

Knowledge translation “Peripheral arterial disease”



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Peripheral arterial disease (PAD)

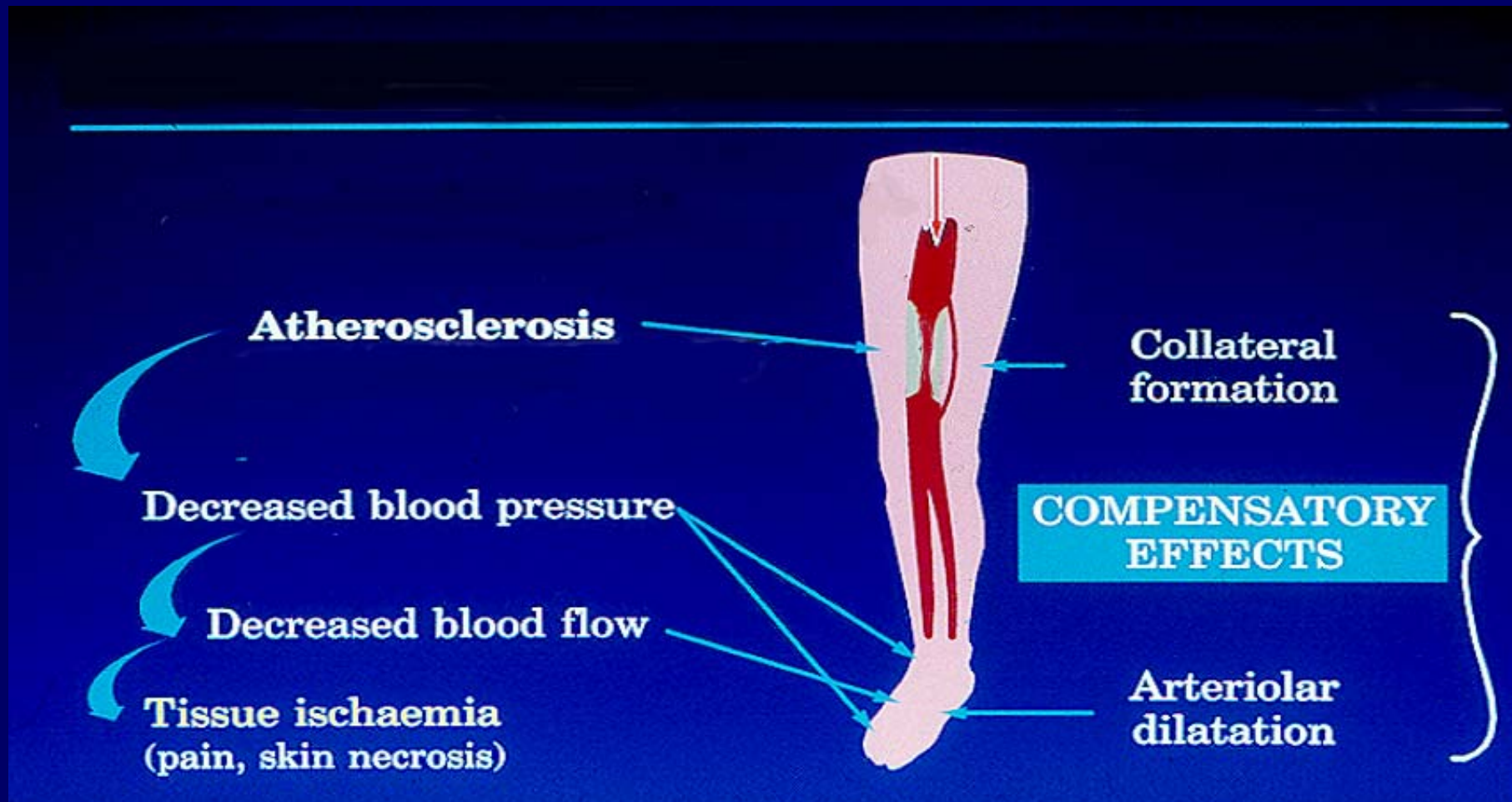
- Definition: encompass a large series of disorders that affect arterial beds exclusive of coronary arteries.(AHA guideline 2005)
- Practical definition: arterial insufficiency of leg (TASC 2007)
- The most severe form of PAD both morbidity and mortality is PAD in DM group.

Introduction

- PAD: Circulatory disorder caused mainly by atherosclerosis that limits blood flow to the limbs



Pathophysiology of PAD



Clinical feature

Initially

“Intermittent claudication
(IC)”

- Pain at calf, thigh,
buttock on exercise
- Relieve by a few minute
rest



Critical limb ischemia (CLI)

Rest pain-Ulcer - Gangrene



Arterial occlusion



Palpate pulse is a must.

“เห็นแผลต้องทำแผลๆๆๆๆ”

Do not confuse your own pulse

Ankle brachial index (ABI)

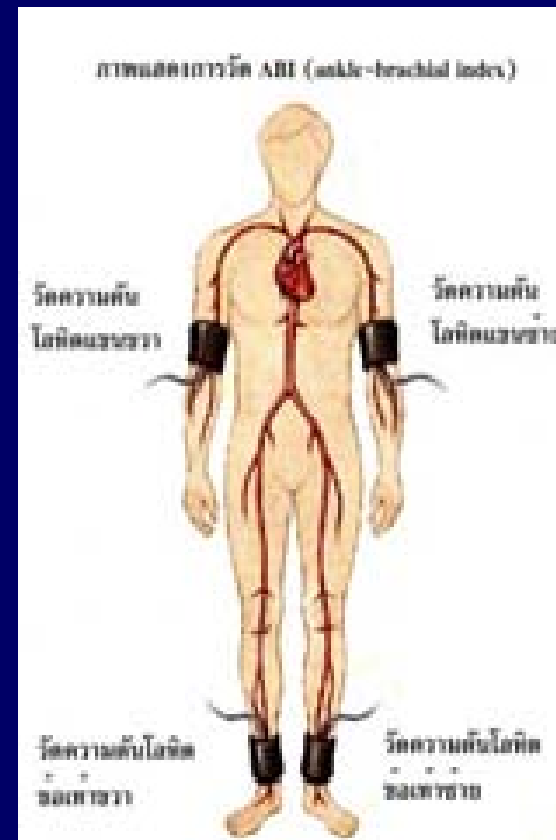
Measure systolic pressure (Ps) by Doppler

$$\text{ABI} = \frac{\text{Ps of ankle artery}^*}{\text{Ps of brachial artery}} \quad \text{ABI} < 0.9 = \text{PAD}$$

