CARDIAC ARRHYTHMIA SERVICES IN AFRICA FROM 2011 TO 2018: THE SECOND REPORT FROM THE PAN AFRICAN SOCIETY OF CARDIOLOGY WORKING GROUP ON CARDIAC ARRHYTHMIAS AND PACING

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Background

- In the 1960s “tropical” cardiology was limited to as the management of hypertension and rheumatic heart disease. Since then, the number of cardiologists and the utilization of conventional cardiac imaging techniques have become more available in Africa, uncovering a profound burden of other cardiac disorders, such as cardiac arrhythmias.
- However, the high cost of medical equipment and the requirement of highly skilled experts to treat complex arrhythmias, in conjunction with inadequate public health policies, underlie why patients with arrhythmias in Africa experience a high mortality and mortality.
- This neglected field of cardiology in the vast majority of African countries motivated an initiative taken by the Pan-African Society of Cardiology (PASCAR) to address reports on cardiac arrhythmia services in Africa.

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Background

- In 2017, the first report described invasive arrhythmia treatment from 2011 to 2016 in 31 countries. In 2018, these data were complemented by a survey of diagnostic work-up available, as well as the use of anticoagulation and anti-arrhythmic.
- Regular statistic reports on the use of drugs, cardiac implantable electronic devices (CIED) and ablation techniques in Africa will help determine the heterogeneity in the access to cardiac arrhythmia treatment and identify potential targets to improve patient management.
- Therefore, this second report is welcomed and we thank ESC/WHF to accepted it for a presentation in this meeting.

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Methodology

- **Methodology**
  - ✓ Type: cross-sectional study
  - ✓ Duration: Thre (3) weeks
  - ✓ Respondents: One or two cardiologists per country
  - ✓ Target sample: 31 countries
  - ✓ Sample: 23 countries
  - ✓ Response rate: 74.2%
- **Questionnaire**
  - ✓ Type: electronic Author: scientific committee of the PASCAR task force on cardiac arrhythmias

- **Information collected on the availability of:**
  - ✓ human resources (pacemaker operators and electrophysiologists),
  - ✓ anticoagulants and antiarrhythmic drugs,
  - ✓ facilities to perform cardiac implantable electronic devices (CIED) and ablation procedures.
  - ✓ invasive procedures (CIED and ablations) healthcare systems, demographics, economics and vital status have also been collected, mainly from World Bank database

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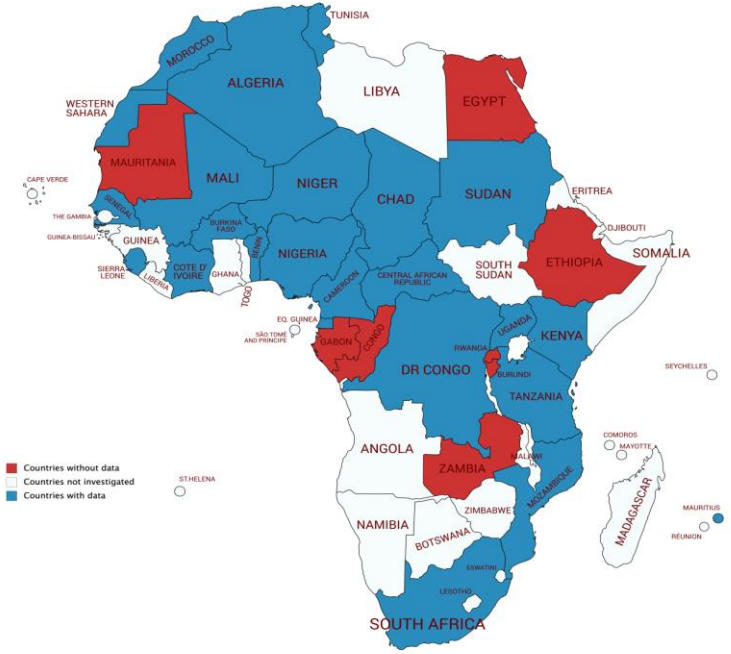
Countries surveyed



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Demographics, economic and health indicators

