

Atrial Fibrillation Management post-CABANA Challenges and Unmet Need

Suneet Mittal, MD

Director, Electrophysiology

Director, The Snyder Center for Comprehensive Atrial Fibrillation

Director, Cardiac Research

www.valleymedicalgroup.com/EP



@drsuneet

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AF: Historical Perspective

1528 THE BRITISH MEDICAL JOURNAL [Nov. 27, 1909.]

intermediate metabolites in the urine, the stiffness of the muscles, and other symptoms, lead us to believe that such products of metabolic activity are inefficiently removed from the system. The introduction of more fluid would remedy this deficiency of excretion, which we hold to be of far greater importance than deficiency of nutrition.

Repeated experience contradicts the popular conviction that large quantities of food must be taken in order to "keep up the strength" in contests of this kind. For instance, soldiers bearing heavy clothing and equipment have frequently marched for many hours with no food, provided that a sufficiency of water is available. Experiments on animals, too, show that external work can be performed for some days on a water diet only.

These facts serve to justify us in advising the consumption of little or no solid food during the race; we think that in this way the gastric disturbances would be entirely avoided. In order to avoid the depressing mental effect consequent upon the withholding of all food, albumen water, or some such preparation might be given. This would only be as a concession to the men's preconceived ideas, and not with the object of providing nutriment. The use of a little alcohol as a readily diffusible and oxidizable stimulant in the last stages of the race seems to be free from objection.

Although a walking race such as this seems to involve far less risk of over exertion than has hitherto been supposed, it is, as a general test of a man's physical capabilities, in our opinion, much less satisfactory than running, and infinitely less so than a contest of the nature of a football match, which brings into play the full exercise of every faculty as well as that of every muscle. It appears, indeed, that endurance was the most potent factor in determining a competitor's position at the finish, and it quickly became evident that to estimate a man's chances from consideration of his physical appearance was absolutely impossible. This conclusion was shared with us by several physiologists who were present.

The mental factor in contests of this kind is worthy of careful consideration, the man of fine sensibility needing constant self-control in order to compete on equal terms with the man of sterner temperament. This was recognized by the Committee in the provision of music during the night, and was also exemplified in the obvious mental and physical improvement which followed the rising of the sun.

The expenses of this investigation were defrayed from the British Medical Association's grant to Dr. Pembrey, who has added to the many other kindnesses shown to us that of engaging the lines which the present research should follow. We are also greatly indebted to Mr. A. Sanderson for valuable assistance in many of these observations.

REPORT CXIX.
AURICULAR FIBRILLATION: A COMMON CLINICAL CONDITION.*
By THOMAS LEWIS, M.D.LOND., D.Sc.WALES.
(From the Research Laboratories of University College Medical School.)

[A Preliminary Communication.]

It is well known that in the late stages of mitral stenosis, and in cases of general cardio-vascular degeneration, the pulse is frequently continuously and extremely irregular. The type of irregularity is remarkable in that in radial and cardiographic curves it defies analysis. The nature of the arterial curves has given rise to the term *pulsus irregularis perpetuus*, and it has been supposed that the rhythm of the heart producing it has its origin in the node of Tawara (hence the term "nodal rhythm"). This condition is extremely common.

Facts are now at my disposal permitting of two conclusions:

1. That a rhythm arising in the neighborhood of the node gives rise to a totally different clinical picture. This conclusion is based upon a detailed examination (polygraphic and electrocardiographic) of a case of paroxysmal tachycardia, in which it can be demonstrated that auricle and ventricle contract together. This rhythm is a rare clinical phenomenon.
2. That the irregular pulse of mitral stenosis, etc., already referred to, is due to fibrillation of the auricle.

The second conclusion is based upon the following evidence:

1. The clinical irregularity presented by arterial and heart apex curves is unique. The rhythm is entirely disorderly, and the sites of the beats do not correspond to the pauses which precede them. Fibrillation of the auricle results in a similar action of the ventricle, and its action under these circumstances is unique experimentally.
2. Electrocardiograms taken from patients exhibiting the irregularity show a number of irregular waves, apart from the ventricular curve; they are more clearly defined in diastole. They are found in no other disorder of the heart's action. They disappear when, in a paroxysmal case, the irregularity vanishes, and are therefore due to a temporary and disorderly action of some part of the heart wall. Cardiographic curves give no evidence of such a disorderly action in the ventricle. Fibrillation of the auricle yields curves which are identical in every respect, and no such curves have been obtained by any other experimental means. Further, the waves on the experimental electrocardiograms can be shown to correspond to the fibrillary movements in the auricle, by means of synchronous tracings.
3. The venous curves in the clinical irregularity is of the ventricular type; all the component waves occur during ventricular systole, and there is no wave corresponding to a normal auricular contraction. The same statement applies to the venous curves in fibrillation of the auricle. The clinical and experimental curves are of the same nature.

The facts point clearly to the conclusion that the irregularity in question is the result of auricular fibrillation, and the conclusion affords an explanation of several otherwise obscure facts. It provides us with a rational understanding of the disorderly nature of the ventricular rhythm, for it is dependent upon the irregular auricular movements. It explains the slowing which is obtained by digitalis in those instances in which auriculo-ventricular conduction is known to be frequently impaired—namely, in cases of rheumatic origin; for digitalis is known to increase the hindrance to the passage of the impulses where conduction is already damaged. Further it explains the difference between the type of venous pulse in the "nodal extra-systole." It is in accord with the now generally accepted fact that the rhythm is supra-ventricular in origin; it harmonizes equally well with the evidence that the auricle is active in certain instances where the irregularity is present—for example, the auricular hyper trophy found at autopsy in cases succumbing with the irregularity present and of long duration. Finally, it suggests a possible explanation of so-called "nodal bradycardia." This condition may be regarded as auricular fibrillation and spontaneous auriculo-ventricular block. The full evidence, including the curves, will be placed on record at an early date.

THE HERBERT SPENCER LECTURE before the University of Oxford will be delivered by Dr. G. C. Bourne, Lincoln Professor of Comparative Anatomy, who has taken for his subject, "Herbert Spencer and animal evolution."

A BRITISH telegram from Peking states that considerable progress has been made in the suppression of opium smoking in the northern provinces and in Yunnan and Kwangtung, both the central provinces, and very little in Szechuan, Kweichow, and Shensi.