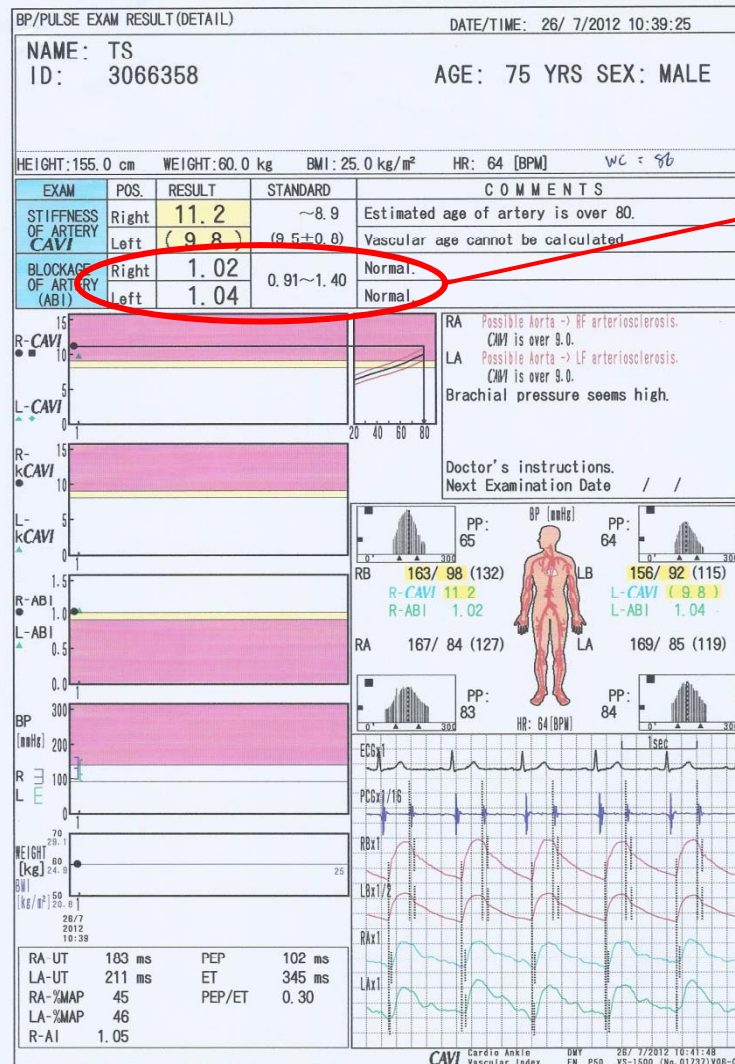


เครื่องตรวจสมรรถภาพหลอดเลือดอัตโนมัติ

(Automatic Ankle Brachial Index machine;ABI)



ผลที่ได้จากการตรวจ



ค่าปกติ 0.91-1.40

Angiogram



CTA

DSA

- Digital subtraction angiogram (DSA)- gold standard
- CT angiogram (CTA)
- MR angiogram

Treatment: Revascularisation

Percutaneous Angioplasty
(PTA, stenting)

Re-Opening of Femoral Occlusion Using PTA

Occlusion in
femoral artery

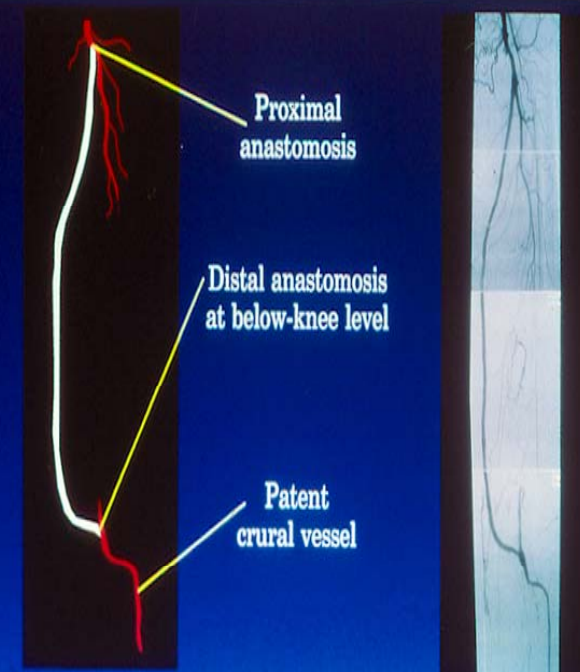


Occlusion successfully
re-opened



Bypass surgery

Examples of Graft Procedures (II): Femoro-Popliteal Bypass Using *In Situ* Vein Graft



The Case For Primary Amputation

Severe ischaemia and
extensive tissue loss



PLUS

No run-off below
femoral artery



Very flailed patients

Amputation





A 35 years old diabetes lady with hemodialysis dependent had had a gangrene of Rt 5th toe . Then she was amputated this toe, but the necrosis progress further to right 3rd &4th toes. Again she was amputated these toes. Then she was referred because her doctor could not feel pedal pulse and suspect arterial occlusion.

Osteolytic lesion “Osteomyelitis”



CT angiogram



Angioplasty with stent but wound fail to healing



stent

“wound healing with pulsatile flow”

