

# Cryptogenic Stroke and Underlying Atrial Fibrillation

차명진

서울대학교병원

순환기내과

# The Korean Society of Cardiology COI Disclosure

The authors have no financial conflicts of interest to disclose concerning the presentation

# Stroke

뇌혈류 이상에 의해,

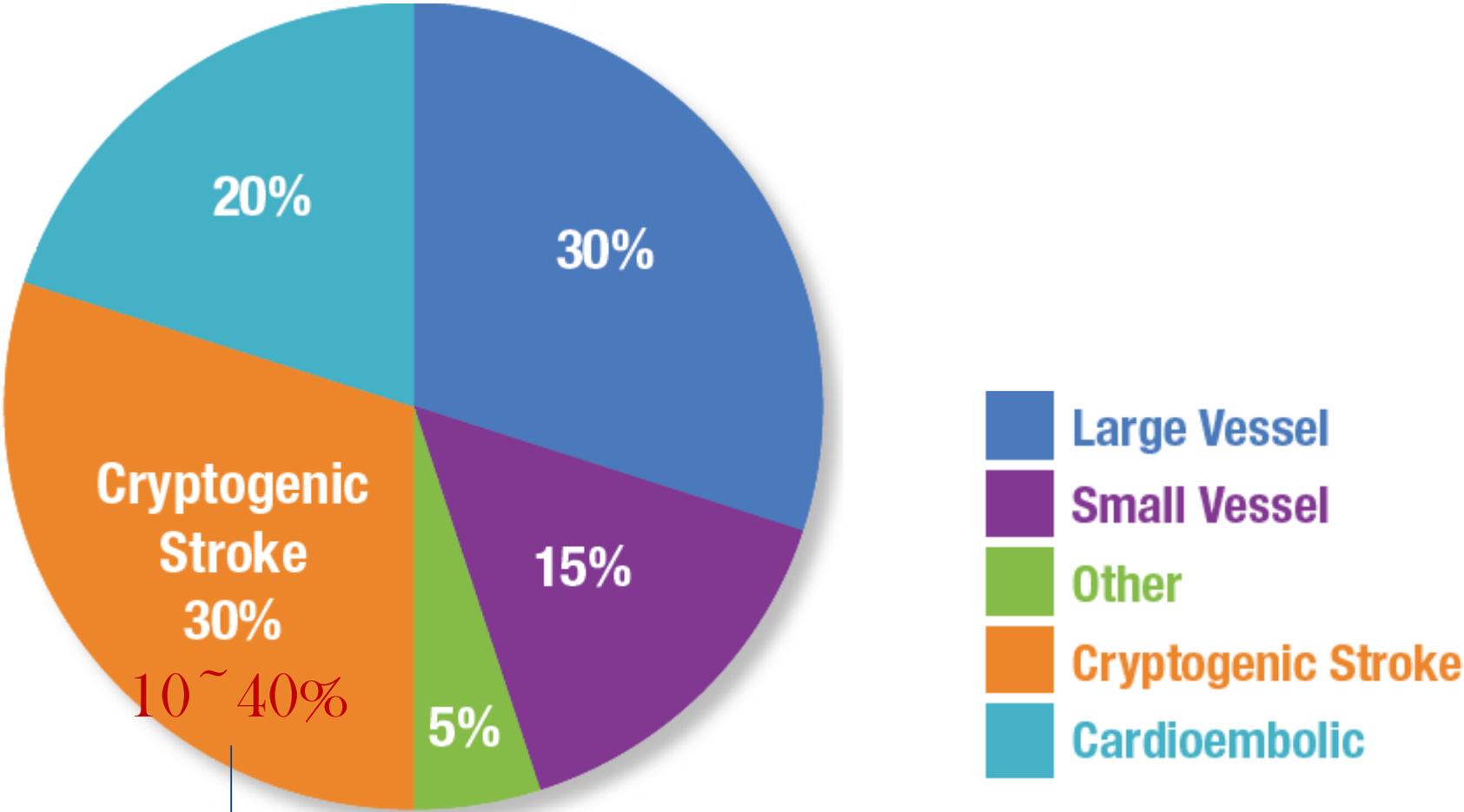
뇌에 혈류 공급이 부족하여 유발되는 갑작스런 이상으로,

뇌혈관이 막혀서 발생하는 **허혈뇌혈관병**과

뇌혈관이 파열되어 발생하는 **출혈성뇌혈관병**

으로 크게 구분된다.

# Subtype of ischemic stroke



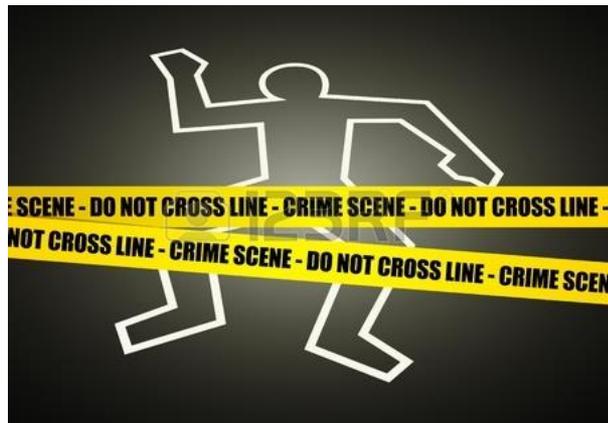
About 200,000 strokes annually with no clear etiology

# Cardiologist



AF이라는 잠재적 범죄자...