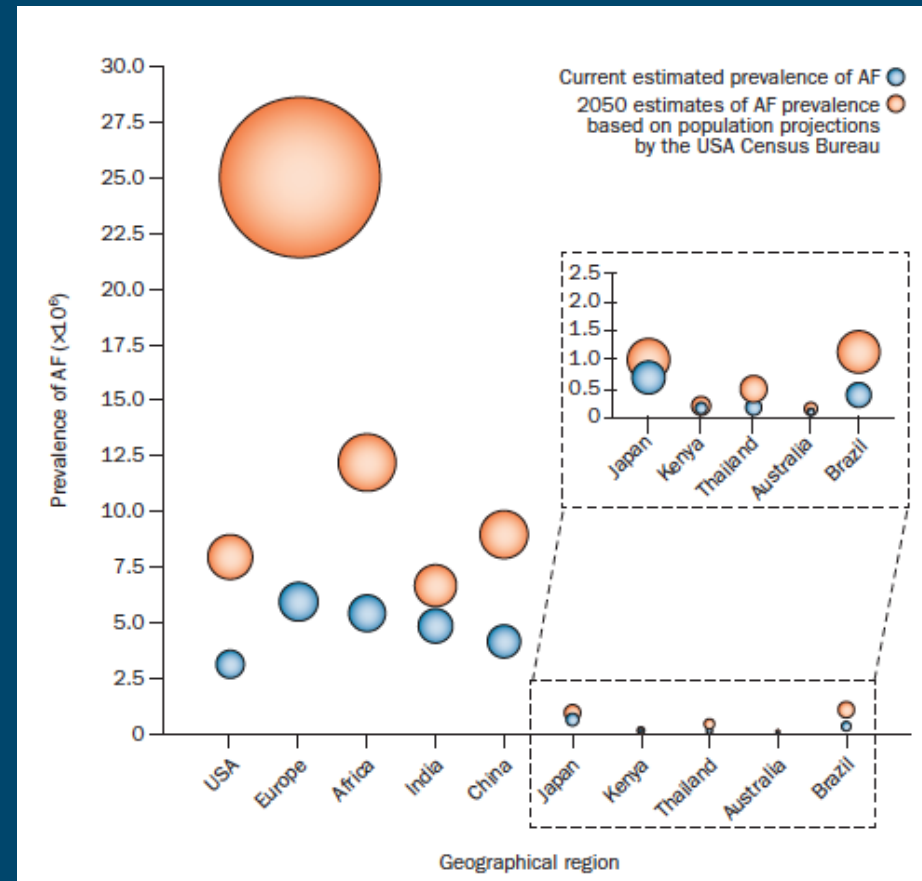
THE resolution adopted at the meeting of medical practitioners on November 19th, organized by the Chinese Division of the British Medical Association, as to payment to medical practitioners for midwives' calls, was considered by the Postman guardians at a meeting on November 19th, but the full discussion was adjourned to a later date. Meantime it may be said that one member of the council held that though medical men could not point to any passage in the Act which gave them a definite claim upon postmasters in this connexion, it was the undoubted duty of postmasters to guarantee the payment of his fee to any medical man called in to save life during childbirth.

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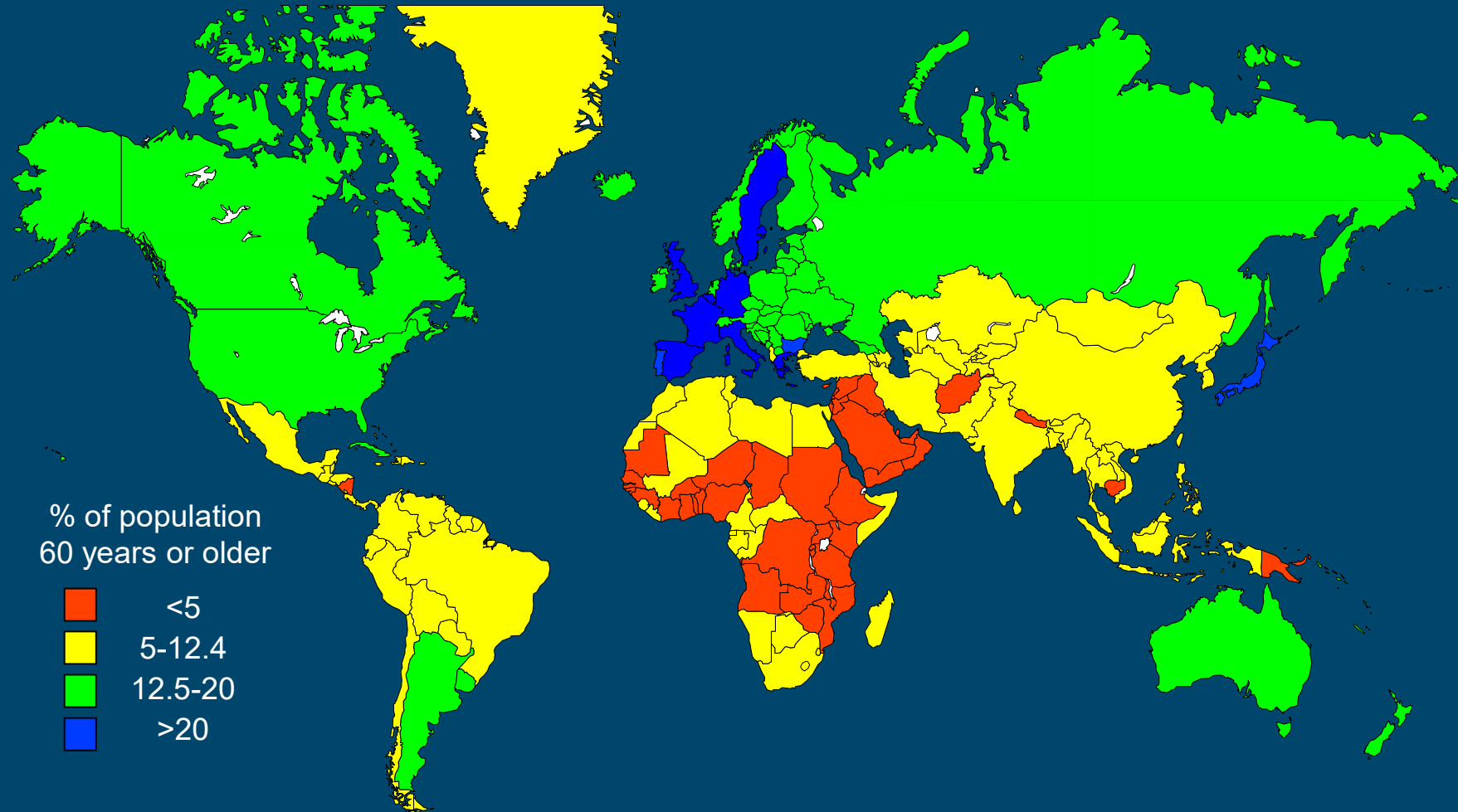
It is well known that in the late stages of mitral stenosis and in cases of general cardio-vascular degeneration, the pulse is frequently continuously and extremely irregular....the irregular pulse of of mitral stenosis, etc....is due to fibrillation of the auricle.