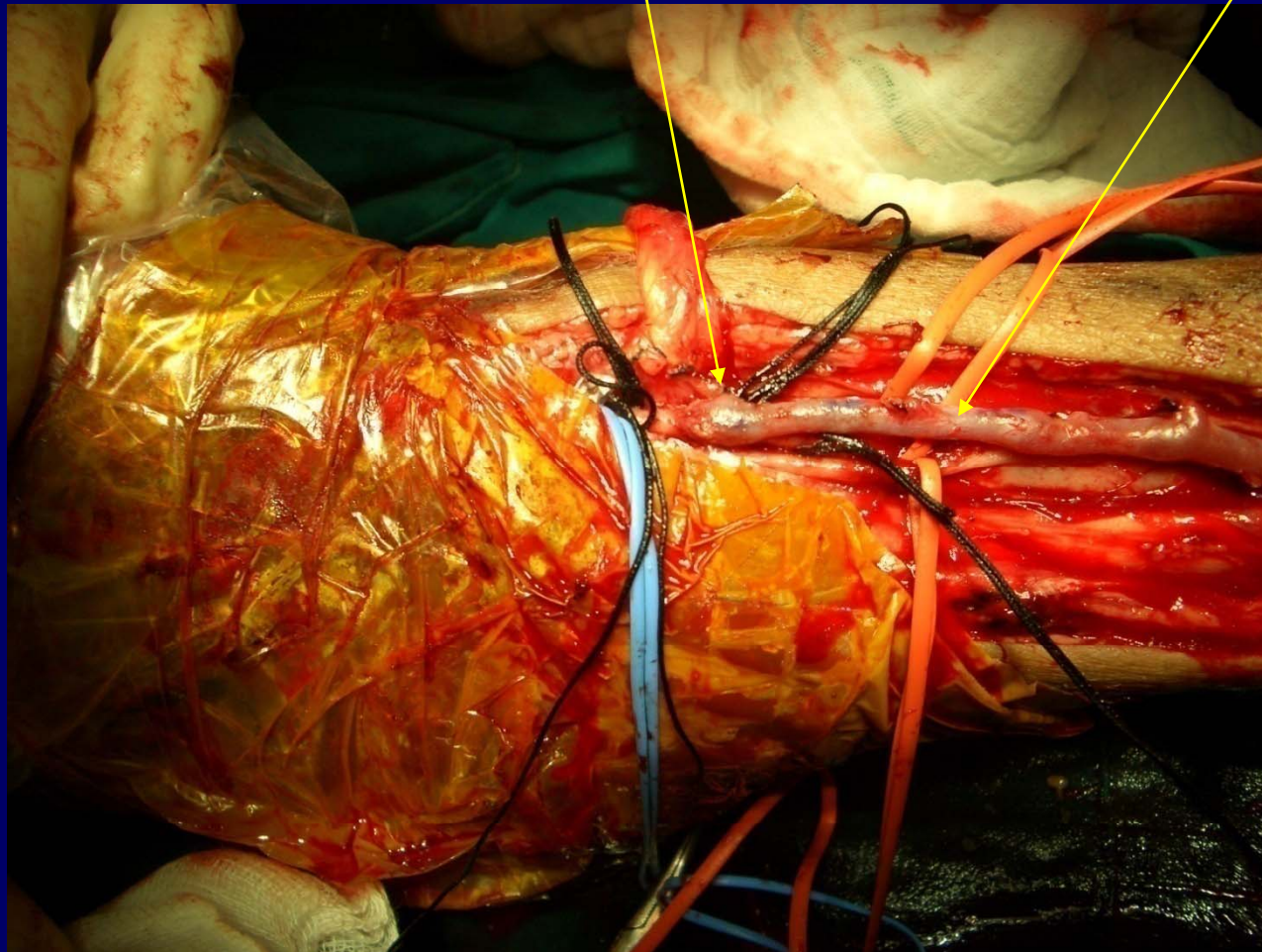
Occlusion all tibial vessel run off at dorsalis pedis



Left femoropedal bypass graft with non-reverse saphenous vein

anastomosis

vein



1 month after bypass



Preoperative and postoperative wound one month after operation in preparing for stump management

