Atrial Fibrillation Screening in General Practice for Stroke Prevention

Associate Professor Bryan Yan

Head (Academic Affairs), Division of Cardiology

Department of Medicine & Therapeutics

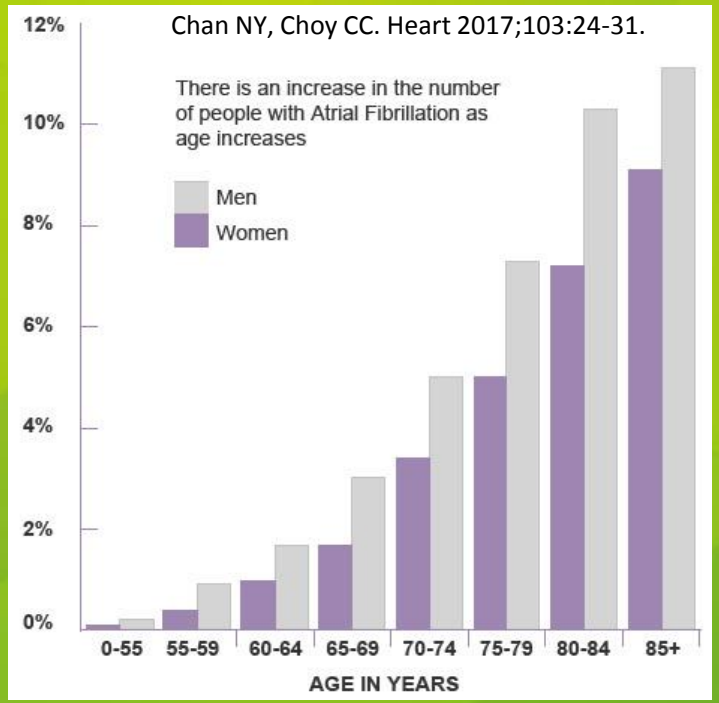
The Chinese University of Hong Kong

Learning Objectives

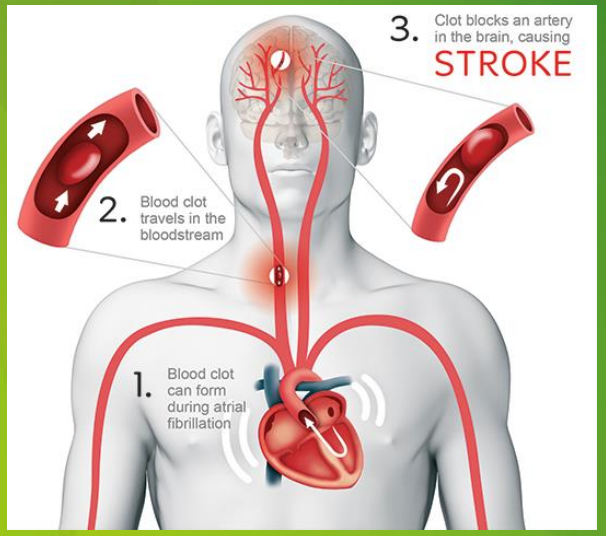
Why Screen?	Who to Screen?	How to Screen?	Role of GP in AF Screening?
AF leads to significant mortality & morbidity	Patients who at risk of developing AF & stroke	- Palpation - Hand-hand ECG devices - BP monitor	- Patient education - Prescription of OAC - Ensure OAC Adherence

Why Screen for AF?

- Most common cardiac arrhythmia
- Growing prevalence with ageing population
  - Expected to double 3.9 to 9 million in China by 2050



AF Related Stroke



- **5x** increased risk of stroke
  - –Up to 30% of ischemic stroke AF related
- AF-related stroke more severe
  - –20% death
  - –60% disability
- Healthcare burden could be reduced if AF related stroke can be prevented

Diagnostic Challenge

Identify AF before stroke occurs

- AF 1st diagnosed at time of stroke (~20%)
- AF often asymptomatic & many unaware they have AF
- Screening is necessary to identify asymptomatic AF
- Early AF detection provide opportunity to prevent strokes by initiating appropriate oral anticoagulation therapy

Treatment Challenges

Therapeutic & Knowledge gaps in Hong Kong

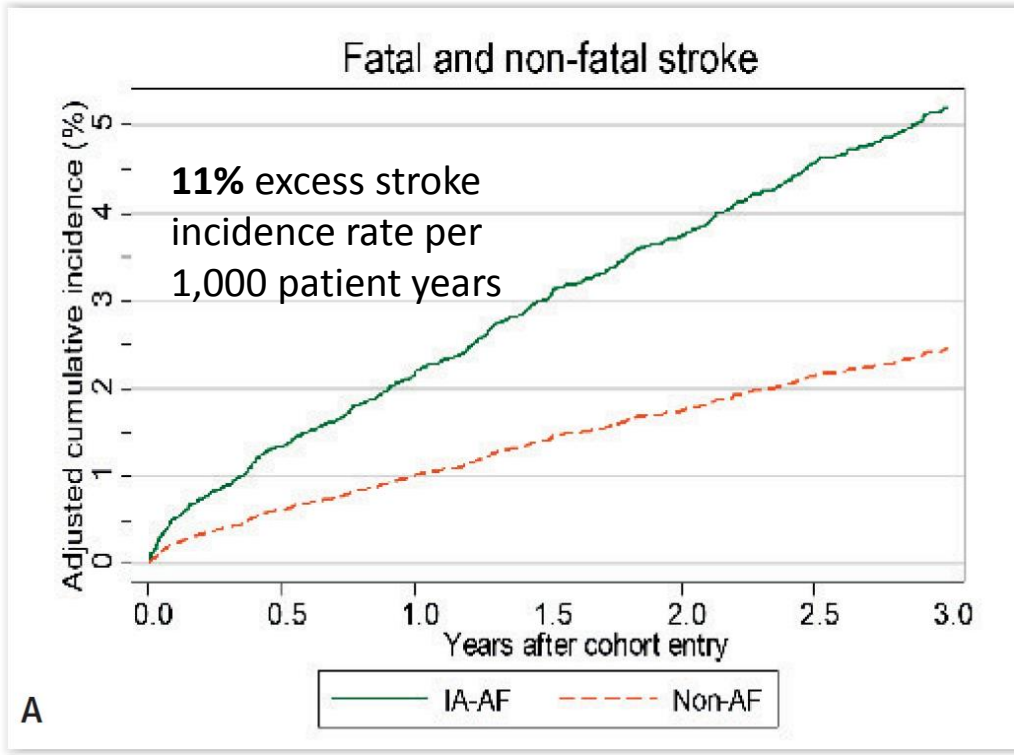
- Up to 50% known AF sub-optimally treated[1]
- Poor patient awareness of AF[2]
- Poor long-term compliance with oral anticoagulation therapy[3]
- Suboptimal physician knowledge & adherence to guidelines[4]