Epidemiology of AF

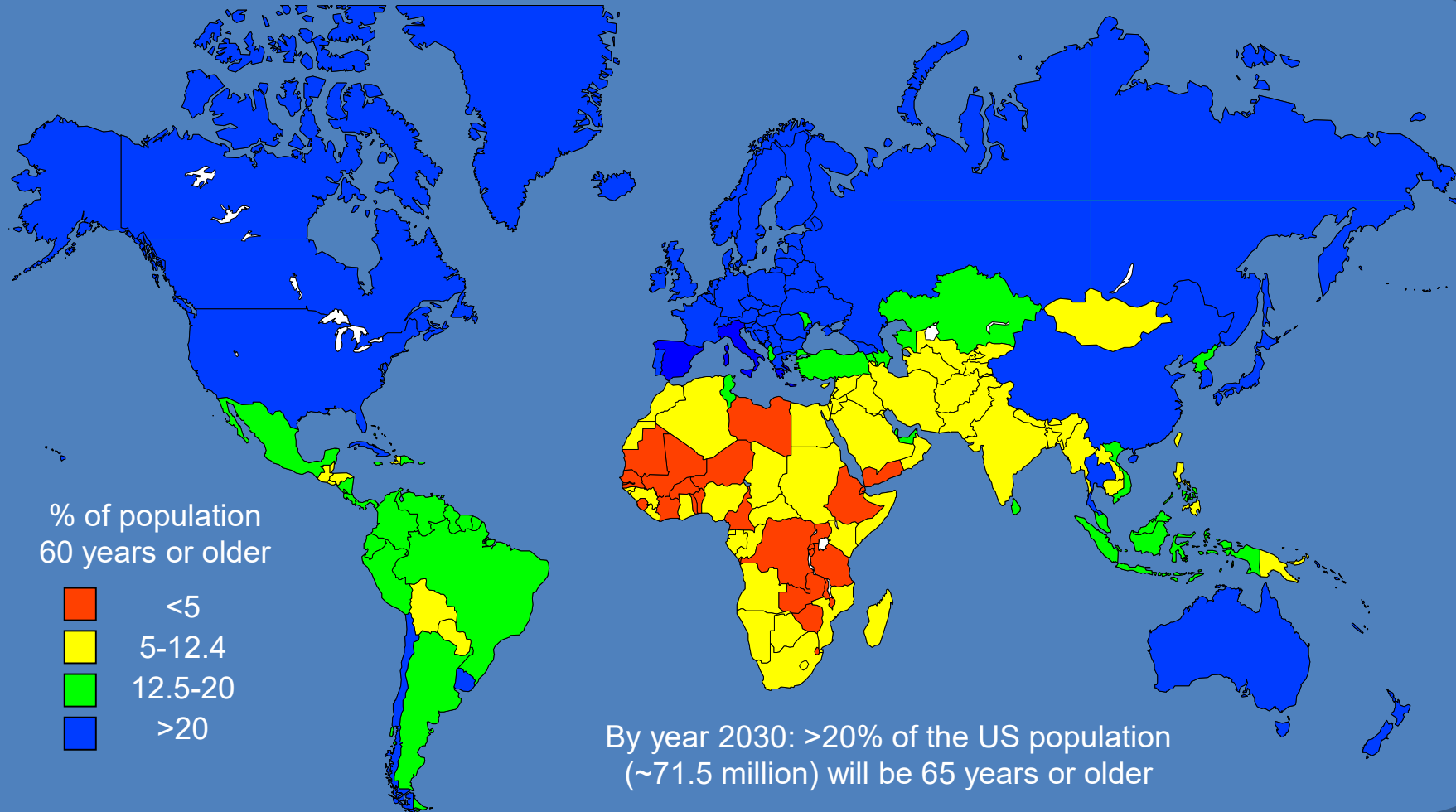
- Most common sustained cardiac arrhythmia observed in clinical practice
- An estimated 2.7–6.1 million people in the US have AF.
 - With the aging of the population, this number is expected to increase worldwide.
- Approximately 2% of people <65 have AF, while about 9% of people >65 years have AF.
- Because AF cases increase with age and women generally live longer than men, more women than men experience AF.