# Neurologist



원인불명의 stroke

용의자



# AHA/ASA Guidelines for the prevention of stroke

- Hypertension
- Dyslipidemia
- Glucose disorders
- Obesity
- Physical inactivity
- Nutrition
- Sleep apnea
- Carotid disease
- Intracranial atherosclerosis
- **Atrial fibrillation**
- MI and thrombus
- Cardiomyopathy
- Valvular heart disease
- Prosthetic HV
- Aortic arch atheroma
- PFO
- Homocysteinemia
- Hypercoagulation
- Antiphospholipid antibodies
- Sickle cell disease

# Stroke classification system

	TOAST	CCS	ASCOD
<b>Mechanism Categories</b>	1) Large artery atherosclerosis 2) Cardioembolic 3) Small vessel disease 4) Other determined 5) Undetermined	1) Large artery atherosclerosis 2) Cardioembolic 3) Small vessel disease 4) Other determined 5) Undetermined	1) Large artery atherosclerosis 2) Cardioembolic 3) Small vessel disease 4) Dissection 5) Other determined 6) Undetermined
<b>Requirements for probable large artery atherosclerosis</b>	≥50% stenosis	≥50% stenosis <50% with ulceration, thrombus <50% at origin of penetrating artery	≥50% stenosis <50% with thrombus Mobile thrombus at aortic arch
<b>Aortic atherosclerosis</b>	Not described	Classifies as cardioembolic	Classifies as large artery atherosclerosis
<b>Strengths</b>	Well-established Good inter-rater reliability	Available as web algorithm Fewer cryptogenic assignments Excellent inter-rater reliability	Profiles non-causative and causative neurovascular disease Fewer cryptogenic assignments Excellent inter-rater reliability

TOAST, Trial of Org 10172 in acute stroke treatment; CCS, Causative classification of stroke; ASCOD: Atherosclerosis, small-vessel disease, cardiac pathology, other causes, dissection.

CCS: require brain imaging, imaging of cerebral vessels,  
heart function evaluation

# AHA/ASA Guideline

## Guidelines for the Early Management of Patients With Acute Ischemic Stroke

### A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association

*The American Academy of Neurology affirms the value of this guideline as an educational tool for neurologists.*

*Endorsed by the American Association of Neurological Surgeons and Congress  
of Neurological Surgeons*

Edward C. Jauch, MD, MS, FAHA, Chair; Jeffrey L. Saver, MD, FAHA, Vice Chair;  
Harold P. Adams, Jr, MD, FAHA; Askiel Bruno, MD, MS; J.J. (Buddy) Connors, MD;  
Bart M. Demaerschalk, MD, MSc; Pooja Khatri, MD, MSc, FAHA;  
Paul W. McMullan, Jr, MD, FAHA; Adnan I. Qureshi, MD, FAHA;  
Kenneth Rosenfield, MD, FAHA; Phillip A. Scott, MD, FAHA;  
Debbie R. Summers, RN, MSN, FAHA; David Z. Wang, DO, FAHA;  
Max Wintermark, MD; Howard Yonas, MD; on behalf of the American Heart Association Stroke  
Council, Council on Cardiovascular Nursing, Council on Peripheral Vascular Disease,  
and Council on Clinical Cardiology

**Background and Purpose**—The authors present an overview of the current evidence and management recommendations for evaluation and treatment of adults with acute ischemic stroke. The intended audiences are prehospital care providers, physicians, allied health professionals, and hospital administrators responsible for the care of acute ischemic stroke patients within the first 48 hours from stroke onset. These guidelines supersede the prior 2007 guidelines and 2009 updates.

**Methods**—Members of the writing committee were appointed by the American Stroke Association Stroke Council's Scientific Statement Oversight Committee, representing various areas of medical expertise. Strict adherence to the American Heart Association conflict of interest policy was maintained throughout the consensus process. Panel members were assigned topics relevant to their areas of expertise, reviewed the stroke literature with emphasis on publications since the prior guidelines, and drafted recommendations in accordance with the American Heart Association Stroke Council's Level of Evidence grading algorithm.

**Results**—The goal of these guidelines is to limit the morbidity and mortality associated with stroke. The guidelines support the overarching concept of stroke systems of care and detail aspects of stroke care from patient recognition; emergency medical services activation, transport, and triage; through the initial hours in the emergency department and stroke unit. The guideline discusses early stroke evaluation and general medical care, as well as ischemic stroke, specific interventions such as reperfusion strategies, and general physiological optimization for cerebral resuscitation.