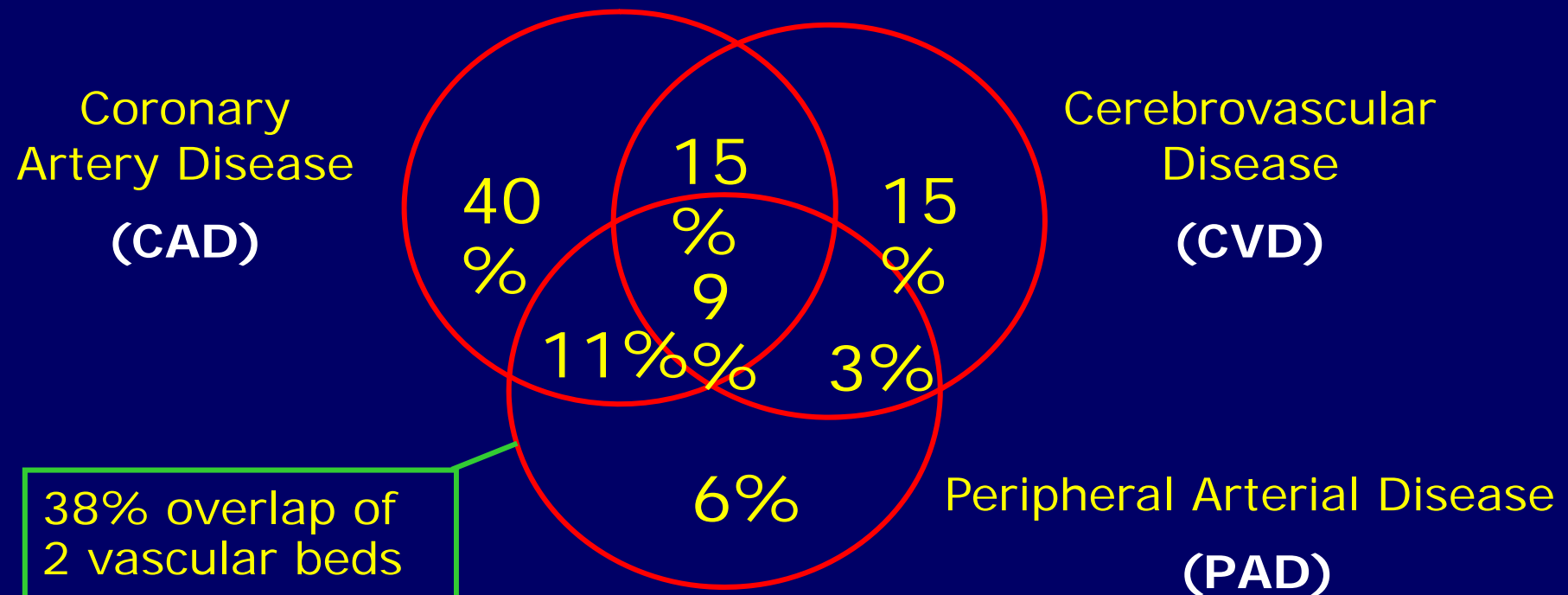


Patients expired after due to MI 3
days after 1 month follow up



Overlap of Atherosclerotic Disease

Generalized disease

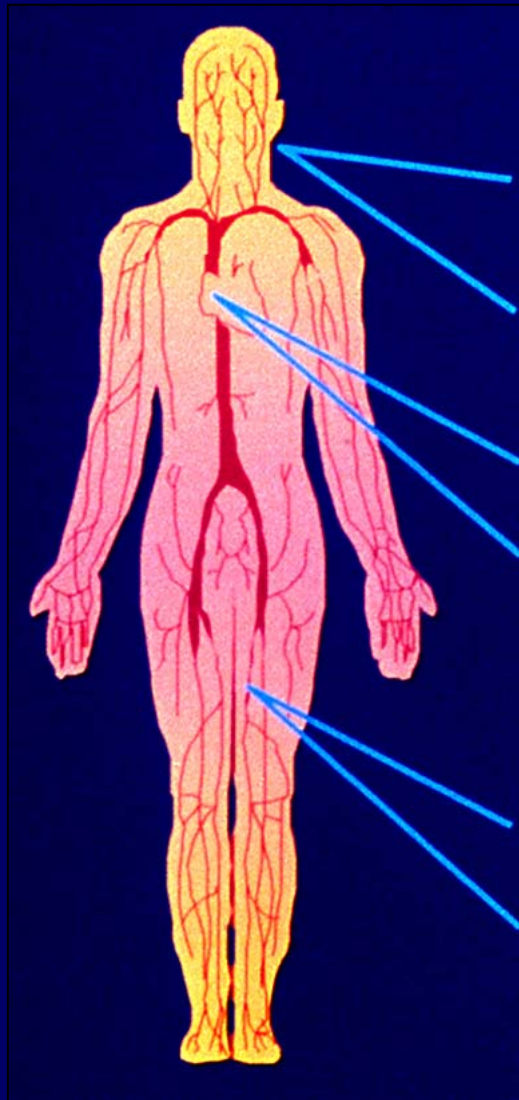


Ness J, Aronow WS. J Am Geriatric Soc. 1999;47:1255-1256.

N = 1802 patients

Mean age = 80 yrs

Major Clinical Manifestations of Atherosclerotic Disease



- Ischemic stroke
- Transient ischemic attack
- Myocardial infarction
- Angina pectoris (stable, unstable)
- Claudication
- Critical limb ischemia, rest pain, gangrene, necrosis

