

# Cardiac Arrhythmias in Africa: prospect, challenges, and perspectives



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**PASCAR/SHS/WHF/PAFCIC, 7-11 October 2017, Khartoum, Sudan**

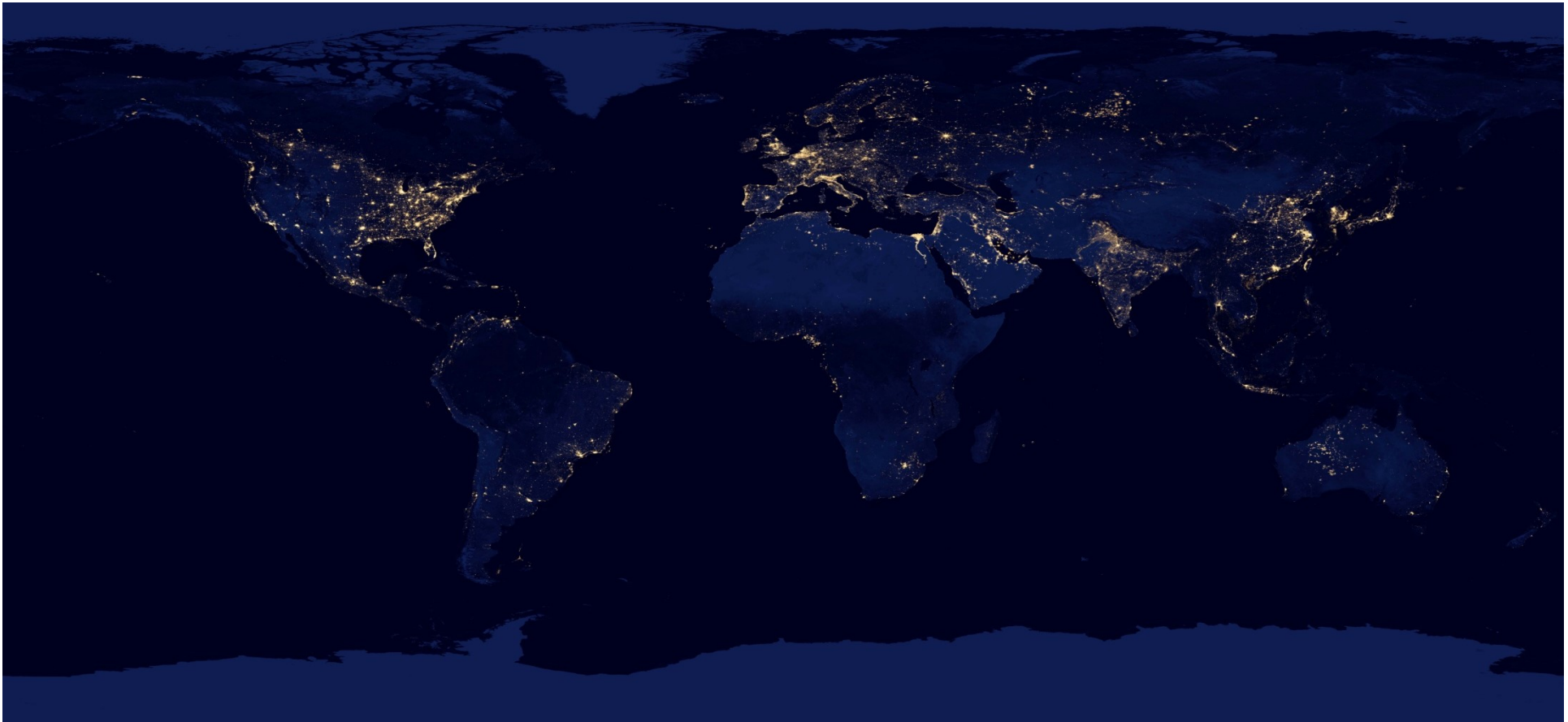


# Disclosures

Chair of PASCAR Task Force

on

Sudden Cardiac Death and Electrophysiology



# AFRICA

- 1.5 billion people (15% of the world population)
- 54 countries
- World's poorest and most underdeveloped continent
- GDP per capita: many SSA countries < 1500 USD

# Leading causes of death in Africa

- Diarrhoeal illnesses
- HIV/AIDS
- TB
- Malaria



- **Bourgeoning NCDs/CVD**

# Outline (I)

- Current Status of Pacing and EP in AFRICA
  - ❑ *PASCAR CIED and EP procedures statistics*
- Atrial Fibrillation in Africa
  - ❑ *RE-LY study*
  - ❑ *REMEDY registry*
  - ❑ *AF-Cameroon study*
- Sudden cardiac death in Africa
  - ❑ *Overview*
  - ❑ *First population-based incidence study*
- Challenges
- Perspectives

“Permanent pacing remains one of the most cost-effective treatments available in modern medicine”

*... Still unavailable to many patients living in Africa today...*

*... 62,459, 264 people in 8 out of 31 countries (26%) live without any access to pacemaker's implantation...*

Republic of Congo

Guinea Equatorial

Sao Tome et Principe

Togo

Guinea Conakry

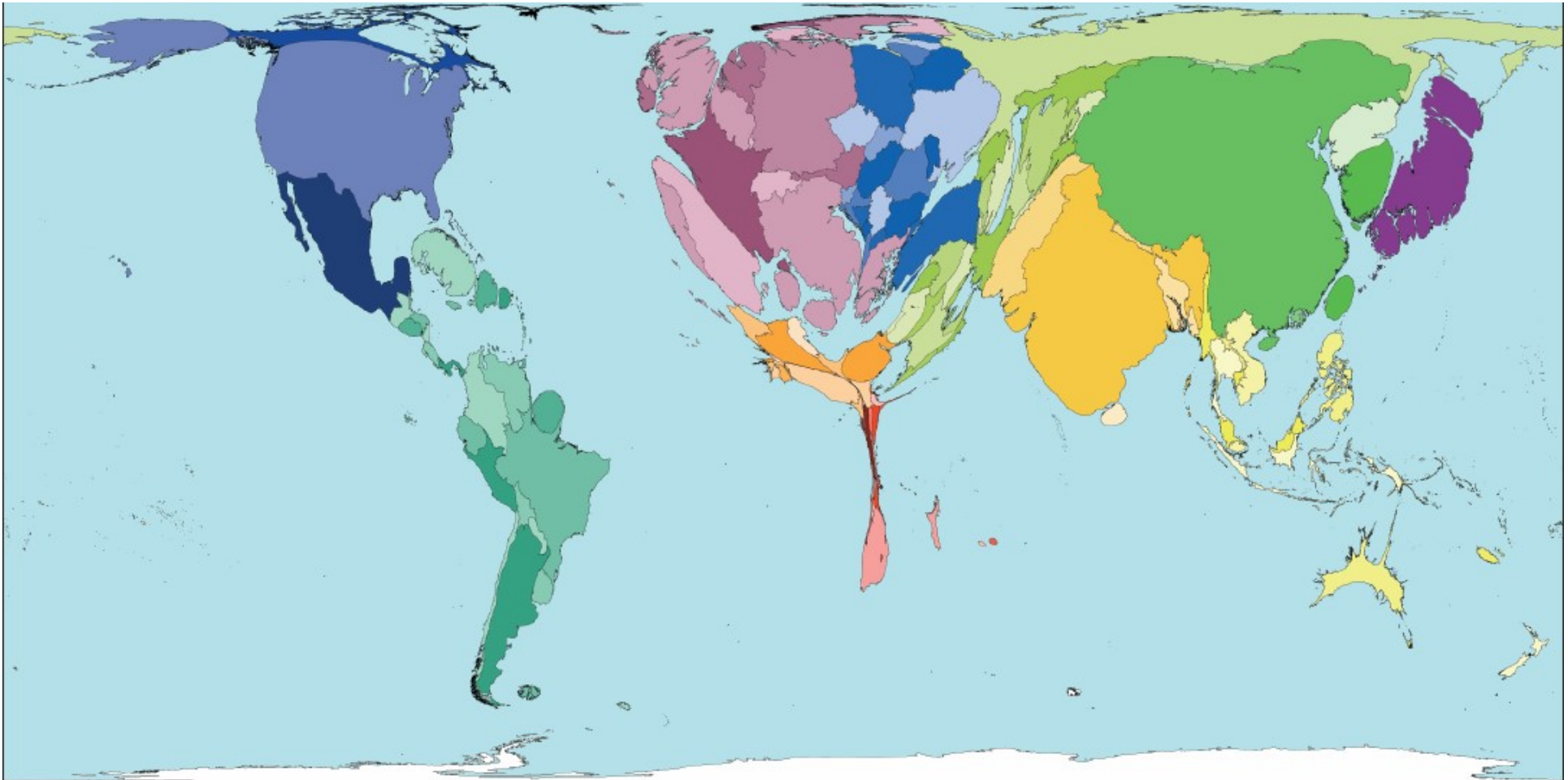
Chad

Niger

Central African Republic

*R Sutton, The foundation of Cardiac Pacing 1991*

*Bonny et al. PASCAR CIED and EP study, Europace J 2017*



The reality...