# Minimum work up

According to guidelines, baseline evaluations, at a minimum, should include:

- Noncontrast brain CT or brain MRI
- Blood glucose
- Oxygen saturation
- Serum electrolytes/renal function tests
- Complete blood count, including platelet count
- Markers of cardiac ischemia
- Prothrombin time/International Normalized Ratio (INR)
- Activated partial thromboplastin time
- **Electrocardiogram**

# Work up for selected patients

- TT and/or ECT if it is suspected the patient is taking direct thrombin inhibitors or direct factor Xa inhibitors
- Hepatic function tests
- Toxicology screen
- Blood alcohol level
- Pregnancy test
- Arterial blood gas tests (if hypoxia is suspected)
- Chest radiography (if lung disease is suspected)
- Lumbar puncture (if subarachnoid hemorrhage is suspected and CT scan is negative for blood)
- Electroencephalogram (if seizures are suspected)

# Cardiovascular evaluation

## Atrial fibrillation

- clearly drives the post-stroke management paradigm
- may be seen on admission ECG
- Holter monitoring
- continuous cardiac monitoring for at least the first 24 hours after stroke

# Occult Atrial Fibrillation

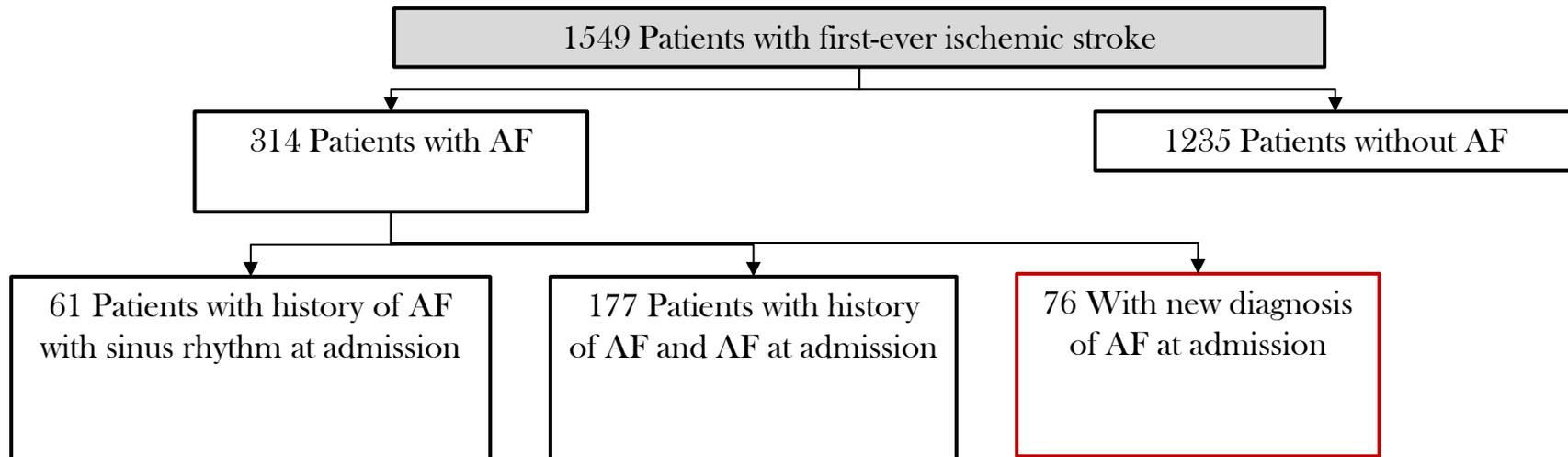
Technology to detect infrequent paroxysmal atrial fibrillation has dramatically improved over the past decade, with the development of mobile cardiac telemetry systems that may be worn externally for 2 to 4 weeks, subcutaneous loop recorders with battery lives enabling detection for 1 to 3 years, and in patients needing therapeutic internal pacemakers or defibrillators, implantable therapeutic devices with the capability to detect atrial fibrillation for 3 years or more.



나 포기하지 않을 겁니다.  
어떤 일이 있어도 끝까지 갑니다.

# Occult atrial fibrillation

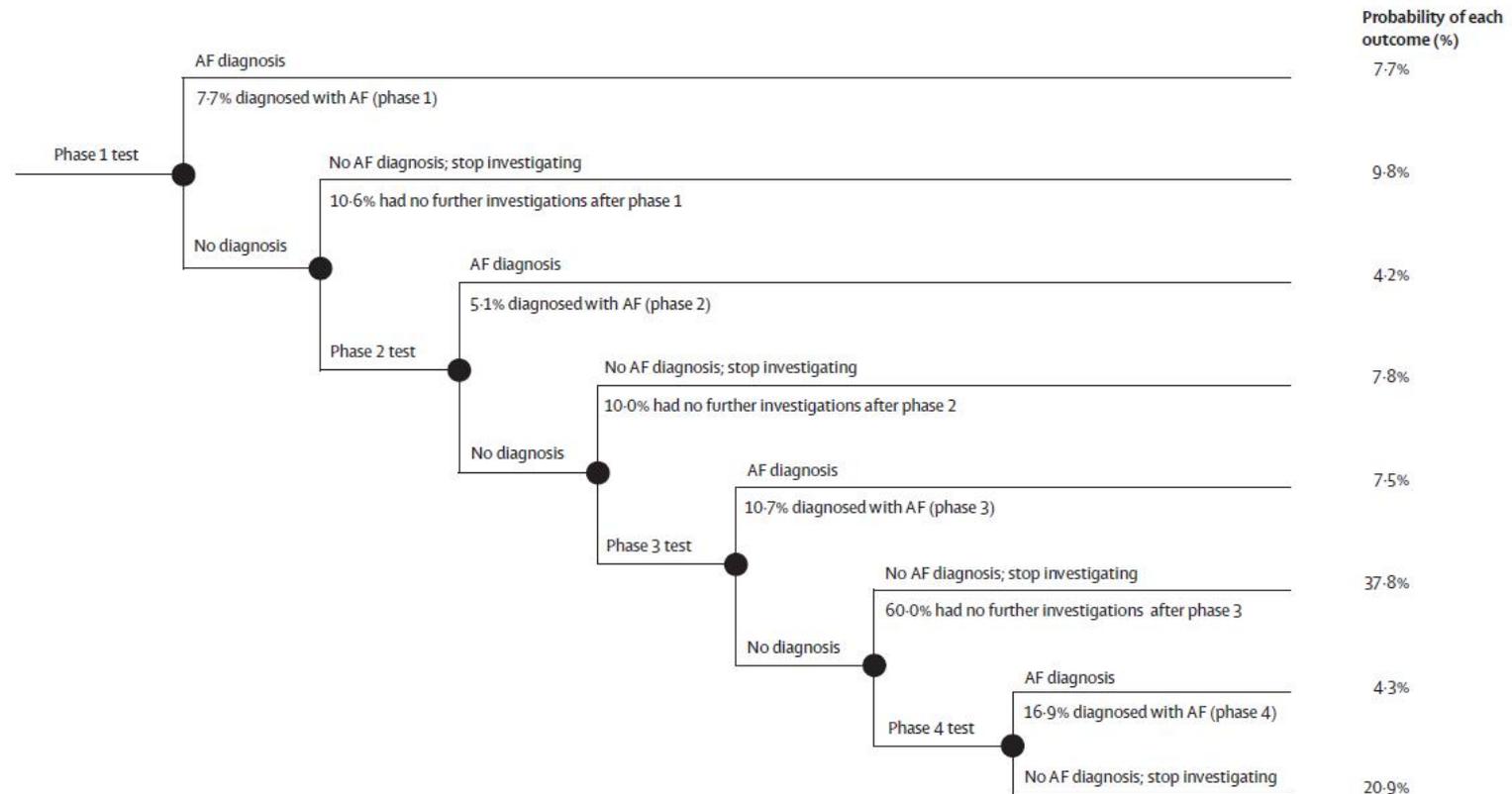
In the standard evaluation, of ischemic stroke