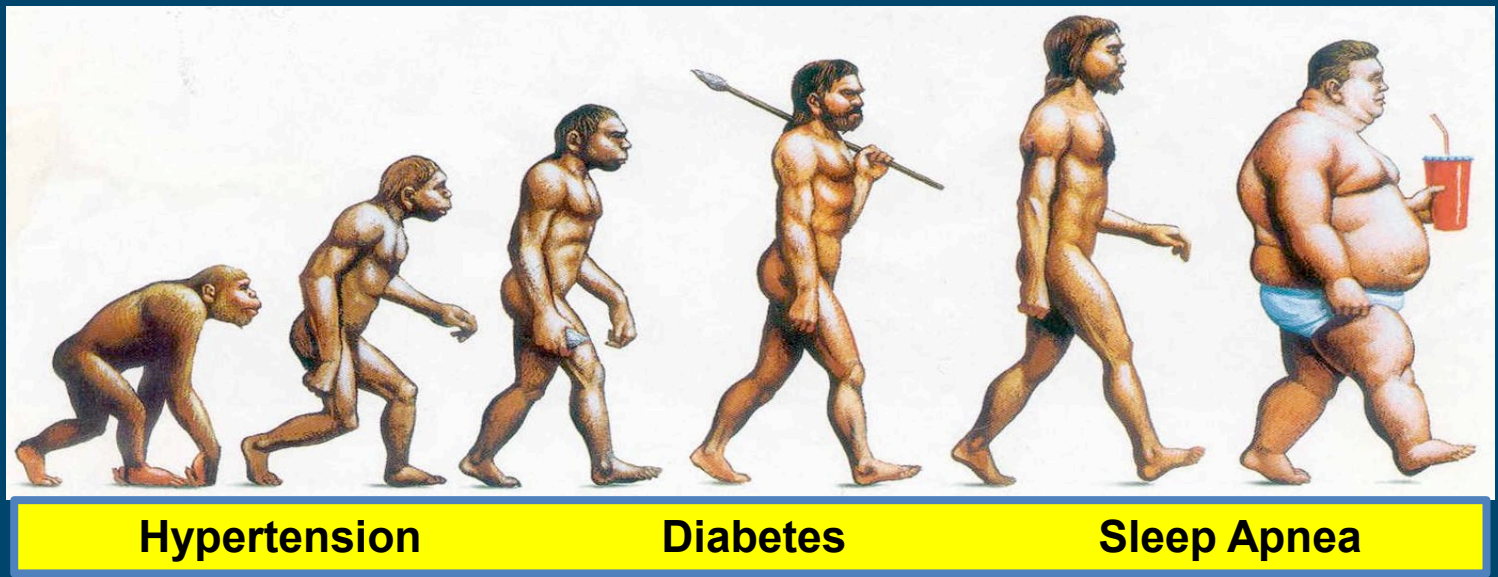
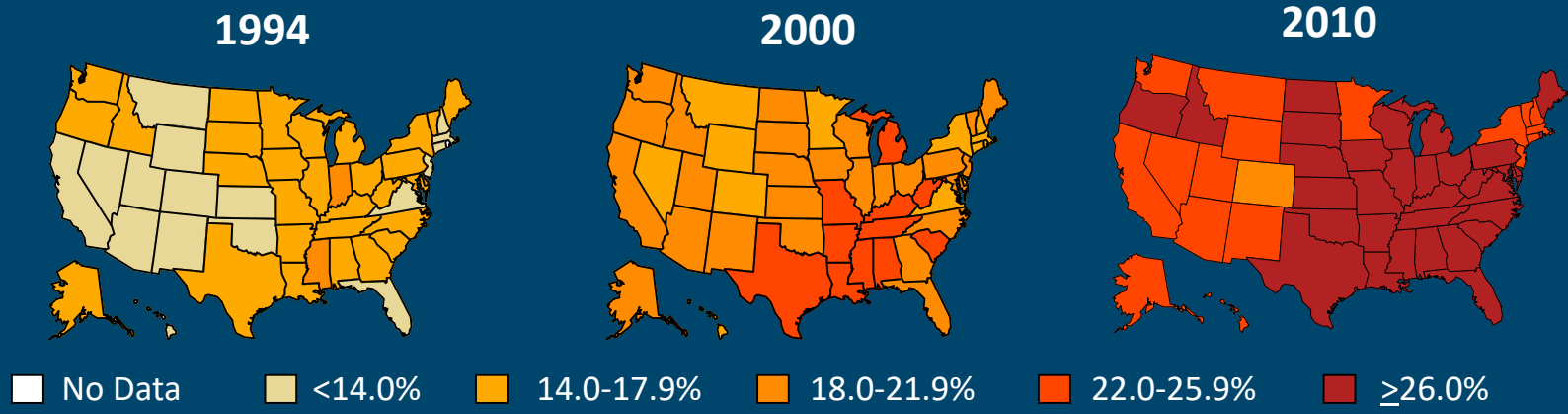
Aging and World Population 2005-2025



Aging and World Population Projection to 2030



Obesity (BMI ≥ 30 kg/m²)