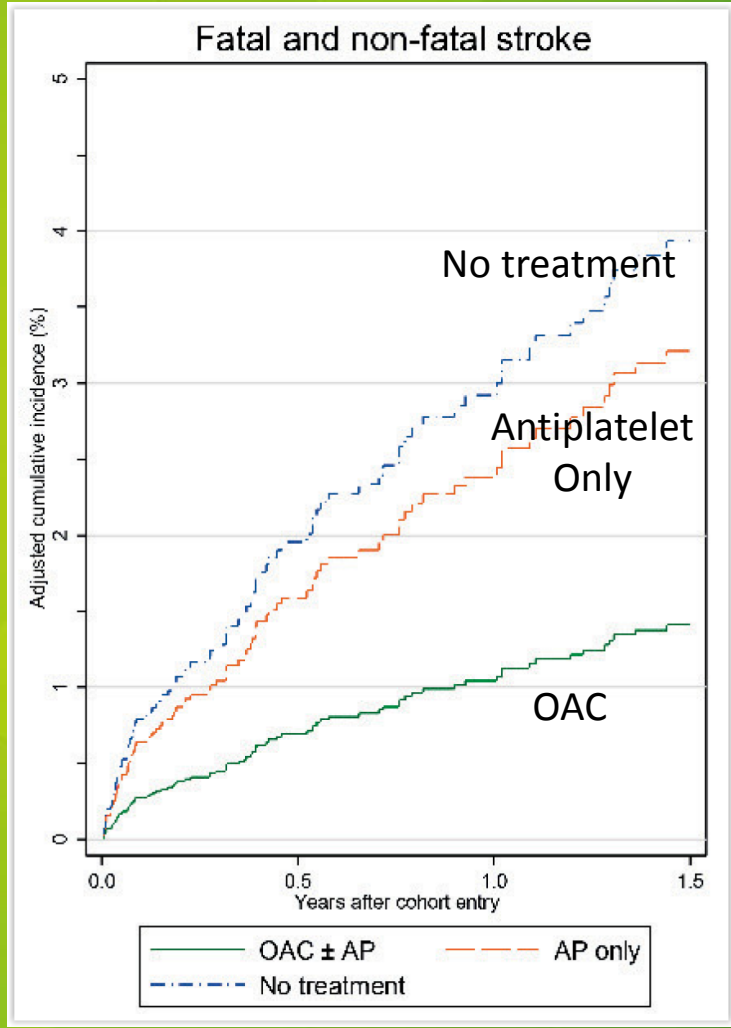
1. **Yan BP**. Unpublished data
2. Lee VWY, **Yan BP**, et al. Clinical Cardiology . 2013
3. Wang ZZ et al. Circ Cardiovasc Qual Outcomes. 2016
4. Lee VWY, **Yan BP**, et al. Clinical Cardiology . 2012