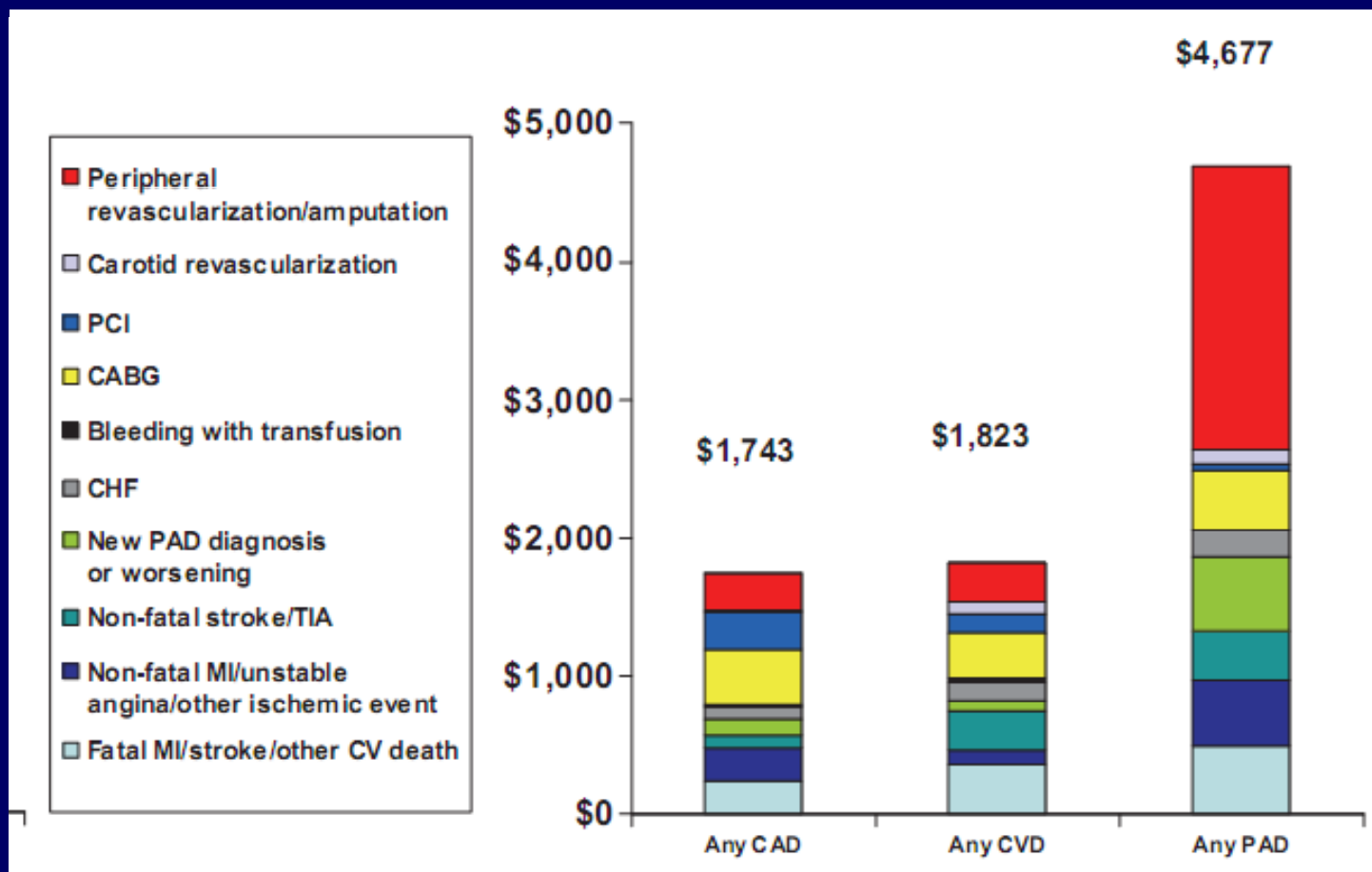
One year CV outcome REACH registry

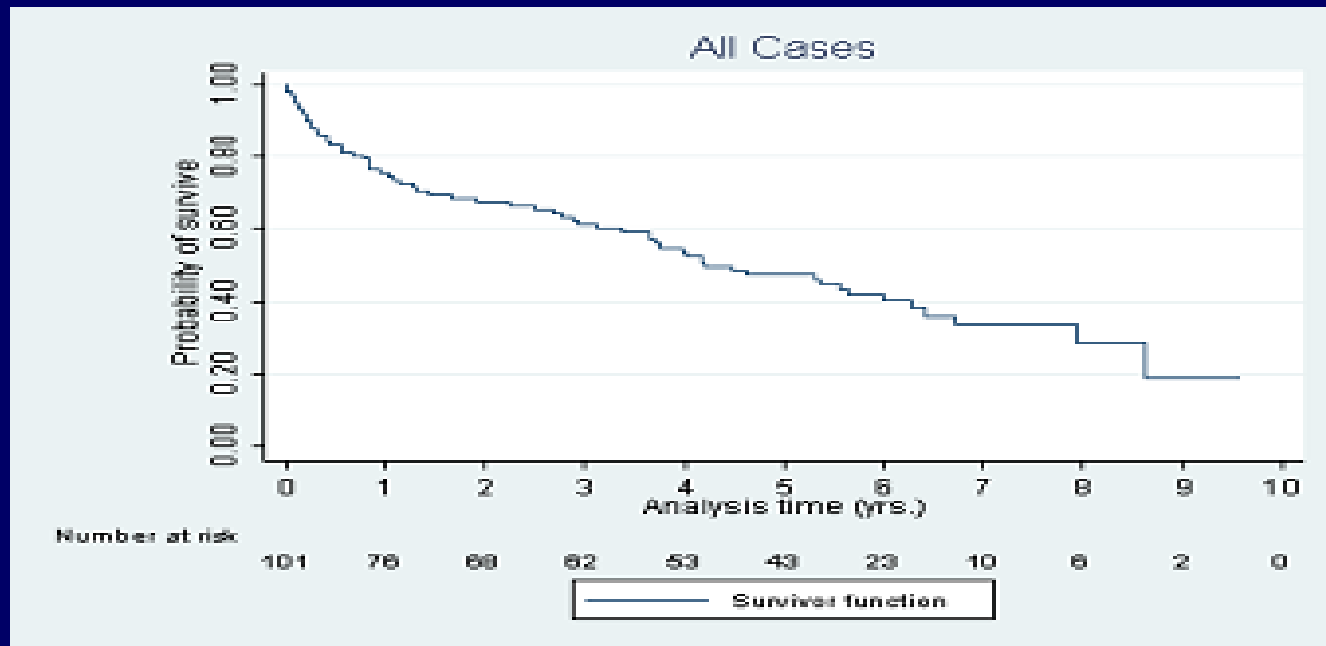
Event	Overall Single Disease Bed (n = 42 716)	CAD Alone (n = 28 867)	CVD Alone (n = 10 603)	PAD Alone (n = 3246)
All-cause mortality	2.45 (2.23-2.68)	2.42 (2.17-2.68)	2.55 (2.18-2.91)	2.39 (1.82-2.96)
CV death	1.58 (1.39-1.76)	1.58 (1.38-1.79)	1.62 (1.32-1.91)	1.37 (0.93-1.81)
Nonfatal MI	1.12 (0.97-1.28)	1.37 (1.17-1.57)	0.51 (0.35-0.67)	1.00 (0.61-1.39)
Nonfatal stroke	1.54 (1.36-1.73)	0.86 (0.72-1.00)	3.60 (3.10-4.09)	0.81 (0.49-1.14)
CV death, MI, or stroke	4.07 (3.78-4.36)	3.64 (3.34-3.94)	5.54 (4.98-6.09)	3.06 (2.41-3.71)
CV death, MI, stroke, or hospitalization for atherothrombotic event(s)†	12.58 (12.12-13.04)	13.04 (12.52-13.57)	9.87 (9.24-10.50)	17.44 (16.10-18.75)

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Average 1 yr cost in REACH registry





Our 5 year cohort 107 DM patients:
In 3 years, the mortality is 56.6% (survival 43.4%) in PAD-DM. All deaths are due to coronary artery disease.

Diabet. Med. 28, 608–611 (2011)

การค้นหา คัดกรองโรค PAD

1. การตรวจ ABI ใน high risk group

การศึกษาในโรงพยาบาลภาครัฐ

- คนเป็น **DM** จากการทำวิจัย **screen** 2200 คน โดยทุนสนับสนุนจาก สวรส.-วช. 2557 พบจาก
คณะแพทย์ มช. 1000 คน (15.2%) และ
โรงพยาบาลลำพูน 850 คน โรงพยาบาลเชียงราย
ประชานุเคราะห์ 350 คน (10.0%)

การศึกษาในโรงพยาบาลภาคเอกชน

การศึกษาตรวจวัดสมรรถภาพหลอดเลือด

- ผู้ที่มีอายุมากกว่า 45 ปีขึ้นไป
 - เป็นโรคเบาหวาน
 - มีความดันโลหิตสูง
 - ไขมันในเลือดสูง
 - สูบบุหรี่
 - ผู้ที่มีสมาชิกในครอบครัวเป็นโรคหลอดเลือดหัวใจ
- และหลอดเลือดสมองก่อนวัยอันควร

The study to detection of early atherosclerosis

- 2029 people attended for the health check up program
- Detection by Doppler ultrasound: ankle brachial index and arterial stiffness (CAVI)
- Overall abnormality 50%

(P Kumyongyuen ,the 6th Asian Chapter Congress of IUA 2005. poster 09)

- 1. การตรวจ ABI ใน high risk group
(ต่อ)

- CAD, CVD

2. คนทุกคนที่มีพยาธิสภาพที่เท้าควรคลำชีพจรที่เท้า

3. คนที่มีอาการ rest pain โดยเฉพาะ
gangrene ต้องรีบส่งมาศูนย์การแพทย์

Conclusion

PAD

- High morbidity (amputation), mortality
- Easily detection by palpation of pedal pulse and ABI

ขอขอบคุณ

ได้รับทุนทำการศึกษาจาก



สถาบันวิจัยระบบสาธารณสุข (สวรส.)
Health Systems Research Institute (HSRI)