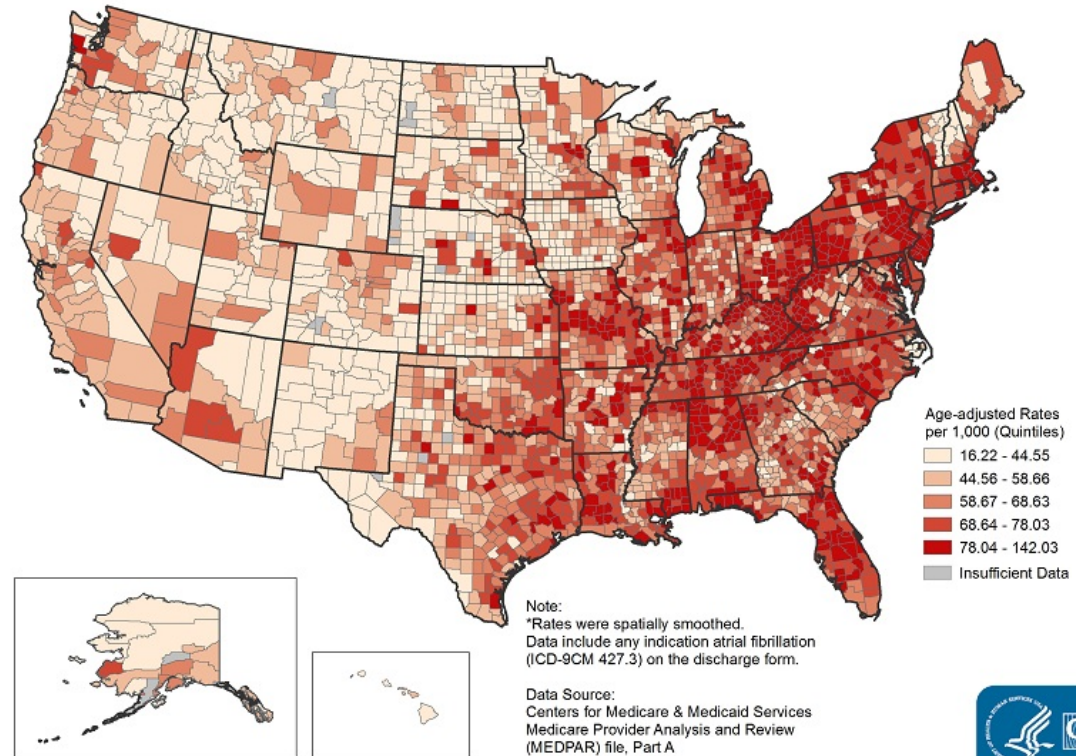


Epidemiology of AF

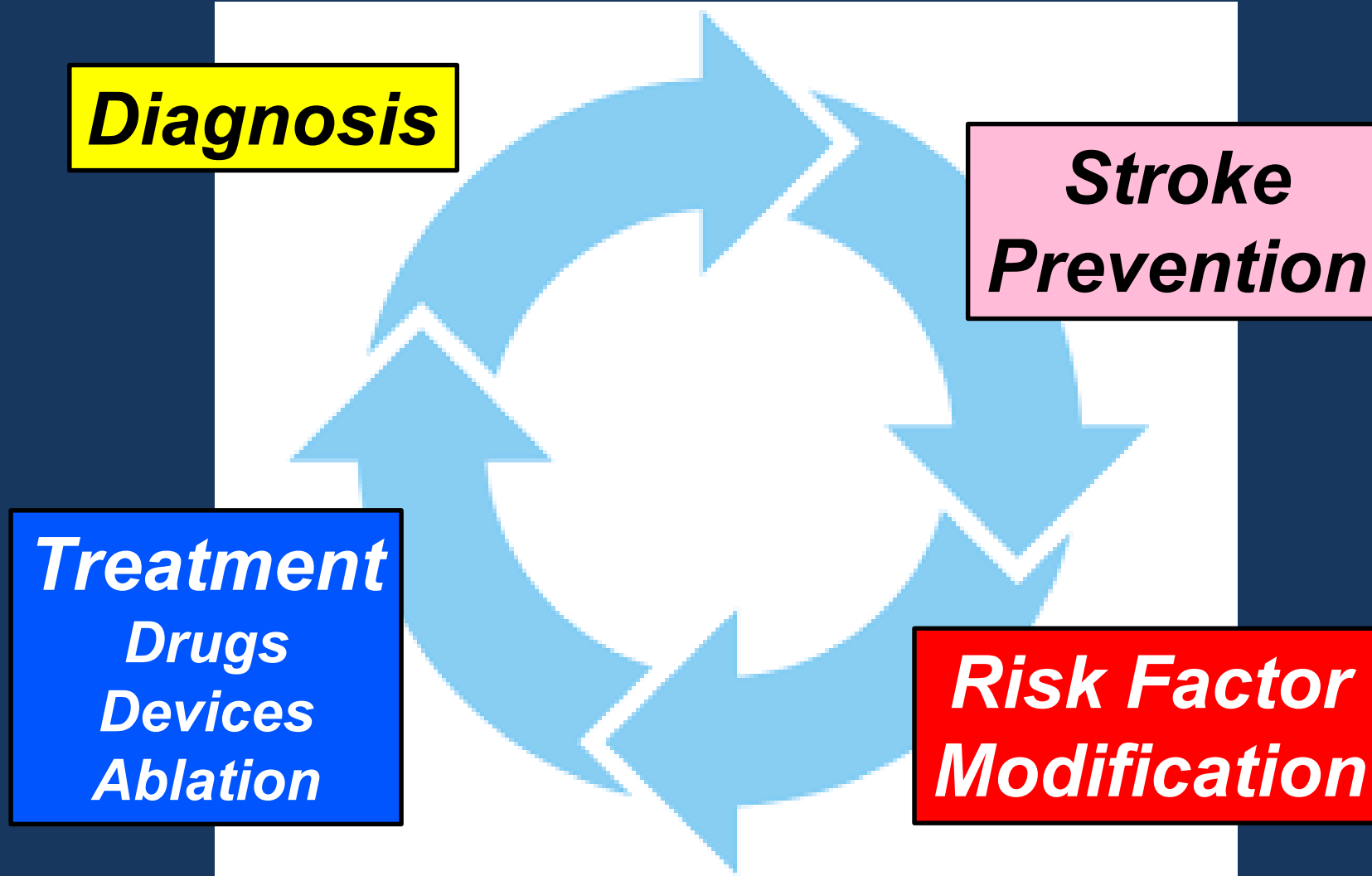
- More than 750,000 hospitalizations occur each year because of AF.
- The condition contributes to an estimated 130,000 deaths each year.
 - The death rate from AF as the primary or a contributing cause of death has been rising for more than two decades.
- AF costs the US about \$6 billion each year.
- Medical costs for people who have AF are about \$8,705 higher per year than for people who do not have AF.

Fee-For-Service Medicare Beneficiaries
Ages 65 Years and Older 2009-2014

Atrial Fibrillation Hospitalization Rates*
Total Population

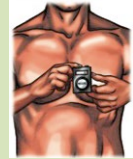


Lifecycle of AF Patients



ECG Monitoring Tools

Spot Single-Lead ECG Check



Event Recorder

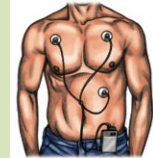


Smartphone
(e.g., Alivecor)



Smartwatch
(e.g., Kardiaband)

Holter Monitoring (1-2 days)



Holter

Holter Monitoring (1-2 weeks)



Patch Based
(e.g., Zio)

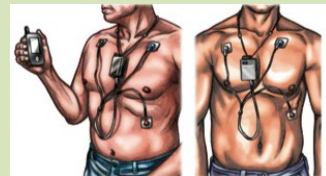


(e.g., ePatch)

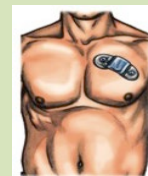


Lead Based
(e.g., CardioKey)

Mobile Telemetry Monitoring (Up to 30 days)



Lead Based
(e.g., multiple; Telesense)



Patch Based
(e.g., SEEQ, Body Guardian)



Garment Based
(e.g., nECG)

Implantable Loop Recorder (Up to 3 years)



Lead Based (1-Piece)

- ❖ Scottcare– TeleSense, TeleSentry
- ❖ Spectacor – Pocket ECG
- ❖ TeleRhythmics – Heartrak TCAT

Lead Based (2-Piece)