Incidentally Detected AF is Not Benign

Incidental AF (Holter monitor) = 5,555
Matched Control = 24,705

- Mean age = 70.9
- Mean CHA2DS2VASc Score = 2.1

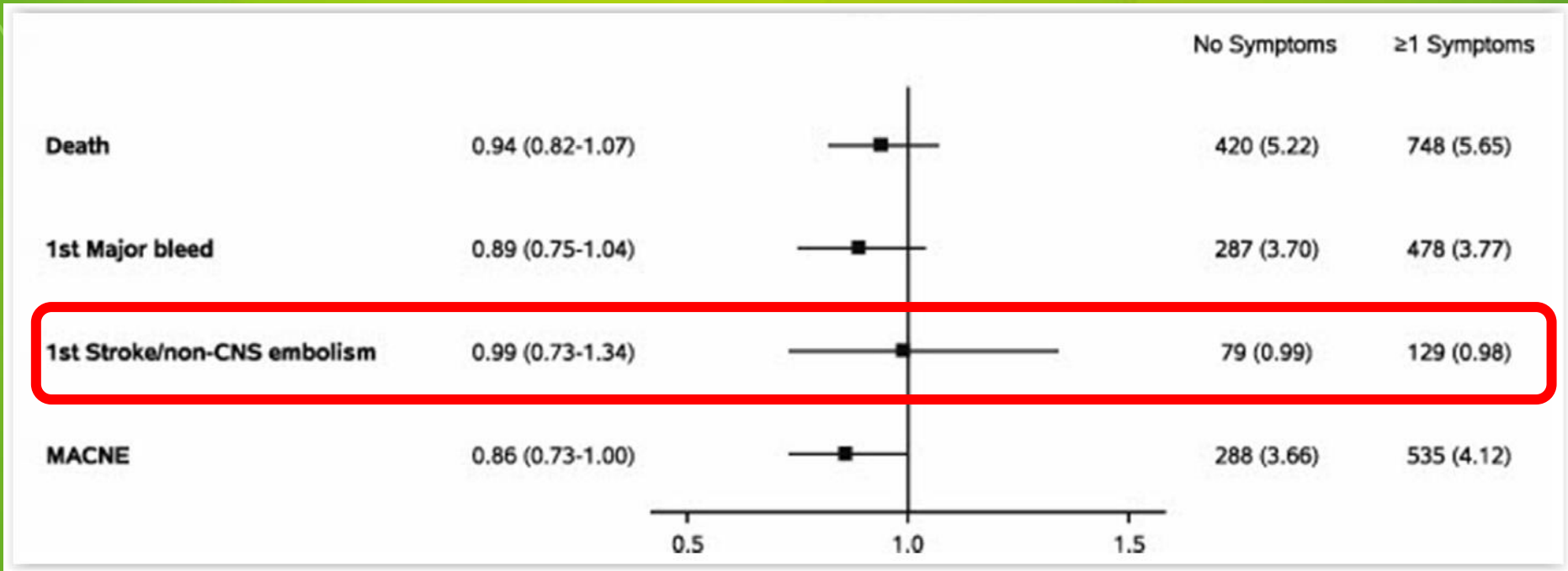




Martinez C et al. Thromb Haemost 2014

Asymptomatic & Symptomatic AF have Similar Risk of Stroke

- ORBIT AF Registry



Thind M, et al. Am J Cardiol 2018;122:1677–1683

Rationale for AF Screening

WHO Criteria for Screening *	Applicability of AF Screening
Condition should be an important health problem	**YES**, AF is common with rising prevalence & major cause for stroke & associated with increased mortality, morbidity & reduced QOL
Natural history of the condition should be adequately understood	**YES**, it is generally agreed that AF causes stroke & there is clear mechanism for treatment
Detectable early stage	**YES**, AF is readily detectable with simple measures
Accepted treatment at an early stage should be more benefit than later stage	**YES**, all guidelines agree OAC should be given to patients at high risk of stroke unless bleeding risk is very high
Suitable test for early stage	**YES,** a number of tests are suitable both pulse-based & ECG-based with single- or multi-time point testing
Test should be acceptable	**YES**, pulse check, ECG & smart-devices are simple & non-invasive
Interval for repeating the test should be known	**YES & NO**, permanent AF is easily detected with a single ECG recording but no consensus for paroxysmal AF
Adequate health service provision for extra workload resulting from screening	**YES,** AF screening is likely to be cost effective & potentially life-saving. Additional clinical workload is minimal in most cases
Risk of screening (physical & psychological) should be less than benefits	**YES,** negligible physical risk & most patients find process reassuring and grateful for early detection
Cost of case (including diagnosis & treatment) should be economically viable	**YES**, recent studies showed AF screening is likely to be cost effective

*Wilson & Jungner. Principle of Screening for Disease. WHO. 1968

Screening Strategies for AF: Systematic Review & Cost-effectiveness Analysis

Welton NJ, et al. HEALTH TECHNOLOGY ASSESSMENT 2017 VOL. 21 NO. 29

Conclusions: A national screening programme for AF is likely to represent a cost-effective use of resources. Systematic opportunistic screening is more likely to be cost-effective than systematic population screening. Nurse pulse palpation or modified blood pressure monitors would be appropriate screening tests, with confirmation by diagnostic 12-lead electrocardiography interpreted by a trained GP, with referral to a specialist in the case of an unclear diagnosis. Implementation strategies to operationalise uptake of systematic opportunistic screening in primary care should accompany any screening recommendations.

Cost-Effectiveness of a National Opportunistic Screening Program for Atrial Fibrillation in Ireland

Patrick S. Moran, PhD[1,2,], Conor Teljeur, PhD[2,3], Patricia Harrington, PhD[2], Susan M. Smith, MD[4], Breda Smyth, MD[5], Joseph Harbison, MD[6], Charles Normand, DPhil[7], Máirín Ryan, PhD[2,8]*

To be screened to detect one additional AF case compared with no screening.

Feasibility and cost-effectiveness of stroke prevention through community screening for atrial fibrillation using iPhone ECG in pharmacies

The SEARCH-AF study

Australia

Canadian Journal of Cardiology 34 (2018) 1522–1525

Training/Practice
Health Policy and Promotion

Is Screening for Atrial Fibrillation in Canadian Family Practices Cost-Effective in Patients 65 Years and Older?

European Society of Cardiology doi:10.1093/europace/euw285

CLINICAL RESEARCH
Atrial fibrillation

Cost-effectiveness of screening for atrial fibrillation in primary care with a handheld, single-lead electrocardiogram device in the Netherlands

Who to Screen?

