998, DIF=10.945%	CC=0.999, DIF=8.877%	CC=0.999, DIF=6.377%	CC=1.000, DIF=5.589%	CC=0.998, DIF=0.771%



Pharmacodynamics: Ticagrelor site experience

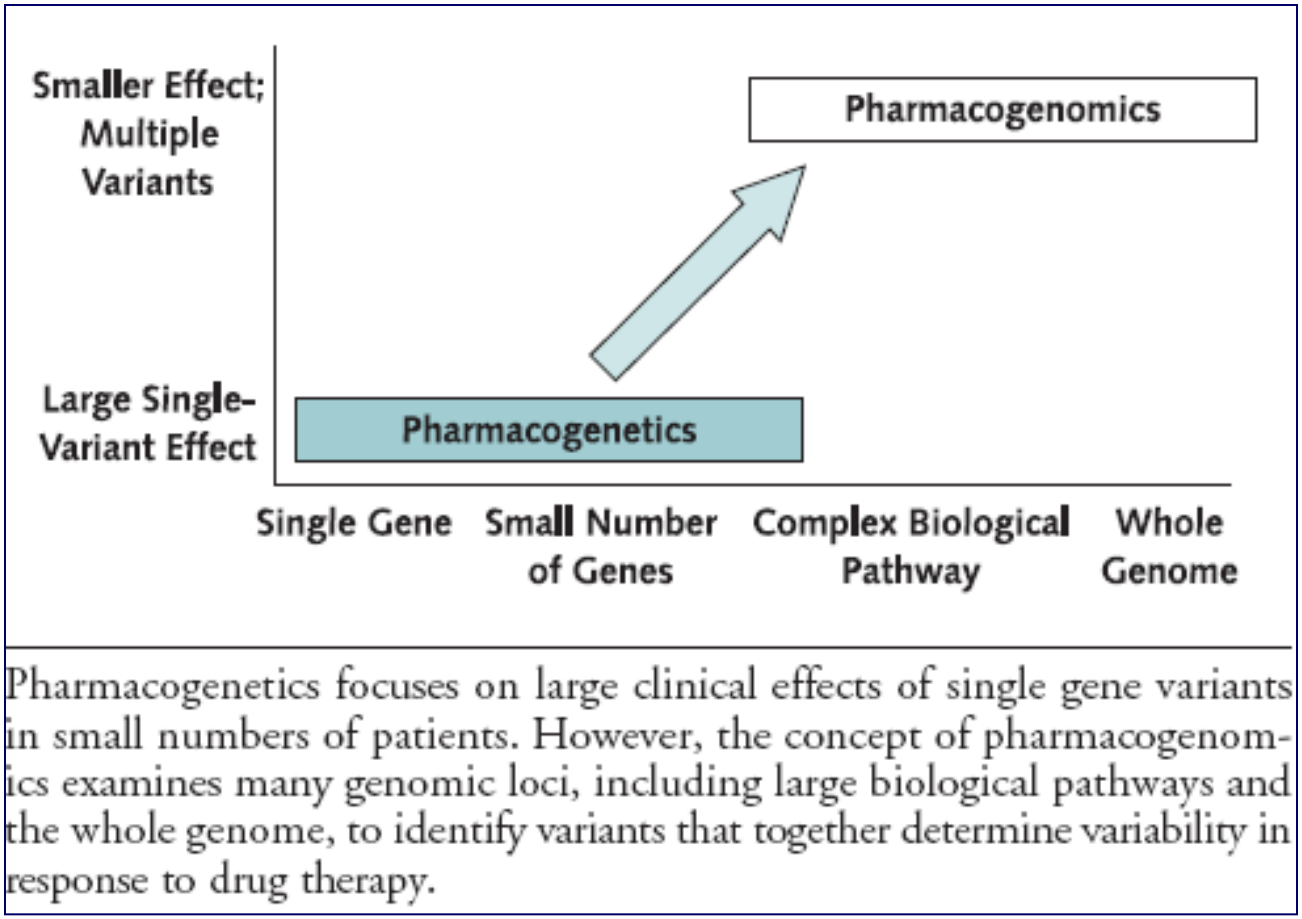
The new jumpstart in therapeutics



Science, 16 February 2001

Newsweek, 25 June 2001

Pharmacogenetics vs Pharmacogenomics

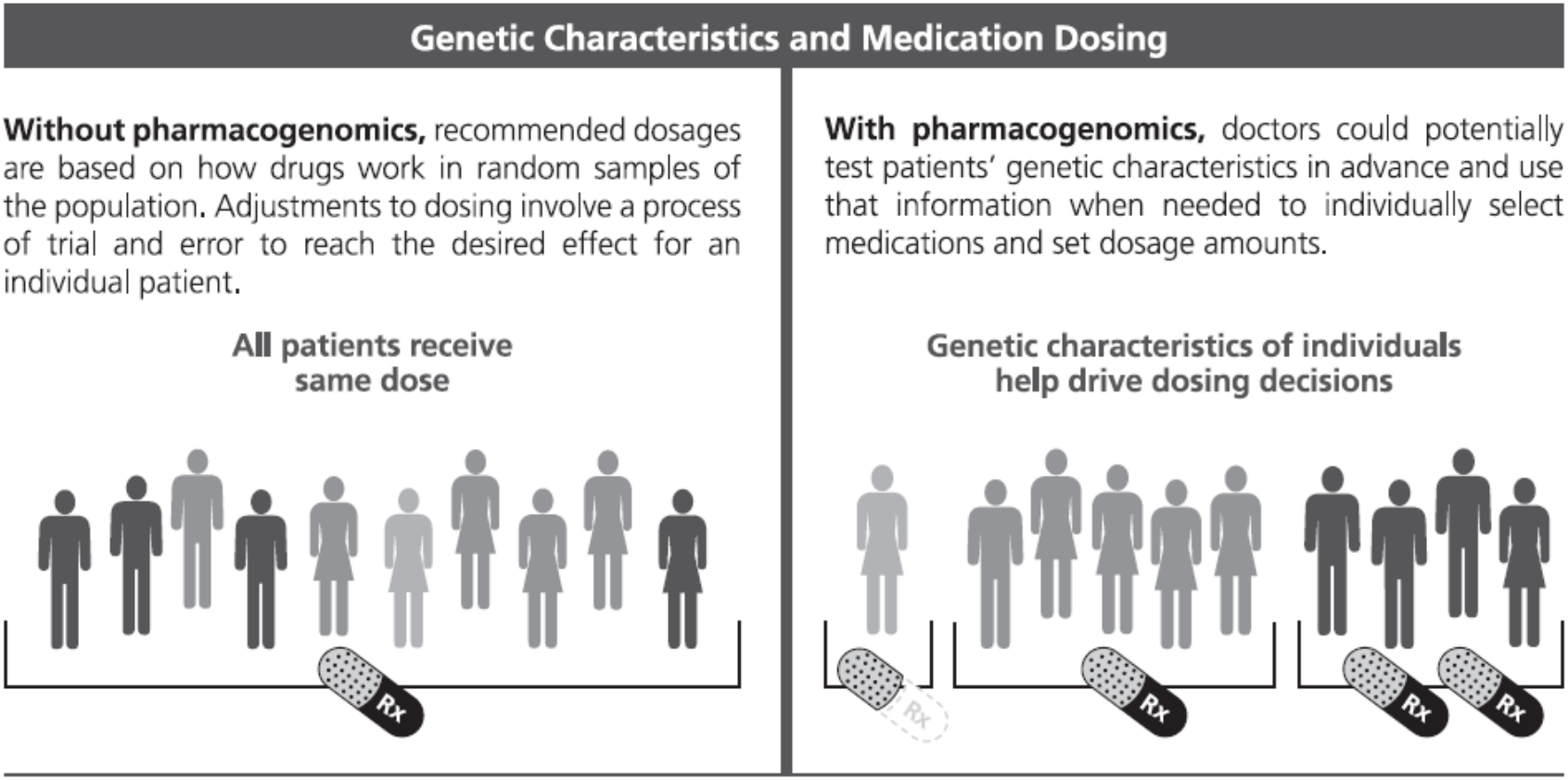


Pharmacogenetics focuses on large clinical effects of single gene variants in small numbers of patients. However, the concept of pharmacogenomics examines many genomic loci, including large biological pathways and the whole genome, to identify variants that together determine variability in response to drug therapy.

Ann Intern Med. 2006;145:749-757.

Drilling down…

Everyone is so different! (Subtyping patients)



Source: Adapted from Felix W. Frueh, U.S. Food and Drug Administration, "Personalized Medicine, What Is It? How Will It Affect Healthcare?" slides from the 11th Annual FDA Science Forum, April 26, 2005; available at www.fda.gov/Cder/genomics/scienceForum2005.pdf.

Pharmacogenomics = less waste ($ and life!)

