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

Global burden of disease study 2013, CVJA 2015
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...

R Sutton, The foundation of Cardiac Pacing 1991
Bonny et al. PASCAR CIED and EP study, Europace J 2017
The reality...

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 Bouzelmot (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

Bonny et al. PASCAR CIED and EP study, Europace J 2017
PM centers per million population (2013)

Bonny et al. PASCAR CIED and EP study, Europace J 2017
PM implantations per million population (2014)

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

Bonny et al. PASCAR CIED and EP study, Europace J 2017
## ICD and CRT in Africa vs European countries with comparable GDP per capita

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP per capita (USD)</th>
<th>Number of ICD implants</th>
<th>Number of CRT (CRT-P+ CRT-D) implants</th>
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</table>

*Bonny et al. PASCAR CIED and EP study, Europace J 2017*
Ablation procedures: rate per million population in Africa (2014)

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

Bonny et al. PASCAR CIED and EP study, Europace J 2017
Full cardiac arrhythmia services in Africa (2014)

Bonny et al. PASCAR CIED and EP study, Europace J 2017
## Cardiac arrhythmia services in Africa: governance challenges

<table>
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<tr>
<th>Country</th>
<th>Population</th>
<th>Population growth rate(%)</th>
<th>Life expectancy at birth</th>
<th>Death rate/1000 population</th>
<th>GDP(x 1000 billion USD)</th>
<th>GDP per capita (USD)</th>
<th>Health expenditure as % of GDP</th>
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Outline (II)

- 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
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)

Oldgren et al, RE-LY AF, Circulation 2014
# AF in AFRICA

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

- 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

P<0.005 for all characteristics

*Oldgren et al, RELY AF, Circulation 2014*
AF in AFRICA

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

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

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

Received 7 September 2009; accepted after revision 8 January 2010; online published 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 country and assess how successfully current guidelines are applied in that context.

Methods and results
This prospective study involved 10 cardiologists in Cameroon. Enrollment started on 1 June 2006 and ended on 30 June 2009. Exclusion criteria were: age > 80 years and AF was self-managed or cut at ECGs showing the index office visit. In this survey, 172 patients were enrolled (75 males and 97 females; mean age 65.8 ± 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 CHADS2 score was 1.9 ± 1.1 and 158 of 172 patients (91.9%) had a CHADS2 score ≥ 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 ± 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 CHADS2 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. 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.2 Even in developed countries, suboptimal anticoagulation is frequently observed3,4 and a high level of adherence to the guidelines has been shown only rarely.5 Only very few data are available concerning AF or AF-related stroke in Africa6,7 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 ~150% in the developing...
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< INR<3

Karthikeyan et al, Am Heart J 2012
### AF and RHD in AFRICA: the era of Global heart health

<table>
<thead>
<tr>
<th>STUDY</th>
<th>Total AF cases N</th>
<th>AF and RHD N(%)</th>
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<tr>
<td>Heart of Soweto study¹</td>
<td>246</td>
<td>51 (21%)</td>
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<tr>
<td>AF Cameroon study²</td>
<td>172</td>
<td>44 (26%)</td>
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<tr>
<td>RELY-AF study³</td>
<td>1137</td>
<td>250 (22%)</td>
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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

![Bar chart showing prevalence of AF and RHD in different regions.](chart.png)

*P≤0.005 v N. America

*Chin et al, Heart Rhythm (abst) 2012*
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

* P≤0.005 v N. America

Chin et al, Heart Rhythm (abst) 2012
Outline (III)

- Current Status of Pacing and EP in AFRICA
  - PASCAR CIED and EP procedures statistics
- Atrial Fibrillation in Africa
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  - REMEDY registry
  - AF-Cameroon study
- Sudden cardiac death in Africa
  - Overview
  - First population-based incidence study
- Challenges
- Perspectives
### SCD in AFRICA: overview

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<td>Bonny A et al.</td>
<td>Epidemiology of SCD in Cameroon: the first population-based cohort survey in sub-Saharan Africa</td>
<td>Cameroon</td>
<td>Int J of Epidemiology 2017</td>
</tr>
<tr>
<td>Talle MA et al.</td>
<td>Sudden Cardiac Death: Clinical Perspectives from the University of Maiduguri Teaching Hospital, Nigeria</td>
<td>Nigeria</td>
<td>World J of Cardiovasc Diseases 2015</td>
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<tr>
<td>El Saiedi SA et al.</td>
<td>Hypertrophic cardiomyopathy: prognostic factors and survival analysis in 128 Egyptian patients</td>
<td>Egypt</td>
<td>Cardiol Young 2014</td>
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<td>Akinwusi PO et al.</td>
<td>Pattern of sudden death at Ladoke Akintola University of Technology Teaching Hospital, Osogbo, South West Nigeria</td>
<td>Nigeria</td>
<td>Vasc Health Risk Manag. 2013</td>
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<tr>
<td>Rotimi O et al.</td>
<td>Sudden unexpected death from cardiac causes in Nigerians: a review of 50 autopsied cases.</td>
<td>Nigeria</td>
<td>Int J Cardio1998</td>
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<tr>
<td>Arthur JT et al.</td>
<td>Sudden deaths: cardiac and non-cardiac in children in Accra</td>
<td>Ghana</td>
<td>West J Africa 1995</td>
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Incidence of SCD in Africa: the Douala study

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

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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): 20.3–40.8) per 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 43% of cases, 55.5% of which occurred at home. Of the 88.9% of 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.
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%

Bonny et al, *Int J of epidemiology* 2017
Outline (IV)

- Current Status of Pacing and EP in AFRICA
  - PASCAR CIED and EP procedures statistics
- Atrial Fibrillation in Africa
  - RELY study
  - REMEDY registry
  - AF-Cameroon study
- Sudden cardiac death in Africa
  - Overview
  - First population-based incidence study
- Challenges
- Perspectives
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
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 professionals)
  - Facilities (for diagnosis and treatments)
  - Therapies:
    - drugs availability
    - invasive treatments: volume+++ (for PASCCAR certification?)
"If you want to go quickly, go alone.

- African Proverb

If you want to go far, go together."