- approximately 15% of patients have a known history of chronic or paroxysmal atrial fibrillation predating the stroke
- approximately 8% receive a new diagnosis of atrial fibrillation on the basis of the results of **the first ECG**
- another 5% receive a new diagnosis, after initial presentation in sinus rhythm, on the basis of results of **inpatient cardiac telemetry or 24-hr Holter monitoring**

# Diagnosis of atrial fibrillation after stroke and TIA

- Meta analysis of 50 studies (comprising 11,658 patients)

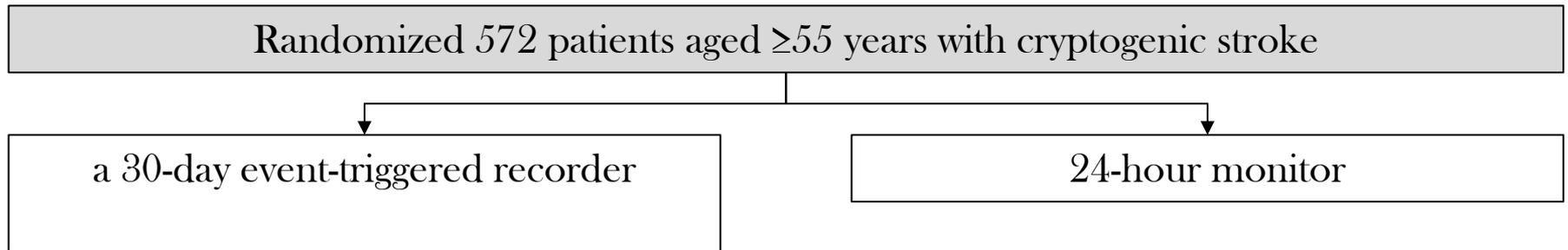


By sequentially combining cardiac monitoring methods, atrial fibrillation might be newly detected in nearly a quarter of patients with stroke or transient ischaemic attack.

# EMBRACE trial

Event Monitor Belt for Recording Atrial Fibrillation after a Cerebral Ischemic Event

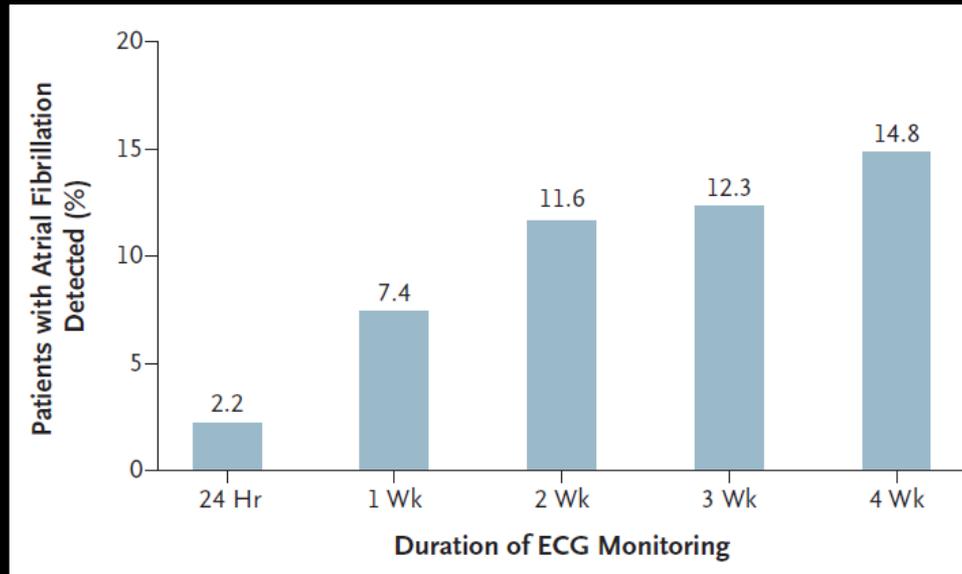
- ❖ **Cryptogenic stroke**: diagnosed by a stroke neurologist after a standard workup, including 12-lead ECG, Holter monitor for a minimum of 24 hours, brain and neurovascular imaging, and echocardiography