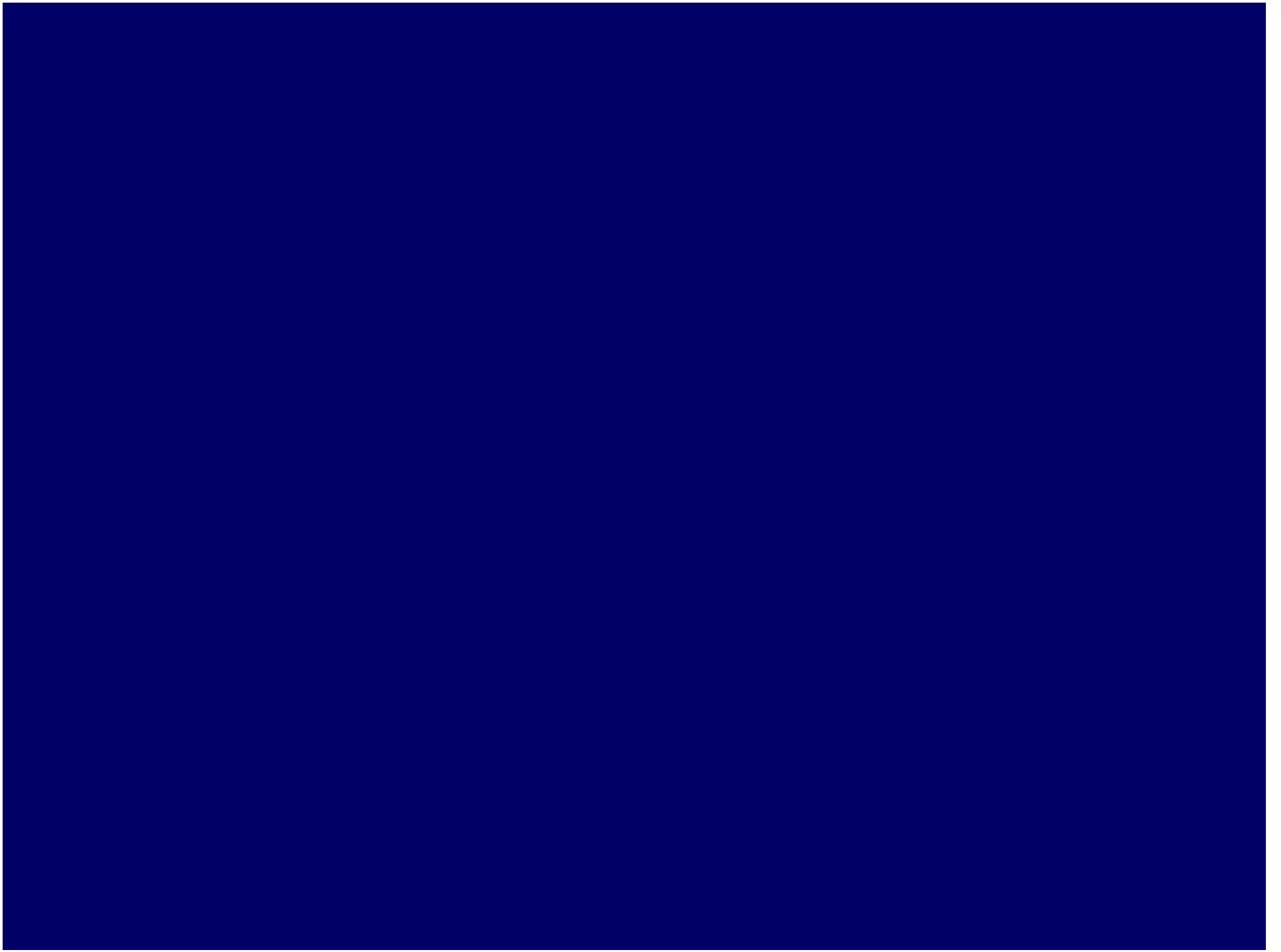
วช.
NRCT



สำนักงานกองทุนสนับสนุน
การวิจัยเพื่อสุขภาพ

Thank you





Topic

- Peripheral arterial disease
- Diabetic foot

Unique to Diabetics

Neuropathy:
Sensory
Motor
Autonomic

**Impaired
Wound Healing**

Vascular Disease
Macrovascular Occlusive
Microvascular Dysfunction

Abnormal Response Infection
Cellular & Humoral Abnormalities
Loss of Regulatory Functions
and Reflexes



Diabetic Foot Wounds

Evidence Based Treatments

- **Off Loading**
- **Debridement**
- **Dressings**
- **Antibiotics**
- **Vascular Reconstruction**
- **Reconstructive Foot Surgery vs. Amputation**

- **Adjunctive Therapies**
- **Normalization of Blood Sugar**
- **Control Comorbid Conditions**
- **Treatment of Edema**
- **Nutritional Support**
- **Physical & Emotional Therapy**

ADA Consensus: Diabetes Care Aug 1999

- Before 2005, each specialist at our center worked independently rather than as a member of a multidisciplinary team.
- For instance, surgeons treating patients with ulcers tended to take care of the ulcer by surgical debridement without any significant input from other specialists in metabolic control or finding the footwear to achieve for offloading.



Multidisciplinary team for diabetic foot

From 2005 A foot care team was formed, consisting of endocrinologists, a rehabilitation physician, a family doctor, nurses, and plastic and vascular surgeons. This team met monthly to develop coordinated strategies for improving access to and utilization of appropriate foot care services.

- From 2005 a diabetic-foot protocol (DFP) was developed and used by multidisciplinary team. We developed our protocol based on many articles in the literature.
- Practice guidelines were developed to address criteria for diagnosis, risk factor assessment, treatment options, therapeutic targets, monitoring, and follow-up.



Rerkasem. Int J lower Extremity Wound 2011;10:86-90



Nurse: take care wound,
callus removal, educate,
follow protocol



Group therapy



Home visit



- Foot care education took 10 to 20 minutes for each patient, including verbal and written instructions

Wash feet daily with warm water and mild soap



Inspect your feet daily



Apply a moisturizing cream after washing



Avoid walking barefoot, even in your house



Good shoes



bad shoes



Inspect your footwear to see whether any small object is caught in the shoe



Wear socks and make sure they are big enough



Do not wash or submerge your feet with hot water



If there is swelling, redness or pus, consult doctor immediately. Hotline



During cutting your nail, never poke down the edges or try to cure ingrown toenail yourself



Exercise your foot
regularly



Stop smoking



- Throughout the 2 periods 2003-2005 (standard (solo), 2005-2007 (DFP) we compared firstly the leg or foot amputation rate.
- The average incidence rates for the standard care and DFP period were calculated by dividing the number of amputation cases in the registries for each period by the sum of diabetes cases with foot lesions.

Table 3. The number of lower extremity amputations in each group (percentages in parentheses)

Type of amputation	DFP (N = 73)	Standard Care (N = 110)	P Value
Major amputation			
Above knee	0	3 (2.7)	0.28
Below knee	3 (4.1)	12 (10.9)	0.10
Minor amputation			
Toe	4 (5.5)	10 (9.1)	0.37
Transmetatarsal	0	4 (3.6)	0.15
Syme	0	1 (0.9)	1.00

NOTE: DFP = diabetic-foot protocol; N = total.

Rerkasem K Int J Low ext wound 2008;7: 88-92.

