

Stroke Prevention

How do we best stop lightning striking twice?

Rónán Collins

Consultant Physician in Geriatric and Stroke medicine
Clinical Lead Irish National Stroke Programme
Tallaght University Hospital / Trinity College Dublin



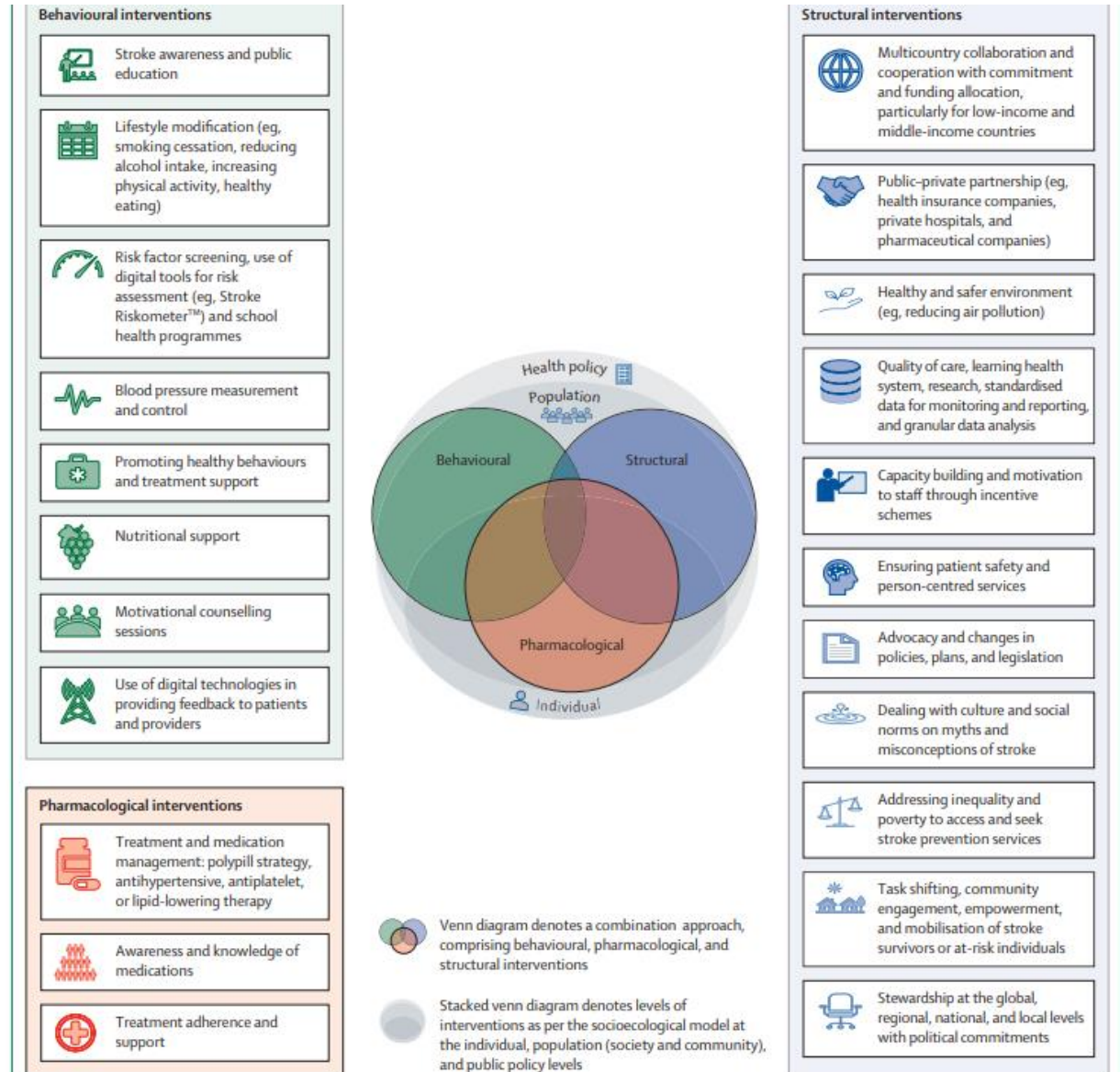
Conflicts of interest

- **Honoraria** I have received honoraria for speaking at educational events sponsored by Bayer, Boehringer Ingelheim, Daiichi- Sankyo, Pfizer.
- **Guidelines:** I am a member of the European Heart Rhythm Association (EHRA) writing group on *'Practical Guide to anticoagulation with NOACS', 'the 2023 Intercollegiate guidelines for stroke for Great Britain and Ireland'*
- **Steering committees:** *Blitz-AF registry, TICH-2 , ENOS, CONVINCE trials, Stroke Clinical Trials Network Ireland , National Thrombectomy Service , Irish National Audit of Stroke (INAS), National stroke Programme, Stroke Prevention Atrial Fibrillation Ireland (SPAFI)*
- **Charities :** *former director in SAGE advocacy*

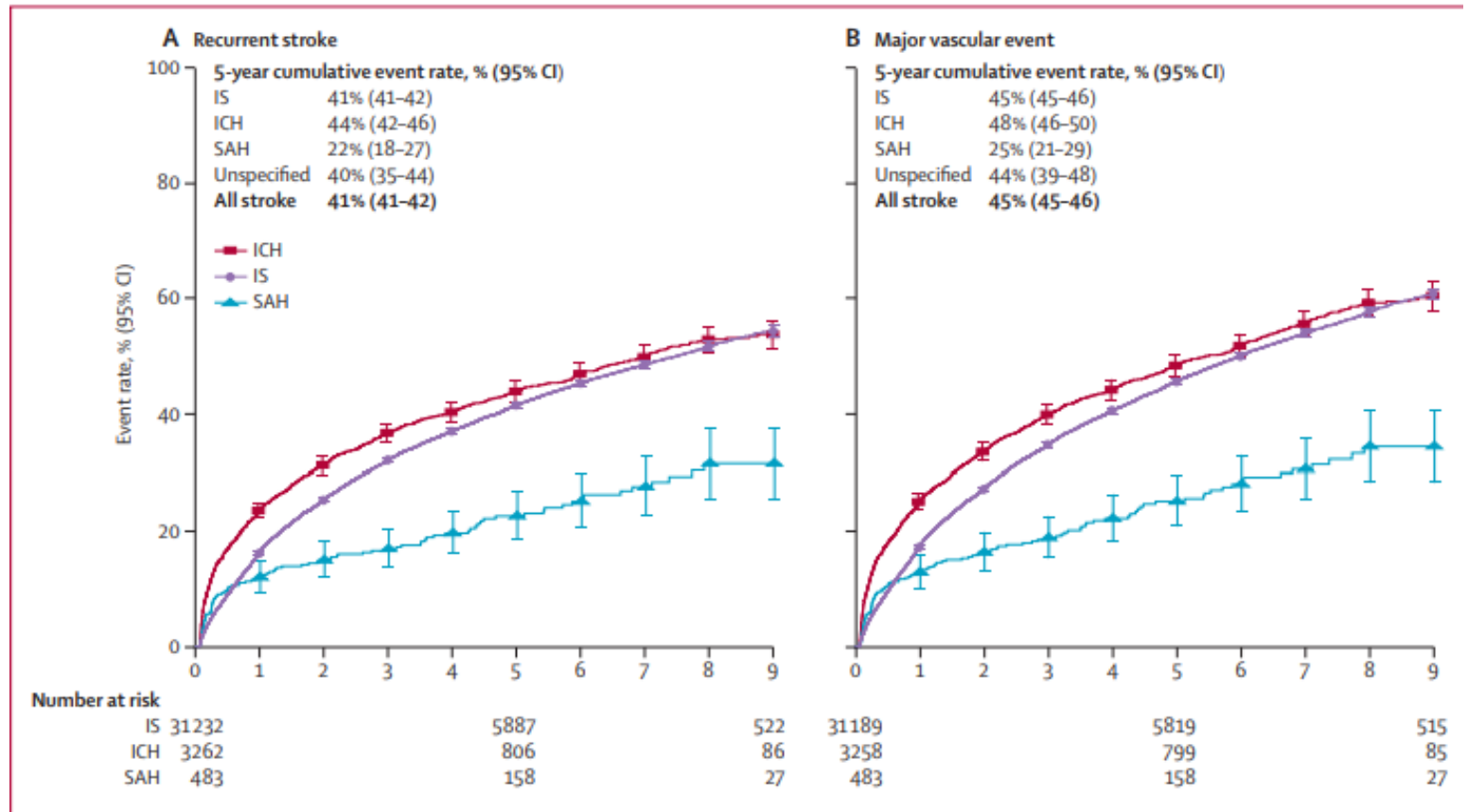




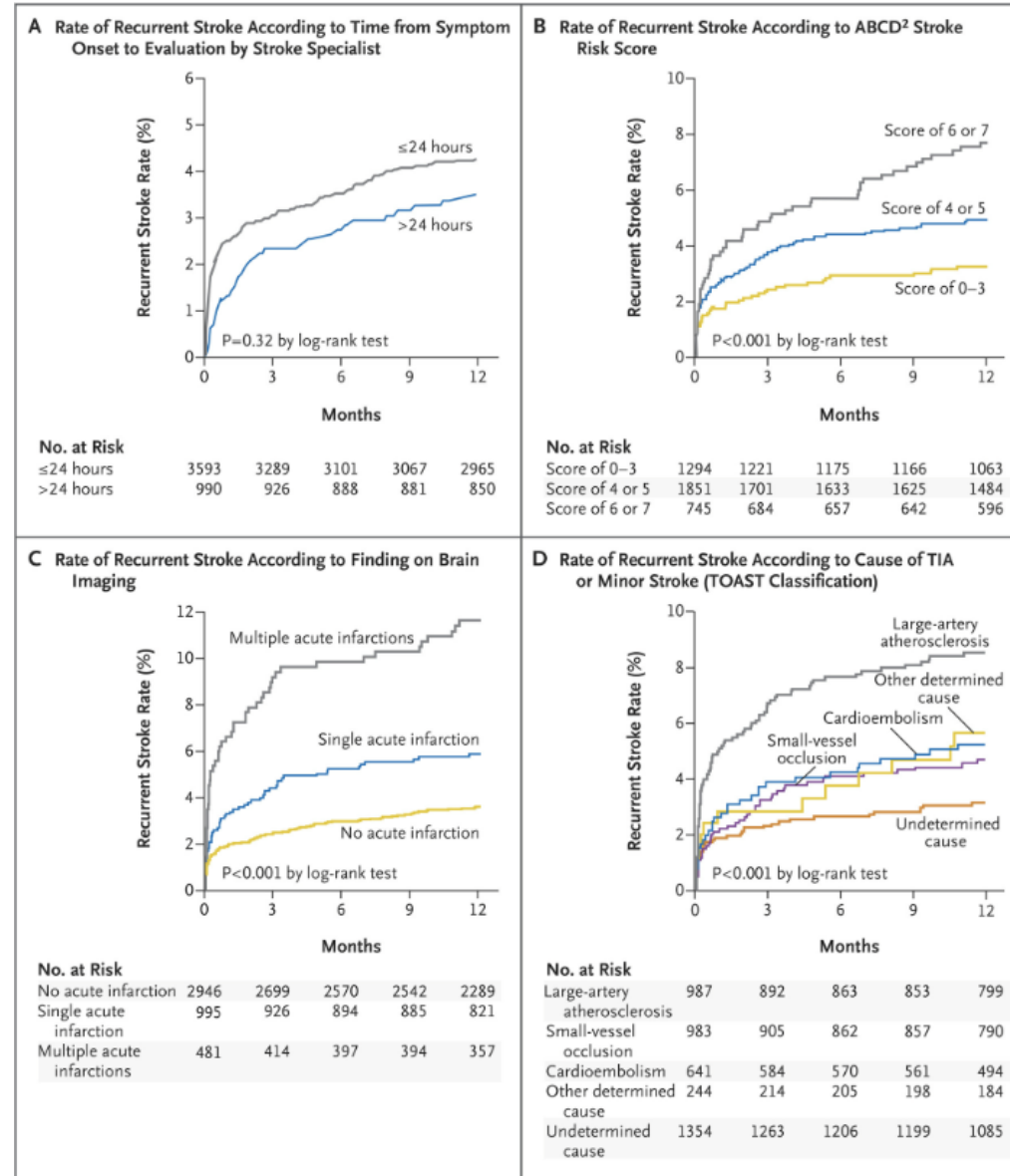
- Bam et al *Lancet Public Health* 2022;7:e721-24