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- ❖ **Cryptogenic stroke:** diagnosed by a stroke neurologist after a standard workup, including 12-lead ECG, Holter monitor for a minimum of 24 hours, brain and neurovascular imaging, and echocardiography



52/280 (18.6%)

31/279 (11.1%)

# CRYSTAL AF trial

: Cryptogenic Stroke and Underlying AF

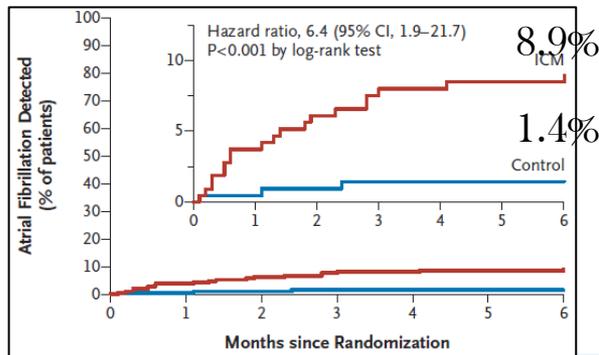
- ❖ **Cryptogenic stroke**: after extensive testing – including 12-lead ECG, 24 hours or more of ECG monitoring, transesophageal echocardiography, screening for thrombophilic states (in patients <55 years of age), and MRA, CTA, or catheter angiography of the head and neck – did not reveal a clear cause

Randomized 441 patients aged  $\geq 40$  years with cryptogenic stroke

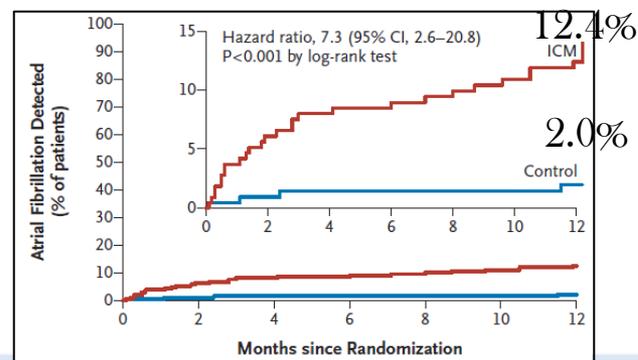
insertable cardiac monitors (ICMs)

Control group

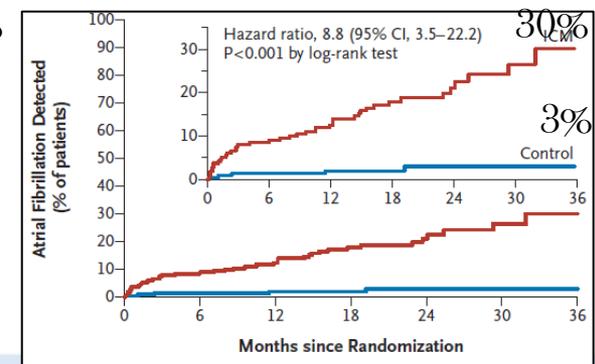
AF detection rate (6 / 12 / 36 months)



6month



12month



36month

CLINICAL PRACTICE

Caren G. Solomon, M.D., M.P.H., *Editor*

## Cryptogenic Stroke

Jeffrey L. Saver, M.D.

*This Journal feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the author's clinical recommendations.*

After a gym workout, a 48-year-old man had sudden ataxia, nausea, and diplopia, followed by persistent inability to see the upper left quadrant of space with either the left or right eye. He did not have neck pain. His medical history included hypertension and migraines with aura. Magnetic resonance imaging (MRI) showed a right occipitotemporal and thalamic infarct. Magnetic resonance angiography showed an abrupt cutoff of a distal segment of the right posterior cerebral artery. The complete blood count, prothrombin time, and partial-thromboplastin time were normal. Transthoracic echocardiographic results suggested a possible right-to-left shunt. Cardiac telemetry during the first 2 inpatient days revealed no dysrhythmias. How should this case be further evaluated?