Country	Population	Life expectancy at birth	Death rate/ 1000 population	GDP (USD)	GDP Per capita (USD)	Health expenditure as % of GDP	Health expenditure per capita (USD)	Human Development index (HDI)
Mauritius	1265303	75	8	14220348	11239	5.75	553	0.79
Algeria	42228429	76	5	1.81E+08	4279	6.65	260	0.754
Tunisia	11565204	76	6	39860716	3447	6.95	257	0.735
South Africa	57779622	63	10	366298210	6340	8.11	428	0.699
Morocco	36029138	76	5	118495328	3238	5.84	171	0.667
Equatorial Guinea	1308974	58	10	13317453	10174	3.38	281	0.591
Kenya	51393010	67	6	87908263	1711	4.55	66	0.59
Cameroon	25216237	59	10	38502060	1527	4.69	64	0.556
Tanzania	56318348	66	6	57437074	1051	4.14	35	0.538
Nigeria	1.96E+08	54	10	9239514	2028	3.65	79	0.532
Uganda	42723139	60	9	27476946	643	6.17	37	0.516
Benin	11485048	61	9	10358986	902	3.86	30	0.515
Senegal	15854360	67	6	24129600	1522	5.51	52	0.505
Sudan	41801533	65	7	40851536	977	5.66	152	0.502
Cote d'Ivoire	25069229	54	12	43007046	1716	4.4	68	0.492
Democratic Congo Rep.	84068091	60	10	47227535	562	3.87	21	0.457
Mozambique	29495962	59	10	14457964	490	5.07	19	0.437
Mali	19077690	58	10	17196689	901	3.82	30	0.427
Burkina Faso	19751535	61	8	14441964	731	6.75	41	0.423
Sierra Leone	7650154	52	13	3999945	523	16.53	86	0.419
Chad	15477751	53	13	11302544	730	4.54	32	0.404
Central Africa Rep.	4666377	53	13	2379717	510	4.28	16.36	0.367
Niger	22442948	60	9	9239514	412	6.23	22.68	0.354

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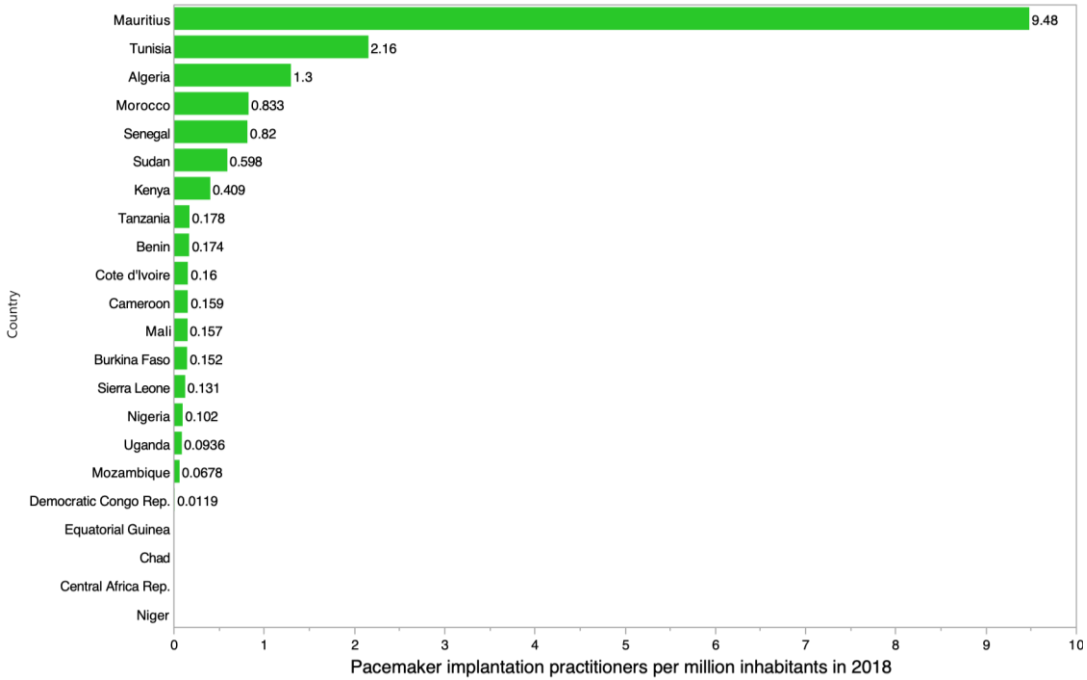
Pacemaker implantation practitioners per million inhabitants