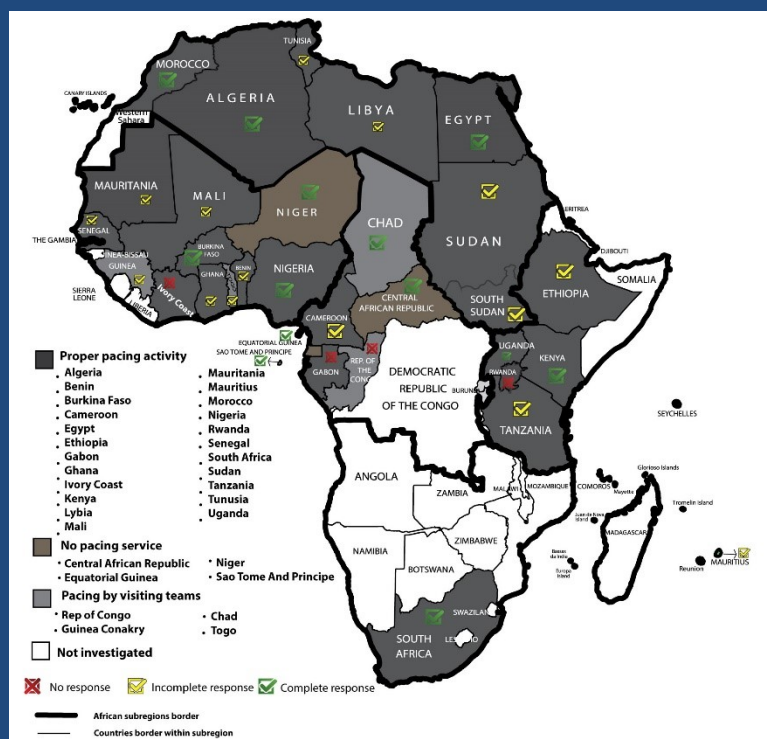
*Source: Worldmapper, Working Physicians, 2006*



# PASCAR SURVEY on the use of cardiac implantable electronic devices and EP procedures in Africa

## INVESTIGATORS

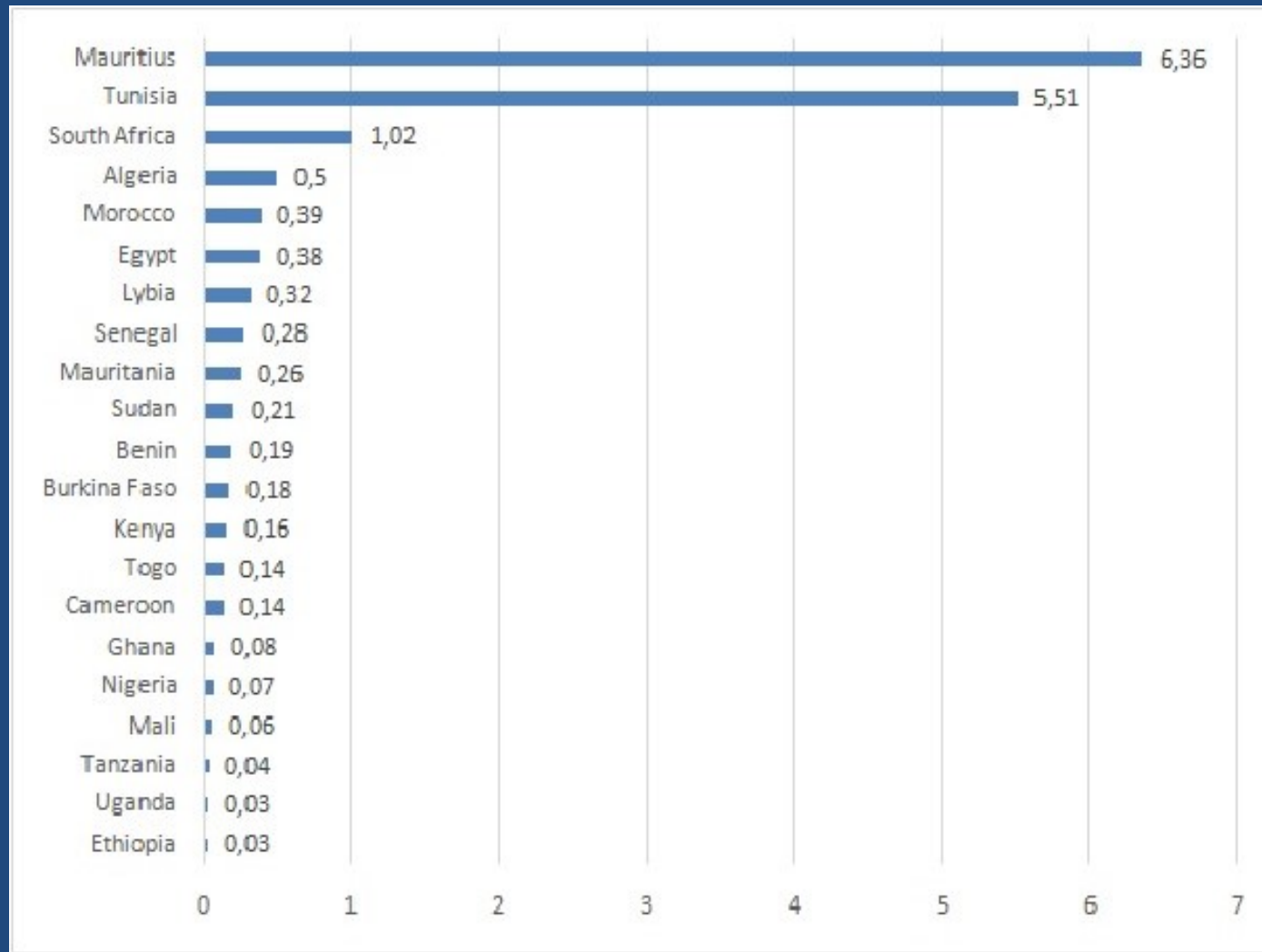
M. Jeilan (Kenya), M. Ngantcha (Cameroon), E. Okello (Uganda), I.A. Toure (Niger), MA Talle (Nigeria), Anastaze Dzudie (Cameroon), MA Awad (Sudan), G. Millogo (Burkina Faso), B. Kavira (Mauritius), M. Houenassi (Benin), R. Houndolo (Senegal), M. Diakité (Mali), S. Marrakchi (Tunisia), C. Tantchou (Cameroon), A Gehani (Libya), Icham Bouzelmat (Morocco), Ad. Kane (Senegal), I. Kofi Owusu (Ghana), E. Marijon (France), G Nel (South Africa), Bonny (Cameroon), A.Chin (South Africa)