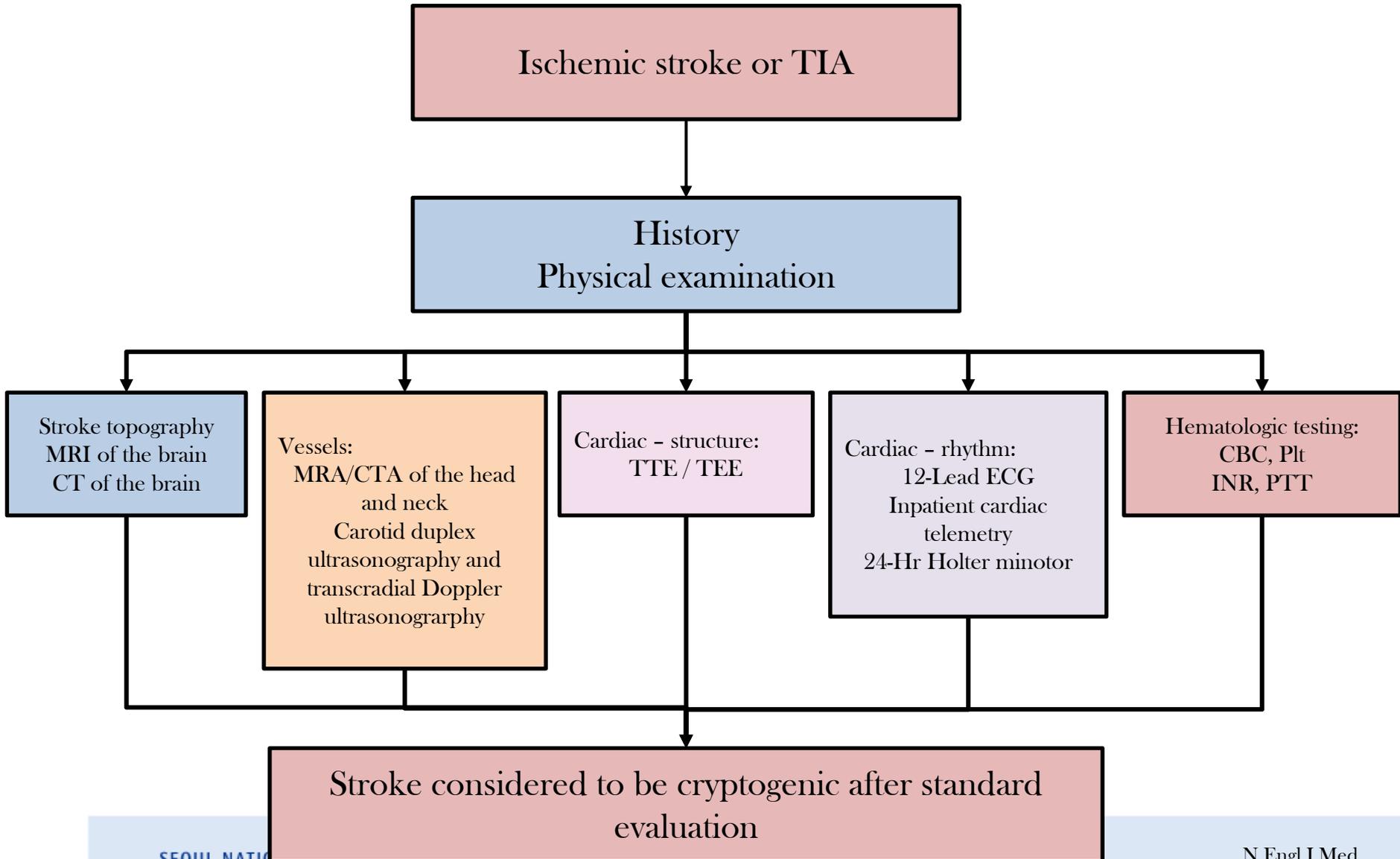
From the Department of Neurology and Comprehensive Stroke Center, David Geffen School of Medicine at the University of California, Los Angeles (UCLA), Los Angeles. Address reprint requests to Dr. Saver at the UCLA Stroke Center, 710 Westwood Plaza, Los Angeles, CA 90095, or at [jsaver@mednet.ucla.edu](mailto:jsaver@mednet.ucla.edu).

N Engl J Med 2016;374:2065-74.