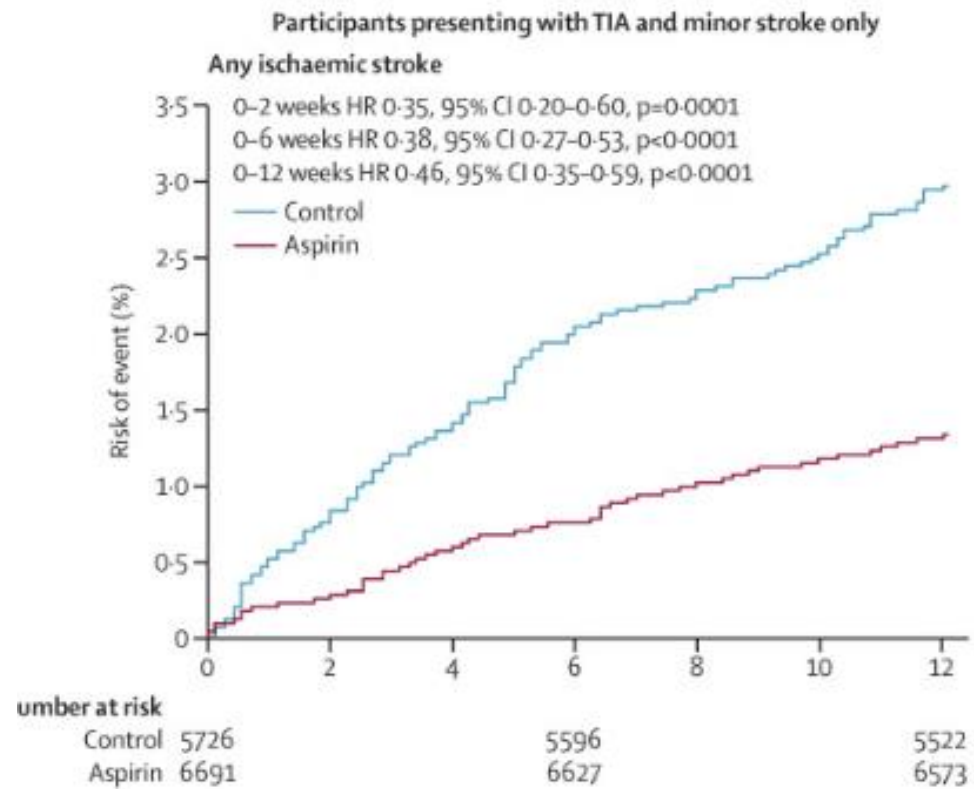
Incidence of recurrent stroke



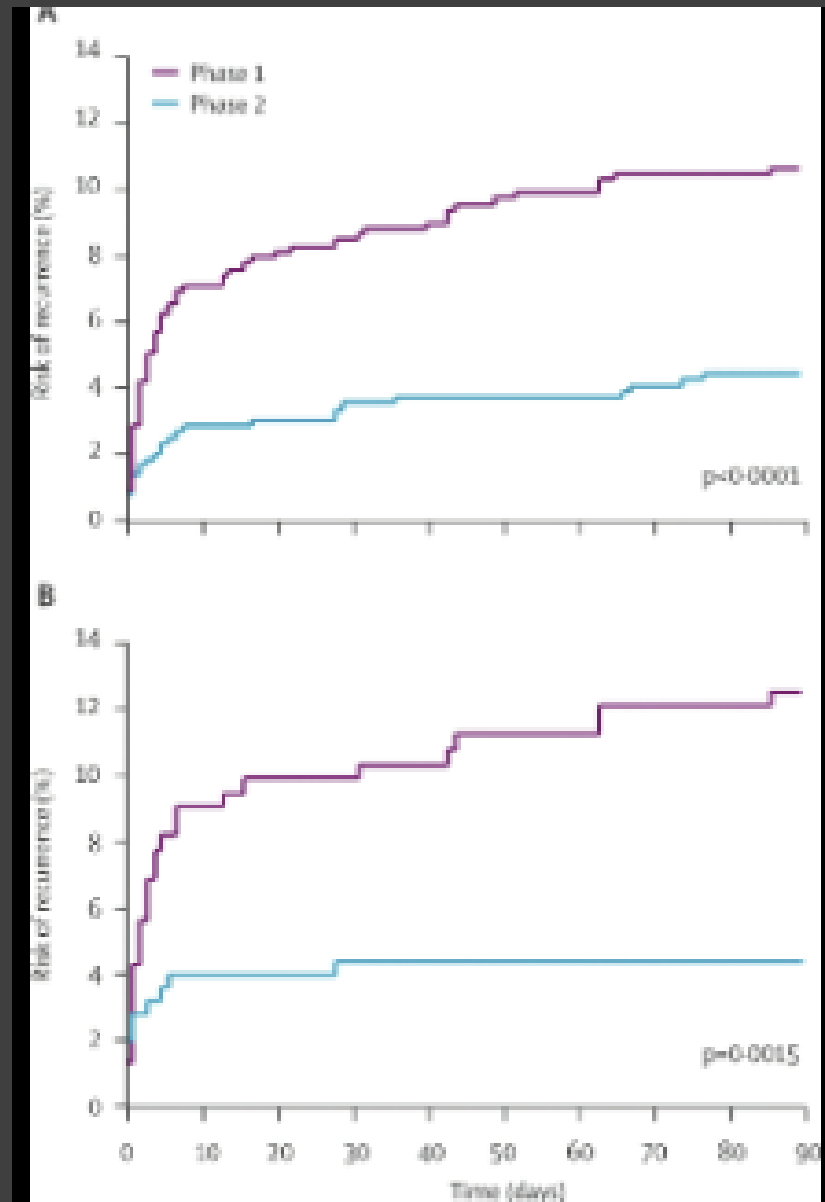
But type of stroke, its cause and radiology findings influence recurrence



But
secondary
prevention
works and
early!



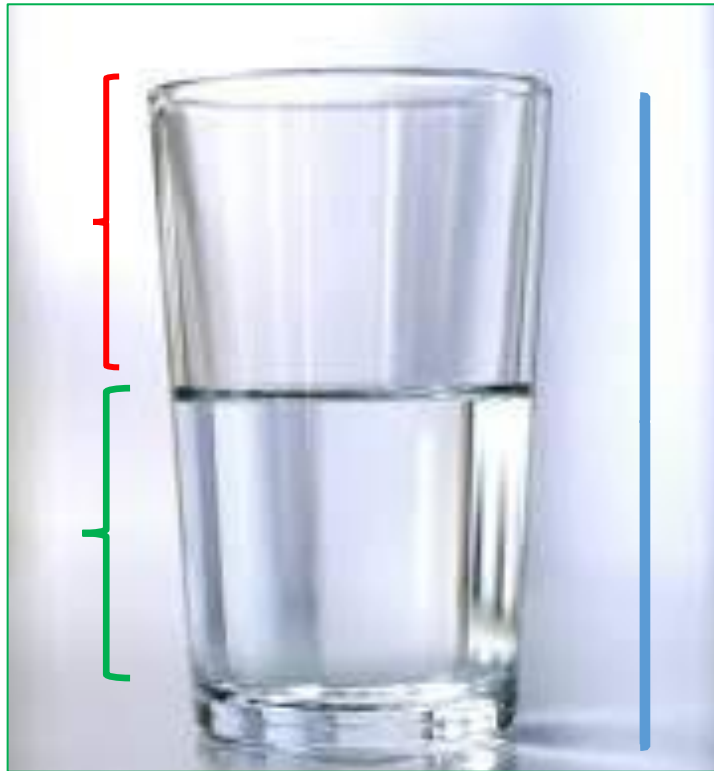
Organisation
is key to
prevention



Glass half empty ?

Half Empty

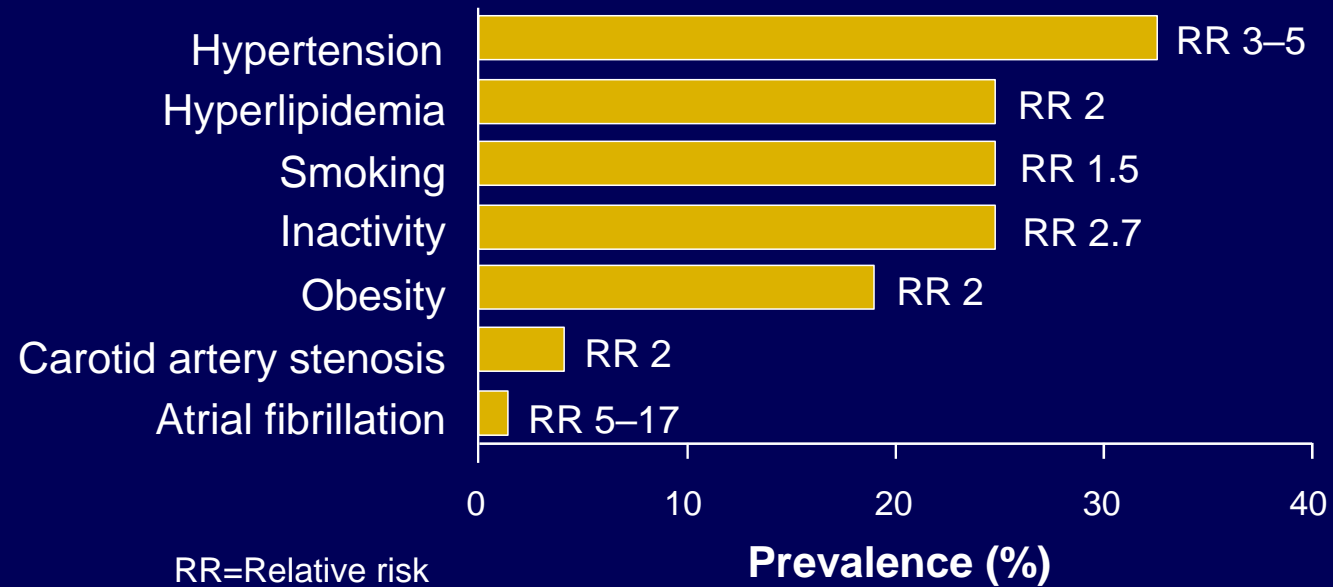
Half Full



FULL !
50% water
50% Air

Risk factor modification

Stroke Risk Factors by Prevalence and Relative Risk



- Risk of Recurrence
can be High

Risk assessment
needs individual
focus

Secondary
Prevention works

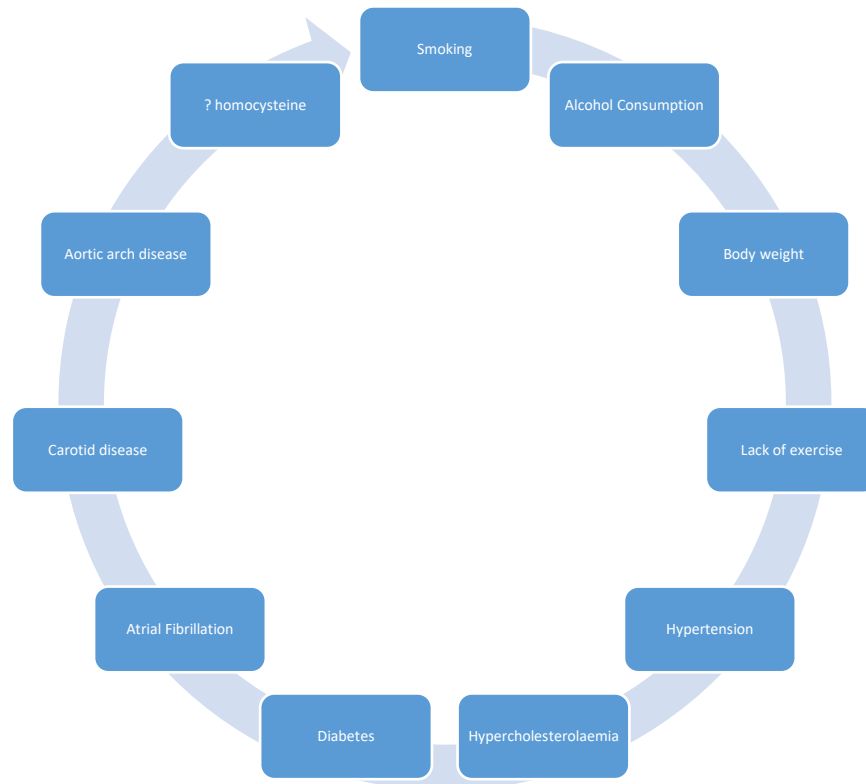
and early

Prevention services
need to be
organized



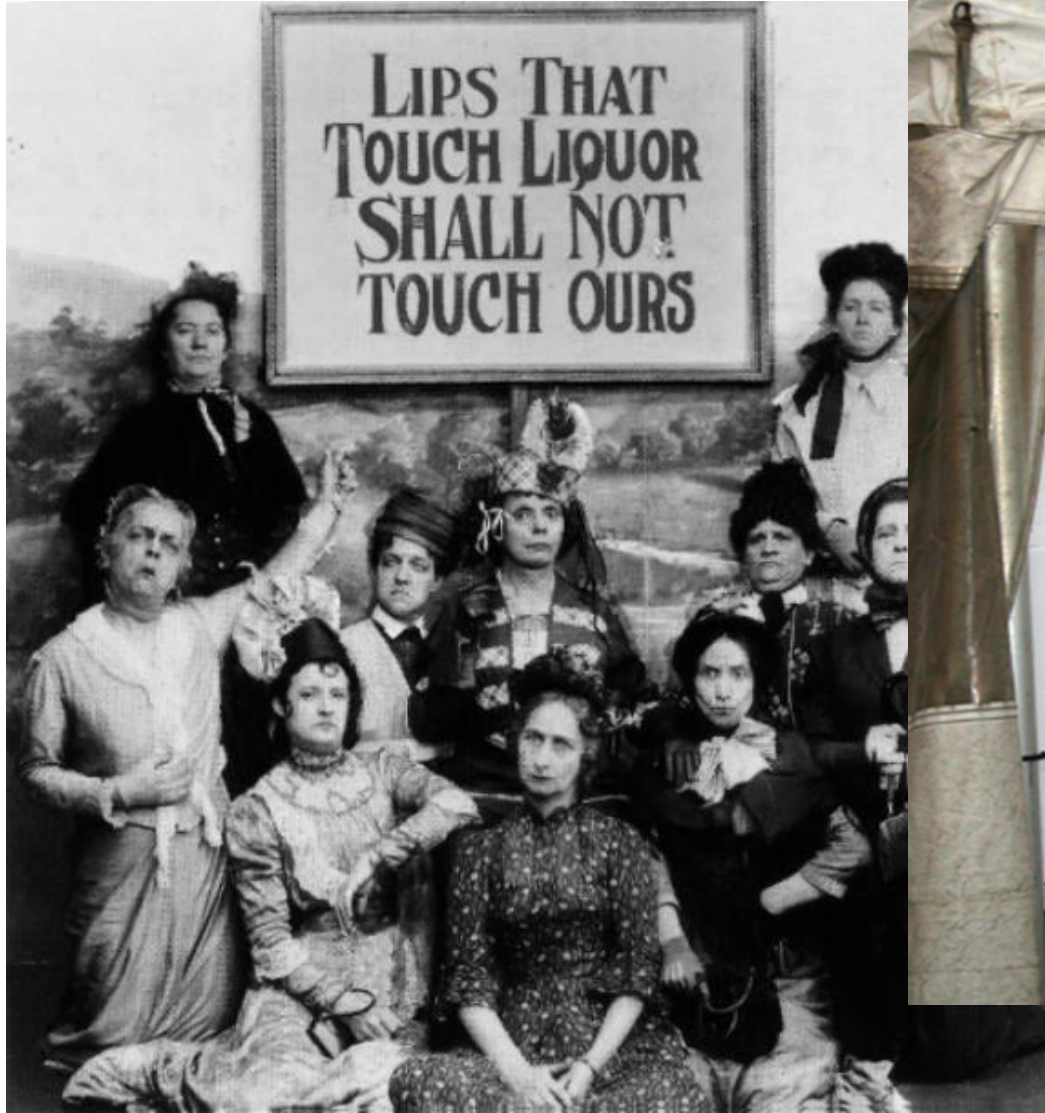
..the serenity to accept the things I cannot change and courage to change the things I can'

Modifiable



Not so modifiable

- Age
- Sex / Genotype
- Family History
- Past medical History
- Socioeconomic status



FORTINOS ANCASTER
CHARITY BBQ
ALL PROCEEDS TO THE HEART & STROKE FOUNDATION

ITALIAN SAUSAGE	On a bun	\$4.00
HAMBURGER		\$3.00
HOT DOG		\$2.00
POP		\$1.00
<small>OR WATER</small>		

PLEASE ORDER HERE

10



Consumo de álcool elevado
FUMAR CAUSA
CÂNCER DE LARINJA



Este produto contém
mais de 4.700
substâncias tóxicas,
e nicotina que causa

HORROR



O consumo de álcool elevado
Este produto causa embelesamento
proprio de pelo.

NÃO SE FUMAR
Proibido fumar
durante a ingestão

IMPOTÊNCIA



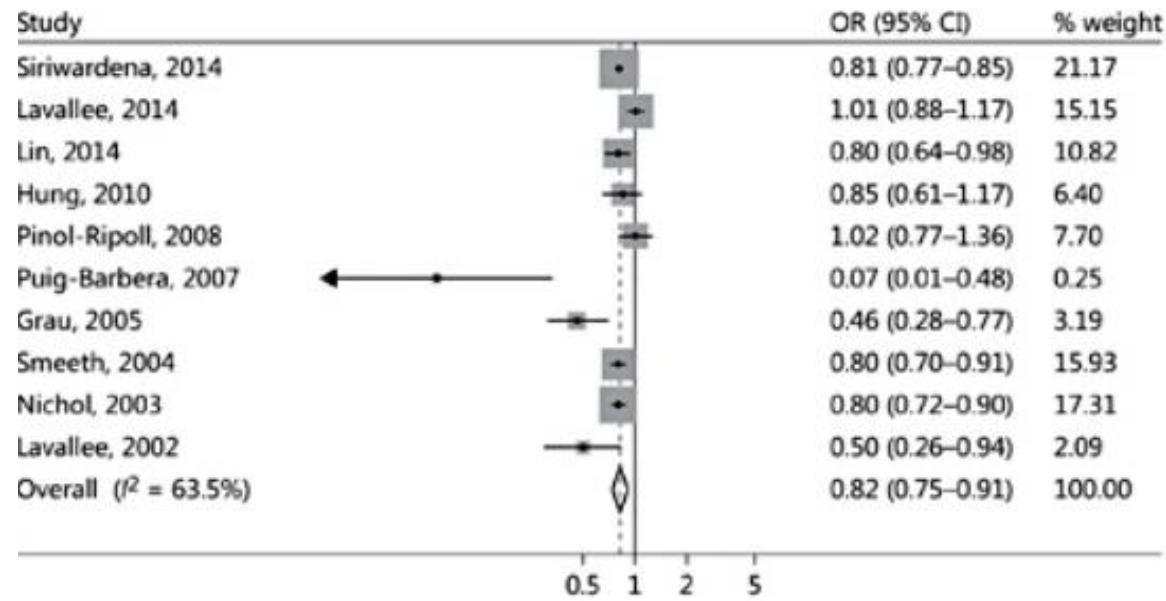
O consumo de álcool elevado
Este produto provoca distúrbios, dificuldade
de manter a ereção.