- ❖ Applied Cardiac Systems – CORE
- ❖ Biomedsys – TruVue
- ❖ Infobionic – MoMe Kardia
- ❖ Lifewatch – ACT Elite
- ❖ Medicomp – Duet

Patch Based

- ❖ Biotelemetry – MCOT Patch
- ❖ Lifewatch – ECG mini
- ❖ Medicomp – TelePatch
- ❖ Medtronic – SEEQ
- ❖ Nuubo - nECG
- ❖ Preventice – Body Guardian

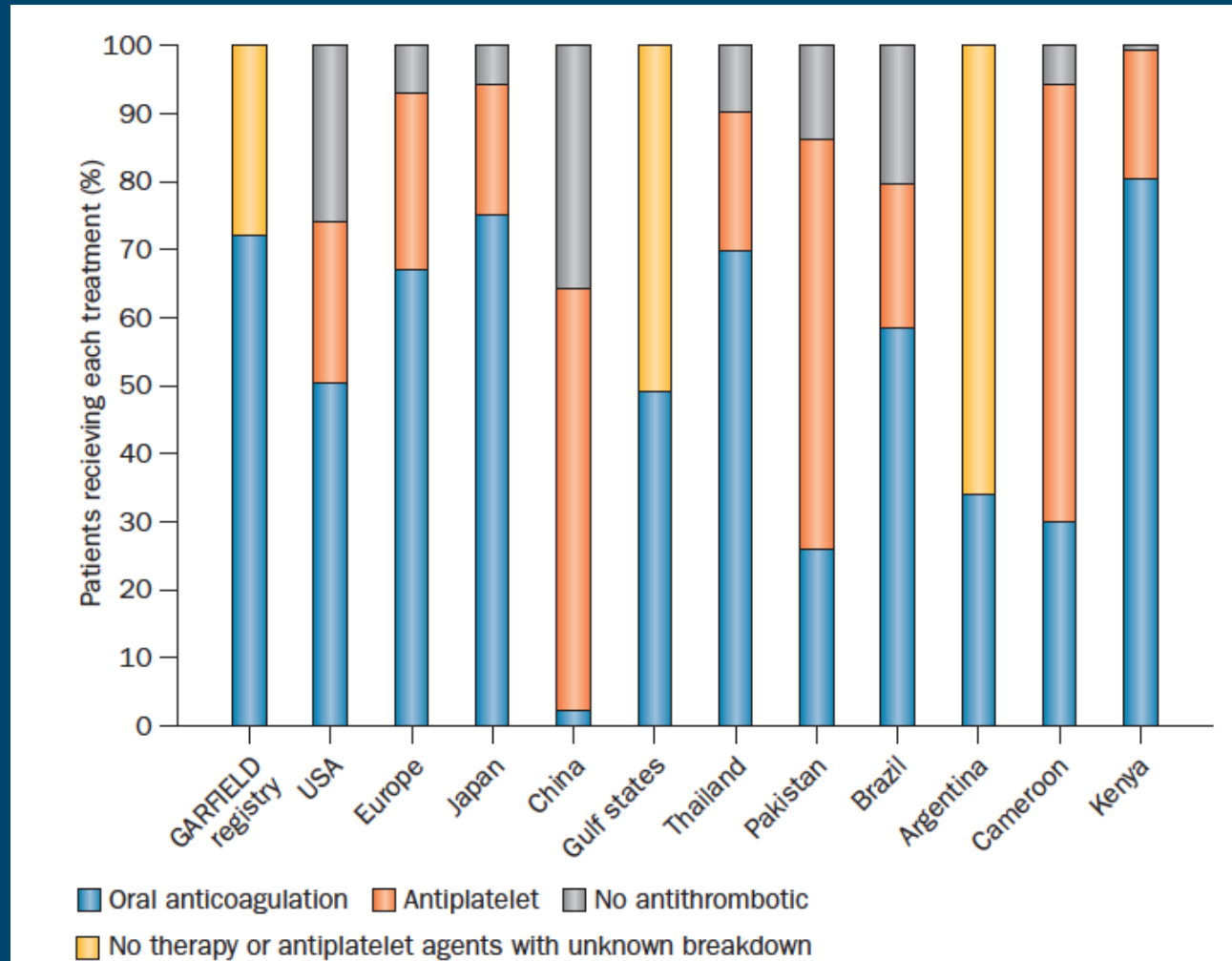
AF and Stroke

- AF increases a person's risk for stroke by four to five times compared with stroke risk for people who do not have AF
- Strokes caused by complications from AF tend to be more severe than strokes with other underlying causes
- AF causes 15%–20% of ischemic strokes


Increasing AF Prevalence and Stroke with Age

Age (years)	AF prevalence (%)	Strokes attributable to AF (%)
50–59	0.5	6.5
60–69	1.8	8.5
70–79	4.8	18.8
80–89	8.8	30.7

Stroke Prevention



Shared Decision Making

 Home Atrial Fibrillation Send Feedback Login

Instructions **Data** Assessment Decision Library Patient Info Chart Note Credits


Does the patient have significant mitral stenosis or a mechanical valve?

Pick one:

Data Review:

Stroke, Embolism & Bleed Risks	Stroke or Thromboembolism Risks	Bleeding Risks
*Age (40-90) <input type="button" value="INFO"/> <input type="text"/>	*Sex <input type="button" value="INFO"/> <input type="button" value="Male"/> <input type="button" value="Female"/>	Uncontrolled HTN <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
Systolic (mmHg) <input type="button" value="INFO"/> <input type="text"/>	Hypertension <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	Antiplatelet agent <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
Stroke <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	CHF <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	≥ 8 Drinks / Week <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
TIA or Systemic TE <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	Diabetes <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	Major Bleeding <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
	CVD <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>	Uncontrolled INR <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
		Liver Dysfunction <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
		Dialysis or transplant <input type="button" value="INFO"/> <input type="button" value="No"/> <input type="button" value="Yes"/> <input checked="" type="button" value="UNK"/>
		Creat (mg/dL) <input type="button" value="INFO"/> <input type="text"/>

Footnotes
"Unknown" is selected for severe mitral stenosis or mechanical valve. The tool assumes "No" but this should be confirmed.