Drug Class	Frequency of Absent or Incomplete Efficacy (%)[1]	Total Market Size	Cost to the Health Care System of Ineffective Therapy
Angiotensin-converting enzyme (ACE) inhibitors	10-30	$3.9B[2] (2003)	$390M-$1.2B
Beta blockers	15-25	$ 2.3B[2] (2003)	$345M-575M
Anti-depressants	20-50	$11.7B[3] (2003)	$2.3B-$5.8B
Statins	30-70	$12.6B[4] (2004)	$3.8B-$8.8B
Beta agonists	40-70	$1.4B[5] (2004)	$560M-$1B

[1] *Ross JS & Ginsburg GS, Am J Clin Pathol 2003;119:26-36*
[2] *Datamonitor, August 1, 2005*
[3] *Global Industry Analysts, October 10, 2004*
[4] *Carnegie Research*
[5] *Specialty Pharmaceutical Pulse, SG Cowen, October 2005*

Sarawak General Hospital

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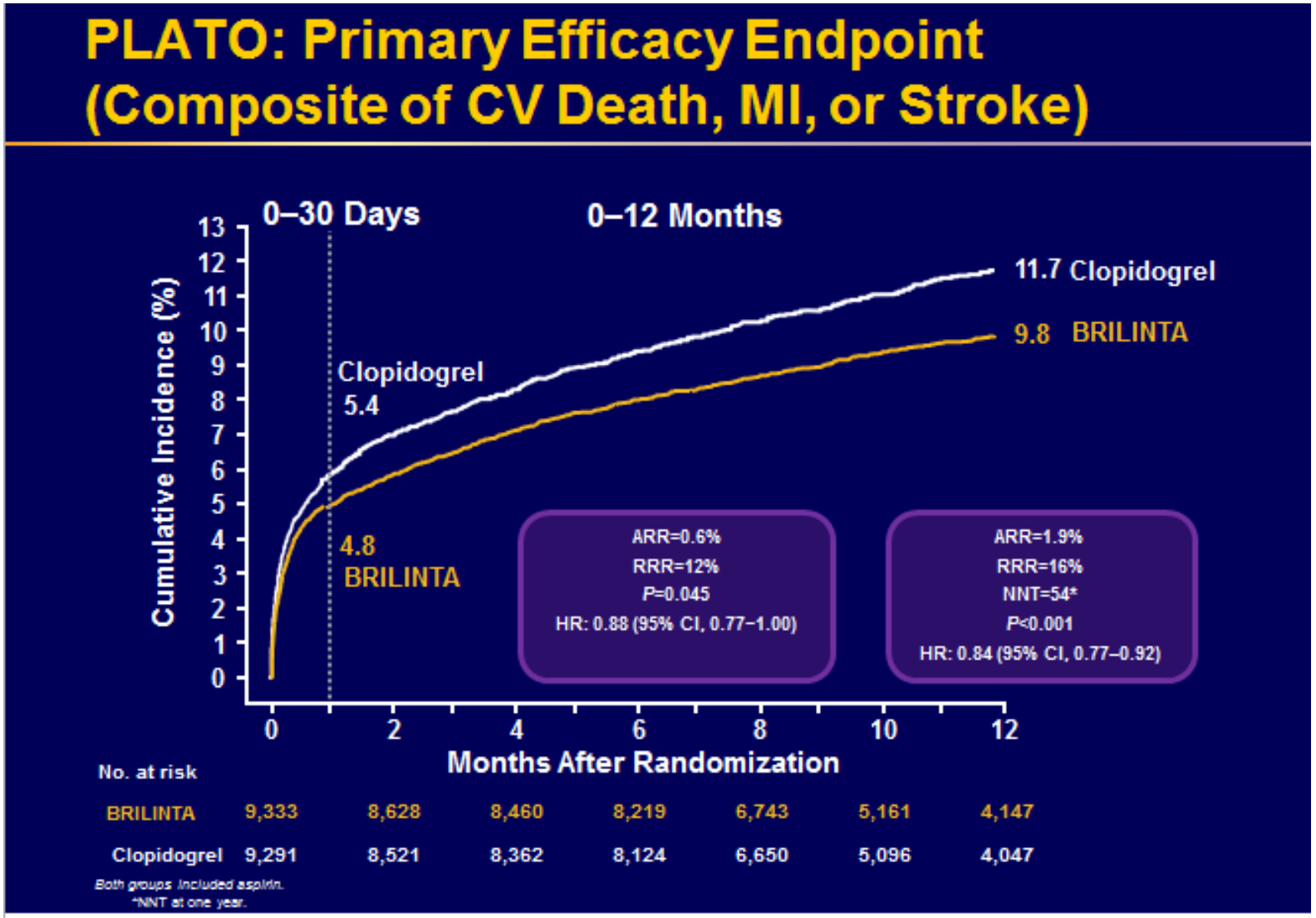
9 – 12 April 2015