Risk factors for AF (Framingham Cohort)

- Male
- **Age >65**
- **Diabetes**
- **Hypertension**
- **CAD/heart failure**
- Smoking
- Obesity
- Sleep Apnoea
- COPD
- Positive family history of AF
- **History of stroke** & thyroid disease

CHA_2DS_2VASc Score

Risk Factor
C - Congestive heart failure
H - Hypertension
A - Age ≥ 75 yrs
D - Diabetes mellitus
S_2 - Prior stroke or TIA
V - Vascular disease
A - Age 65-74 years old
Sc - Sex category (female)

Latest ESC Guidelines (2016)

Recommendations	Class[a]	Level[b]	Ref[c]
Opportunistic screening for AF is recommended by pulse taking or ECG rhythm strip in patients >65 years of age.	I	B	130, 134, 155
In patients with TIA or ischaemic stroke, screening for AF is recommended by short-term ECG recording followed by continuous ECG monitoring for at least 72 hours.	I	B	27, 127
It is recommended to interrogate pacemakers and ICDs on a regular basis for atrial high rate episodes (AHRE). Patients with AHRE should undergo further ECG monitoring to document AF before initiating AF therapy.	I	B	141, 156
In stroke patients, additional ECG monitoring by long-term non-invasive ECG monitors or implanted loop recorders should be considered to document silent atrial fibrillation.	IIa	B	18, 128
Systematic ECG screening may be considered to detect AF in patients aged >75 years, or those at high stroke risk.	IIb	B	130, 135, 157

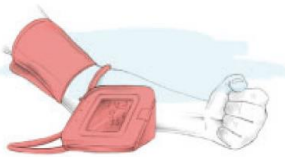
Kirchhof P et al. Eur Heart J. 2016;37(38)

How to Screen?

CLINICAL SCREENING

RISK SCORES

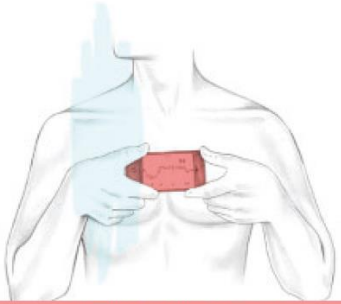
PULSE TAKING



AUTOMATED BLOOD PRESSURE MONITORS

> NEW TOOLS

PHOTOPLETHYSMOGRAPHIC APP

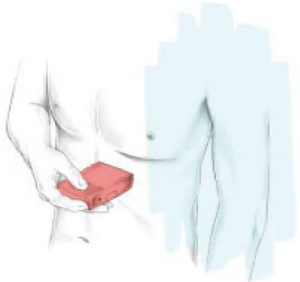


SMARTPHONE + CASING ELECTRODE

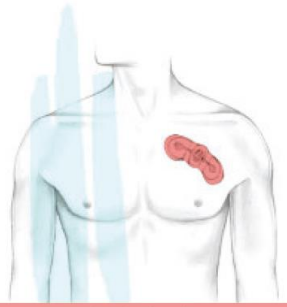
SMARTPHONE HANDHELD ECG

ECG SCREENING > SINGLE LEAD

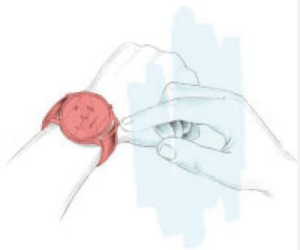
ELECTRODE STICK



SINGLE-CHANNEL ECG MONITOR

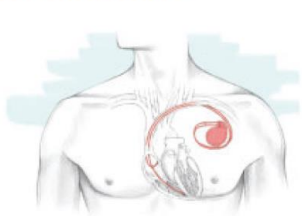


MONITORING PATCH

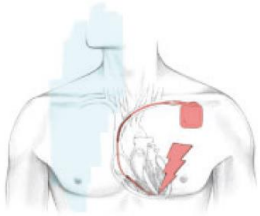


WATCH-LIKE RECORDER

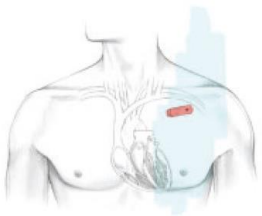
IMPLANTED DEVICES



PACEMAKER



IMPLANTABLE CARDIOVERTER DEFIBRILLATOR



IMPLANTABLE LOOP RECORDER

TELEMETRY

Pulse Palpation

- Traditional, simple & should be routine practice
- Pulse is infrequently assessed in 'real world' practice
  - Expert recommend 1 minutes palpation[2]
  - Automatic BP & pulse rate machines
- Diagnostic accuracy depends on training & expertise[1]
  - Sensitivity = 0.94 (0.87-0.97)
  - Specificity = **0.72** (0.69-0.75)
- Confirmatory ECG takes time, space & staff
  - 1 in 10 ECG may require further investigations for abnormalities
  - Many primary care physicians cannot accurately detect AF on ECG[3]

1. Taggar JS, et al. Eur J Prev Cardiol, 2016; 23(12)
2. Sneed N, et al. J Crit Care. 1991; 21(5)
3. Martin J, et al. BMJ 335(7616):380

AliveCor™ Heart Monitor

- Real-time high-grade single-lead ECG tracing
  - Smartphone, tablet, Apple Watch
- Automatic AF detection algorithm
  - 30 seconds recording
  - Presence of P wave & RR irregularity
  - High sensitivity (98%) & specificity (97%)[1]
- US FDA approved
  - Advise ECG reading is “normal” or “possible AF”

Kardia Band

Kardia Mobile ECG (4th Generation)
AC-009-UA-C

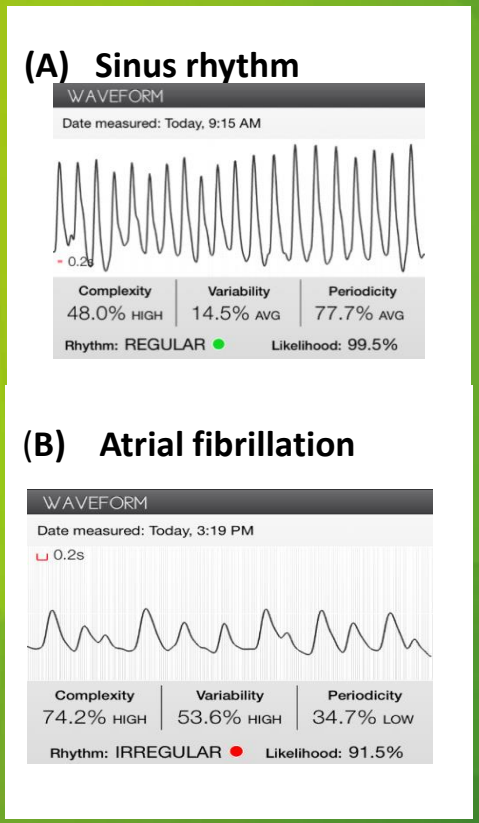
1. Lau JK, Freedman B. Int J Cardiol. 2013