Type of amputation	DFP	Standard care	P-value*
Major amputation (BK, AK)	3.3%	13.6%	0.02
Minor amputation (toe amputation)	3.4%	15.8%	0.03

* Student T test

Rerkasem K Int J Low ext wound 2008;7:88-92

Why Thais seem to be more concern than USA data

1. Underrecognition: ratio IC: CLI

AHA data (2006) 17:1¹

Thai Report (2006) 1:4²

2. Undertreatment (low compliance):

HbA1C < 7%

USA 52.2%³

Thais 41.3%⁴

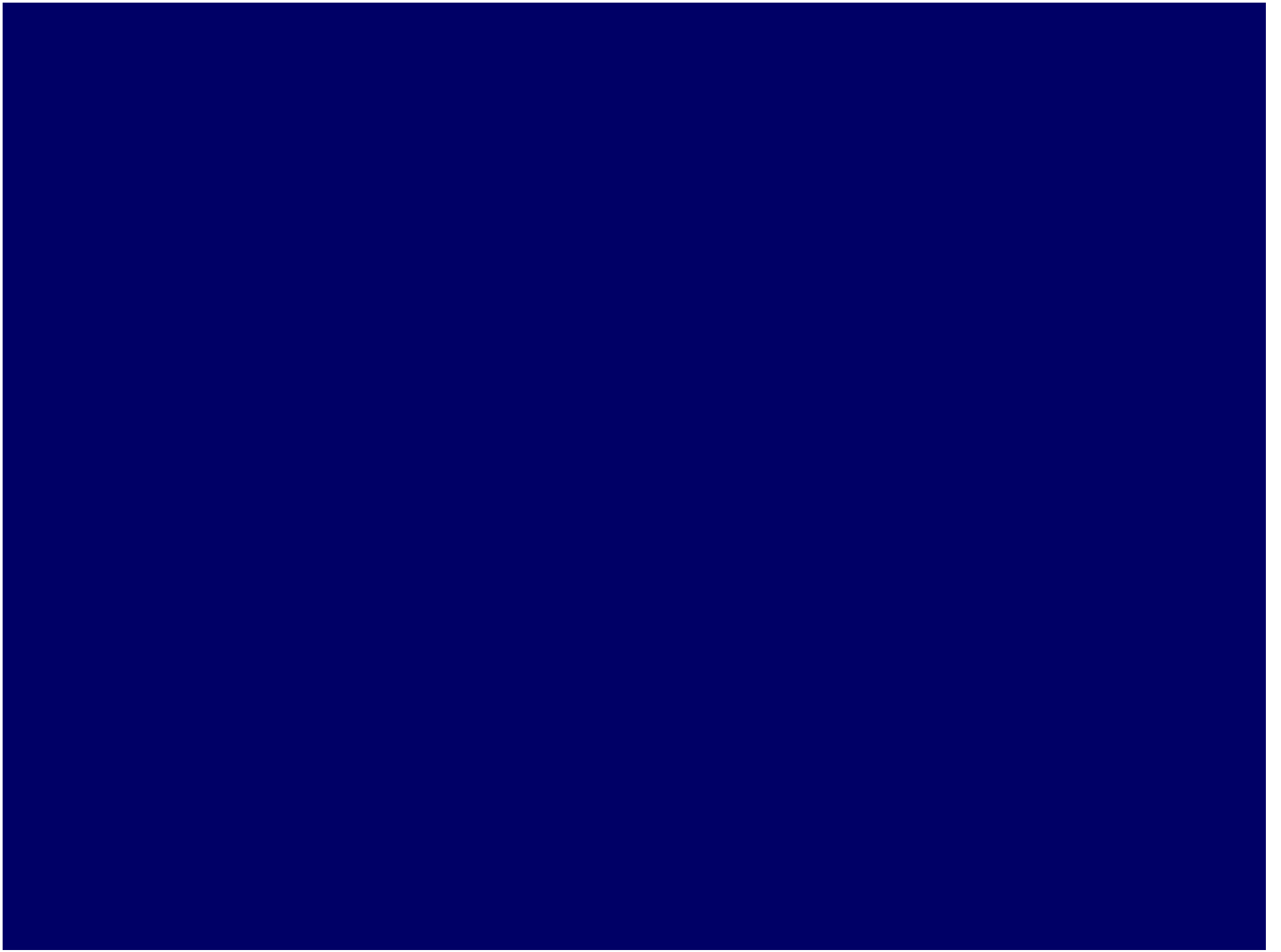
AHA: American Heart Association

¹ Am Coll Cardiol 2011;58:2020.

² J Med Assoc Thai 2006;89: 12

³ N.Engl.J Med 2013;368:1613

⁴ J Med Assoc Thai 2009;92:1094



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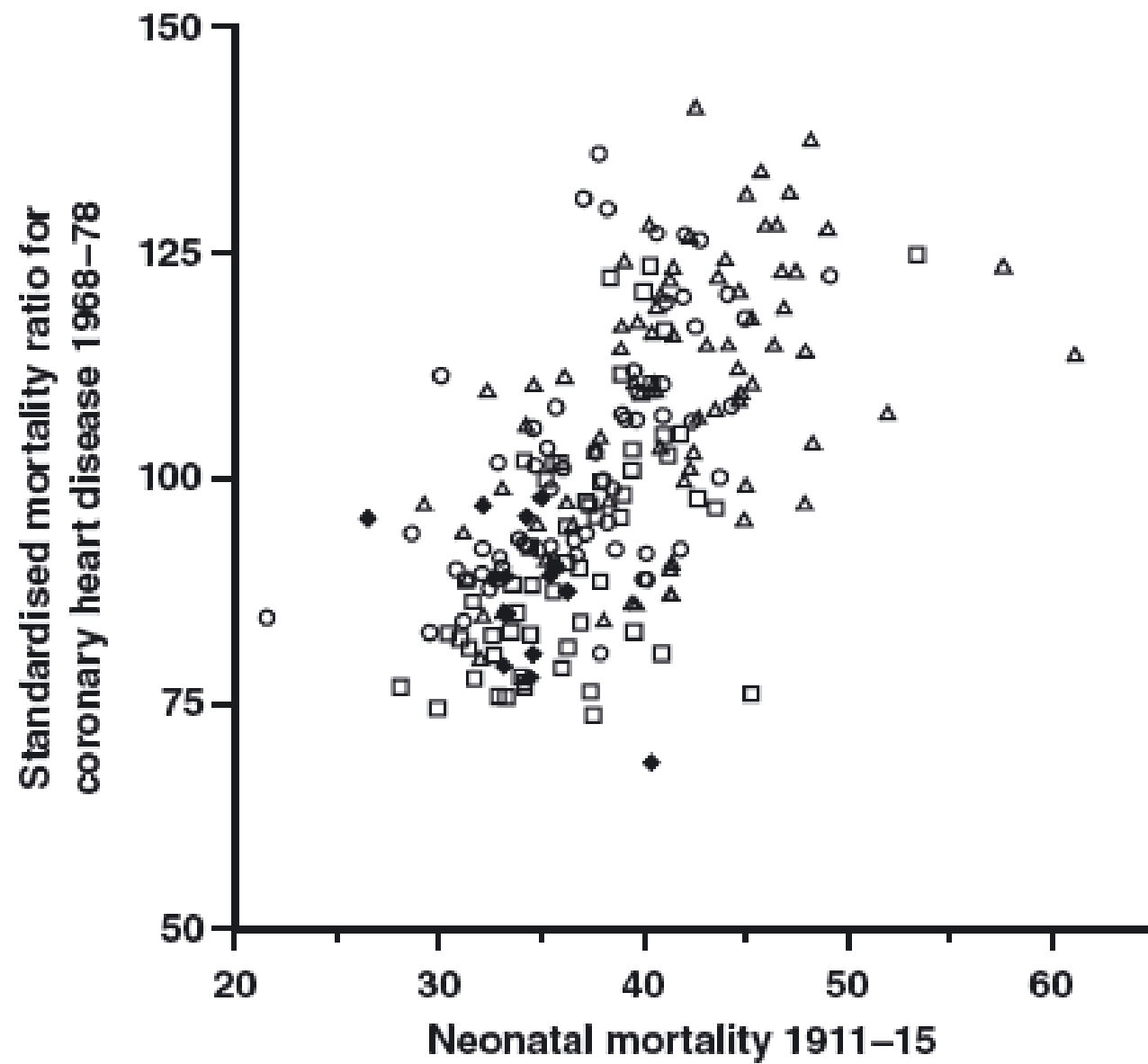
August 2011: Over 20 years ago, Professor David Barker came up with a way to predict the future of each and every one of us. He studied a group of people from Hertfordshire and found that birth weight was linked to future health.



