From screening of AF to efficient stroke prevention in AF patients

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Conflicts of interest

- Payment for lectures (AstraZeneca, Boehringer Ingelheim, FCG Koulutus, GE Healthcare, Medtronic, Orion, Sanofi)
- Consulting (Boehringer Ingelheim, Medieta)
- Travel/accommodations/meeting expenses (Boehringer Ingelheim, Pfizer, St. Jude Medical)
- Grants (Abbvie, Medtronic)

Definitions

- Routine practice
- Systematic screening (by invitation to have an ECG)
- Opportunistic screening (pulse palpation at a GP/nurse visit followed by an ECG if irregular)

Among those ≥65 years, systematic and opportunistic screening reveal 1.6% new AF cases a year vs. 1.0% without screening.

Screening with a single-lead ECG device during influenza vaccination in primary care resulted in 1.1% new cases of AF. Kaasenbrood et al. Europace 2016
Handheld ECG device in primary prevention
The STROKESTOP Study


- 7173 patients, 75-76 years of age
- 1-lead ECG, twice daily + when palpitations, 2 weeks
- 218 (3.0%) had a previously unknown AF
- 149 (2.1%) had a known AF without OAC
- Initiation of OAC treatment in 3.7%
- €4164 per QALY

2012 focused update of the ESC Guidelines for the management of atrial fibrillation

Recommendation for screening of AF

AHA/ASA Guideline

Guidelines for the Primary Prevention of Stroke
(Stroke. 2011;42:517-584.)

- Active screening for atrial fibrillation in patients >65 years of age in primary care settings using pulse taking followed by an ECG as indicated can be useful (Class IIA; Level of Evidence B).
Stroke subtypes according to age

- 42.4% non-cardioembolic
- 34.1% cardioembolic stroke with a known source
- 23.5% USEPs (poor prognosis)


The NEW ENGLAND JOURNAL of MEDICINE

Cryptogenic Stroke

Jeffrey I. Saver, M.D.

About 20% of stroke patients have a previous Dx of AF.

Prevalence of atrial fibrillation in patients with ischemic stroke

- About 20% of stroke patients have a previous Dx of AF.
PSAF = post-stroke atrial fibrillation

Prevalence?

Diagnosis of atrial fibrillation after stroke and transient ischaemic attack: a systematic review and meta-analysis

Luciano A Sposato, Lauren E Cipriano, Gustavo Soares, Estefania Roa Vergas, Patricia M Ricco, Vladimir Hochenski

- 50 studies (comprising 11 658 patients without prior Dx of AF)
- Four sequential phases of screening
- (What is AF? Episodes with >30 s? When searching for AF, the definitions vary.)

![Figure 2: Proportion of patients diagnosed with post-stroke atrial fibrillation during phase 1 (admission to the emergency room)](image-url)
Better yield than for the overall in-hospital stay, but includes long Holters.
Arrhythmia detection in the everyday life

Norman Holter 1947

1970

2000

Technological considerations

- A clear need for devices/apps to catch arrhythmia with rare occurrence.
- Does the arrhythmia cause symptoms?
  - Continual ECG vs. event recorder vs. intermittent?
- If symptoms, is there an arrhythmia?
  - ECG needed when the symptoms are "on".

- 1 channel is often enough, 1-3 typical.
- Electrodes!
- Artefacts?
- P-wave visible?

Beat2Phone, from a review Nikus, Nieminen. Sydänääni 2015.
Trends in mobile ECG

- Smaller devices
- Longer follow-ups
- Wireless
- Wearable
- Apps
- Implantable devices

Plenitude of recorders for intermittent use

http://www.ndsu.edu/pubweb/~grier/Comparison-handheld-ECG-EKG.html
EMBRACE

Methods

We randomly assigned 572 patients 55 years of age or older, without known atrial fibrillation, who had had a cryptogenic ischemic stroke or TIA within the previous 6 months (cause undetermined after standard tests, including 24-hour electrocardiography [ECG]), to undergo additional noninvasive ambulatory ECG monitoring with either a 30-day event-triggered recorder (intervention group) or a conventional 24-hour monitor (control group). The primary outcome was newly
Wearable ECG

ECG patches on a mobile phone

Nuubo
Patients with AF, ablation and an iPhone were screened for enrollment. AliveCor case and a traditional transtelephonic monitor. Post-ablation, 60 patients recorded their rhythm using both monitors simultaneously whenever they had symptoms or at least once a week. 389 simultaneous recordings: $\kappa$ statistic excellent 0.82.