Contact-Free Facial AF Detection

- Pulsatile PPG signals from beat-to-beat variations of facial skin color reflects cardiac pulsatile signal similar to heart beat

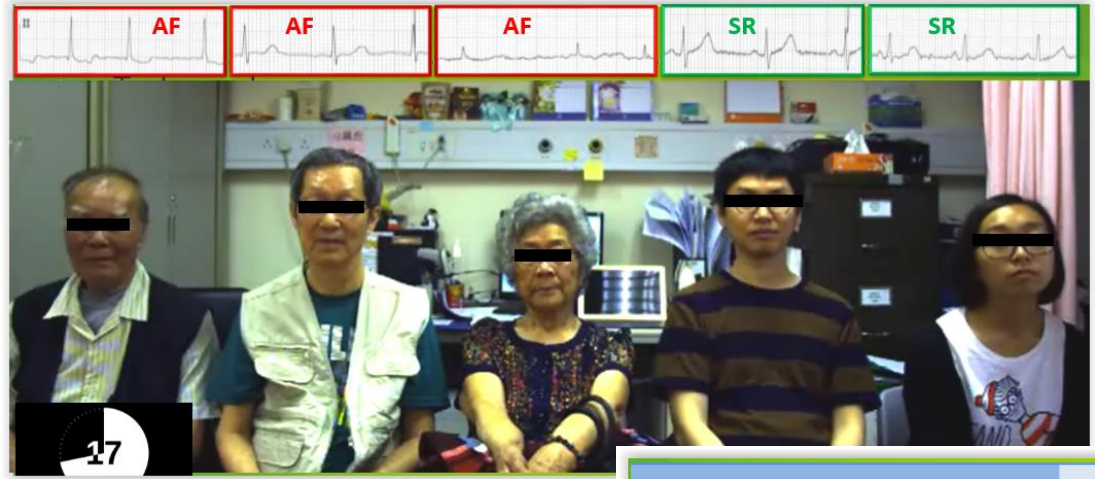
	Facial PPG	Fingertip PPG
No. of subjects	217	
Sensitivity	**94.7%**	94.7%
Specificity	**95.8%**	93.0%
Accuracy	**95.4%**	93.5%

- Convenience of contact free approach attractive for community screening & potential for distal AF screening



Yan BP, et al. J Am Heart Assoc. 2018;7(8)

Proof-of-concept Study: Simultaneous Multi-facial AF Detection



- Digital SLR
- Automatic facial recognition & identify "region-of-interest"
- 5 facial PPG signals extracted from video
- Pulse irregularity in >50% considered AF

Inter-method Reliability		ECG (32 combinations recorded 2 times)		
		AF	SR	Total
PPG (32 combinations recorded 2 times)	AF	154	7	161
	SR	6	153	159
	Total	160	160	320
Cohen's K coefficient		0.92 (CI 0.88-0.96)		
Range across 32 combinations		0.55-1.00		
Range across 5 seating positions		0.84-1.00		
Agreement		95.9%		
Range across 32 combinations		80.0-100.0%		
Range across 5 seating positions		92.2-96.9%		

Yan BP. JAMA Cardiol. 2019 (under revision)

Circulation

STATE OF THE ART

Screening for Atrial Fibrillation

A Report of the AF-SCREEN International Collaboration

AF-SCREEN

AF Screen International Collaboration

Ben Freedman, John Camm, Hugh Calkins, Jeffrey S. Healey, Mårten Rosenqvist, Jiguang Wang, Christine M. Albert, Craig S. Anderson, Sotiris Antoniou, Emelia J. Benjamin, Giuseppe Boriani, Johannes Brachmann, Axel Brandes, Tze-Fan Chao, David Conen, Johan Engdahl, Laurent Fauchier, David A. Fitzmaurice, Leif Friberg, Bernard J. Gersh, David J. Gladstone, Taya V. Glotzer, Kylie Gwynne, Graeme J. Hankey, Joseph Harbison, Graham S. Hillis, Mellanie T. Hills, Hooman Kamel, Paulus Kirchhof, Peter R. Kowey, Derk Krieger, Vivian W. Y. Lee, Lars-Åke Levin, Gregory Y. H. Lip, Trudie Lobban, Nicole Lowres, Georges H. Mairesse, Carlos Martinez, Lis Neubeck, Jessica Orchard, Jonathan P. Piccini, Katrina Poppe, Tatjana S. Potpara, Helmut Puererfellner, Michiel Rienstra, Roopinder K. Sandhu, Renate B. Schnabel, Chung-Wah Siu, Steven Steinhubl, Jesper H. Svendsen, Emma Svennberg, Sakis Themistoclakis, Robert G. Tieleman, Mintu P. Turakhia, Arnljot Tveit, Steven B. Uittenbogaart, Isabelle C. Van Gelder, Atul Verma, Rolf Wachter, Bryan P. Yan

DOI https://doi.org/10.1161/CIRCULATIONAHA.116.026693
Circulation. 2017;135:1851-1867

1 of 5 Key Messages:

Setting for AF screening should be both country- & health system-specific.