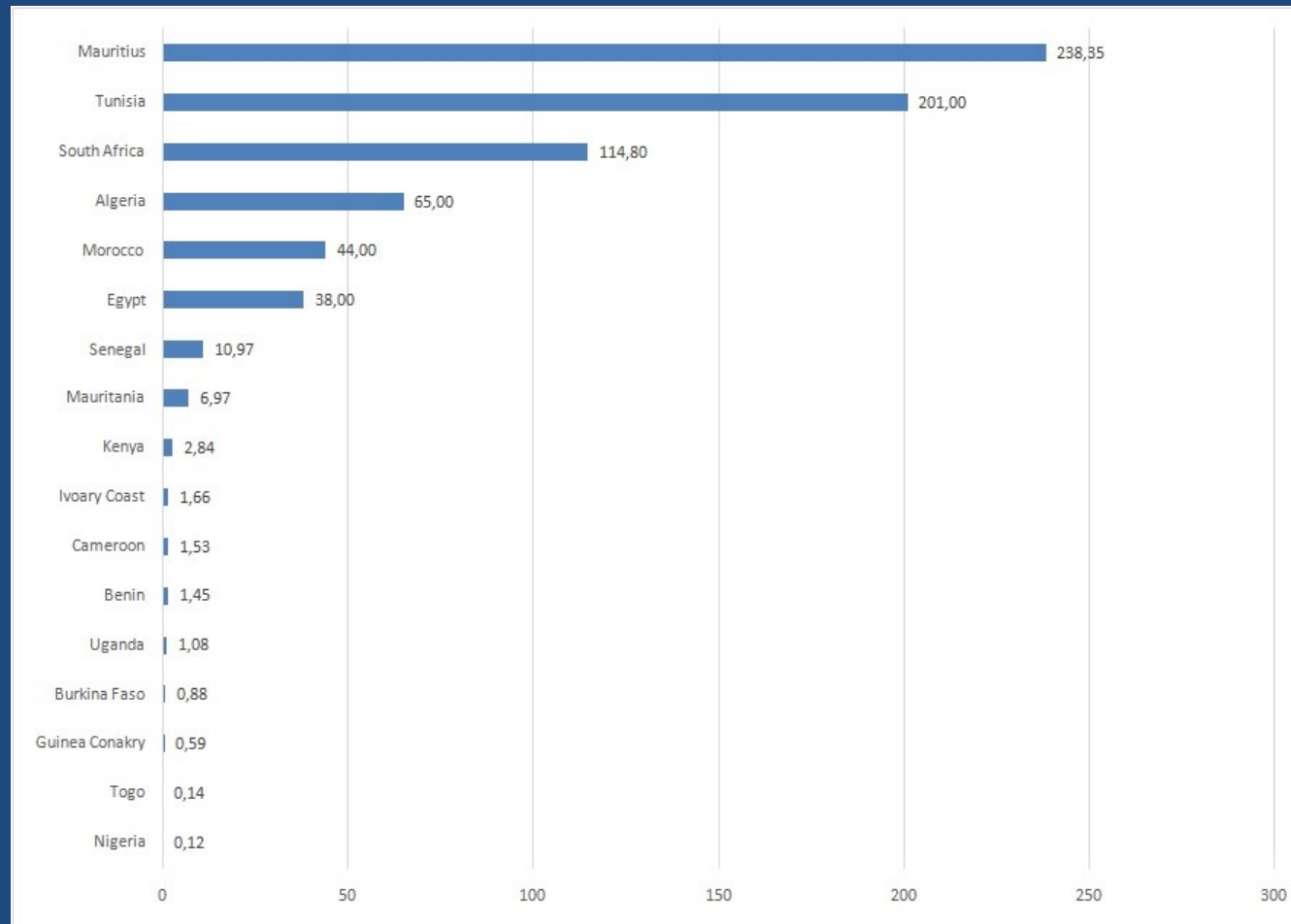
31 African countries  
From 2011 to 2016



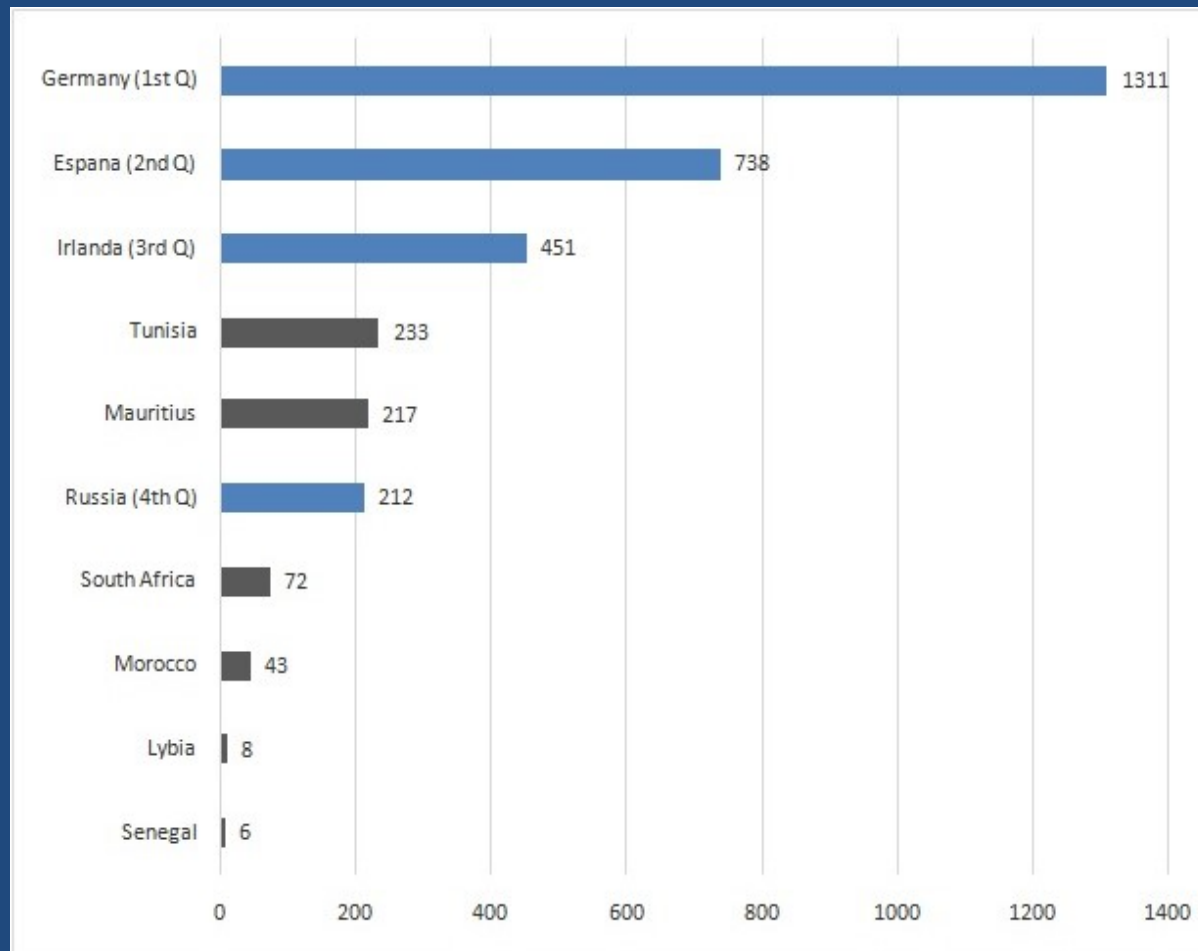
# PM centers per million population (2013)