Spares

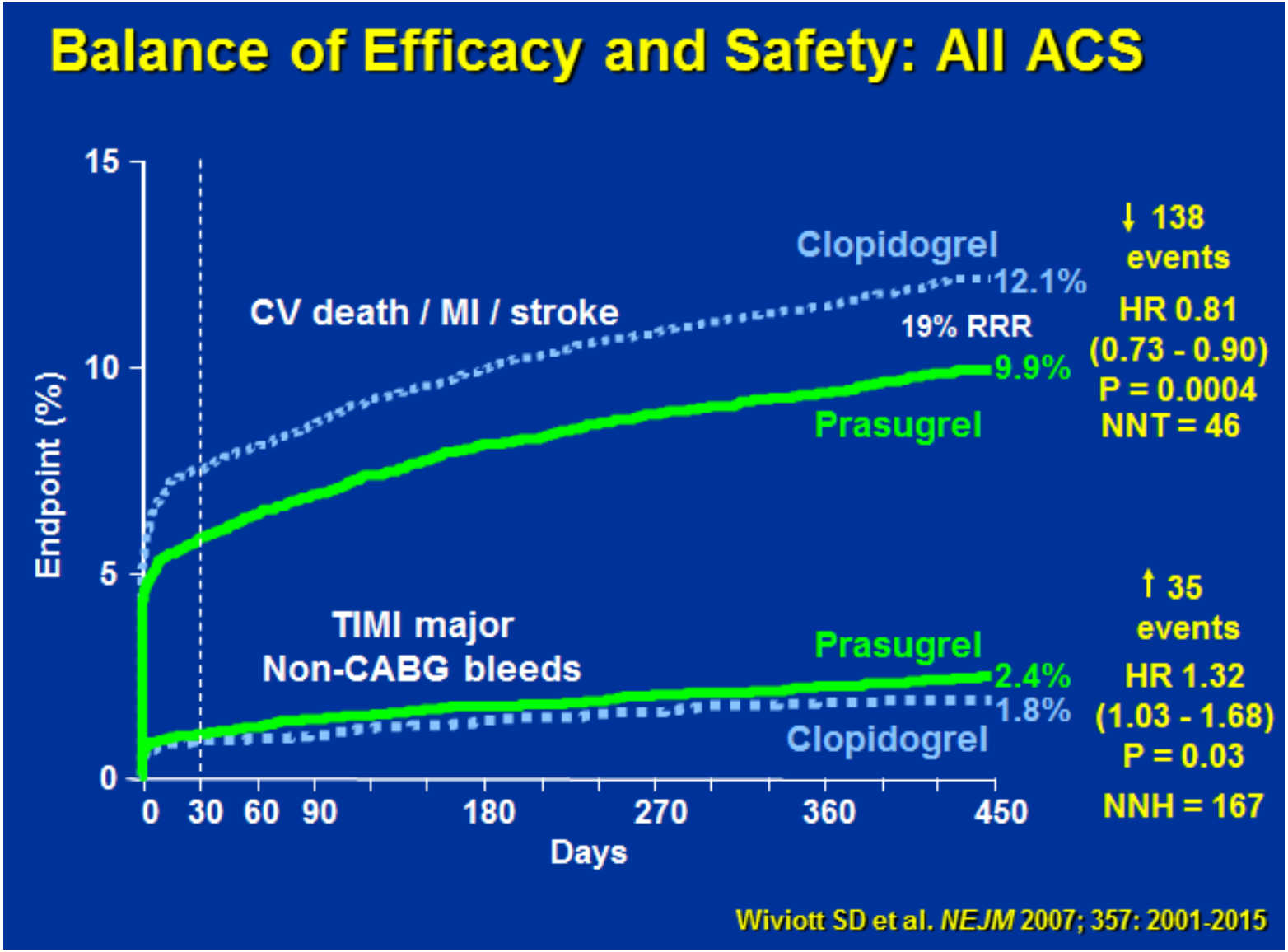
Ticagrelor in ACS



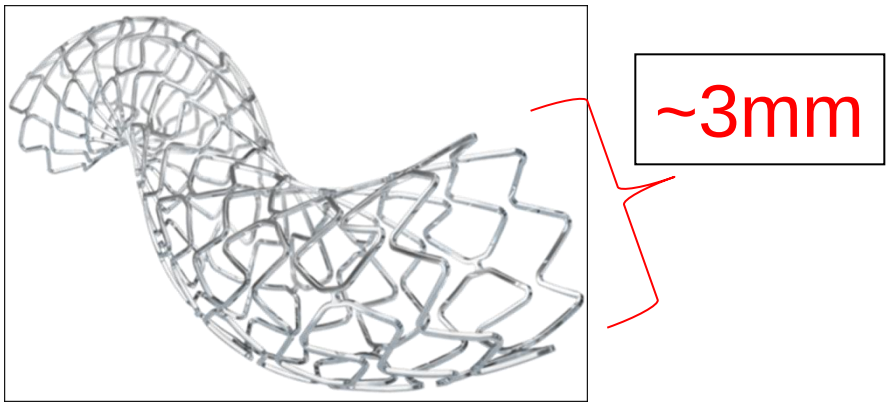
Wallentin L, et al. *N Engl J Med*. 2009;361:1045–1057.

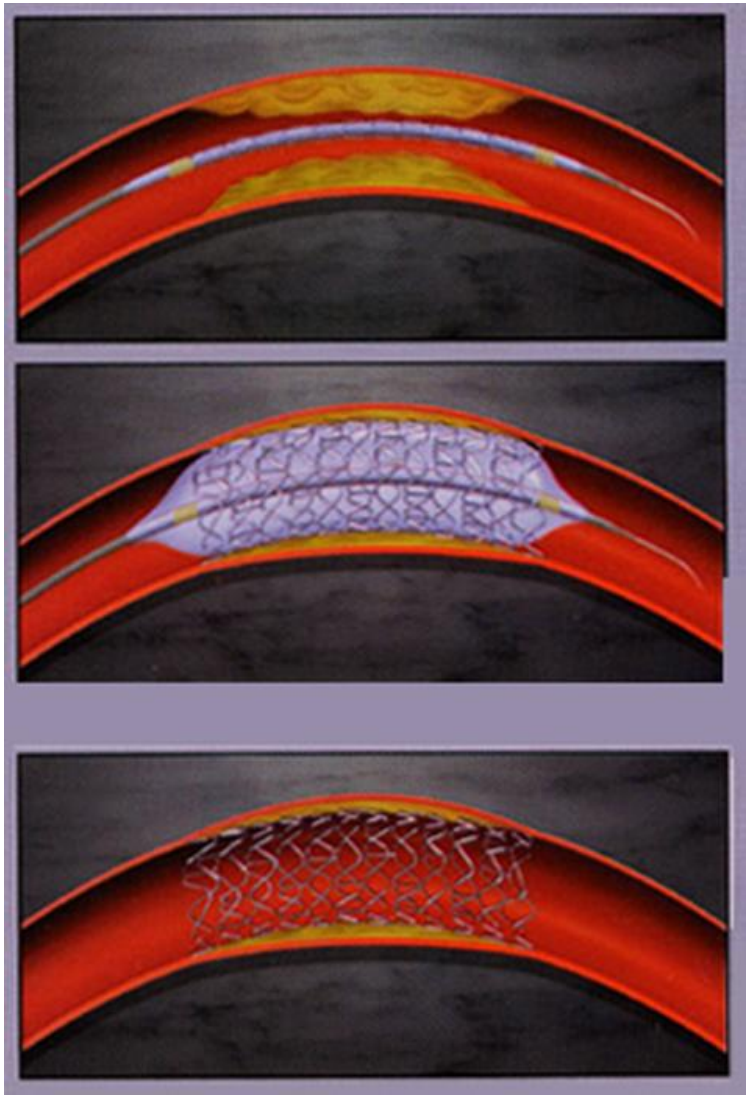
PLATO

Prasugrel in Triton-TIMI38



Targeting the problem: I am a plumber….





Stent thrombosis rates

- Exponential drop in the last 20 years
  - 24%, Serruys, 1991
  - 6% (+ ASA & OAC), Schatz, 1991
  - 0.9% (+ ASA & Clop), Cutlip, 2001
  - 0.4% (+ ASA, Clop, Newer stents), Kedhi, 2010
  - 0.3% (+ ASA, Clop, Newer stents), Stone, 2010

- Newer antiplatelets & diagnostics
  - Prasugrel, Ticagrelor
  - POC Genotyping for CYP2C19 allelic variants