ได้รับรางวัลสมเด็จพระเจ้าฟ้ามหิตล ค.ศ. 2000

Incidence amazing story

- In UK the incidence of Neonatal death is paralleled with the death in CAD in later life
e.g. low CAD mortality in rich region in the South and East, whereas high CAD mortality in poor region in the North and West of country.



Collaborative cohort study in the relationship between birth weight - metabolic syndrome



Dr. Kittipan Rerkasem
NRU, RIHES, Chiang Mai University,
Chiang Mai, Thailand

1989 study

- A study in Chiang Mai to identify the maternal risk factors of low birth weight(LBW) was conducted due to high rate of LBW in Chiang Mai(12%)
- This recruited 2184 pregnant women with gestational age (GA) < 24 weeks .
Researcher follow up every antenatal care up to delivery.
- This study was approved by local Ethic committee and funded by Ford Foundation.

Maternal Risk factors

- Demographic data: age, underlying disease, level of education
- Anthropometric data: height, weight, tricep skin fold, midarm circumference. We also calculated weight gain or loss
- Socioeconomic data: saving, debt of wife and husband
- Food diary: amount of protein, carbohydrate in each trimester was assessed and converted prot, fat, CHO (gram/day), energy (Kcal/Day)
- Subgroup data of plasma level of protein, albumin, hemoglobin, sodium , zinc, magnesium and iron

- Complication during pregnancy and delivery
- Neonatal data: weight, height, chest-head circumference, placental data (diameter, cord length, weight)

ราว 1990 หัก-ขาด
 ครอบครองไทยไทใหม่



ธันวาคม ๑๙๙๐ มีอ-ชด
ครอบครัวไทยใหม่



รศ.นพ.เพียร เชี่ยววานิช, PI 1990 study



Our current study 2009
Cohort study in the relationship
between birth weight - metabolic
syndrome

- **Aim to recruit all mothers and
offsprings
700 couples (10% drop out 770
couples) in the study 1989 to assess
the incidence of metabolic syndrome
(MS)**

Method

- Ethic clearance (as document), this project has been funding by Thailand Research Fund and Faculty of Medicine, Chiang Mai University
- Offsprings: (history of socioeconomic and underlying disease was also collected)
 - fasting blood sugar , 2 hours blood sugar after taking 75 gm of glucose
 - Fasting triglyceride, fasting high density lipoprotein (HDL)
 - Waist circumference
 - BP rest
 - HOMA
 - DEXA and carotid intimal media thickness(IMT)
 - Collect blood at -80 degree celcius for DNA methylation and plasma in aliquot for adeponectin and insulin (Cambridge study)

Carotid intimal medial thickness surrogate end point for vascular event



Original Article

Intrauterine nutrition and carotid intimal media thickness in young Thai adults

Kittipan Rerkasem MD, PhD^{1,2}, Antika Wongthanee MS², Amaraporn Rerkasem MD¹,
Pien Chiowanich MD³, Piyamitr Sritara MD⁴, Sakda Pruenglampoo PhD²,
Ampika Mangklabruks MD^{2,5}

Table 3. Mean (95% CI) of carotid intimal medial thickness (mm) by quartiles of nutrient intakes

Maternal nutrient intake	First trimester	Second trimester	Third trimester
Protein			
Q1	0.452 (0.440-0.463)	0.435 (0.4281-0.442)	0.436 (0.429-0.442)
Q2	0.443 (0.437-0.449)	0.437 (0.434-0.441)	0.437 (0.433-0.440)
Q3	0.435 (0.429-0.441)	0.439 (0.436-0.443)	0.437 (0.434-0.441)
Q4	0.426 (0.415 -0.438)	0.442 (0.435-0.448)	0.438 (0.432-0.444)
<i>p-value for trend</i> †	0.02	0.27	0.69
Fat			
Q1	0.447 (0.437-0.456)	0.436 (0.431-0.441)	0.435 (0.430-0.440)
Q2	0.442 (0.436-0.447)	0.438 (0.434-0.441)	0.436 (0.433-0.440)
Q3	0.437 (0.431-0.442)	0.439 (0.436-0.442)	0.438 (0.434-0.441)
Q4	0.432 (0.422-0.441)	0.440 (0.435-0.446)	0.439 (0.434-0.444)
<i>p-value for trend</i> †	0.06	0.33	0.44
Carbohydrate			
Q1	0.433(0.418-0.448)	0.442(0.434-0.451)	0.441 (0.433-0.449)
Q2	0.437(0.430-0.444)	0.440(0.436-0.443)	0.438 (0.435-0.442)
Q3	0.441(0.434-0.448)	0.437(0.433-0.441)	0.436 (0.432-0.439)
Q4	0.445(0.430-0.460)	0.434(0.426-0.443)	0.433 (0.425-0.441)
<i>p-value for trend</i> †	0.39	0.34	0.27

สิ่งอื่นที่พบ

- น้ำหนักแม่ที่เพิ่มกับการศึกษาของลูก
- IUGR จะเป็น metabolic syndrome สูง
- Methylation ของยีนน่าจะมีส่วนเกี่ยวข้อง