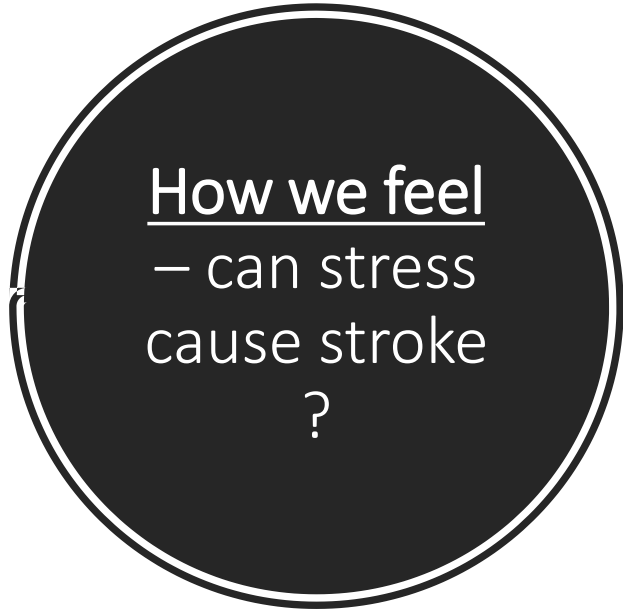
NÃO SE FUMAR
Proibido fumar
durante a ingestão

New modifiable targets

Fig. 2

Forest plot showing the effect of influenza vaccination on risk of stroke. OR, odds ratio; CI, confidence interval.





How we feel
– can stress
cause stroke
?

November 10, 2015; 85 (19) **ARTICLE**

Association between job strain and risk of incident stroke A meta-analysis

Yuli Huang, Shuxian Xu, Jinghai Hua, Dingji Zhu, Changhua Liu, Yunzhao Hu, Tiebang Liu, Dingli Xu

First published October 14, 2015, DOI: <https://doi.org/10.1212/WNL.0000000000002098>



BMC Medicine



Original Investigation | Neurology

Association of Psychosocial Stress With Risk of Acute Stroke

Cariona Reddin, MB, Robert Murphy, MB, Graeme J. Hankey, MD, Conor Judge, PhD, Denis Xavier, MD, Annika Rosengren, PhD, John Ferguson, PhD, Alberto Alvarez-Iglesias, PhD, Shahram Oveisgharan, MD, Helle K. Iversen, MD, DMSci, Fernando Lanas, PhD, Fawaz Al-Husseini, MD, Anna Czlonkowska, PhD, Aytekin Oguz, PhD, Clodagh McDermott, MD, Nana Pogossova, MD, German Málaga, MD, Peter Langhorne, PhD, Xingyu Wang, PhD, Mohammad Wasay, MD, Salim Yusuf, DPhil, Martin O'Donnell, PhD; for the INTERSTROKE investigators

Abstract

IMPORTANCE Psychosocial stress is considered a modifiable risk factor for stroke. Given the prevalence of chronic and acute exposure to stress, it represents a potentially attractive target for population-health interventions.

Key Points

Questions Is psychosocial stress associated with an increased risk of acute stroke, and does higher locus of control modify this risk?

Research article

Self-perceived psychological stress and ischemic stroke: a case-control study

Katarina Jood*¹, Petra Redfors¹, Annika Rosengren², Christian Blomstrand¹ and Christina Jern^{1,3}

Address: ¹Institute of Neuroscience and Physiology, the Sahlgrenska Academy at University of Göteborg, Göteborg, Sweden, ²Department of Medicine, Sahlgrenska University Hospital/Östra, Göteborg, Sweden and ³Department of Clinical Genetics, Sahlgrenska University Hospital, Göteborg, Sweden

Open Access

Emotional stress and stroke

Lifestyle response

- Smoking
- Alcohol
- Drugs
- 'comfort eating'

Metabolic

- hypothalamic pituitary adrenal axis
- insulin resistance
- weight gain
- sympathetic drive

Emotional stress

CardioVascular

- Hypertension
- Endothelial dysfunction
- Atherosclerosis
- Pro-thrombotic
- Arrhythmias

Other factors

Inflammation
Medication use

What we do

Stroke

Volume 42, Issue 11, November 2011; Pages 3207-3213
<https://doi.org/10.1161/STROKEAHA.111.620187>



ORIGINAL CONTRIBUTIONS; CLINICAL SCIENCES

Comprehensive Cardiac Rehabilitation for Secondary Prevention After Transient Ischemic Attack or Mild Stroke

I: Feasibility and Risk Factors

Peter L. Prior, PhD, Vladimir Hachinski, MD, DSc, Karen Unsworth, MSc, Richard Chan, MD, Sharon Mytka, BScN, MEd, Christina O'Callaghan, BAppSc(PT), and Neville Suskin, MBChB, MSc

Table 2. Mean Intermediate Outcomes: Exit Versus Intake (Table view)

Outcome	n	Target	Intake, Mean (SD)	Exit, Mean (SD)	Change, Units (%)	P
METs	82	≥7.00	6.49 (3.07)	8.53 (3.36)	2.04 (31.4)	<0.001*
TC, mmol/L	79	<4.00	4.41 (1.16)	4.11 (0.94)	-0.30 (-6.8)	0.008*
LDL, mmol/L	79	<2.00	2.33 (1.03)	2.09 (0.79)	-0.24 (-10.3)	0.015
HDL, mmol/L	79	>1.00	1.35 (0.41)	1.41 (0.39)	0.06 (4.4)	0.069
TC/HDL	79	<4.00	3.44 (0.98)	3.04 (0.71)	-0.40 (-11.6)	<0.001*
TG, mmol/L	79	<1.80	1.62 (1.15)	1.35 (0.67)	-0.27 (-16.5)	0.003*
FBG, mmol/L						
All	79	<6.00	5.96 (1.66)	5.95 (1.32)	-0.01 (-0.2)	0.95
Nondiabetic	59	<6.00	5.32 (0.74)	5.49 (0.79)	0.17 (3.2)	0.022*
Diabetic	20	<7.00	7.83 (2.16)	7.28 (1.64)	-0.55 (-7.0)	0.365
BP, mm Hg						
All SBP	82	<140	132.02 (13.80)	128.82 (13.33)	-3.21 (-2.4)	0.098
All DBP	82	<90	78.04 (9.35)	75.70 (8.50)	-2.34 (-3.0)	0.061
SBP						
Nondiabetic	61	<140	130.43 (13.45)	129.10 (13.93)	-1.33 (-1.0)	0.546
DBP						
Nondiabetic	61	<90	78.51 (9.78)	76.05 (8.75)	-2.46 (-3.1)	0.094
SBP						
Diabetic	21	<130	136.67 (14.07)	128.0 (11.66)	-8.67 (-6.3)	0.032
DBP						
Diabetic	21	<80	76.67 (8.03)	74.67 (7.83)	-2.00 (-2.7)	0.413
WC, cm	80	Males <102; females <88	100.25 (10.89)	97.81 (11.00)	-2.44 (-2.4)	<0.001*
BMI, kg/m ²	80	<25	29.57 (4.60)	29.03 (4.53)	-0.53 (-1.8)	0.003*
Body weight, kg	80	n/a	81.74 (13.81)	80.32 (13.77)	-1.43 (-1.7)	0.001*



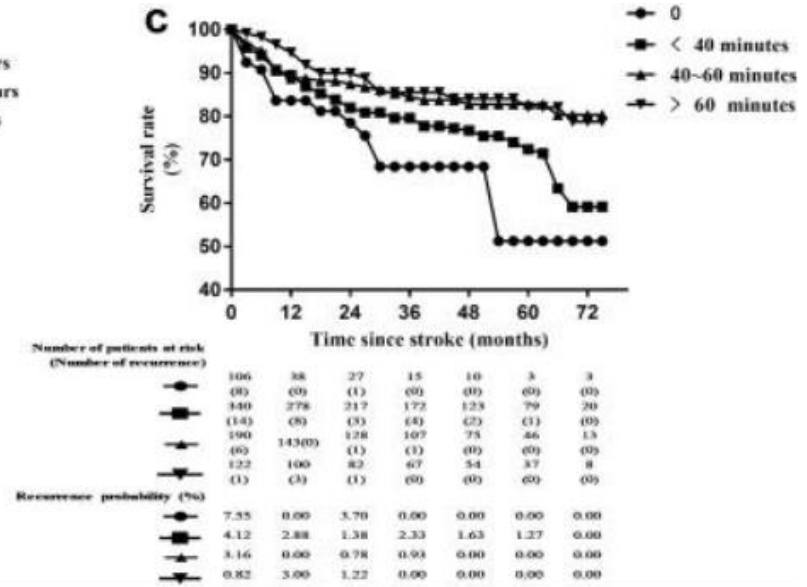
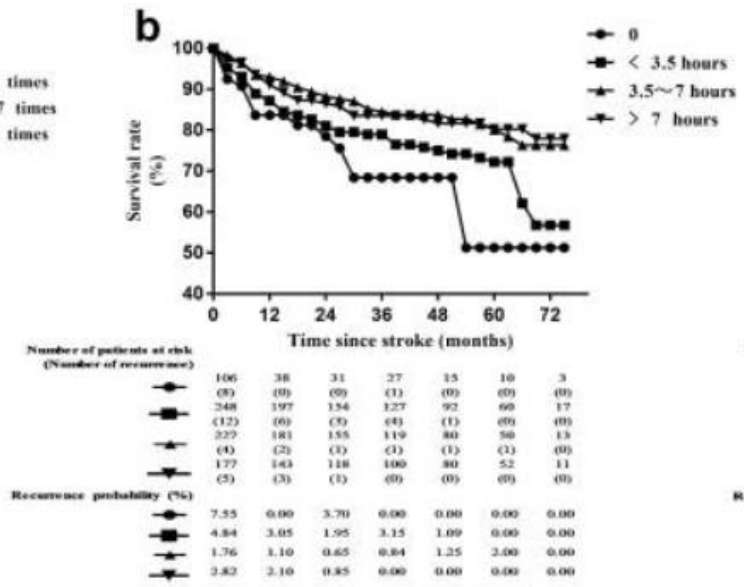
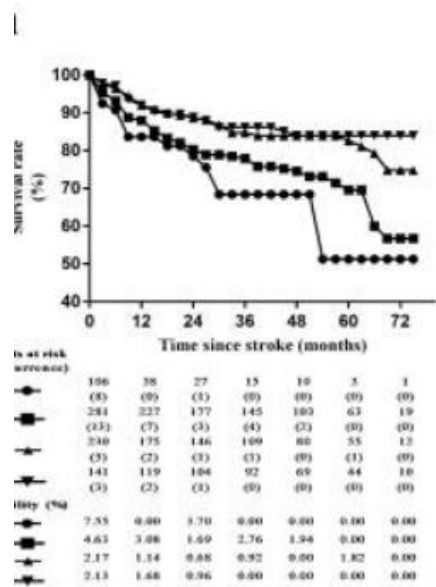
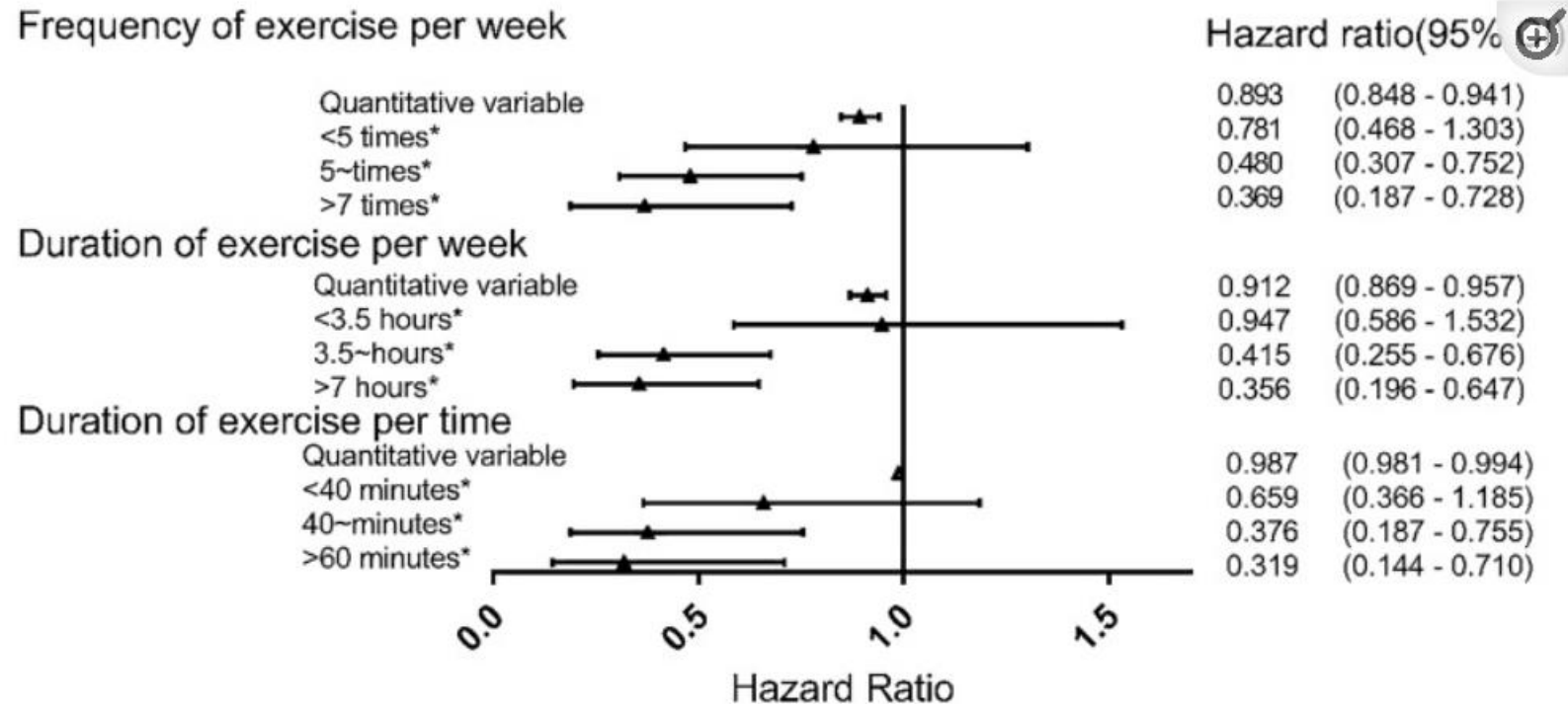
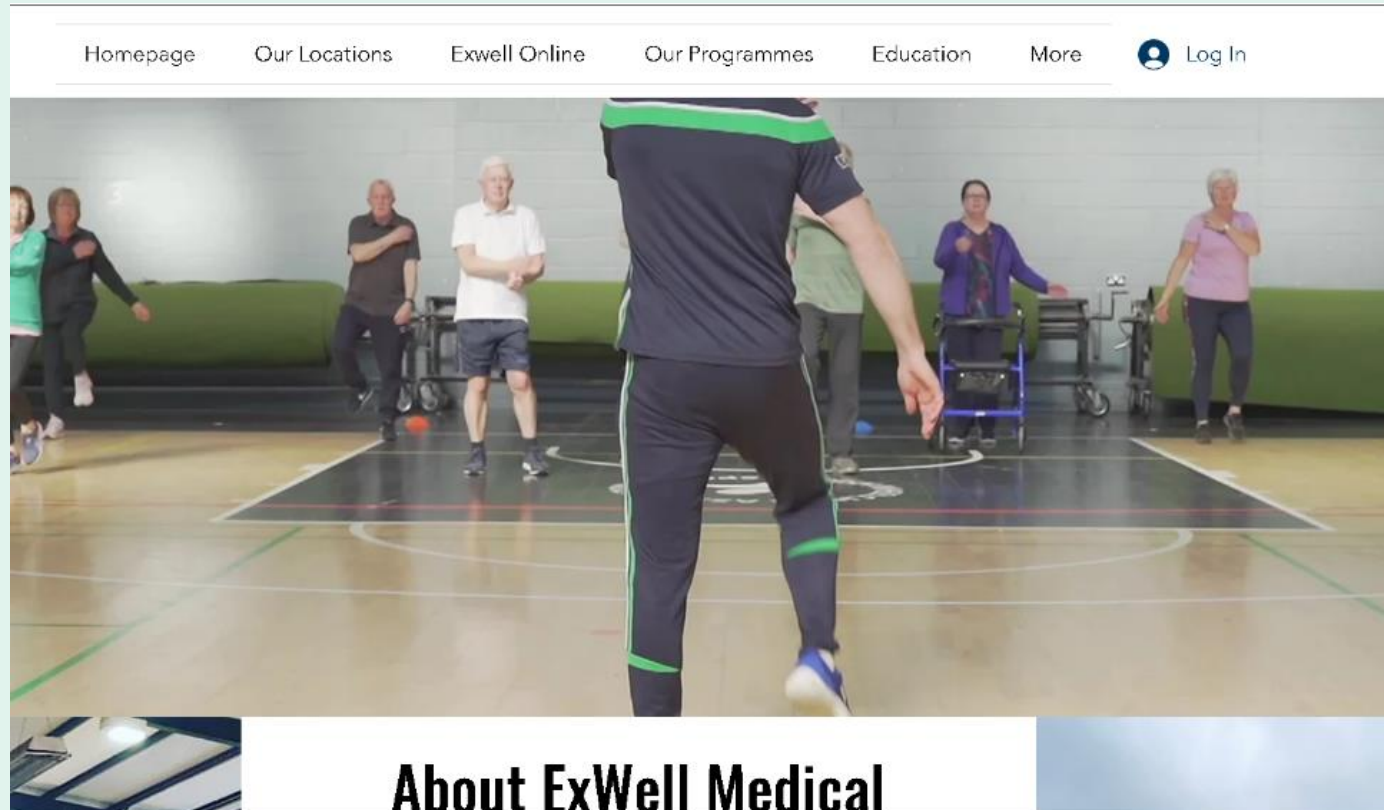