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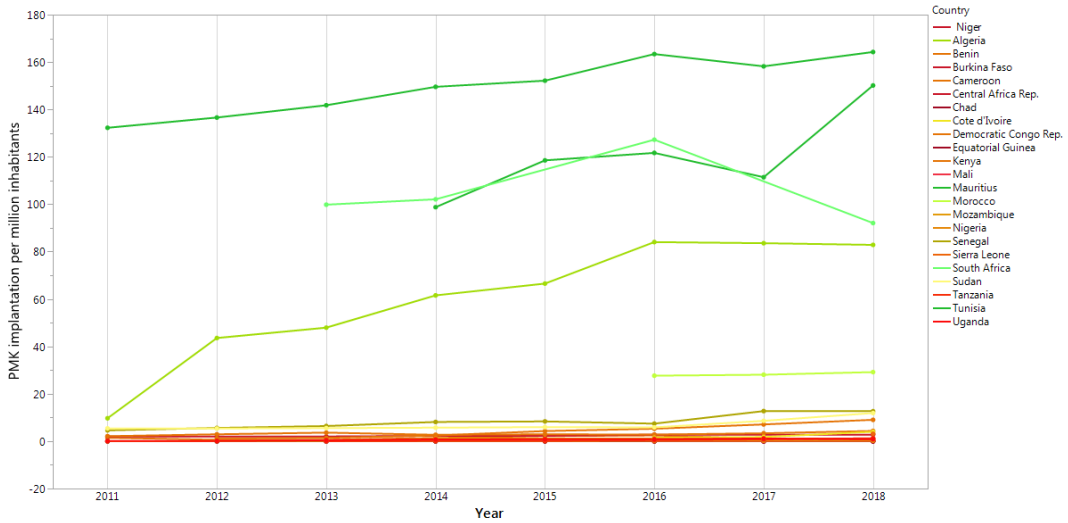
Pacemaker implantation rates per million population



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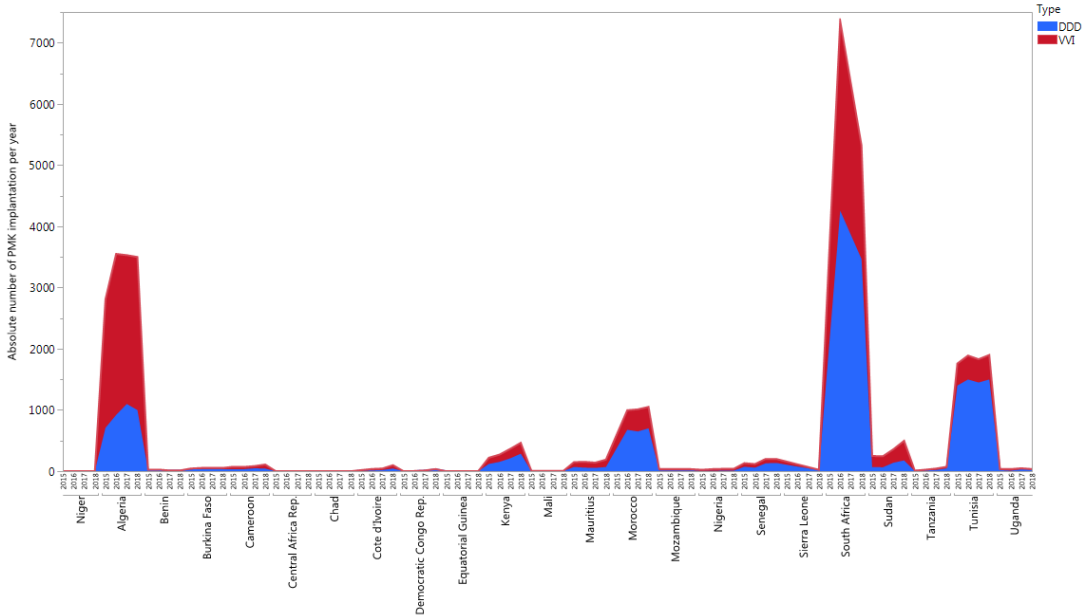
Trend in the number of single- and dual-chamber pacemaker implantation from 2015 to 2018