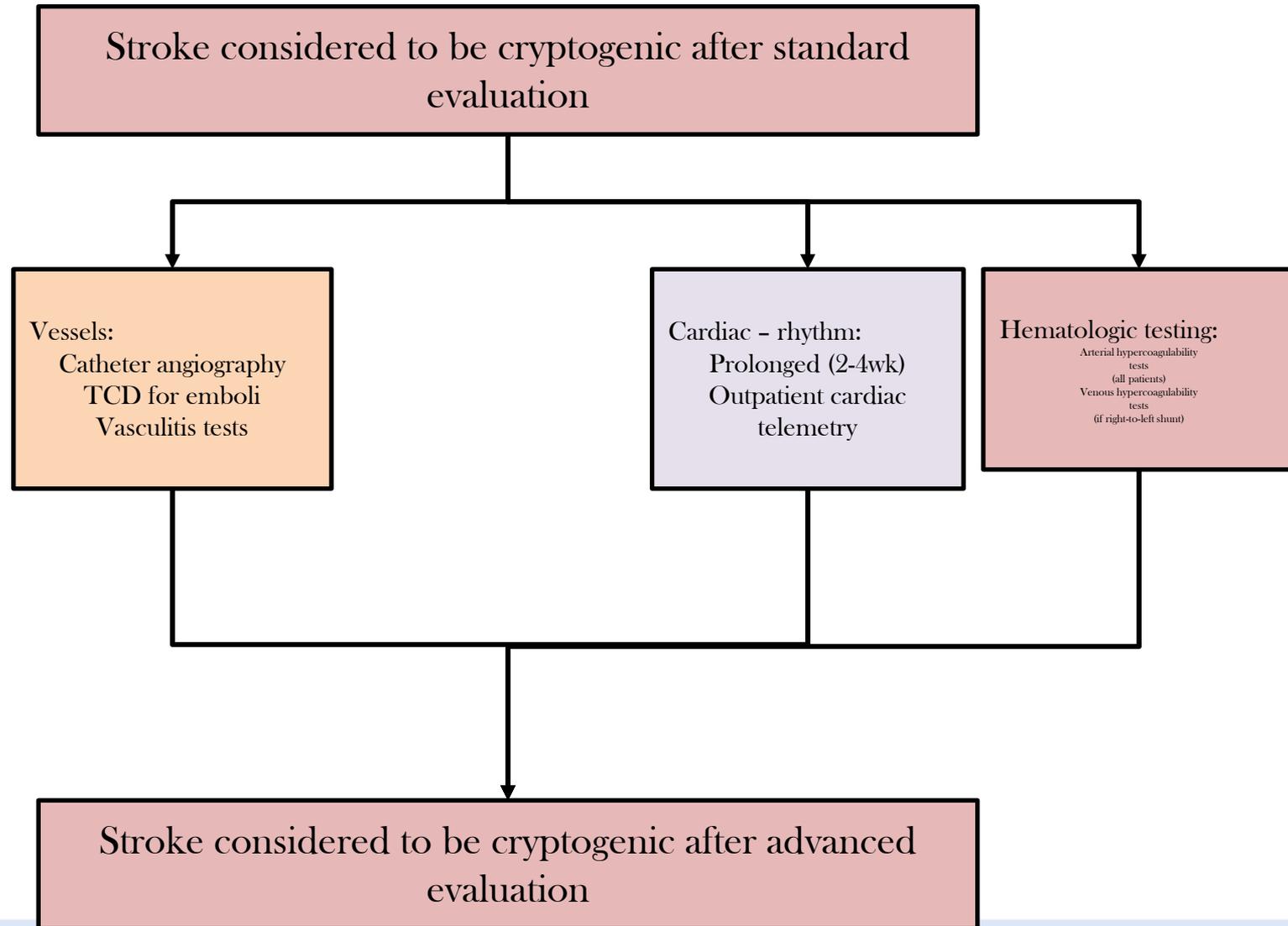
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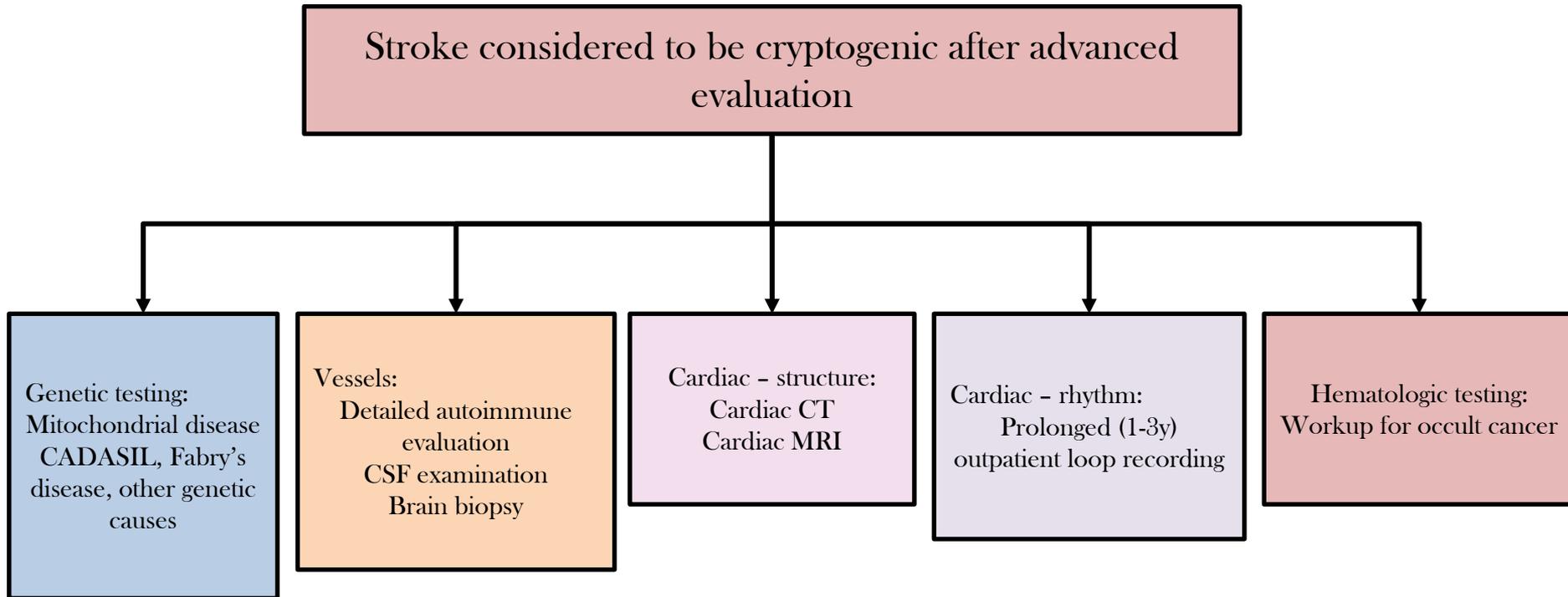
# Algorithm for the Identification and Diagnostic Evaluation