Figure 4

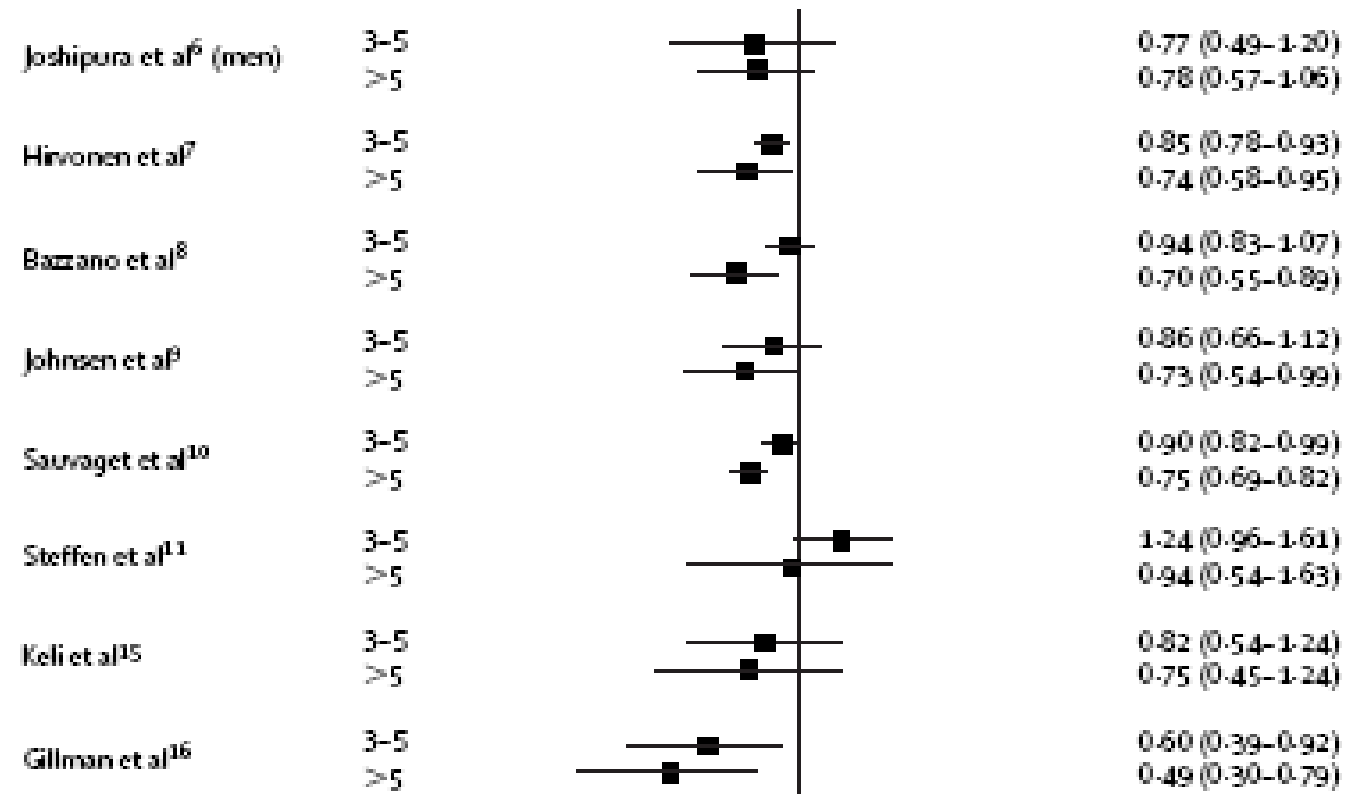


What we feel an what we do



Our Secondary Prevention Programmes should have

- Psychosocial assessment of individual stressors
- Access to psychological support
- A planned exercise programme for stroke



Feng et al. lancet 2006

What we eat

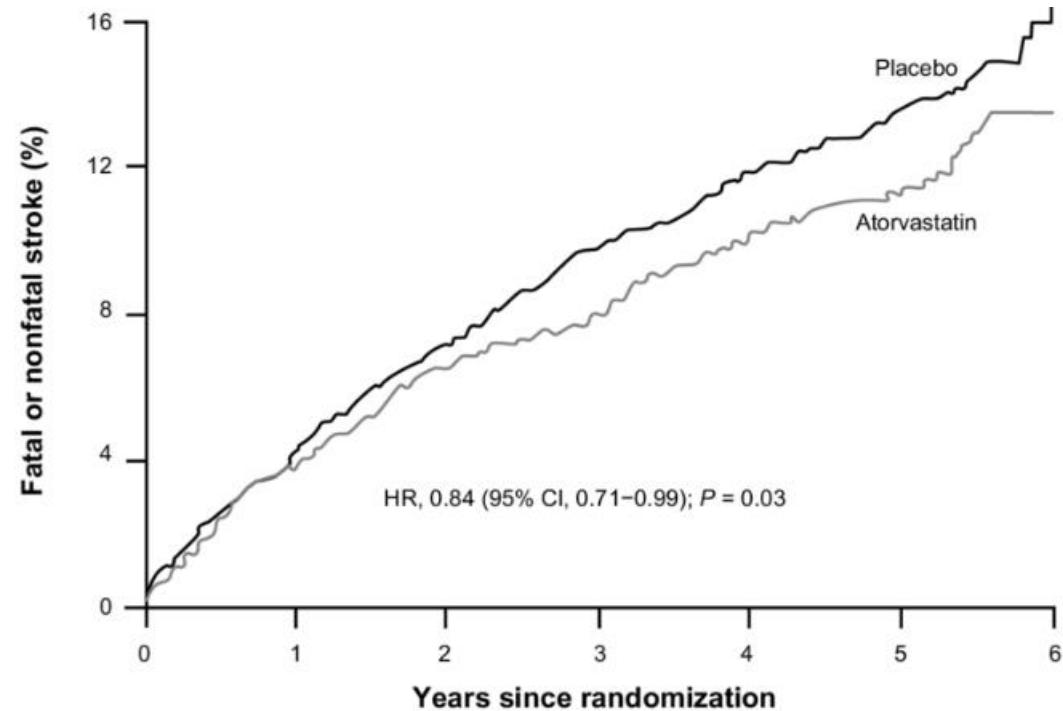
- Eat your fruit and Veg it's as effective as aspirin !
- 3-5 portions 11% reduction
- > 5 portions 26 % reduction

No diet will remove all the fat from your body because the brain is entirely fat. Without a brain, you might look good, but all you could do is run for public office.



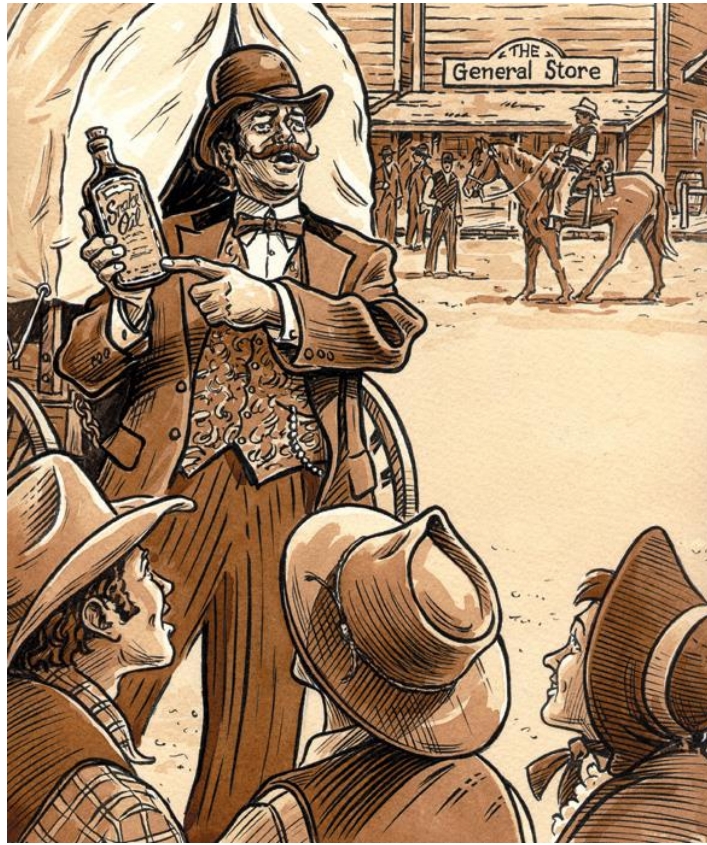
George Bernard Shaw

The cholesterol link



No at risk

Atorvastatin	2365	2208	2106	2031	1935	922	126
Placebo	2366	2213	2115	2010	1926	887	137



Beware merchants selling Snake oil

Omega-3 capsules

Omega-3 supplements do not prevent heart disease, stroke or death

HEART AND CIRCULATION | 06.11.18 | doi: 10.3310/signal-000670

This is a plain English summary of an [original research](#) article

Omega-3 fatty acid supplements from fish oils or plants have little or no effect on the risk of heart disease, stroke or overall death rates. This finding contradicts a widespread belief that omega-3 supplements are protective. Previous evidence in favour of omega-3 supplements is mainly derived from trials at high risk of bias. The better evidence identified in this review does not demonstrate any health benefit.

Omega-3 fatty acids for the primary and secondary prevention of cardiovascular disease

Asmaa S Abdelhamid, Tracey J Brown, Julii S Brainard, Priti Biswas, Gabrielle C Thorpe, Helen J Moore, Katherine HO Deane, Fai K AlAbdulghafoor, Carolyn D Summerbell, Helen V Worthington, Fujian Song, Lee Hooper Authors' declarations of interest

Version published: 18 July 2018 Version history

<https://doi.org/10.1002/14651858.CD003177.pub3>

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29 February 2020

Collapse all Expand all

Abstract

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Licence to krill: the destructive demand for a 'better' fish oil



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+€4.99 delivery



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MorEPA Original Omega-3 Fish Oil (120)

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Lir Pharmacy
Free delivery
★★★★★ (150)



Omega 3 Capsules High Strength, 1000 mg Pure Fish ...

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Sensilab Ireland
+€5.99 delivery
€0.22/1ct



Omega-3 Extra 60 Capsules

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Nutri Advanced...
Free delivery



Omega 3 - Krill Oil - Unflavoured - 90 capsules - Myvitamins

€15.39
Myprotein Ireland
+€5.49 delivery
★★★★★ (158)



Opti-Omega 3 60 Capsules

€14.36 €18
Healthspan IE
+€4.95 delivery
★★★★★ (116)

Supplement Industry

Save the whales !

Omega-3 is part of
balanced diet - eat an egg
or twoor eat FLAX seed
instead



Holland & Barrett
Milled Flax...

€6.79

Holland & Barre...
+€4.99 delivery



Flax - Evergreen
Organic Golde...