# PM implantations per million population (2014)

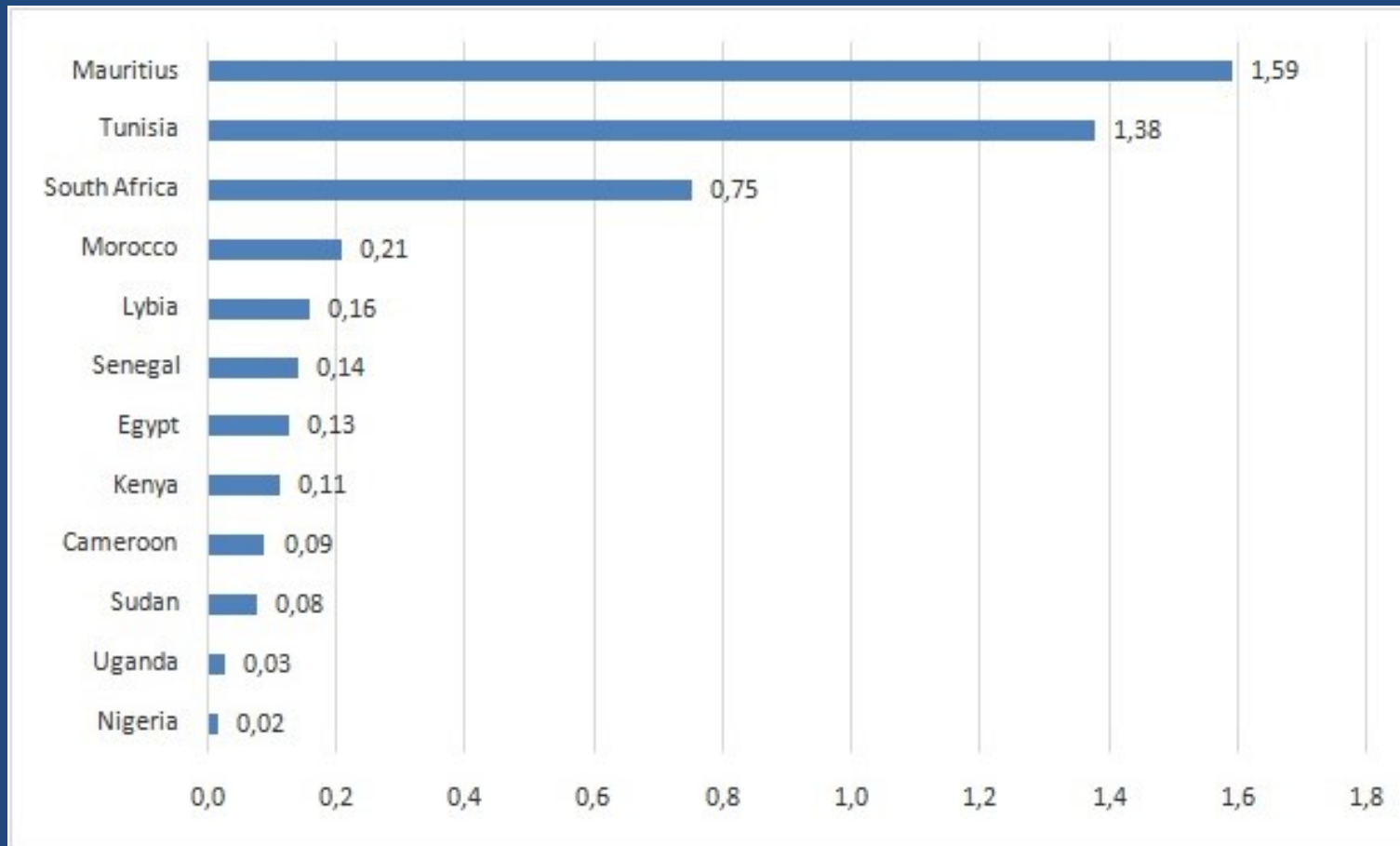


# PM implantations per million population in Africa compared to Europe in 2013



*Bonny et al. PASCAR CIED and EP study, Europace J 2017*

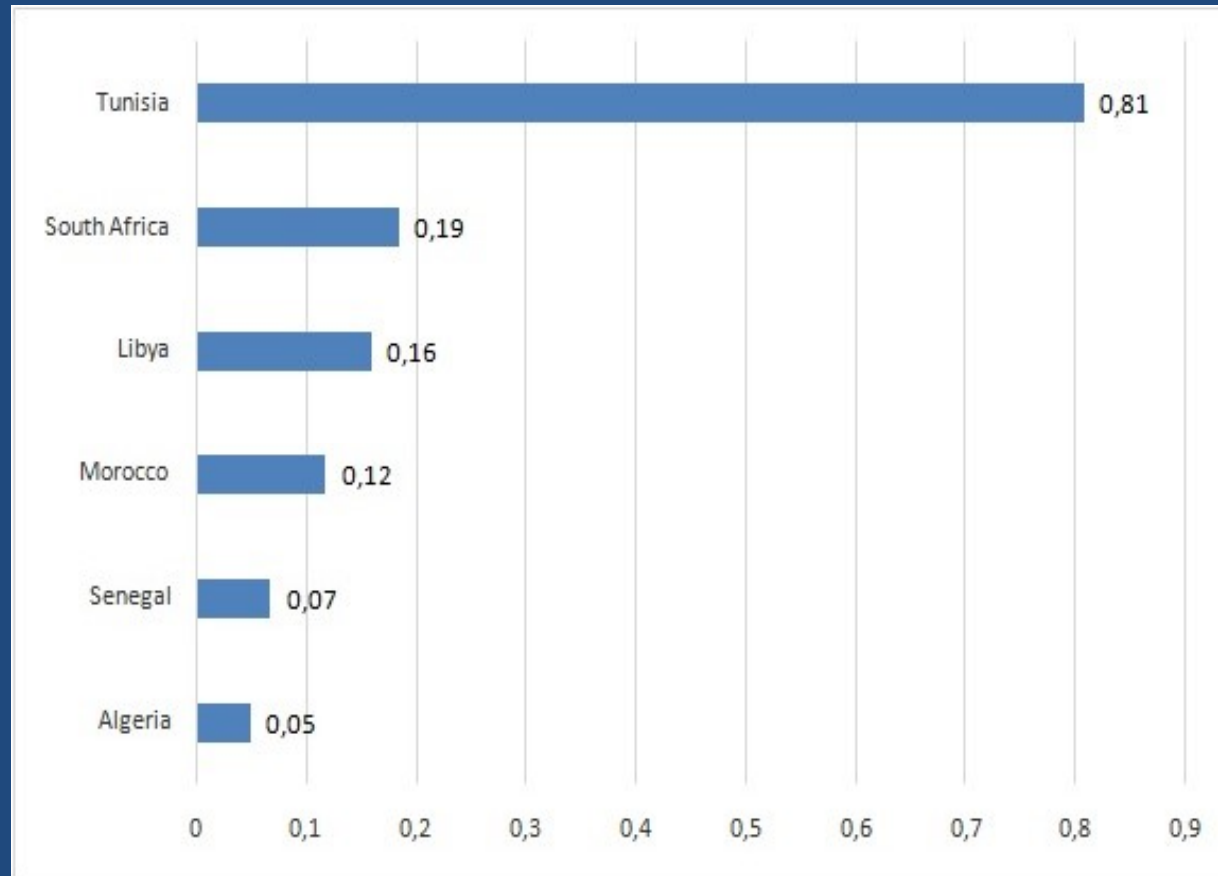
# ICD and CRT in Africa: center's density in 2014