Fill sample data  © 2018 HealthDecision. All Rights Reserved. v4.0.17

2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation - Recommendations for Rate Control

Recommendations	COR	LOE
Control ventricular rate using a beta blocker or nondihydropyridine calcium channel antagonist for paroxysmal, persistent, or permanent AF	I	B
IV beta blocker or nondihydropyridine calcium channel blocker is recommended to slow ventricular heart rate in the acute setting in patients without pre-excitation. In hemodynamically unstable patients, electrical cardioversion is indicated	I	B
For AF, assess heart rate control during exertion, adjusting pharmacological treatment as necessary	I	C
A heart rate control (resting heart rate <80 bpm) strategy is reasonable for symptomatic management of AF	IIa	B
IV amiodarone can be useful for rate control in critically ill patients without pre-excitation	IIa	B
AV nodal ablation with permanent ventricular pacing is reasonable when pharmacological therapy is inadequate and rhythm control is not achievable	IIa	B
A lenient rate-control strategy (resting heart rate <110 bpm) may be reasonable when patients remain asymptomatic and LV systolic function is preserved	IIb	B
Oral amiodarone may be useful for ventricular rate control when other measures are unsuccessful or contraindicated	IIb	C
AV nodal ablation should not be performed without prior attempts to achieve rate control with medications	III: Harm	C
Nondihydropyridine calcium channel antagonists should not be used in decompensated HF	III: Harm	C
With pre-excitation and AF, digoxin, nondihydropyridine calcium channel antagonists, or amiodarone should not be administered	III: Harm	B
Dronedarone should not be used to control ventricular rate with permanent AF	III: Harm	B

2014 AHA/ACC/HRS Guideline for the Management of Patients With Atrial Fibrillation - Recommendations for Rhythm Control

6.2.1. Antiarrhythmic Drugs to Maintain Sinus Rhythm: Recommendations

CLASS I

1. Before initiating antiarrhythmic drug therapy, treatment of precipitating or reversible causes of AF is recommended. (Level of Evidence: C)
2. The following antiarrhythmic drugs are recommended in patients with AF to maintain sinus rhythm, depending on underlying heart disease and comorbidities (Level of Evidence: A):
 - a) Amiodarone
 - b) Dofetilide
 - c) Dronedarone
 - d) Flecainide
 - e) Propafenone
 - f) Sotalol
3. The risks of the antiarrhythmic drug, including proarrhythmia, should be considered before initiating therapy with each drug. (Level of Evidence: C)
4. Because of its potential toxicities, amiodarone should only be used after consideration of risks and when other agents have failed or are contraindicated. (Level of Evidence: C)

CLASS IIa

1. A rhythm-control strategy with pharmacological therapy can be useful in patients with AF for the treatment of tachycardia-induced cardiomyopathy. (Level of Evidence: C)

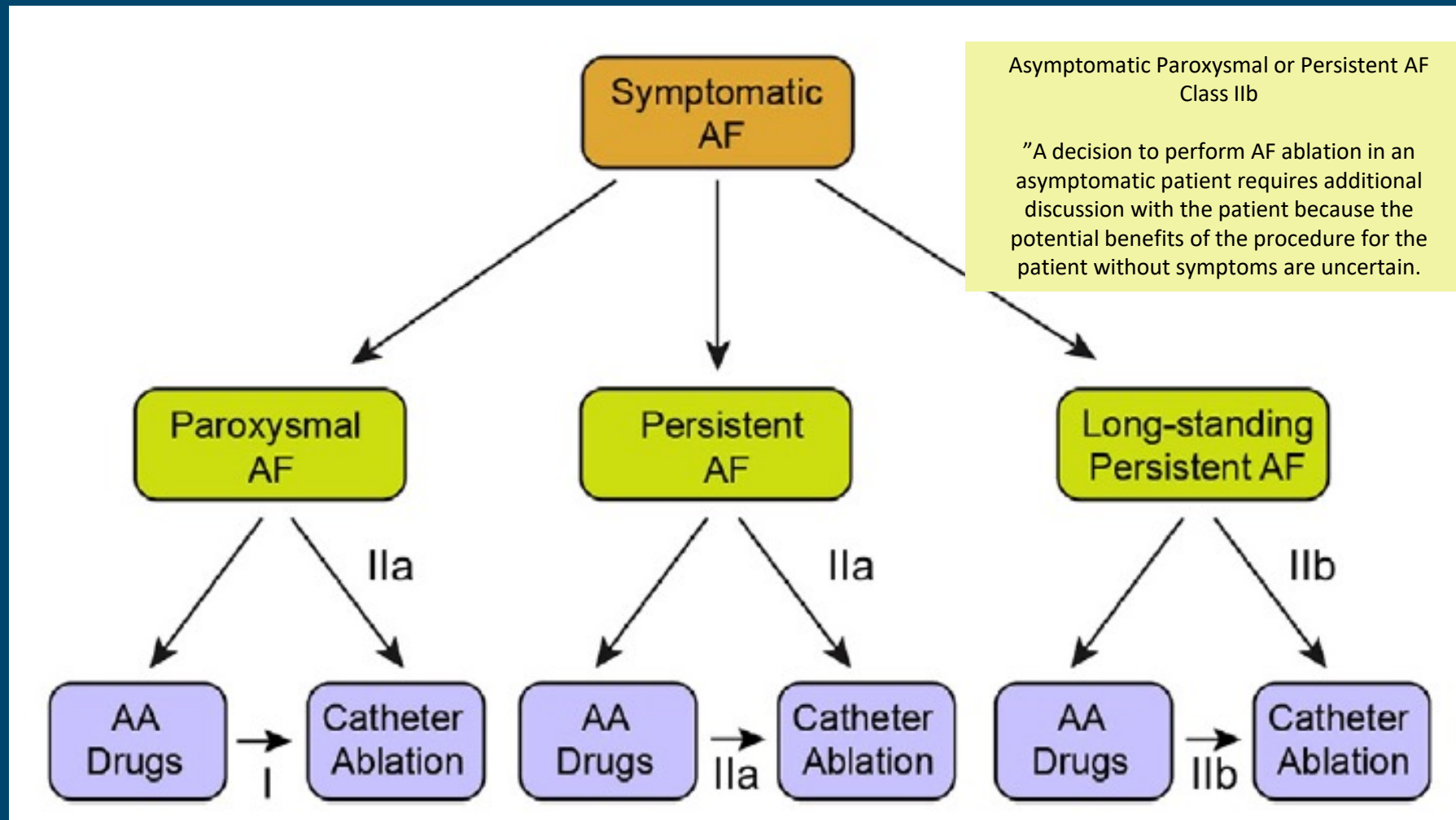
CLASS IIb

1. It may be reasonable to continue current antiarrhythmic drug therapy in the setting of infrequent, well-tolerated recurrences of AF when the drug has reduced the frequency or symptoms of AF. (Level of Evidence: C)