€4.35

Evergreen.ie
+€5.95 delivery

Diet and Cholesterol

Our secondary stroke Prevention programmes

- Should have access to clinical nutrition advice
- Be evidence based
- Eat a balanced diet rich in fresh fruit and vegetables
- Regularly check on cholesterol levels to ensure LDL at target $< 1.8 \text{ mMol} +$ /- with the aid of medication

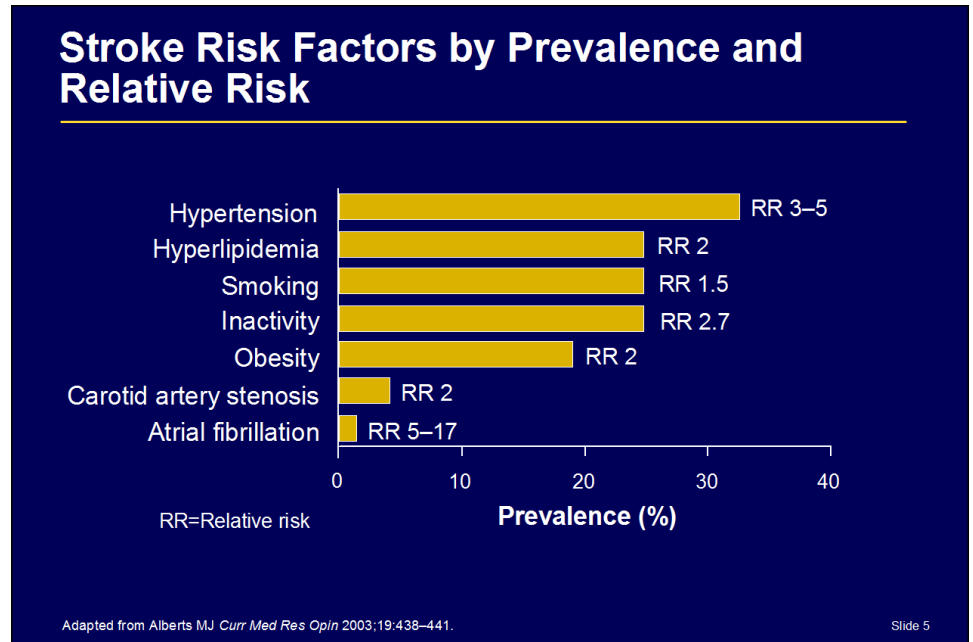
Under pressure

- Blood pressure is the most prevalent of risk factors for Stroke

- Increases risk of stroke x 3-5 times

- Benefits of Blood pressure treatment in stroke prevention well known

- Debate is how tight to control and in which patient ?



What Is High Blood Pressure ?

Table 1 Definitions and classification of blood pressure levels (mmHg)

Category	Systolic	Diastolic
Optimal	< 120	< 80
Normal	120–129	80–84
High normal	130–139	85–89
Grade 1 hypertension (mild)	140–159	90–99
Grade 2 hypertension (moderate)	160–179	100–109
Grade 3 hypertension (severe)	≥ 180	≥ 110
Isolated systolic hypertension	≥ 140	< 90

When a patient's systolic and diastolic blood pressures fall into different categories, the higher category should apply. Isolated systolic hypertension can also be graded (grades 1, 2, 3) according to systolic blood pressure values in the ranges indicated, provided diastolic values are < 90 mmHg.

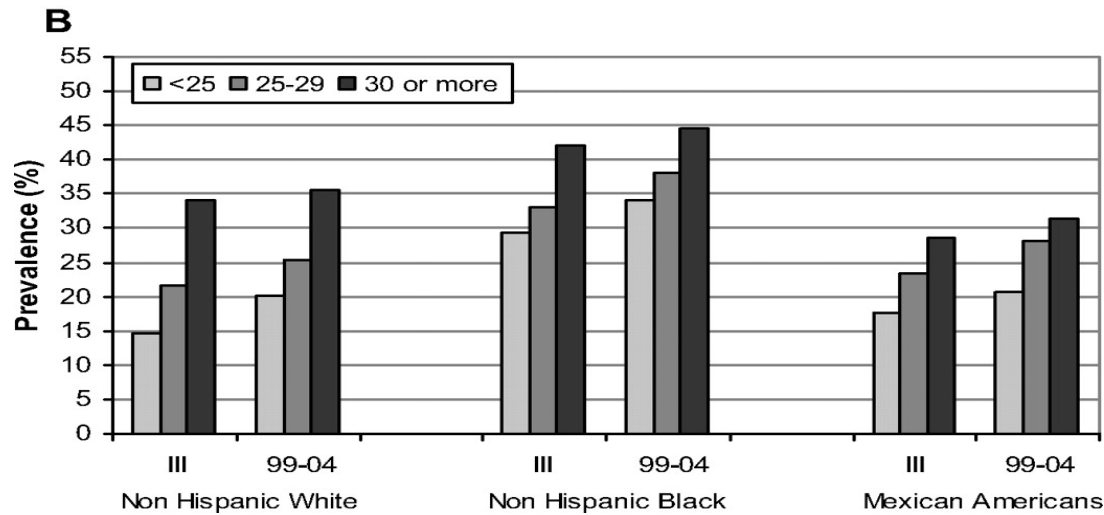
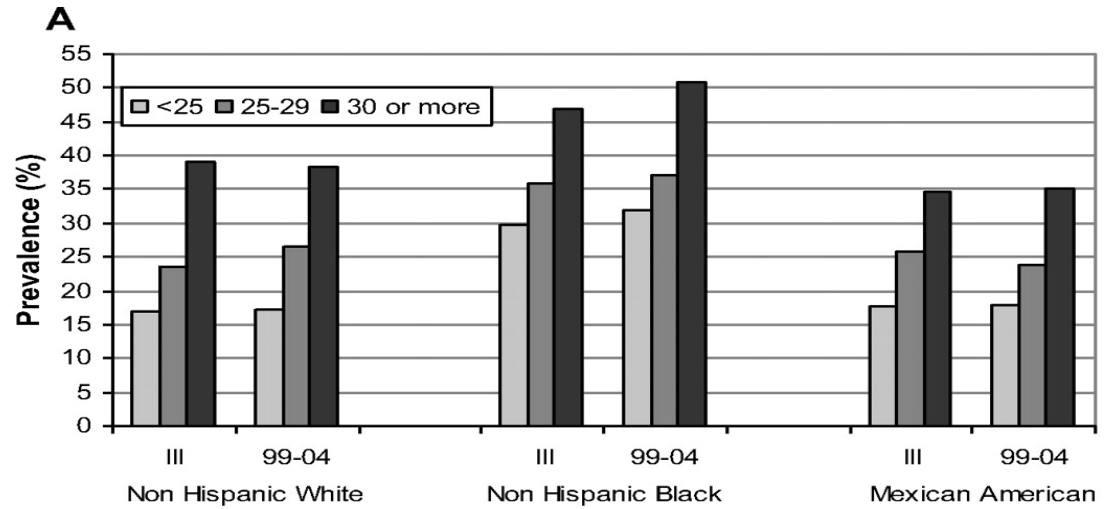
Table 3 Definitions and classification of office blood pressure levels (mmHg)^a

Category	Systolic		Diastolic
Optimal	<120	and	<80
Normal	120–129	and/or	80–84
High normal	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	160–179	and/or	100–109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	and	<90

^aThe blood pressure (BP) category is defined by the highest level of BP, whether systolic or diastolic. Isolated systolic hypertension should be graded 1, 2, or 3 according to systolic BP values in the ranges indicated.

European Society of Hypertension 2003 and 2013

Figure. A, Age-standardized prevalence rate of hypertension by race/ethnicity and BMI for men: NHANES III and NHANES 1999–2004.

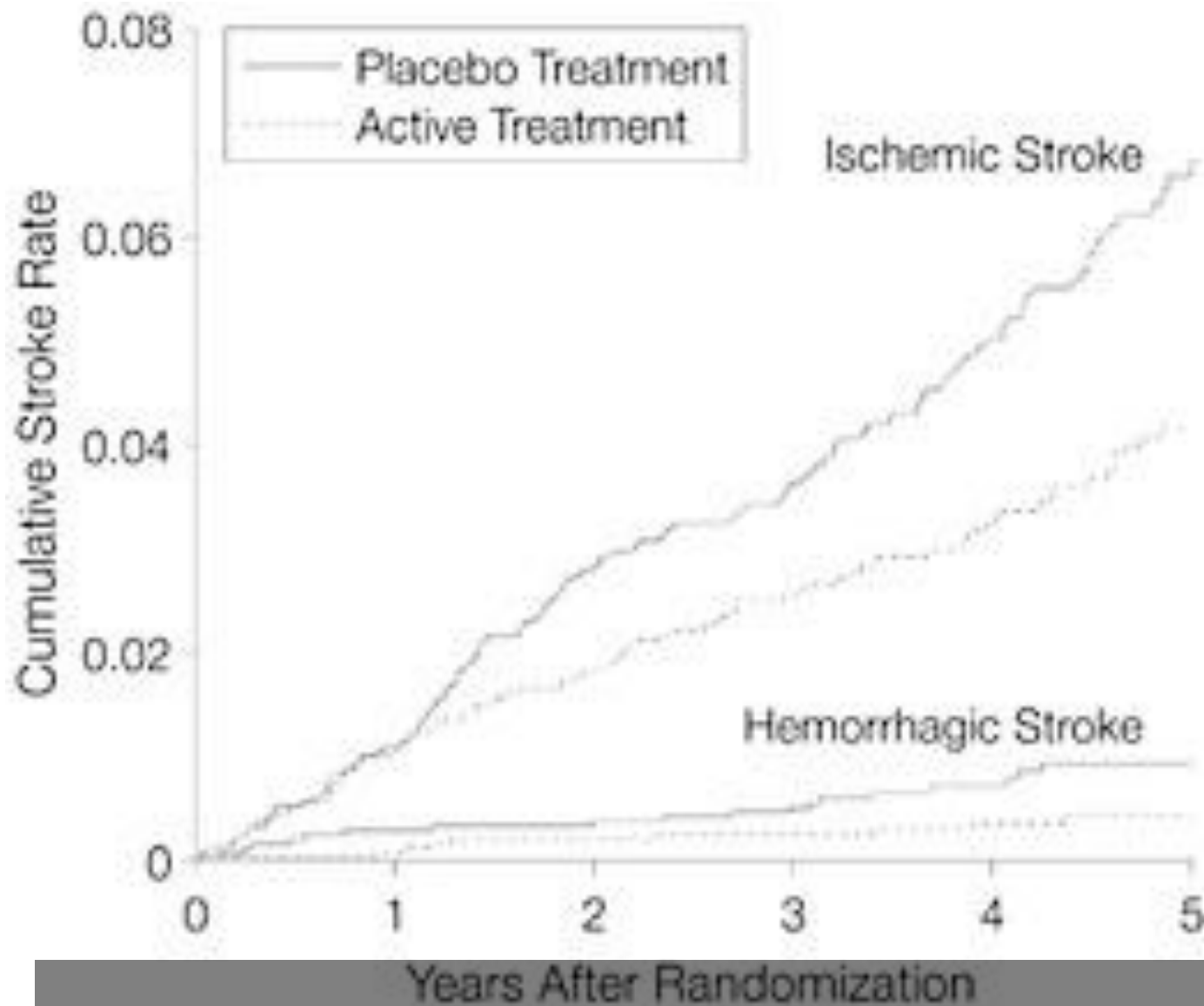


Cutler J A et al. Hypertension 2008;52:818-827

National Health and Nutrition Examination Survey

	<u>'88-94</u>	<u>'99-04</u>
<u>Prevalence</u>	24.4%	28.9% p<0.001
<u>Awareness</u>	68.5%	71.8% p<0.04

Cutler et al. 2008



Controlling
Blood
Pressure
Prevents
Stroke

Current burden in our stroke patients

Table 1 Baseline demographic characteristics, stroke subtypes and risk factors (N = 302)

Demographic details	N (%)	Stroke subtype	N (%)	Risk factor	N (%)
Age		Bamford		Hypertension	176 (57)
<65	103 (34)	PACS	117 (38.7)	Hypercholesterolemia	135 (46.9)
≥65	199 (66)	LACS	81 (26.8)	Atrial fibrillation	120 (38.3)
		POCS	80 (26.5)	Heart disease	91 (29.3)
Gender		TACS	16 (5.3)	Current smoking	84 (28.1)
Male	173 (57.3)	Unclassifiable	8 (2.7)	Previous TIA/stroke	76 (25)
Female	129 (42.7)			Diabetes	60 (19.9)
		TOAST		Past smoking	53 (17.6)
Function (mRS)		Cardioembolism	121 (40.1)	Carotid disease	50 (16)
≤2	156 (51.7)	Undetermined aetiology	84 (27.8)	Alcohol excess	44 (14.5)
>3	146 (48.3)	Large vessel atherosclerosis	51 (16.9)	Depression	24 (8.2)
		Small vessel disease	33 (10.9)	Anxiety	20 (6.6)
		Other determined aetiology	13 (4.3)		

Brewer et al. *BMC Neurology* (2015) 15:216

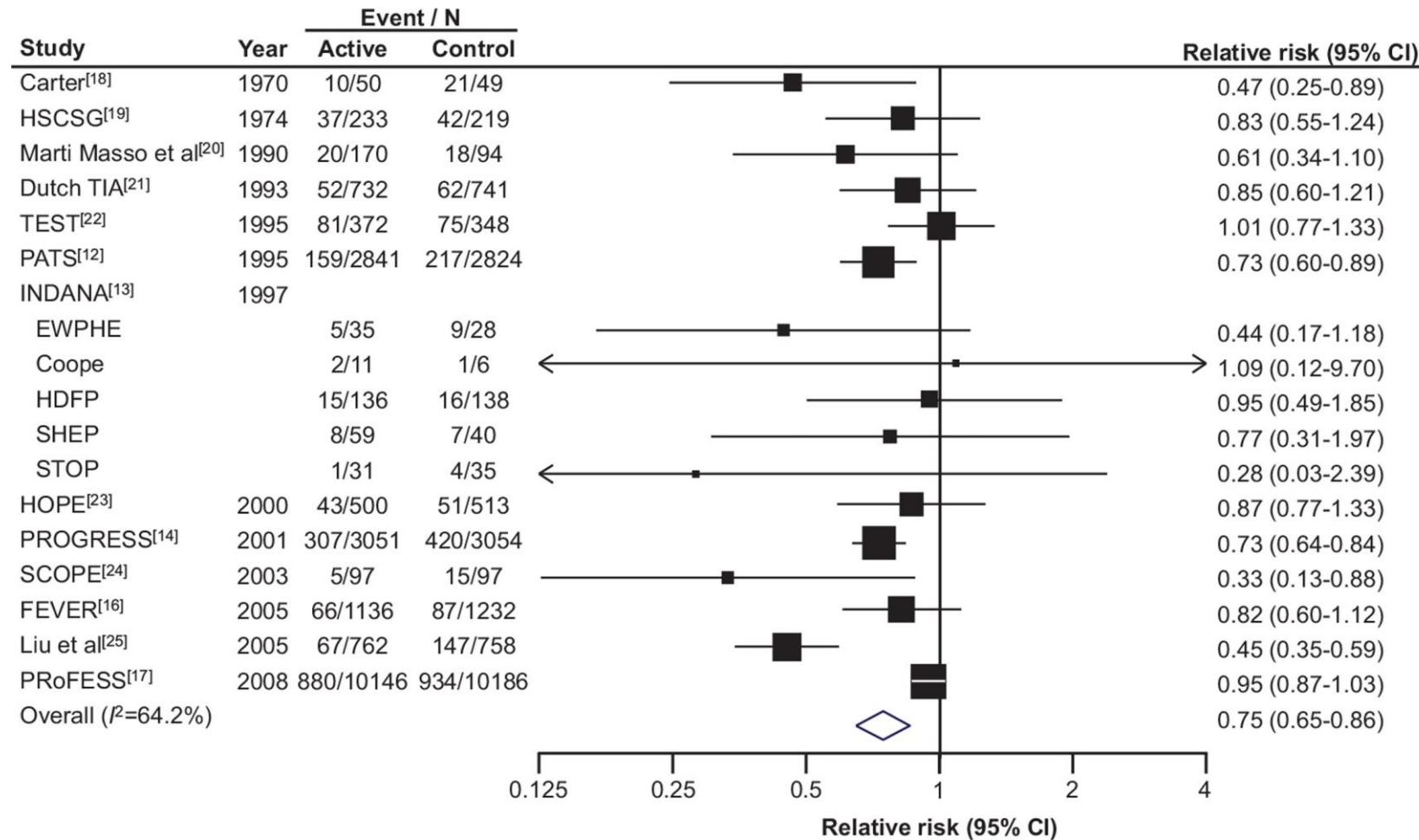
Secondary prevention of stroke

Table 2 Proportion of patients with BP at target (total $N = 249$)