# ICD and CRT in Africa vs European countries with comparable GDP per capita

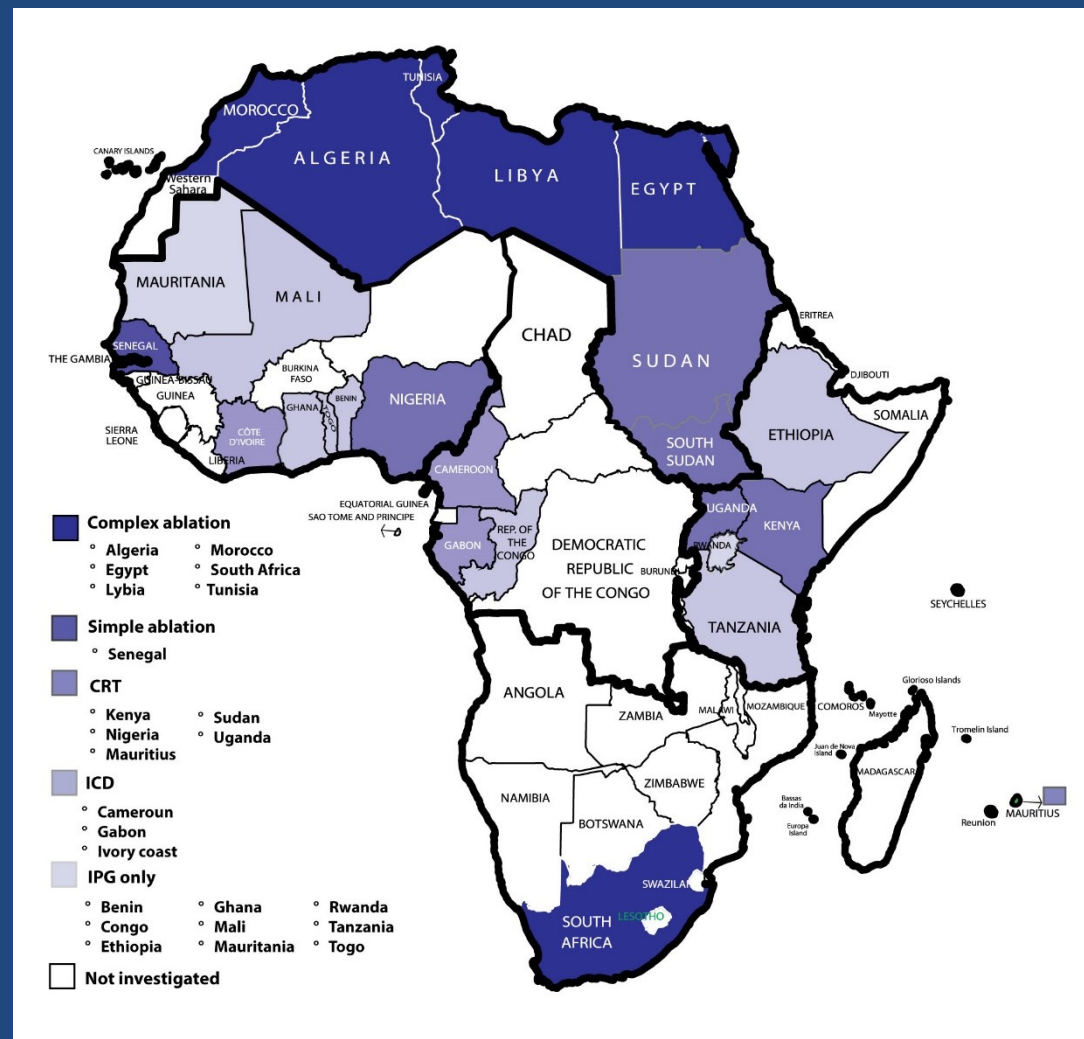
	GDP per capita (USD)	Number of ICD implants		Number of CRT (CRT-P+ CRT-D) implants	
Country		Absolute number	Per million population	Absolute number	Per million population
Ukraine	3104	57	1,29	85	2
Morocco	3154	27	0,81	62	2
Egypt	3328	236	2,72	530	6
Tunisia	4272	140	12,8	180	16
Georgia	4429	104	21,07	55	11
Bosnia-Herzegovia	5194	55	14,21	23	6
Algeria	5470	60	1,55	56	1
Serbia	6200	457	63,39	321	45
South Africa	6479	634	<u>11,71</u>	790	14,59

# Ablation procedures: rate per million population in Africa (2014)



No EP centre in SS Africa  
(excluding South Africa and  
Senegal) > 900 million people

# Full cardiac arrhythmia services in Africa (2014)





# Cardiac arrhythmia services in Africa:

## governance challenges

Country	Population	Population growth rate(%)	Life expectancy at birth	Death rate/1000 population	GDP(x 1000 billion USD)	GDP per capita (USD)	Health expenditure as % of GDP	Health expenditures per capita	Human development index (2010-2015)	Study sample rank	
									World rank		
Mauritius	1260934	0.2	74	8	12803445.9	10153.9	4.8	482	64	1	
Algeria	39113313	2	75	5	213983107.8	5470.9	7.2	362	83	2	
Tunisia	11143908	1.2	75	7	47603227.9	4271.7	7	305	97	3	
Lybia	6204108	0.1	72	5	N/A	N/A	5	372	102	4	
Gabon	1875713	3.2	64	9	18179717.8	9692.2	3.4	321	109	5	
Egypt	91812566	2.2	71	6	305529656.5	3327.8	5.6	178	111	6	
South Africa	54146735	1.6	57	12	350850571.8	6479.6	8.8	570	119	7	
Morocco	34318082	1.4	74	6	109881398.5	3154.5	5.9	190	123	8	
Congo. Rep	4871101	2.5	62	9	14177437.6	2910.5	5.2	162	135	9	
Guinea Equatorial	1129424	4.1	58	11	21461989.5	19002.6	77.1	663	135	9	
Ghana	26962563	2.3	61	9	38616536.1	1432.2	3.6	58	139	10	
Sao Tome et Principe	191266	2.2	66	7	348463.5	1821.9	43.2	166	142	11	
Kenya	46024250	2.6	62	8	61445346.0	1335.1	5.7	78	146	12	
Tanzania	52234869	3.1	65	7	48197218.3	950.4	5.6	52	151	13	
Nigeria	176460502	2.7	53	13	568498939.8	3221.7	3.7	118	152	14	
Cameroon	22239904	2.7	55	11	32050817.6	1441.1	4.1	59	154	15	
Mauritania	4063920	2.9	63	8	5391475.9	1326.7	3.8	49	157	16	
Rwanda	11345357	2.5	64	7	8016288.4	706.6	38.1	52	159	17	
Senegal	14546111	3	66	6	15308965.4	1052.4	4.7	50	162	18	
Sudan	37737913	2.4	63	8	82151588.4	2176.9	8.4	130	165	19	
Uganda	38833338	3.4	58	10	27927875.3	719.2	7.2	52	163	19	
Togo	7228915	2.6	60	9	4482880.4	620.1	5.2	34	166	20	
Benin	10286712	2.8	60	9	9707432.0	943.7	4.6	38	167	21	
IvoryCoast	22531350	2.5	52	14	35372603.5	1569.9	5.7	88	171	22	
Ethiopia	97366774	2.6	64	7	55612228.2	571.2	4.9	27	174	23	
Mali	16962846	2.9	58	10	14004067.5	825.6	6.9	42	175	24	
Guinea Conakry	11805509	2.3	59	10	6624068.0	561.1	48.5	30	183	25	
Burkina Faso	17585977	3	59	10	12400688.6	705.1	5	35	185	26	
Chad	13569438	3.3	52	14	13922223.2	1026	3.6	37	186	27	
Niger	19148219	3.8	61	9	8245312.1	430.6	5.8	24	187	28	
Central African Republic	4515392	0.3	51	15	1702898.9	377.1	4.2	16	188	31	

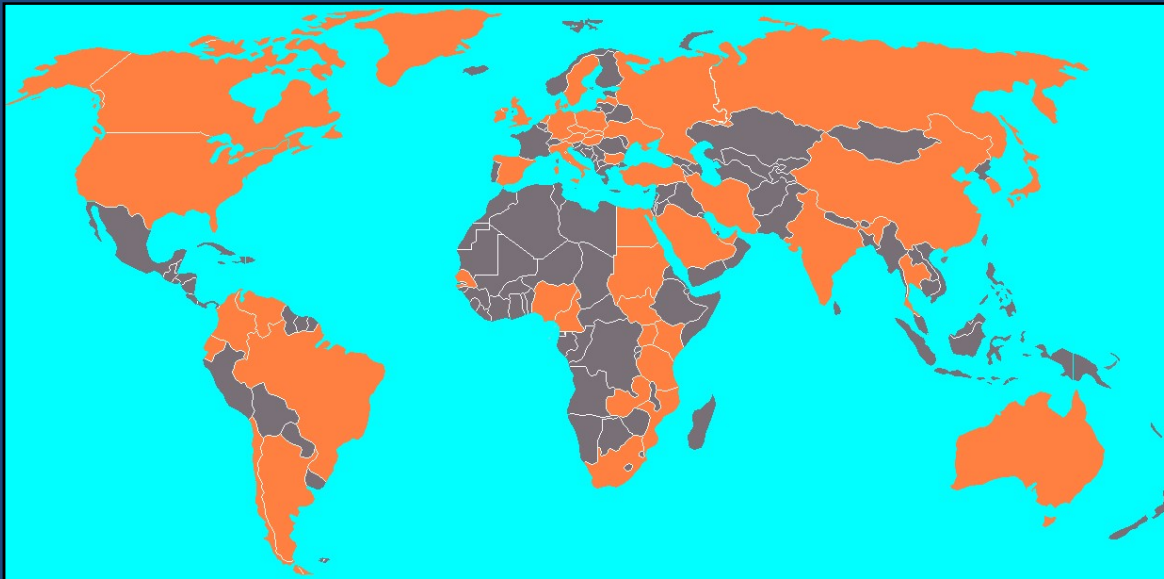
## Outline (II)