- CE mark, Food and Drug Administration 510(k) approval

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Implantable loop recorders

- Pacemaker companies Medtronic, St Jude Medical, Biotronik

- Injectable…
CRYPTAL-AF

13.6.2016

13.6.2016
Prior to the publication of CRYSTAL-AF and EMBRACE. Clearly outdated, an update in process. Cardiac monitoring should be conducted routinely. Extended duration of monitoring, prolonged event loop recording, and confining Holter monitoring to patients with non-lacunar stroke, may improve detection rates.
Cost-effectiveness

- Is middle- to long-term screening for silent PSAF a cost-effective use of scarce resources?
- Dependent on several (partly local) factors.
- Somewhat contradictory findings for Holter 1-7 days.
  - Becoming obsolete as more AF should be found than possible with a Holter.
  - Technology develops and costs fall every year.

249 patients
- ischaemic stroke/TIA
- mean age 72 years
- 57 % male
- no known cardioembolic source

Markov model simulated health states for 20 years.
24-h Holter found 5 vs. handheld device 15 AF patients
Handheld is clearly dominant method vs. Holter 24-h
Why? Reason: a combination of
- low-cost screening technology,
- high-risk target population and
- (cost-)effective OAC.

Cumulative AF-related net cost in Euros of 1000 patients.

A recent report from the Canadian Agency for Drugs and Technologies in Health (CADTH).
Results and conclusions not particularly promising
- 30-day ELR: $85,000 per QALY
- “As technologies such as ELRs decrease in cost, they may become cost-effective in target populations.”
- “ILRs are unlikely to be cost-effective for the purpose of investigating AF in a post-stroke population.”

There are also more positive appraisals.
- Cost-effectiveness analyses are complicated.
Economic considerations

- PSAF screening can be cost-effective.
- Preconditions
  - The cost compared with standard practice must be relatively small.
  - The diagnostic yield must be substantial.
    - High expected prevalence of AF based on medical history and type of stroke.
    - Few investigations for AF in hospital, screening soon after the discharge.
  - The patient cohort must be relatively healthy.
  - The initiation of OACs in newly diagnosed patients must be high.

After all: why bother?

- Should be simply anticoagulate all those with an evidently embolic stroke?
  - NAVIGATE ESUS (rivaroxaban)
  - RE-SPECT ESUS (dabigatran)
  - ATTICUS (apixaban)

- That is another promising strategy.
- However, contradicts the medical megatrend of personalized medicine?
- Both strategies may prove valuable.
A glimpse into the future prospects

Electronic tattoos

- For each and every in-hospital patient?
- For a 30-day AF screening?
AF diagnosis when driving a car

- A contactless ECG sensing seat in a Ford
- Internet of things (IoT)

AF diagnosis when driving a car

- Toyota steering wheel
- Internet of things (IoT)
HEAD TO HEAD

Can healthy people benefit from health apps?
Some apps have the potential to encourage healthier habits and are accessible to most people, writes Iltifat Husain, but Des Spence notes the lack of any evidence of effectiveness and the potential for encouraging unnecessary anxiety.

Iltifat Husain editor, iMedicalApps.com, and assistant professor of emergency medicine, Wake Forest School of Medicine, North Carolina, USA, Des Spence general practitioner, Glasgow, UK

BMJ 2015;350:h1887

Medical News & Perspectives

Is There an App to Solve App Overload?

Bridget M. Kuehn, MSJ

JAMA April 14, 2015 Volume 313, Number 14

Pulse rate from photoplethysmograms

- By back or front built-in camera – for a fingertip pulse rate
Dx of AF with a mobile phone without any peripherals

- 76 adults with AF and cardioversion
- Pulsatile time series before and after CV using an iPhone 4S camera.
- An algorithm combining the 2 statistical methods discriminated AF from sinus rhythm.
  - Sensitivity 0.962
  - Specificity 0.975

McManus et al. Heart Rhythm 2013

Photoplethysmograms

Pulse rate from photoplethysmograms by wearables with special LED sensors, with infrared, red, green or yellow light
Is this where we are going?

Wireless Body Area Network (WBAN)

M-Health is already here for the detection of AF. The consumer (a patient?) gathers arrhythmic data even without MD input. Clinical evidence? A multitude of solutions – which strategies and devices are optimal? Mobile phone apps are emerging. Relatively scarce (or nil) data for each application. Integration to local electronic medical records! Cost-efficient m-health will certainly – and hopefully – be a crucial part of the future options to optimize treatment!
“No, Johnny, it's 'an apple a day keeps the doctor away' not 'an app a day.'”