AF-SCREEN is an international collaboration of >100 health care professionals from **31** countries formed in 2015 (including cardiologists, electrophysiologists, neurologists, geriatricians, epidemiologists, health economists, primary care physicians, nurses, pharmacists, physiotherapists & patient advocates)

More Screening Increases AF Yield

Study	Method	Device	Target	New AF Detected	NNS
Lowres N, et al. Thromb Haemost 2103	Single-time point	Handheld ECG	>65	**1.4%**	71
STROKESTOP *Svennberg E, et al. Circulation 2015*	2 week twice daily	Handheld ECG	75-76	**3.0%**	33
REHEARSE-AF *Halcox JP, et al. Circulation 2017*	12 months twice weekly	Handheld ECG	>75 (younger with risk factors)	**3.8%**	26
mSToPS *Steinhubl S, et al. JAMA 2018*	2 weeks continuous	ECG patch	>65 with risk factors	**3.9%**	26

Community AF Screening in Hong Kong

Study	Population	Mean Age	Device	New AF Detected
Chan NY, et al. Heart. 2017	13,122 General pop	64.7±13.4	Hand-held ECG	**0.8%**
Yan BP, et al. ISPOR 2016, Washington	2,767 (26 elderly centres)	80.3±7.1	Hand-held ECG	**5.1%**

Out-patient Clinic AF Screening in Hong Kong

Study	Population	Strategy	Mean Age	Device	New AF
Chan PH, et al. BMJ Open. 2017	5,969 GOPC	Single-time point	67±11	BP monitor	**1.21%**
Yan BP, et al. ESC 2017, Barcelona	11,972 7 Medical SOPC @PWH	40% repeated screening at 6-12 months interval	76±8	Hand-held ECG	**3.0% Overall** **2.3% 1st Time**

AF Screening in General Practice: Pilot Study

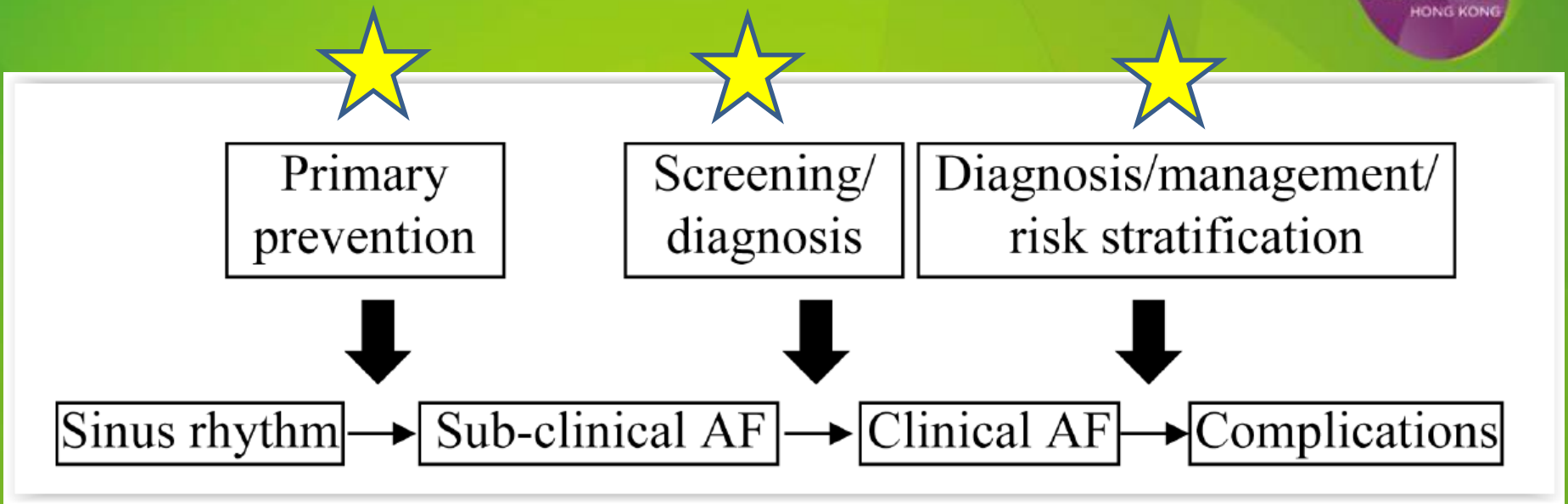
- 1041 patients ≥65 years old (9 GP Clinics)
  - AliveCor hand-held ECG

Table 3. Evaluation of the impact of AF screening from GPs (n=7).

Do you find the ECG device useful for AF screening?		
No/Rarely	0	
Sometimes	14% (1)	
Yes	86% (6)	
How often do you use CHA_2DS_2-VASc score for AF patients?		
	Before AF screening	**After AF screening**
Never/Rarely	43% (3)	29% (2)
Sometimes	14% (1)	0
Often/Always	43% (3)	71% (5)
Do you agree the handheld ECG was easy to operate?		
Yes	100.0% (7)	75.0% (3)
Don't know	0	25.0% (1)
Are you willing to be screened for AF again in the future?		
Yes	100.0% (7)	100.0% (4)
Don't know	0	0