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# AF in AFRICA

## RE-LY AF REGISTRY

Prospective, registry of patients who presented to an emergency room with AF between 2008 and 2011 (N=15400)



Participating countries  
46 countries

10 AFRICAN countries  
(n=1137)

# AF in AFRICA

	AF (AFRICA) N=1137	AF (WORLD) N=15400
AGE	57 years	66 years
MALE	47%	53%
PERMANENT AF	81%	51%
HYPERTENSION	54%	62%
PREVIOUS MI	6%	14%
HEART FAILURE	64%	35%
LV SYSTOLIC DYSFUNCTION	46%	24%
RHEUMATIC HEART DISEASE	22%	12%
DIABETES	14%	22%
LONE AF	6%	11%

P<0.005 for all characteristics

- ❑ Patients with AF from Africa are significantly younger
- ❑ In the setting of hypertension and RHD, patients from Africa were more likely to have:
  - heart failure
  - LV systolic dysfunction

*Oldgren et al, RE-LY AF, Circulation 2014*

# AF in AFRICA



Europace (2010) 12, 482–487  
doi:10.1093/europace/euq006

## CLINICAL RESEARCH

Epidemiological Studies in Atrial Fibrillation

## Atrial fibrillation in Africa: clinical characteristics, prognosis, and adherence to guidelines in Cameroon

Marie Ntep-Gweth, Marc Zimmermann\*, Alexandre Meiltz, Samuel Kingue, Pierre Ndobo, Philip Urban, and Antoine Bloch

Department of Cardiology, Hôpital De La Tour, 1, Avenue J.-D. Maillard, Meyrin, Geneva 1217, Switzerland

Received 7 September 2009; accepted after revision 4 January 2010; online publish-ahead-of-print 23 February 2010

### Aims

The purpose of this prospective study was to characterize the clinical profile of patients with atrial fibrillation (AF) in the urban population of a sub-Saharan African country and to assess how successfully current guidelines are applied in that context.

### Methods and results

This prospective study involved 10 cardiologists in Cameroon. Enrolment started on 1 June 2006 and ended on 30 June 2007. Consecutive patients were included if they were  $\geq 18$  years and AF was documented on an ECG during the index office visit. In this survey, 172 patients were enrolled (75 males and 97 females; mean age  $65.8 \pm 13$  years). The prevalence of paroxysmal, persistent, and permanent AF was 22.7, 21.5, and 55.8%, respectively. Underlying cardiac disorders, present in 156/172 patients (90.7%), included hypertensive heart disease (47.7%), valvular heart disease (25.6%), dilated cardiomyopathy (15.7%), and coronary artery disease (6%). A rate-control strategy was chosen in 83.7% of patients (144 of 172) and drugs most commonly used were digoxin and amiodarone. The mean CHADS<sub>2</sub> score was  $1.9 \pm 1.1$  and 158 of 172 patients (91.9%) had a CHADS<sub>2</sub> score  $\geq 1$ . Among patients with an indication for oral anticoagulation (OAC), only 34.2% (54 of 158) actually received it. During a follow-up of  $318 \pm 124$  days, 26 of 88 patients died (29.5%), essentially from a cardiovascular cause (15 of 26). Ten patients (16.1%) had a non-lethal embolic stroke and 23 (26.1%) had symptoms of severe congestive heart failure.

### Conclusion

Clinical presentation of AF in Cameroon is much more severe than in developed countries. A rate-control strategy is predominant in Cameroon and OAC is prescribed in only 34.2% of eligible patients, despite a high CHADS<sub>2</sub> score at inclusion. Death and stroke rate at 1 year are very high in Cameroon possibly because of a lower use of OAC, and a higher prevalence of rheumatic mitral disease and of more severe co-morbidities.

### Keywords

Atrial fibrillation • Africa • Adherence to guidelines • Cameroon

## Introduction

In industrialized countries, atrial fibrillation (AF) is the most common sustained cardiac arrhythmia, strongly associated with an increased morbidity and mortality. Atrial fibrillation causes a five-fold rise in the risk of stroke and one of every six strokes occurs in a patient with AF. Atrial fibrillation is also associated with heart failure, with frequent physician's or emergency department visits and with hospitalization, and with significant economic consequences.<sup>1</sup> In the last decade, important acquisitions in the

management of AF have emerged concerning treatment strategies, risk assessment or stroke prevention, and 'unified' guidelines (ACC/AHA/ESC) for AF management have been published.<sup>2</sup> Even in developed countries, suboptimal anticoagulation is frequently observed<sup>3–7</sup> and a high level of adherence to the guidelines has been shown only rarely.<sup>8</sup> Only very few data are available concerning AF or AF-related stroke in Africa<sup>9–13</sup> and little is known of the clinical characteristics, treatment, and prognosis of African patients with AF. Since the overall burden of cardiovascular disease is predicted to rise by  $\sim 150\%$  in the developing

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# AF and RHD in AFRICA: the era of Global heart health

## Global RHD Registry - REMEDY study

*Investigators: Ganesan Karthikeyan (India), Liesl Zühlke (South Africa), Mark Engel (South Africa) Sumathy Rangarajan (India), Salim Yusuf (Canada), Koon Teo (Canada) and Bongani M. Mayosi (South Africa)*

- ❑ 14 African countries
- ❑ 3343 patients enrolled
- ❑ Results:
  - ✓ 1/5 pts had AF
  - ✓ AF= a strong risk factor of mortality
  - ✓ 27,4% of pts on VKA had  $2 < \text{INR} < 3$



*Karthikeyan et al, Am Heart J 2012*

# AF and RHD in AFRICA: the era of Global heart health

STUDY	Total AF cases N	AF and RHD N(%)
Heart of Soweto study <sup>1</sup>	246	51 (21%)
AF Cameroon study <sup>2</sup>	172	44 (26%)
RELY-AF study <sup>3</sup>	1137	250 (22%)