CLASS III: HARM

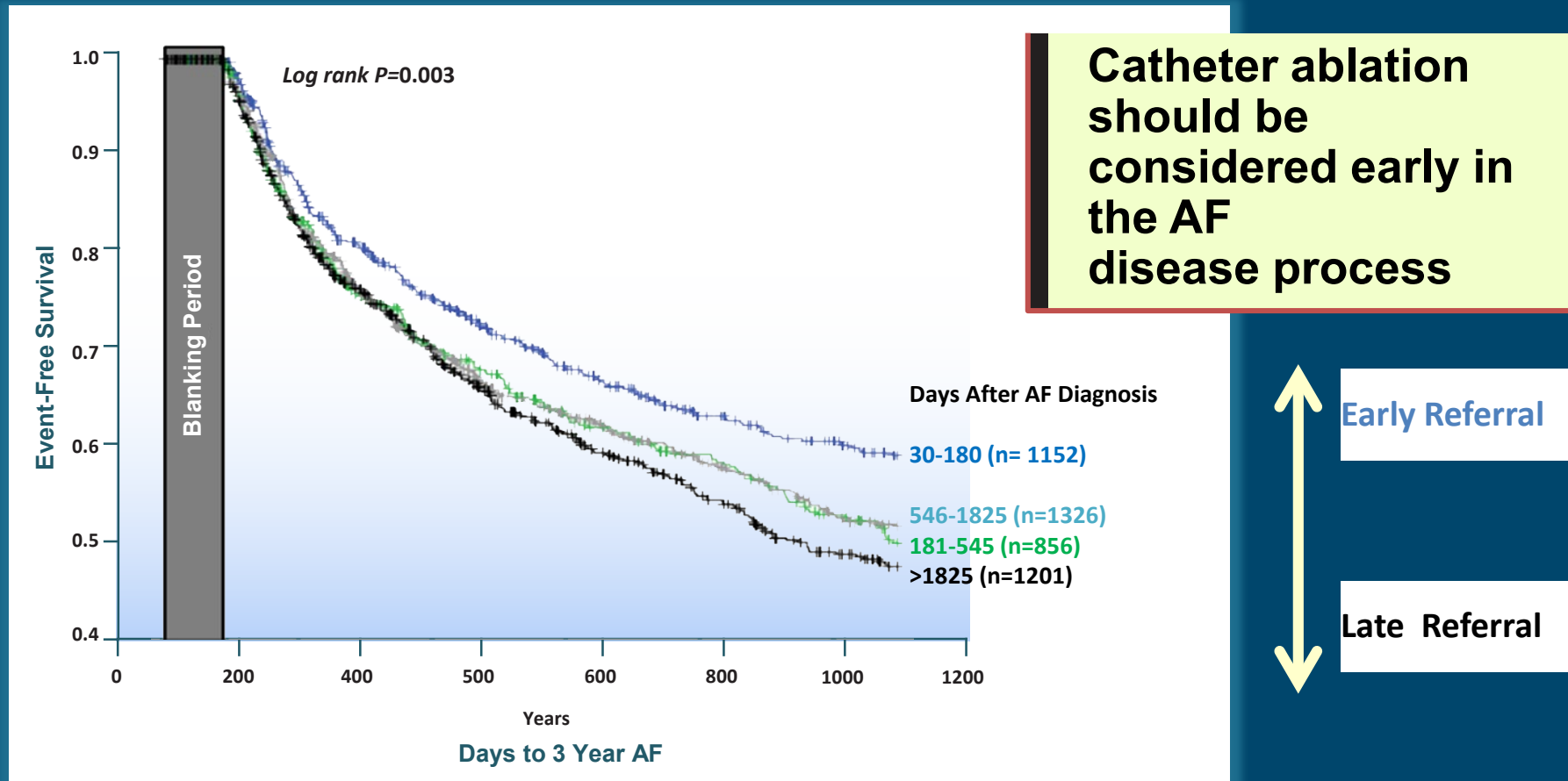
1. Antiarrhythmic drugs for rhythm control should not be continued when AF becomes permanent (Level of Evidence: C), including dronedarone. (Level of Evidence: B)
2. Dronedarone should not be used for treatment of AF in patients with New York Heart Association (NYHA) class III and IV HF or patients who have had an episode of decompensated HF in the past 4 weeks. (Level of Evidence: B)

Catheter Ablation of AF



Catheter Ablation of AF

The Intermountain Health Study (n=4535)



CABANA

JAMA | **Original Investigation**

Effect of Catheter Ablation vs Antiarrhythmic Drug Therapy on Mortality, Stroke, Bleeding, and Cardiac Arrest Among Patients With Atrial Fibrillation The CABANA Randomized Clinical Trial

Douglas L. Packer, MD; Daniel B. Mark, MD, MPH; Richard A. Robb, PhD; Kristi H. Monahan, RN; Tristram D. Bahnson, MD; Jeanne E. Poole, MD; Peter A. Noseworthy, MD; Yves D. Rosenberg, MD, MPH; Neal Jeffries, PhD; L. Brent Mitchell, MD; Greg C. Flaker, MD; Evgeny Pokushalov, MD; Alexander Romanov, MD; T. Jared Bunch, MD; Georg Noelker, MD; Andrey Ardashev, MD; Amiran Revishvili, MD; David J. Wilber, MD; Riccardo Cappato, MD; Karl-Heinz Kuck, MD; Gerhard Hindricks, MD; D. Wyn Davies, MD; Peter R. Kowey, MD; Gerald V. Naccarelli, MD; James A. Reiffel, MD; Jonathan P. Piccini, MD, MHS; Adam P. Silverstein, MS; Hussein R. Al-Khalidi, PhD; Kerry L. Lee, PhD; for the CABANA Investigators