Yan BP, et al. ISPOR, Glasgow, 2017

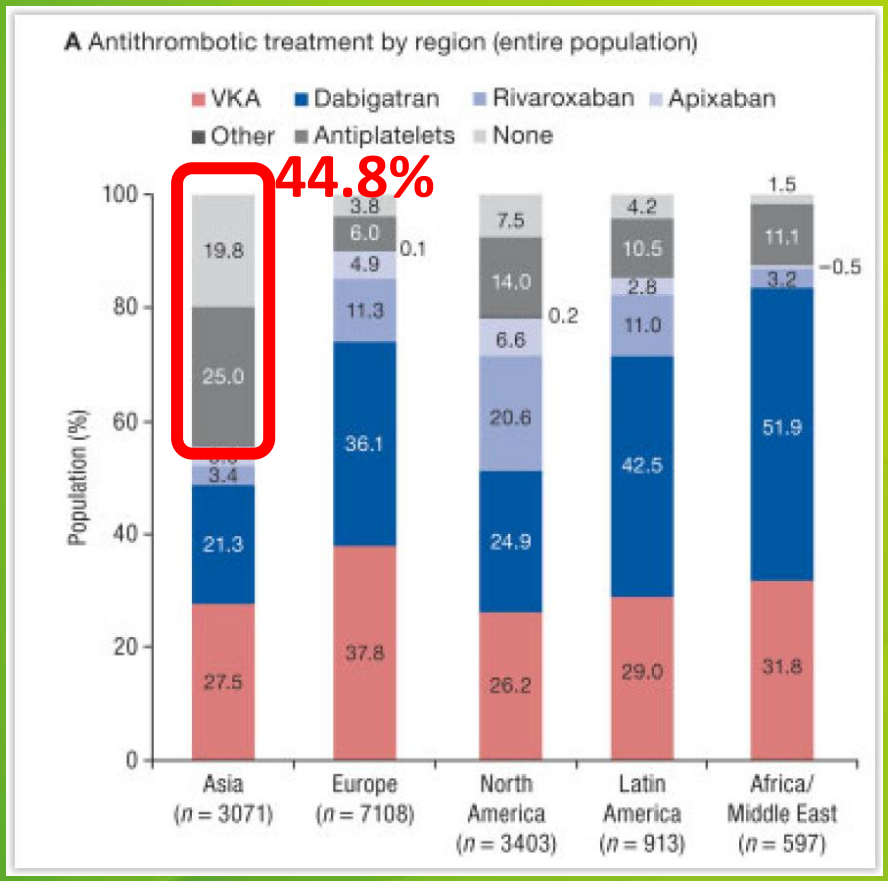
Role of GP in AF Screening

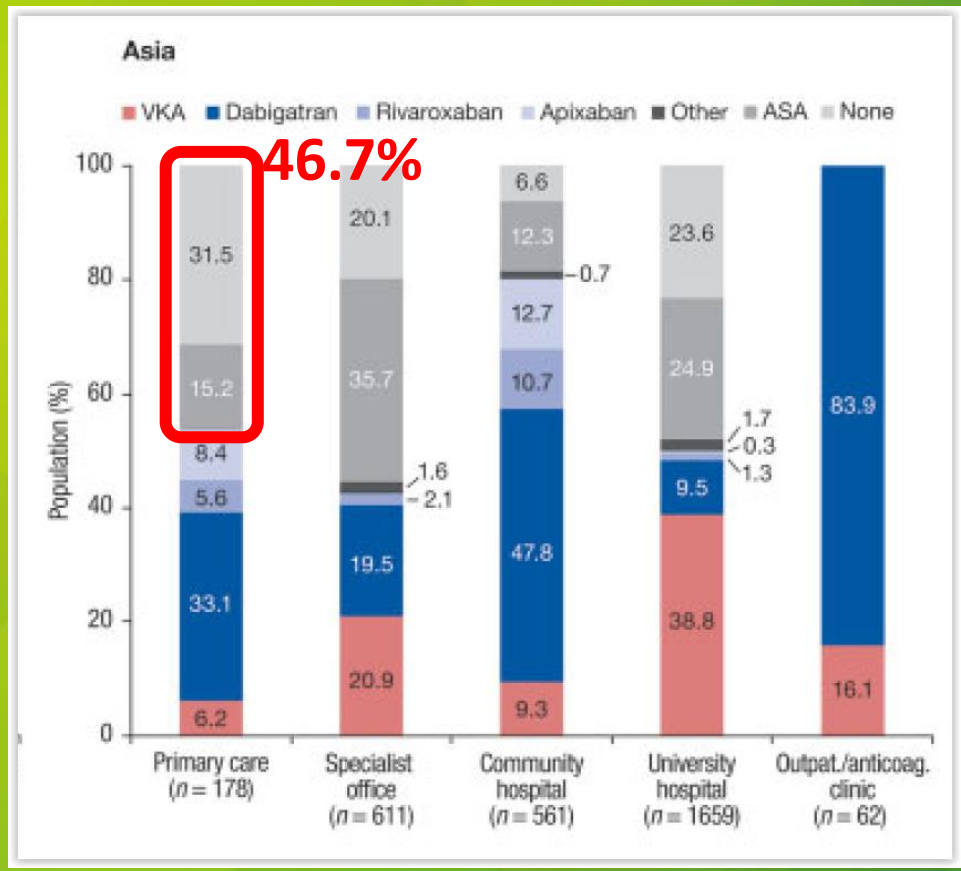


- AF screening & diagnosis
- Assess stroke risk & bleeding
- Initiate OAC if indicated
- Lifestyle interventions
- Patient education & empowerment

Regional Differences in Antithrombotic Treatment for Atrial Fibrillation: Insights from the GLORIA-AF Phase II Registry