*1. Sliwa et al, Heart 2010*

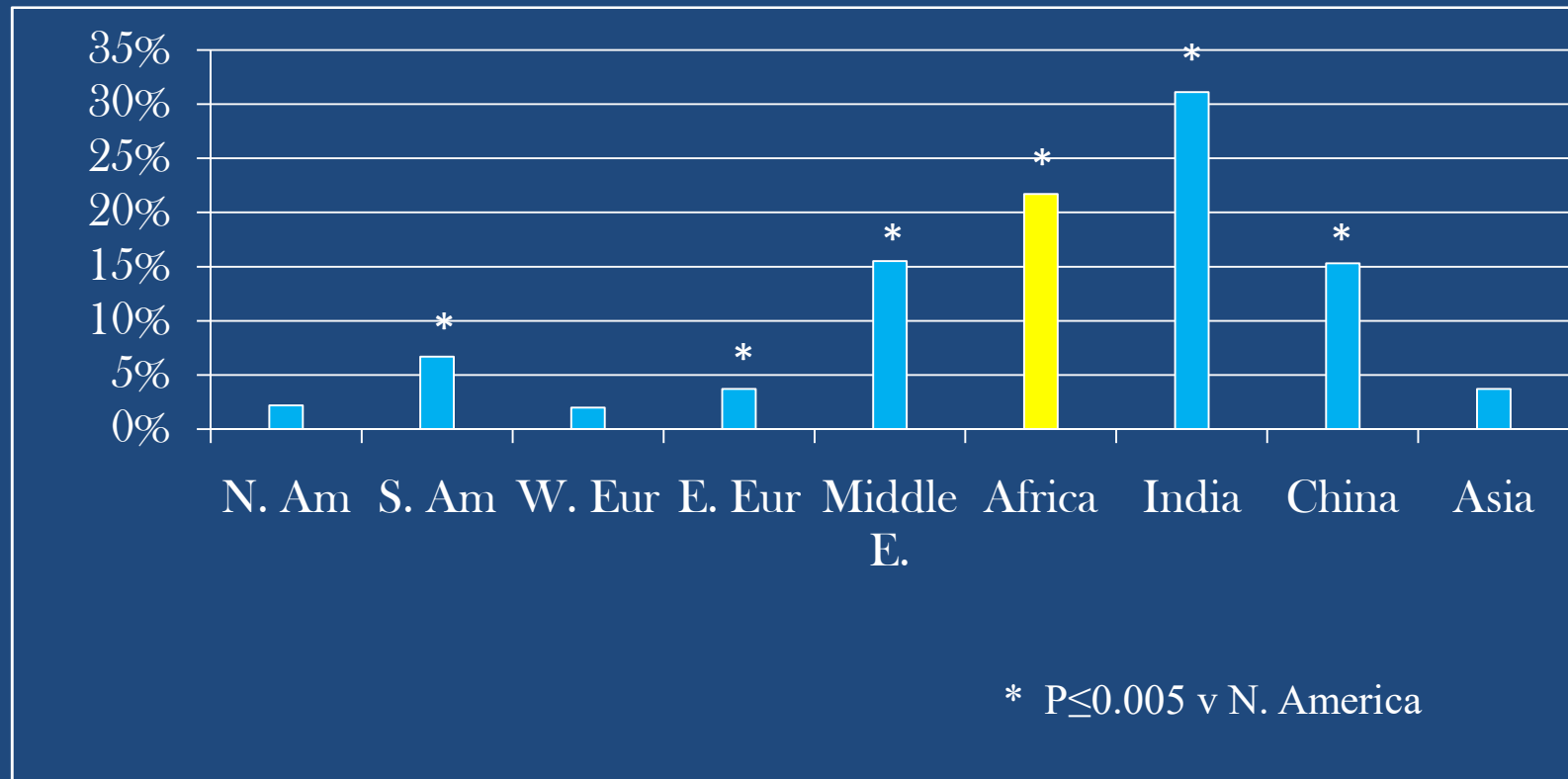
*2. Ntep-Gweth et al, Europace 2010*

*3. Oldgren et al, Circulation 2014*



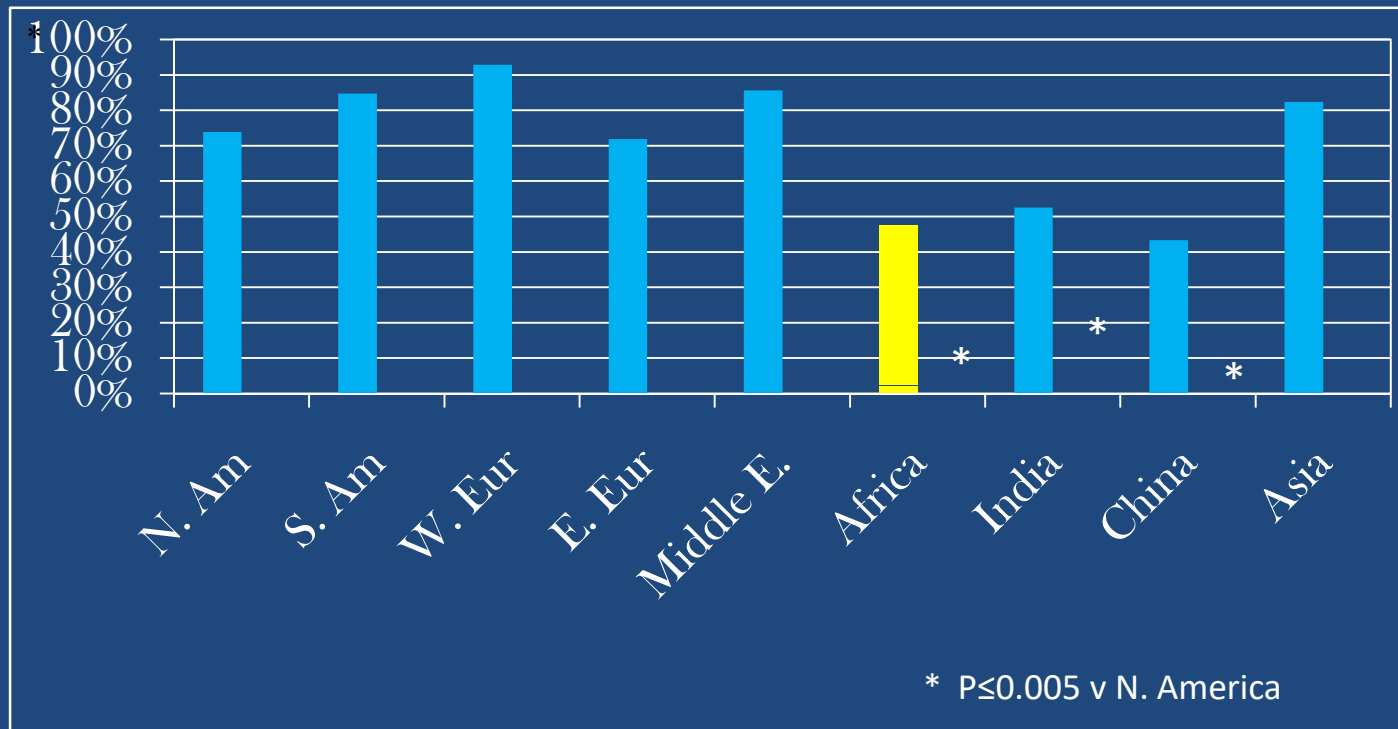
# AF and RHD in AFRICA: the era of Global heart health

- Global prevalence of AF and RHD: 1788/15293 (12%)
- Likely underestimate of prevalence - registry did not include routine 2D-echo



# AF in AFRICA: challenges

## □ Oral Anticoagulation (OAC) use by region



- Use of OACs was low in Africa

- Limited access to INR testing and follow-up

## □ Quid to NOAC use?

## □ Rhythm control (neither AA drugs nor ablation) is underutilized

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- Perspectives

# SCD in AFRICA: overview

Authors	Title	Population Country	Journal and year
Bonny A et al.	Epidemiology of SCD in Cameroon: the first population-based cohort survey in sub-Saharan Africa	Cameroon	Int J of Epidemiology 2017
Talle MA et al.	Sudden Cardiac Death: Clinical Perspectives from the University of Maiduguri Teaching Hospital, Nigeria	Nigeria	World J of Cardiovasc Diseases 2015
El Saiedi SA et al.	Hypertrophic cardiomyopathy: prognostic factors and survival analysis in 128 Egyptian patients	Egypt	Cardiol Young 2014
Akinwusi PO et al.	Pattern of sudden death at Ladoke Akintola University of Technology Teaching Hospital, Osogbo, South West Nigeria	Nigeria	Vasc Health Risk Manag. 2013
Ouali S et al.	Clinical and electrophysiological profile of BrS in the Tunisian population	Tunisia	Pacing and Clinical Electrophysiology 2011
Bonny A et al.	Brugada syndrome in pure black Africans	Ivory Coast, Benin, RDC	J of Cardiovasc Electrophysiol 2008
Kollo PM et al.	Prognostic significance of QT interval prolongation in adult Nigerians with chronic heart failure	Nigeria	Niger J Clin Pract. 2008
Schneider J et al.	Causes of sudden death in Addis Ababa, Ethiopia	Ethiopia	Ethiop Med J 2001
Rotimi O et al.	Sudden unexpected death from cardiac causes in Nigerians: a review of 50 autopsied cases.	Nigeria	Int J Cardio1998
Arthur JT et al.	Sudden deaths: cardiac and non-cardiac in children in Accra	Ghana	West J Africa 1995