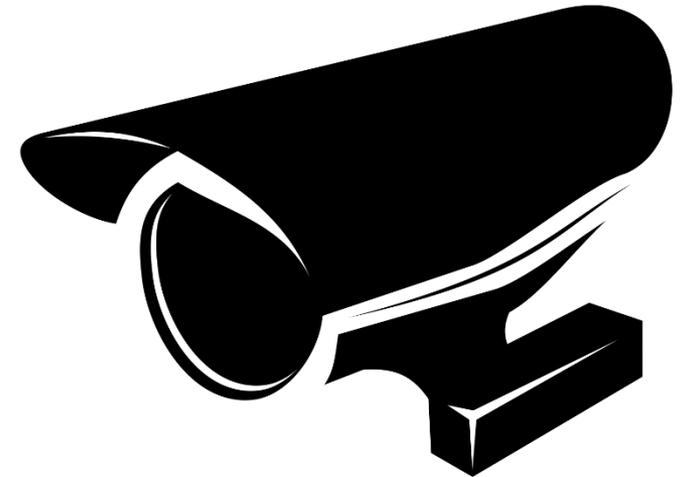
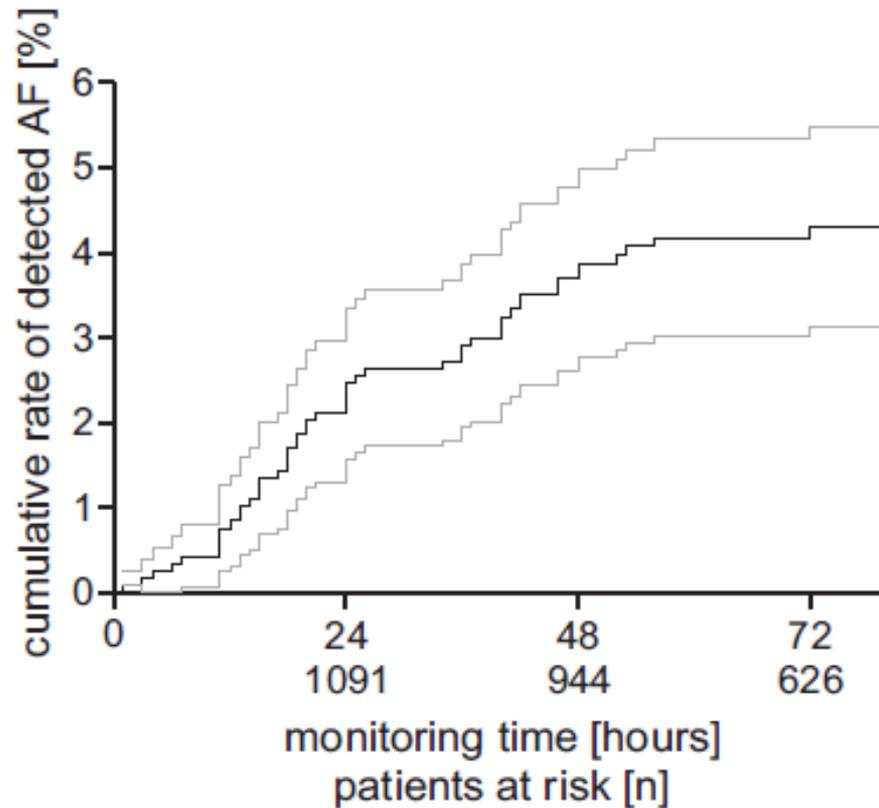
# Algorithm for the Identification and Diagnostic Evaluation



# Algorithm for the Identification and Diagnostic Evaluation



# Unselected survivors of stroke or TIA, 72-hour ECG monitoring is feasible and improves the detection rate of silent paroxysmal AF



In unselected survivors of stroke or TIA, 72-hour ECG monitoring is feasible and improves the detection rate of silent paroxysmal AF.

# AF monitoring for patients with stroke event

- **Cryptogenic stroke** is defined as a stroke in which the cause could not be identified after extensive investigations.
- Several studies have also found AF in patients in whom another **competing cause for stroke** has been identified clinically (e.g. hypertension or carotid artery stenosis).
- Hence, **prolonged ECG monitoring seems reasonable in all survivors of an ischemic stroke** without an established diagnosis of AF.

Take home message

# 심방세동 Screening

Recommendations	Class	Level
Opportunistic screening for AF is recommended by pulse taking or ECG rhythm strip <u>in patients &gt;65 years of age.</u>	I	B
In patients with <u>TIA or ischaemic stroke</u> , screening for AF is recommended by short-term ECG recording followed by continuous ECG monitoring for <u>at least 72 hours.</u>	I	B
It is recommended to interrogate <u>pacemakers and ICDs</u> 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
<u>In stroke patients</u> , additional ECG monitoring by long-term non-invasive ECG monitors or implanted loop recorders should be considered to document silent atrial fibrillation.	IIa	B
Systematic ECG screening may be considered to detect AF in <u>patients aged &gt;75 years, or those at high stroke risk.</u>	IIb	B

# Medical insurance imbursement policy of ILR

다른 검사로 원인이 진단되지 않는 다음의 경우에 요양 급여를 인정함

가. 재발성 실신

다만, 구조적 심장질환을 가진 환자의 경우에는 실신이 1회 발생한 경우에도 인정

나. 재발성 두근거림

다. 심방세동이 의심되는 원인불명의 재발성 뇌졸중

# Cryptogenic Stroke and Underlying Atrial Fibrillation



Thank you