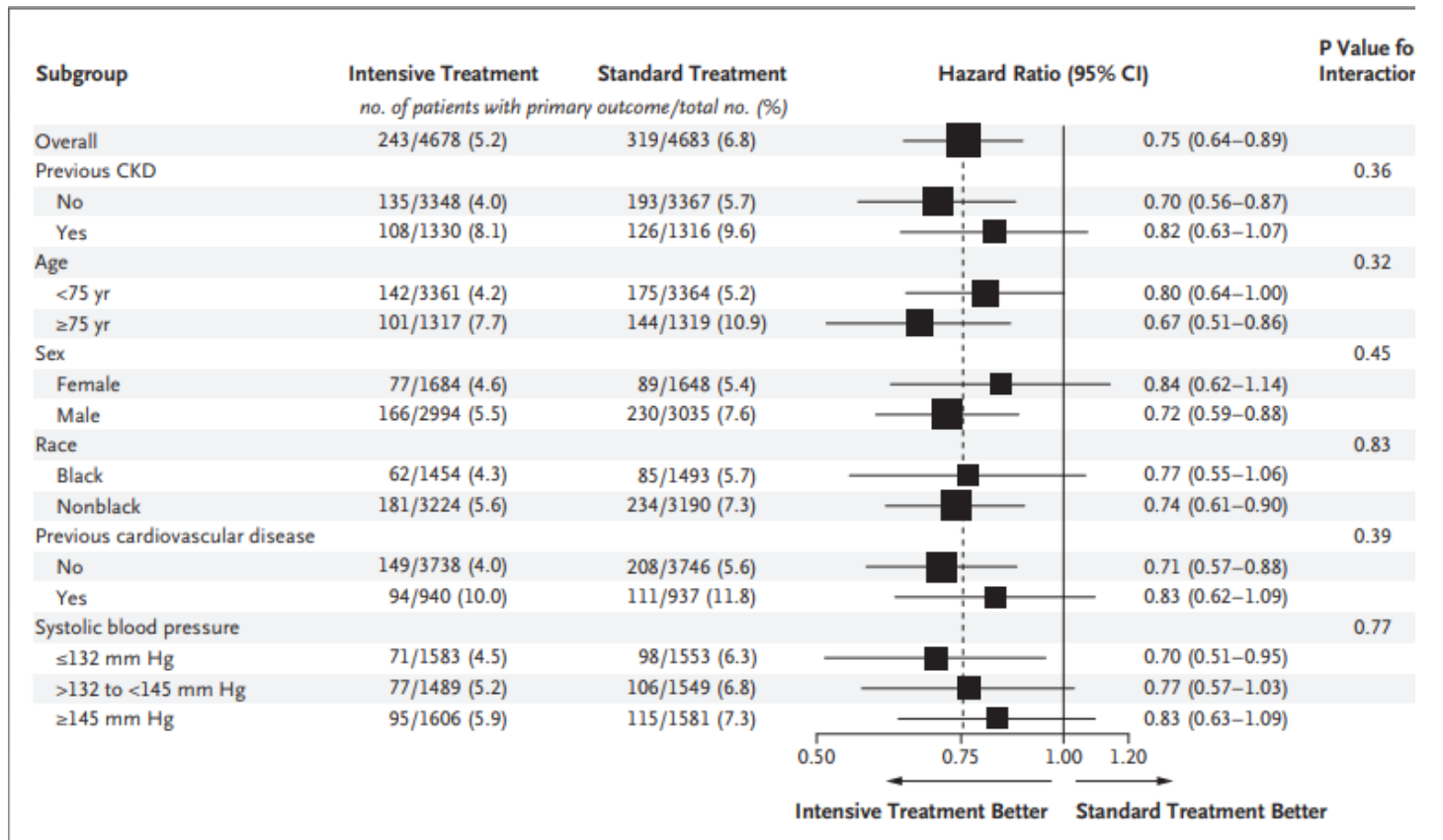
BP target	Proportion of patients at target			p -value
	All patients	With diagnosed hypertension	No hypertension diagnosed	
$\leq 130/80^a$	40 (16.1 %)	15 (10.5 %)	25 (23.6 %)	$p = 0.005$
$\leq 140/90^b$	91 (36.6 %)	43 (30.1 %)	48 (45.3 %)	$p < 0.05$
$\leq 135/85^c$	69 (27.7 %)	31 (21.7 %)	38 (35.6 %)	$p < 0.05$

Brewer *et al.* *BMC Neurology* (2015) 15:216

Controlling Blood Pressure prevents Recurrent Stroke too



But how
much to
control ?



Primum Non Nocere

Table 3. Serious Adverse Events, Conditions of Interest, and Monitored Clinical Events.

Variable	Intensive Treatment (N=4678)	Standard Treatment (N=4683)	Hazard Ratio	P Value
	<i>no. of patients (%)</i>			
Serious adverse event*	1793 (38.3)	1736 (37.1)	1.04	0.25
Conditions of interest				
Serious adverse event only				
Hypotension	110 (2.4)	66 (1.4)	1.67	0.001
Syncope	107 (2.3)	80 (1.7)	1.33	0.05
Bradycardia	87 (1.9)	73 (1.6)	1.19	0.28
Electrolyte abnormality	144 (3.1)	107 (2.3)	1.35	0.02
Injurious fall†	105 (2.2)	110 (2.3)	0.95	0.71
Acute kidney injury or acute renal failure‡	193 (4.1)	117 (2.5)	1.66	<0.001
Emergency department visit or serious adverse event				
Hypotension	158 (3.4)	93 (2.0)	1.70	<0.001
Syncope	163 (3.5)	113 (2.4)	1.44	0.003
Bradycardia	104 (2.2)	83 (1.8)	1.25	0.13
Electrolyte abnormality	177 (3.8)	129 (2.8)	1.38	0.006
Injurious fall†	334 (7.1)	332 (7.1)	1.00	0.97
Acute kidney injury or acute renal failure‡	204 (4.4)	120 (2.6)	1.71	<0.001
Monitored clinical events				
Adverse laboratory measures§				
Serum sodium <130 mmol/liter	180 (3.8)	100 (2.1)	1.76	<0.001
Serum sodium >150 mmol/liter	6 (0.1)	0		0.02
Serum potassium <3.0 mmol/liter	114 (2.4)	74 (1.6)	1.50	0.006
Serum potassium >5.5 mmol/liter	176 (3.8)	171 (3.7)	1.00	0.97
Orthostatic hypotension¶				
Alone	777 (16.6)	857 (18.3)	0.88	0.01
With dizziness	62 (1.3)	71 (1.5)	0.85	0.35



Under Pressure ?

- Is intensive control of blood pressure better or just for haemorrhage
- Ischaemic stroke 1.74 v 1.75%
P=0.999 - NO Effect
- Haemorrhagic stroke 0.0 vs 0.39% (P < 0.001) Big Effect

Randomized Controlled Trial > [Hypertens Res.](#) 2022 Apr;45(4):591-601.

doi: [10.1038/s41440-022-00862-y](#). Epub 2022 Mar 4.

Intensive or standard blood pressure control in patients with a history of ischemic stroke: RESPECT post hoc analysis

[Kazuo Kitagawa](#)¹, [Hisatomi Arima](#)², [Yasumasa Yamamoto](#)³, [Shinichiro Ueda](#)⁴, [Hiromi Rakugi](#)⁵, [Takahide Kohro](#)⁶, [Koji Yonemoto](#)⁷, [Masayasu Matsumoto](#)⁸, [Takao Saruta](#)⁹, [Kazuyuki Shimada](#)¹⁰; [Recurrent Stroke Prevention Clinical Outcome \(RESPECT\) Study Group](#)

[Collaborators, Affiliations](#) + expand

PMID: [35241817](#) DOI: [10.1038/s41440-022-00862-y](#)

Abstract

Summary

Blood pressure is on the increase

Blood pressure most prevalent risk factor in stroke

Controlling blood pressure prevents stroke and recurrent stroke

Tighter control ?
slightly better -
needs to be tailored
for our patients

WE do not do Blood
pressure well

Clots - Atrial Fibrillation

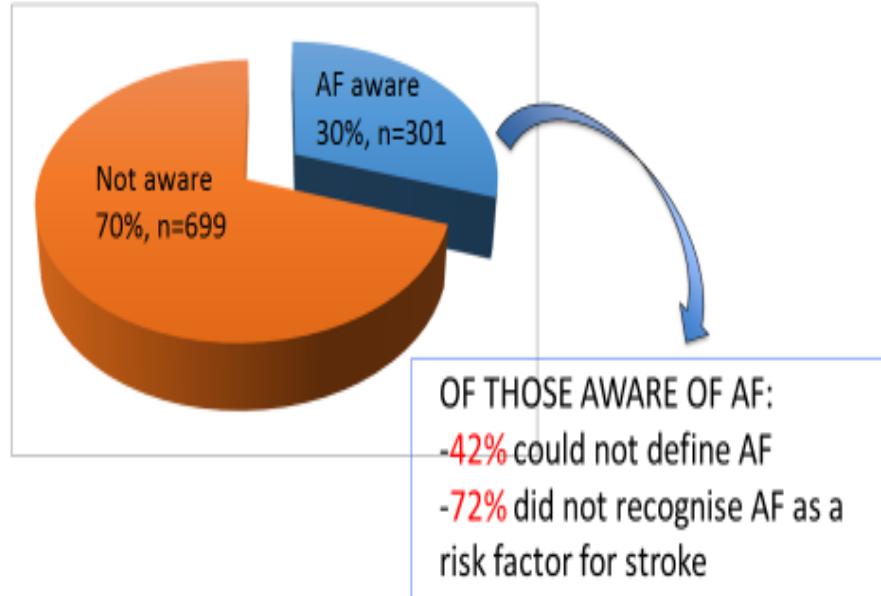


- **Approx 7,500 strokes per year in Ireland**
- **Third leading cause of death (7%)**
- **Leading cause of acquired disability**
- **30% of our strokes attributable to Atrial Fibrillation**
- **Strokes from Atrial Fibrillation are more likely to be severe, disabling and Recurrent**

Language & metaphor is important



Awareness of AF



Women most likely to be able to define and recognise AF as risk factor*
($p < 0.05$)

AF Patients:

- 29% don't know a personal diagnosis of atrial fibrillation !
- 27% couldn't explain it
- 34% did not know it was a risk for stroke

Desteghe et al . In J Cardiology
2016.08.303

Atrial Fibrillation: The Faulty Cement Mixer

For many years, atrial fibrillation (AF) was viewed as a relatively benign dysrhythmia. However, AF is now recognized as a dangerous pathology and a major cause of potentially preventable death and disability. AF is the most common cardiac arrhythmia. It affects 3% of our population, predicted to rise to 4.5% by 2040, and affects up to 20% of over 80 year old men.¹ AF is a leading cause of stroke and is implicated in an estimated 1 in 4 strokes internationally and may be a major factor in 1 in 3 strokes in Ireland². Stroke caused by AF has a higher morbidity and mortality, results in longer hospital stay and represents a higher cost to the economy than stroke due to other aetiologies. However, the majority of AF-related strokes are preventable. Effective anticoagulation can reduce the risk of stroke by 65%. Furthermore, stroke outcomes are improved in patients with AF which occur while on therapeutic anticoagulation³. Extrapolating this to our national stroke rates, we could infer that up to 1600 strokes per year in Ireland are potentially preventable with anticoagulation, with a potential annual saving of 173 million in this country.

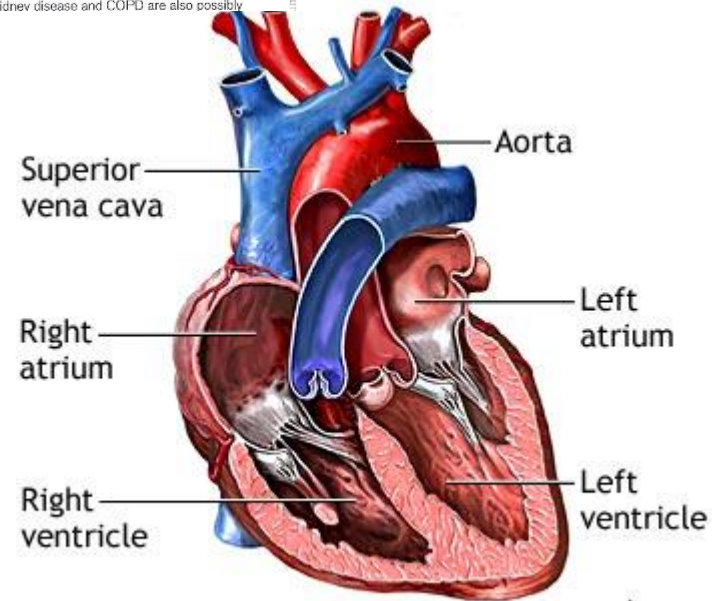
Awareness of AF among the general population is poor. From an Irish population survey, we know that only 30% of the general population have heard of AF⁴. Almost half of these people, despite having heard of it, don't know what AF is, and most are not aware that AF is a risk factor for stroke. From the TILDA study, we now know that 38% of those with AF were not aware of having the condition, and that 59% at high risk of stroke with AF were

bedside is that of a 'faulty' cement mixer. Building site cement mixers are a common image. The fibrillating atrium is represented by the malfunctioning mixer, not mixing the cement adequately so that it hardens and 'clots', which, if it leaves the cement mixer, will obstruct flow downstream, causing stroke.

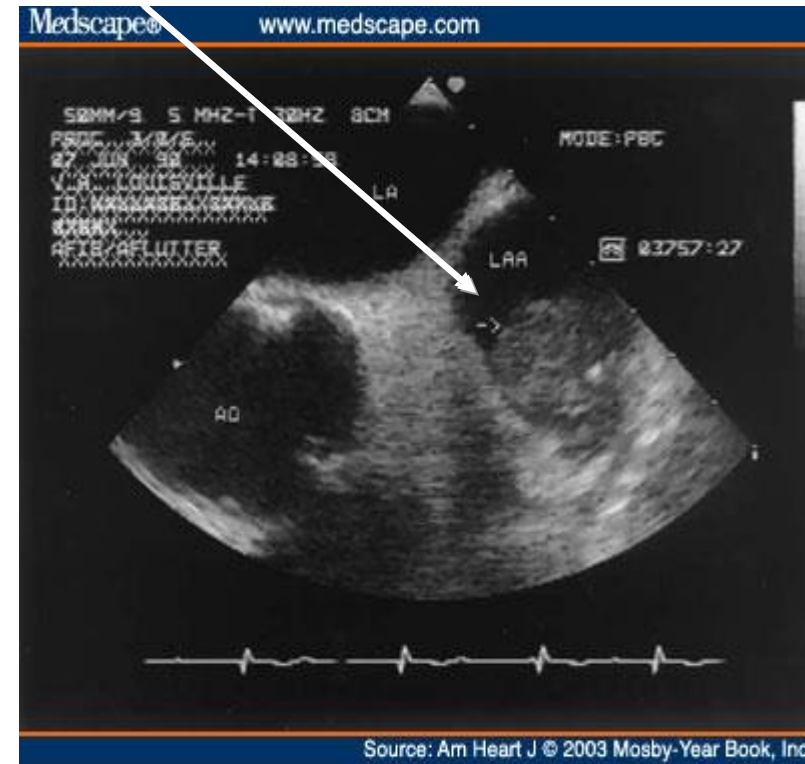
AF: Greater understanding from research needed

On a different level the cement mixer analogy might also prove useful for clinicians, challenging us to better understand the inter-individual variability in the 'mixers' and the 'cement', and what makes AF a greater risk for one individual than for another. While CHADS2 and CHA2DS2-VASC have helped clinicians better identify those with risky 'mixers' or 'thick cement' and have led to a level of consistency between clinicians in deciding upon anticoagulation, they are still relatively blunt tools when it comes to understanding the complex pathophysiology of thrombus formation in the fibrillating atrium. Younger patients with AF and apparently no other risk factor still suffer strokes, and the annual risk of stroke with a CHADS2 score of zero is still an appreciable 1.9%⁵.