# Incidence of SCD in Africa: the Douala study



International Journal of Epidemiology, 2017, 1–9  
doi: 10.1093/ije/dyx043  
Original article



Original article

## Epidemiology of sudden cardiac death in Cameroon: the first population-based cohort survey in sub-Saharan Africa

Aimé Bonny,<sup>1,2,3\*</sup> Kemi Tibazarwa,<sup>4</sup> Samuel Mbouh,<sup>5</sup> Jonas Wa,<sup>6</sup> René Fonga,<sup>7</sup> Cecile Saka<sup>8</sup> and Marcus Ngantcha<sup>1,3</sup>, on behalf of the Pan African Society of Cardiology (PASCAR) Task Force on Sudden Cardiac Death

<sup>1</sup>Cameroon Cardiovascular Research Network, Douala, Cameroon, <sup>2</sup>University of Douala, Department of Clinical Sciences, Douala, Cameroon, <sup>3</sup>Cardiovascular Research Unit, Department of Cardiology, Clinique Paul Picquet, Sens, France, <sup>4</sup>The Jakaya Kikwete Cardiac Institute, Muhimbili National Hospital, Dar es Salaam, Tanzania, <sup>5</sup>Institut national de la jeunesse et sport (INJS), Yaoundé, Cameroon, <sup>6</sup>Hôpital de District de Bonassama, Douala, Cameroon, <sup>7</sup>Hôpital de District de New-Bell, Douala, Cameroon and <sup>8</sup>Service de cardiologie, hôpital Laquintinie de Douala, Cameroon

\*Corresponding Author: University of Douala, Department of Clinical Sciences, BP 2701 Douala, Cameroon.  
E-mail: aimebonny@yahoo.fr

Editorial decision 17 February 2017; accepted 9 March 2017

### Abstract

**Background:** Incidence estimates of sudden cardiac death (SCD) in sub-Saharan Africa (SSA) are unknown.

**Method:** Over 12 months, the household administrative office and health community committee within neighbourhoods in two health areas of Douala, Cameroon, registered all deaths among 86 188 inhabitants aged >18 years. As part of an extended multi-source surveillance system, the Emergency Medical Service (EMS), local medical examiners and district hospital mortuaries were also surveyed. Whereas two physicians investigated every natural death, two cardiologists reviewed all unexpected natural deaths.

**Results:** There were 288 all-cause deaths and 27 (9.4%) were SCD. The crude incidence rate was 31.3 [95% confidence interval (CI): 20.3–40.6]/100 000 person-years. The age-standardized rate by the African standard population was 33.6 (95% CI: 22.4–44.9)/100 000 person-years. Death occurred at night in 37% of cases, including 11% of patients who died while asleep. Out-of-hospital sudden cardiac arrest occurred in 63% of cases, 55.5% of which occurred at home. Of the 88.9% cases of witnessed cardiac arrest, 63% occurred in the presence of a family member and cardiopulmonary resuscitation was attempted only in 3.7%.

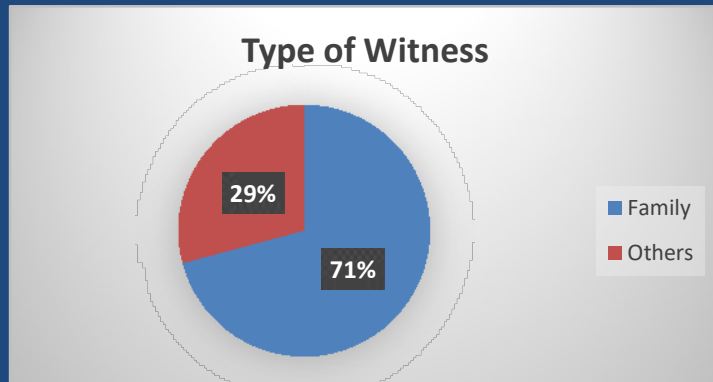
**Conclusion:** The burden of SCD in this African population is heavy with distinct characteristics, whereas awareness of SCD and prompt resuscitation efforts appear suboptimal.

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# SCD in Cameroon: challenges

Age-standardized incidence= 33.6 cases/100 000 pop



**Witness cardiac arrest= 89%**

**CPR (In-hospital CA) = 4%, survivor= 0%**



**OHCA mortality rate= 100%**

- ✓ **Found dead without any attempt to rescue= 33%**
- ✓ **Main transport to hospital= Taxi Cab in 67%**



## Outline (IV)

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## Challenges

- ❑ Inconsistent South-South as well as South-North cooperation
- ❑ Very low healthcare expenditures as % of GDP (2001 Abuja declaration)

### And subsequent:

- ❑ Low EP physicians and EP centers
  - Very low rate of implantable device's and ablation procedures
  - Poor adherence to international guidelines on managing cardiac arrhythmias
    - ✓ AVK use and INR monitoring
    - ✓ NOAC use
    - ✓ Drug challenges for inherited cardiac disease
    - ✓ Cardio-pulmonary resuscitation efforts
- ❑ Low rate of re-use pacemakers and ICDs+++ (Drs Sani/Yousef/Mayosi= Pascar Task Force on device's reuse)
- ❑ High cost of procedure: the mean cost was **USD 1778** and **2379** for VVI and DDD pacemaker respectively, **exceeding the yearly earnings of the average citizen in most LMIC countries**

# Perspectives

## □ GOALS

- No country without permanent pacing activity **by 2025:**  
**NO DEATH FROM CARDIAC CONDUCTION DISTURBANCES**
  - ✓ A reasonable number of centers and trained physicians
  - ✓ Call Governments to increase healthcare expenditures
  - ✓ Call Manufacturers to reduce prices of generators and consumables

## □ Better organise arrhythmia community into a unified working group= African Heart Rhythm Association (AHRA)

- Several commissions (tasks):
  - ✓ Pacing (including re-used devices)
  - ✓ Sudden cardiac death
  - ✓ Atrial fibrillation
  - ✓ Registries on arrhythmias
  - ✓ Inherited arrhythmias
  - ✓ EP facilities
  - ✓ Electrocardiography
  - ✓ Connected cardiac arrhythmias (e-arrhythmia)+++++

**Call young African cardiologists to join arrhythmia task forces that we will become more representative of all Africa inside a unified WG (AHRA?)**

## Perspectives

- ❑ The willingness of Western scientific communities to help Africa through PASCAR cardiac arrhythmia working group
  - EHRA: full cooperation
  - Europace Journal: fast-track review and publication of *the first report of Pan-African statistics on invasive cardiac arrhythmia therapies*
  - Journal of American College of Cardiology (JACC): invited **REVIEW** on managing cardiac arrhythmias
- ❑ Need South-South Collaboration:
  - CASSA (Cardiac Arrhythmia Society of South Africa)
  - PAFCIC (Pan African Course in Interventional Cardiology)
  - National Cardiac Arrhythmia societies

# Perspectives: state-of-the-art



## Invited Review of the week (deadline to submit= 01/12/ 2017): **Managing Arrhythmias in Africa**

### ❑ Team manager:

- ✓ Wiham SCHOLTZ, fellow in MSc (physiology): responsible for survey monkey
- ✓ George NEL (PASCAR)
- ✓ Aimé BONNY (PASCAR)
- ✓ Habib GAMAL (PAFCIC)

### ❑ Investigators: from all African countries

- ✓ Consultant cardiologists
- ✓ Pacing physicians and Electrophysiologists

### ❑ Which Data we will looking for?

- ✓ Human resources (physician, allied professionnals)
- ✓ Facilities (for diagnosis and treatments)
- ✓ Therapies:
  - drugs availability
  - invasive treatments: volume+++ (for PASCAR certification?)



**"If you want to go quickly,  
go alone."**

- African Proverb

**If you want to go far,  
go together."**