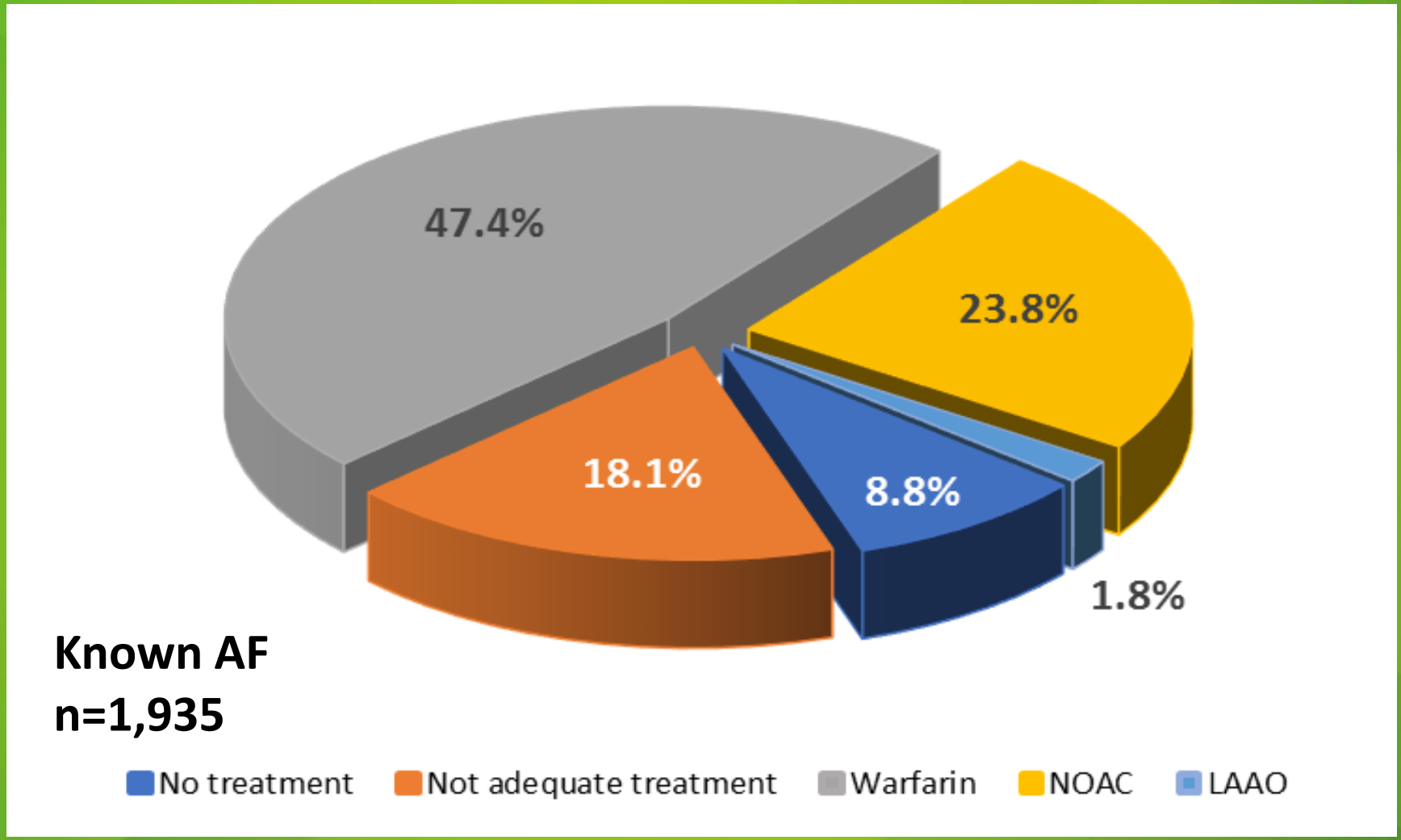
15,092 (Asia 3,071) new AF (>50 countries)





Mazurek M, et al. Thromb Haemost 2017;117:2376 – 2388.

Opportunity to improve stroke prevention in known AF patients identified during screening



Yan BP, et al. ESC 2017, Barcelona

Opportunity to improve patient knowledge gaps

Table 3: Respondents' pre-screening knowledge of facts about atrial fibrillation

EVALUATION: Internal Medicine AF Screening					
	Yes, I knew	N	No, I did not know	N	Total
Women with AF have a higher risk of stroke than men.	33.10%	188	66.90%	380	568
AF strokes are much more dangerous than other types of strokes.	21.14%	119	78.86%	444	563
The risk of stroke is much higher if you have AF that is not treated.	54.23%	308	45.77%	260	568
People living with AF are at risk for stroke even if they have irregular heartbeats only once in a while.	42.53%	242	57.47%	327	569
Most AF strokes are caused by a blood clot in the brain.	36.33%	206	63.67%	361	567
Physicians think about AF stroke risk when suggesting choices about treatment.	38.38%	218	61.62%	350	568
Blood thinners can greatly reduce the risk of AF stroke.	59.36%	336	40.64%	230	566
Even those with occasional AF are at risk for AF stroke.	42.50%	241	57.50%	326	567
Some AF patients may not have any noticeable symptoms.	46.02%	260	53.98%	305	565

Screening programs should take advantage of the opportunity to provide education regarding AF & stroke prevention, thereby increasing benefits to all participants

Rosenfeld LE, et al. Heart Rhythm. 2019

Take Home Message:
Are We Ready for AF Screening?

- AF is a growing problem & increases risk of stroke but is often diagnosed too late after stroke occurs
- Active, opportunistic screening (e.g. GP visit) in patients at risk of AF (aged >65) increases detection rates of asymptomatic AF
- Improved AF detection (by pulse palpation or handheld devices) will amount to little if adequate treatment strategies are not implemented
- GP can play key roles in AF screening & diagnosis of, stroke risk assessment, initiate OAC when appropriate & patient education to translate potential benefits of increased detection into improved stroke prevention, with the associated societal cost benefits & reduction in direct human costs of AF-related stroke

Freedman B, Yan BP, et al.Circulation. 2017

AF-SCREEN

CU Medicine HONG KONG

Thank You