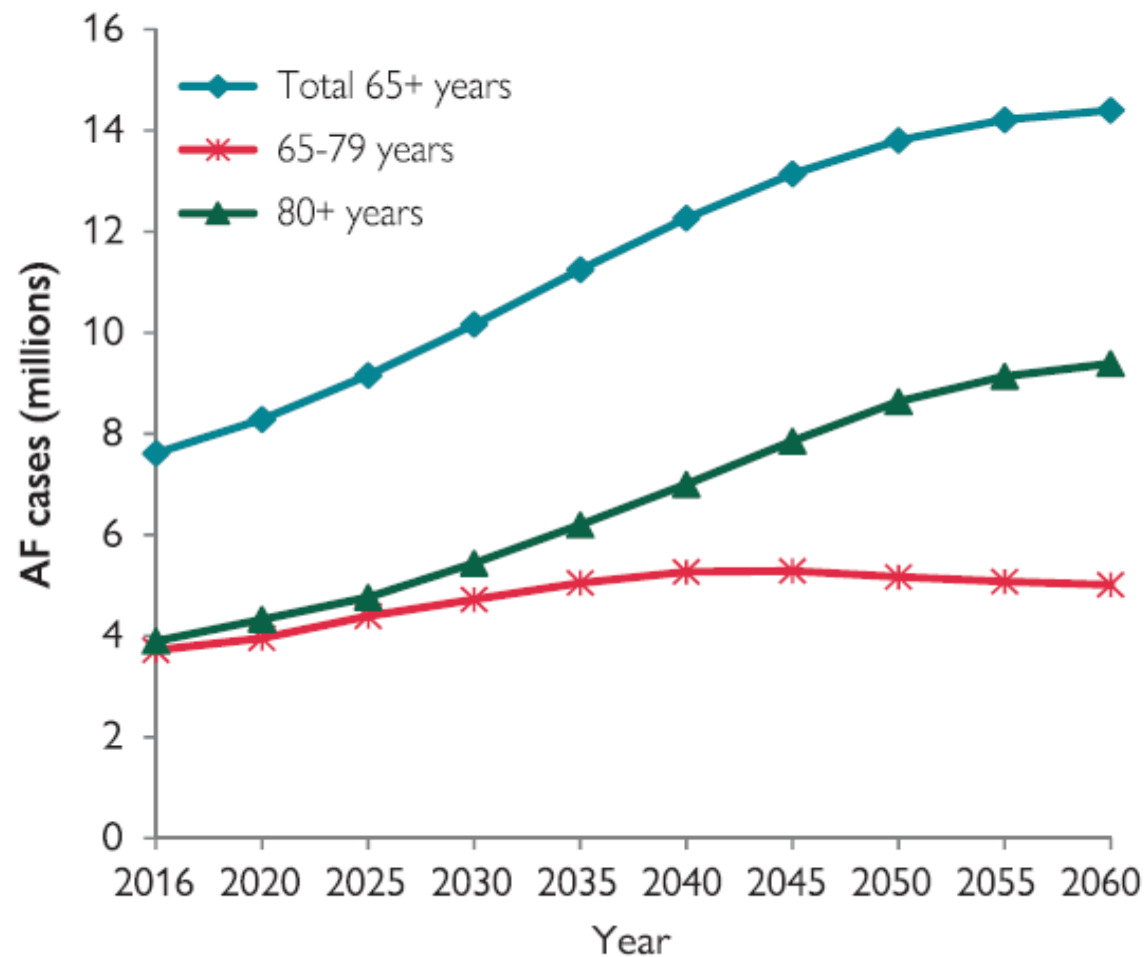
In addition the risk of stroke is probably not static, but changes over time and with circumstance. This is perhaps additionally dependent on the duration of the inadequate 'mixing', the type of mixer and the nature of the 'cement'. We know that advancing age, diabetes, hypertension, vascular disease, heart failure and prior stroke all increase the risk, but other factors such as proteinuria, chronic kidney disease and COPD are also possibly



Stroke prevention – “watering down the cement”



Projected increase in AF prevalence among elderly in EU 2016-2060





Burden of Stroke In Europe

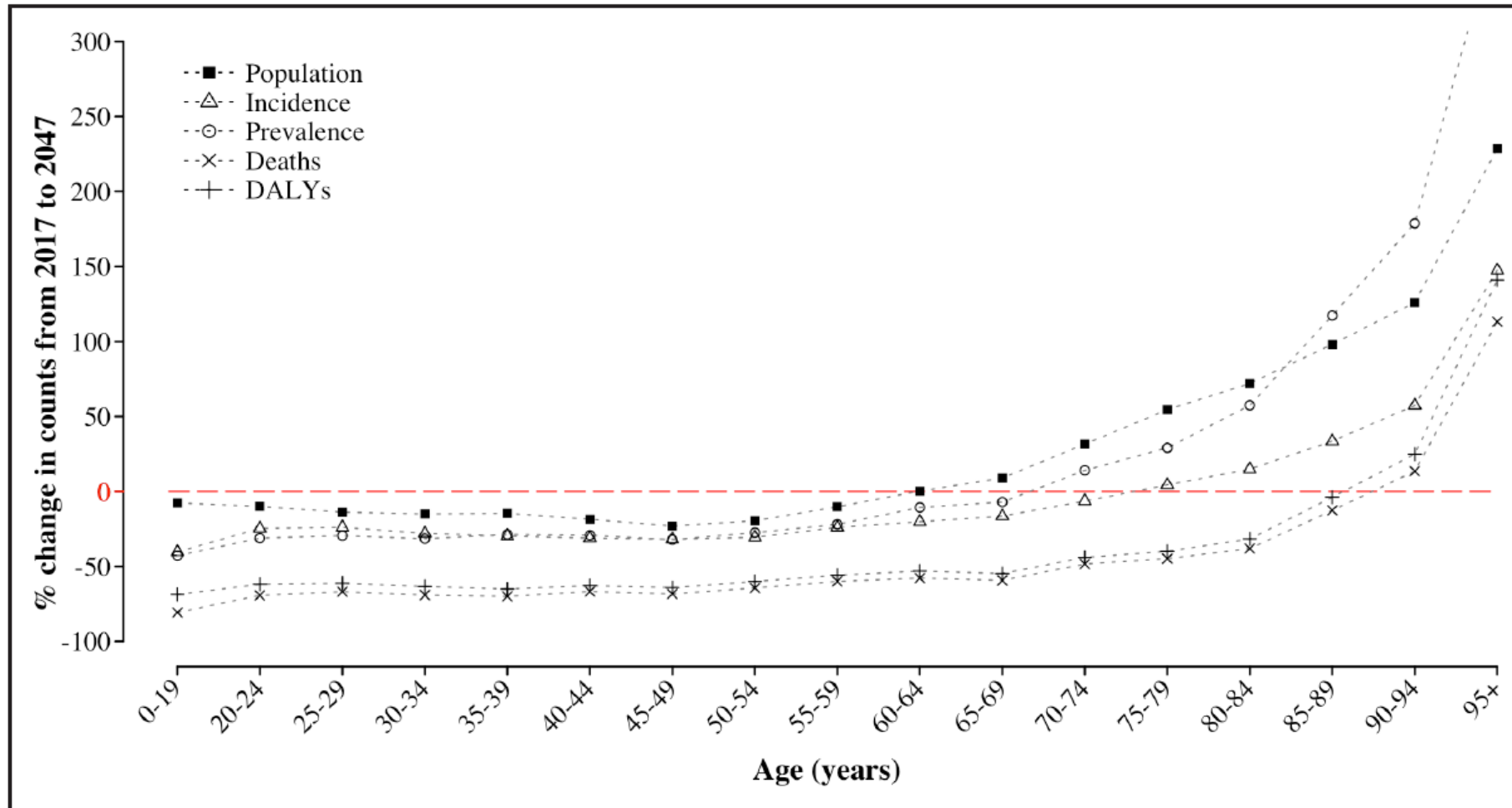
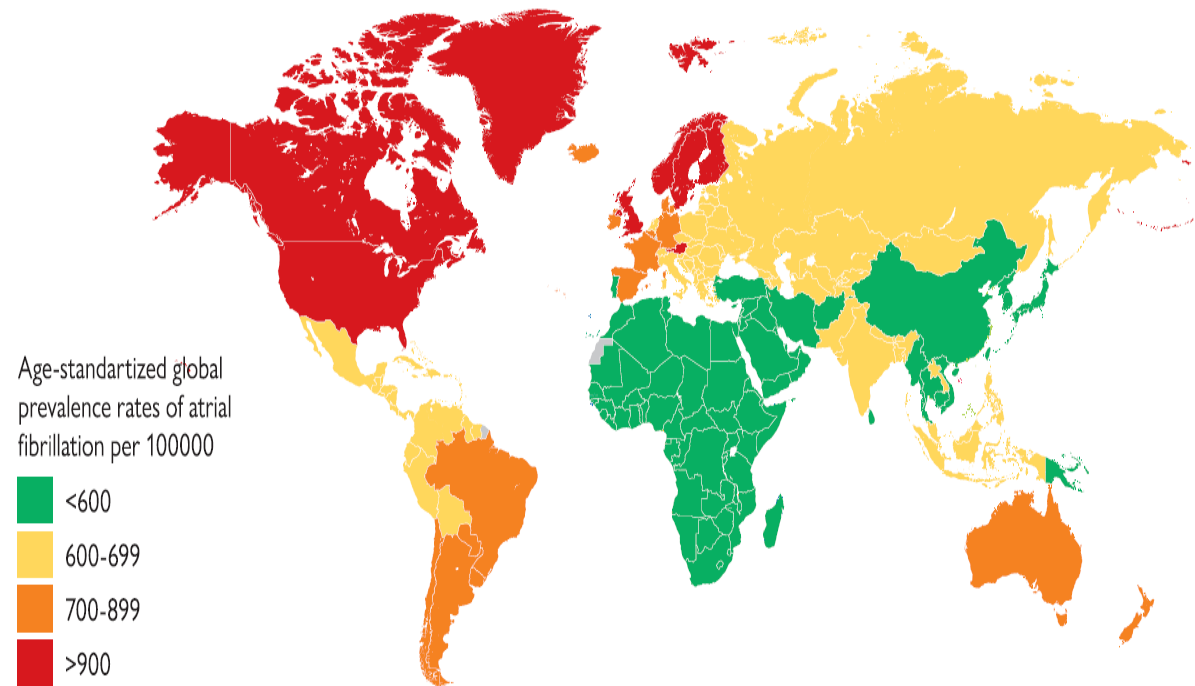


Figure 2. Projected change in population, incidence, prevalence, deaths, and disability-adjusted life years disability-adjusted life years (DALYs) count by age group in the European Union (2047 vs 2017).

Wafa et al. Stroke. 2020;51:2418–2427

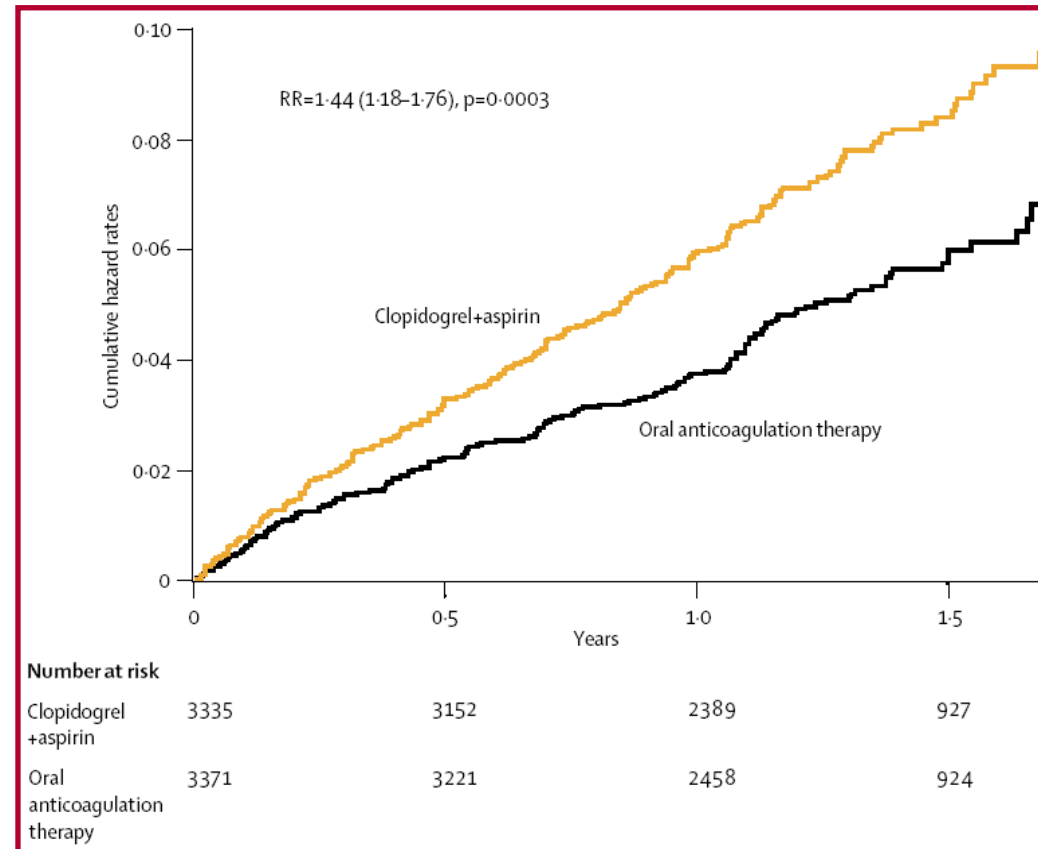
- Hindricks G, Potpara T et al. European Heart journal 2020;00;1-125

GLOBAL PREVALENCE OF AF
(globally, 43.6 million individuals had prevalent AF/AFL in 2016)



Antiplatelets have no role in stroke prevention in AFIB

ACTIVE-W: Clopidogrel Plus Aspirin Versus Anticoagulant Therapy



Summary of major bleeding in trials of New Oral Anticoagulants (NOACs)

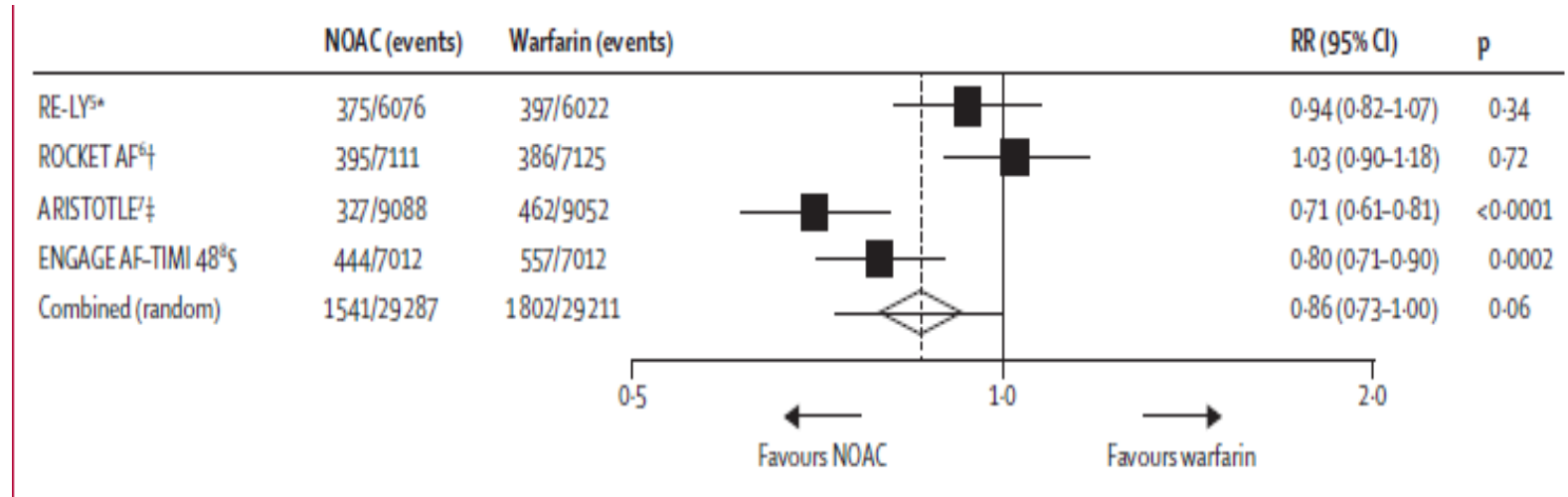


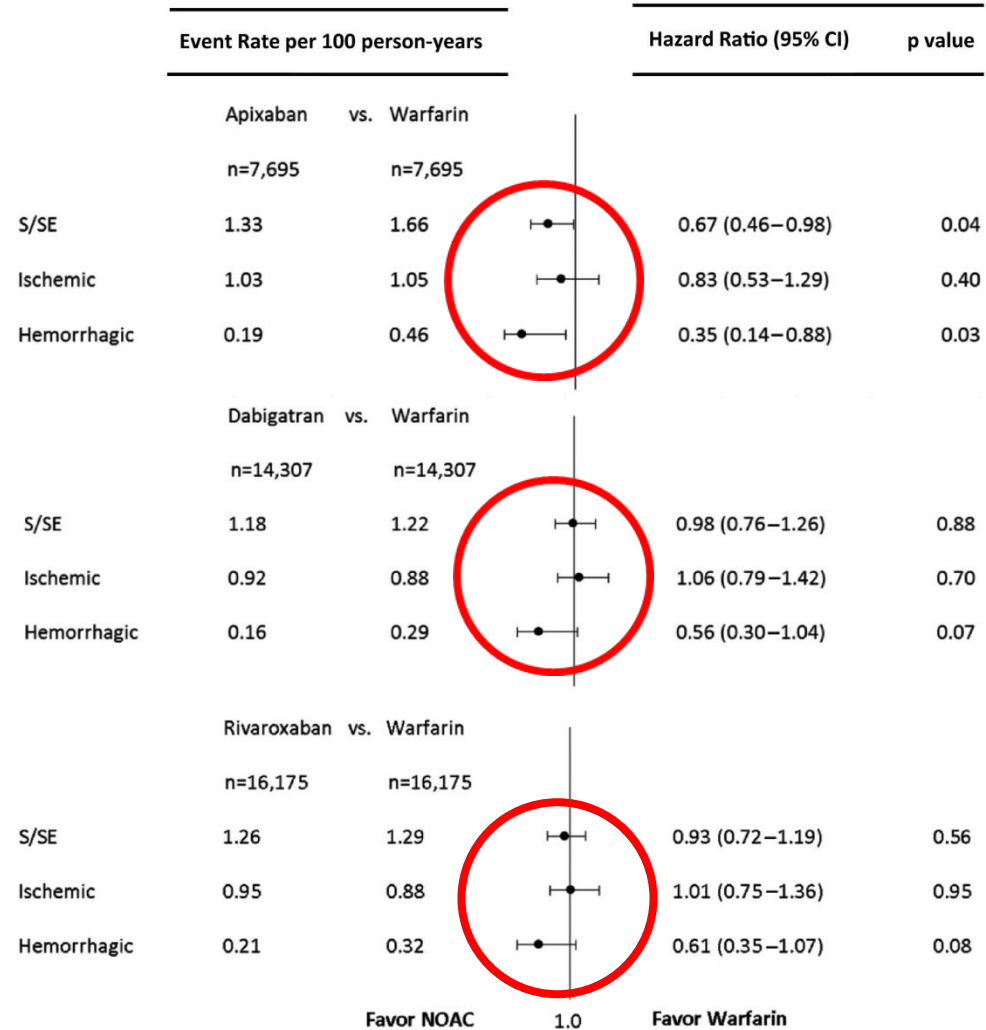
Figure 3: Major bleeding

Data are n/N, unless otherwise indicated. Heterogeneity: $I^2=83\%$; $p=0.001$. NOAC=new oral anticoagulant. RR=risk ratio. *Dabigatran 150 mg twice daily.

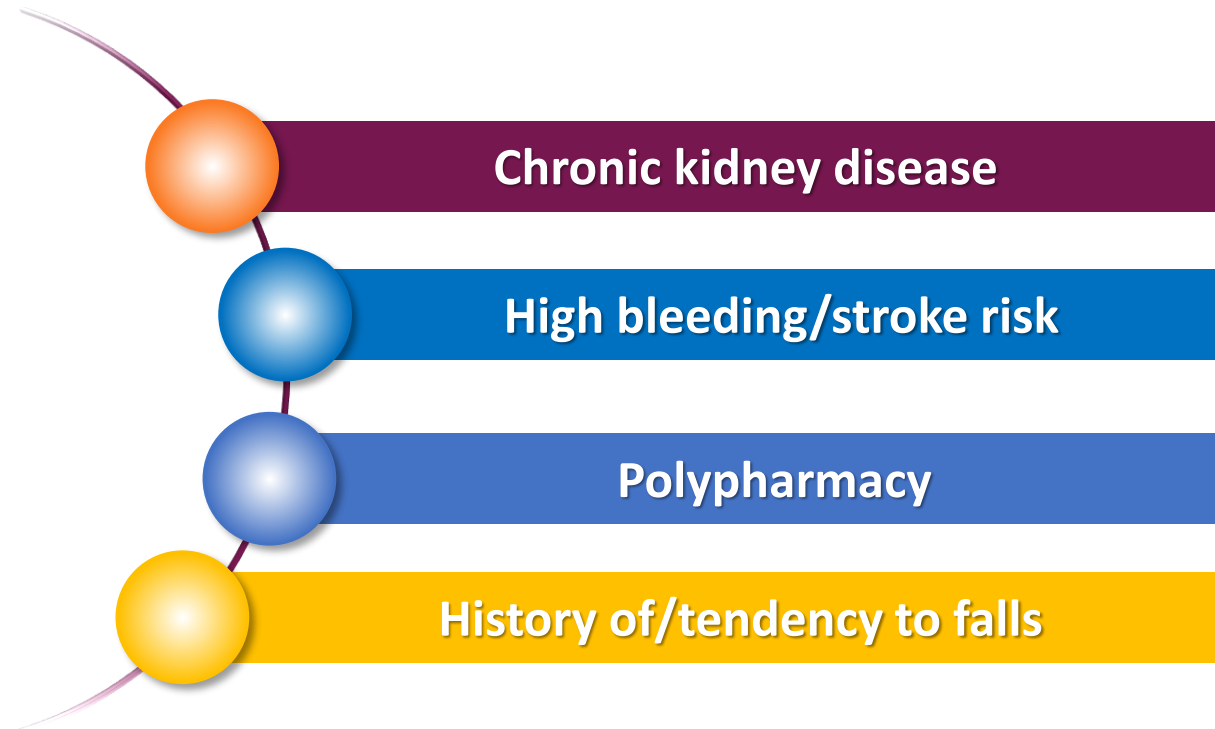
†Rivaroxaban 20 mg once daily. ‡Apixaban 5 mg twice daily. §Edoxaban 60 mg once daily.

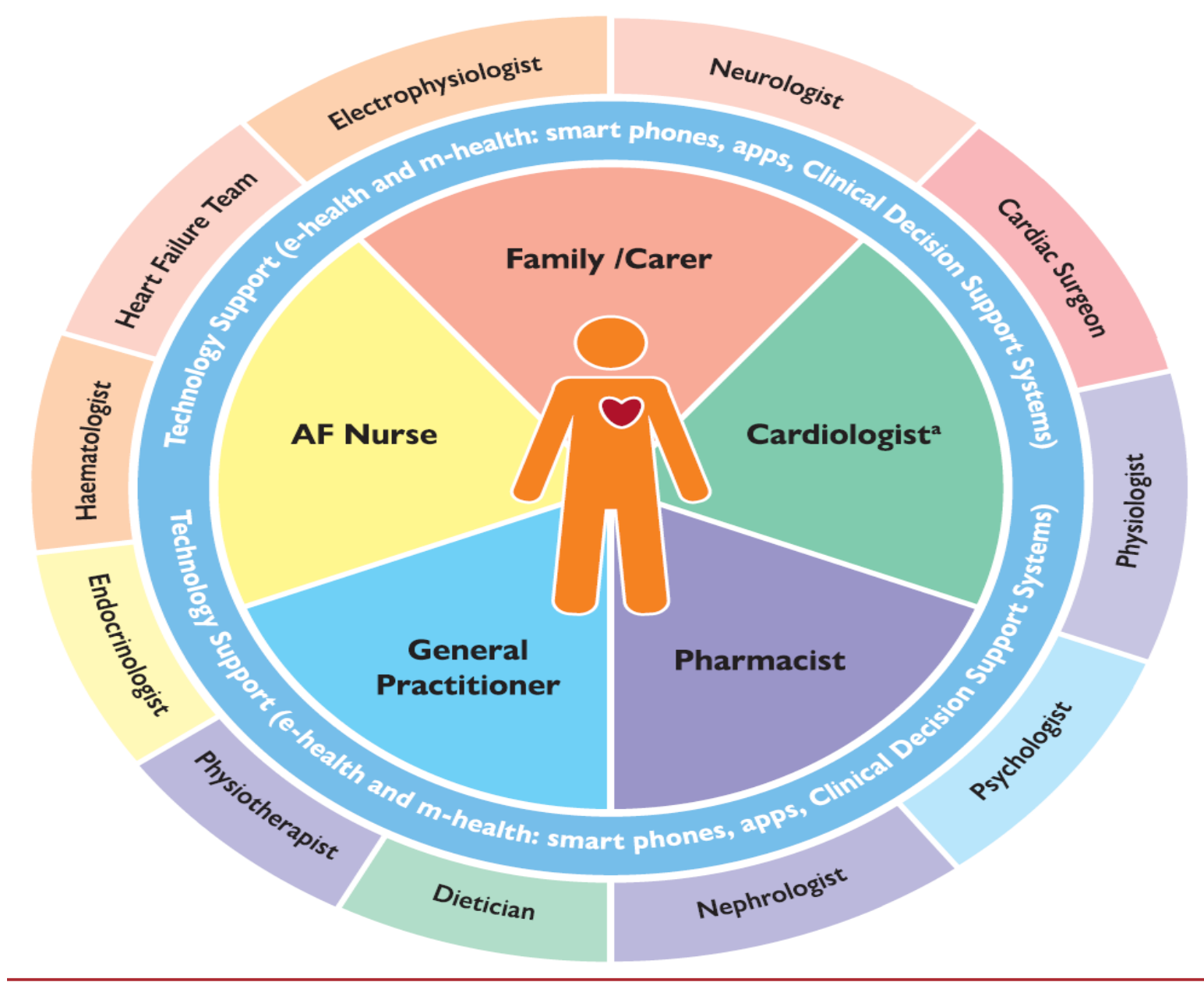
Ruff et al. Lancet 2014;383:955-962

Forest plot depicting the hazard ratio for each pairwise propensity-matched medication comparison (dabigatran, rivaroxaban, and apixaban each vs warfarin) for stroke and systemic embolism (S/SE), ischemic stroke, and hemorrhagic stroke.



The majority of patients with AF are older and are likely to have multiple co-morbidities and clinical considerations.

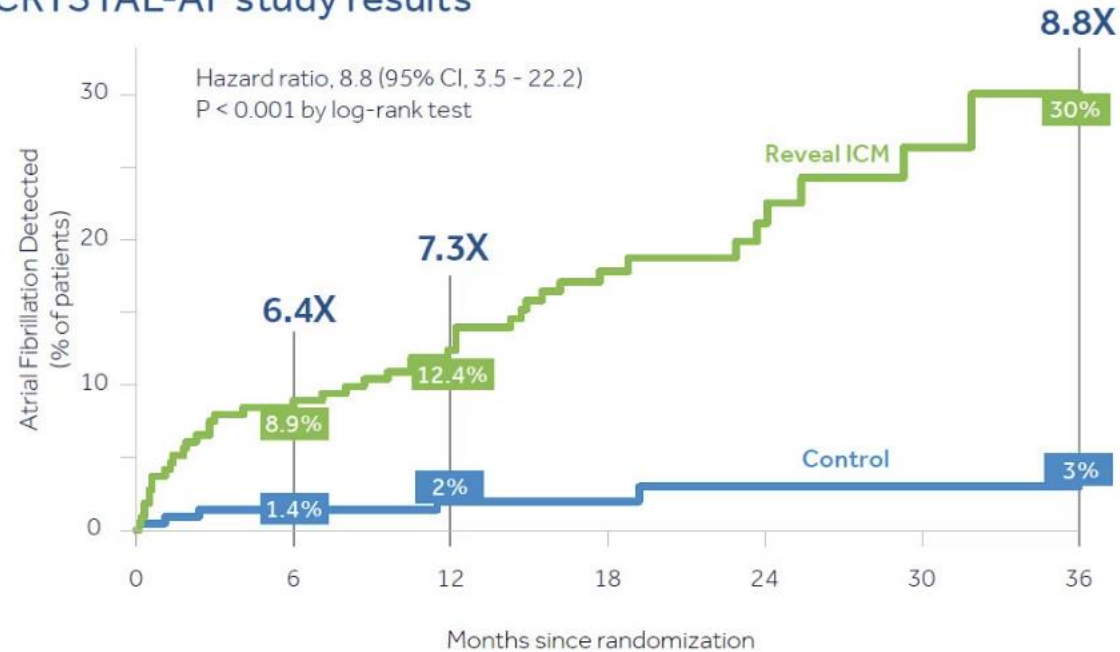




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Atrial Fibrillation – the more we look...

CRYSTAL-AF study results



- **6.4x more AF detected at 6 months:** 8.9% in ICM group vs. 1.4% in control
- **7.3x more AF detected at 12 months:** 12.4% in ICM group vs. 2.0% in control
- **8.8x more AF detected at 36 months:** 30% in ICM vs. 3.0% in control

Secondary prevention

- Address all likely risk factors
- Look for high impact risk factors that may not be immediately evident
- Tailor treatment to patient
- Monitor drug and lifestyle adherence
- Monitor Target measurements





Thank You