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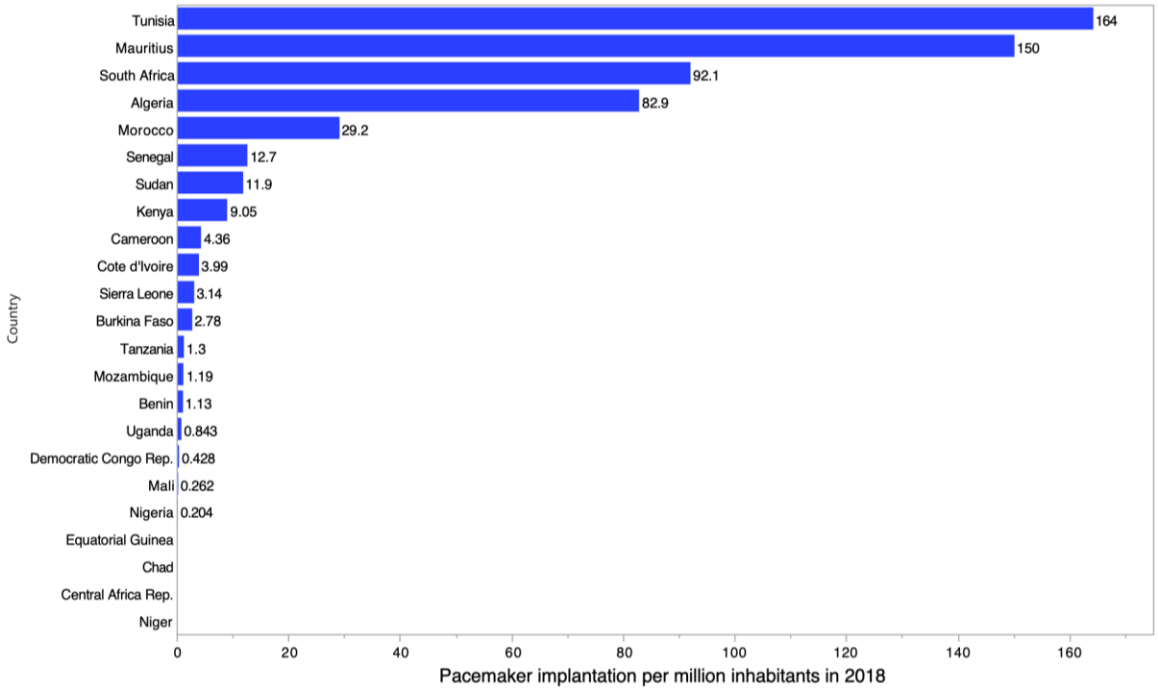
Pacemaker implantation per million of inhabitants in 2018



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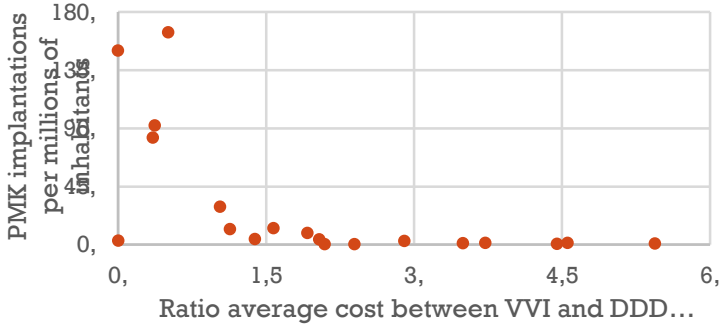
Linear regression between pacemaker implantation rate per ratio of implantation cost on GDP per capita

Parameters	Est	t-Ratio	Prob>|t|	Lower 95%	Upper 95%
Intercept	46.25	5.08	0.0001*	26.94	65.55
Ratio average cost per GDP	-20.33	-5.70	<.0001*	-27.89	-12.76
(Ratio average cost per GDP)^2	8.90	4.14	0.0008*	4.34	13.46



Note: A regression analysis has been performed between the pacemaker rate implanted in 2018 per millions of inhabitants and the average cost between DDD et VVI standardized by the GDP per capita. The result shows that for a unit increase in the ratio there is a decrease of 20 implantations per million habitants. In other words, the more is affordable the cost of a VVI and DDD compared to the GDP per capita the higher is the pacemaker implantation. This relation is limited after 20.33/8.90=2.28.

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Cost of cardiac resynchronization therapy and implantable cardioverter-defibrillator

Country	GDP Per capita in 2018 ($ US)	CRT-P charge ($ US)	CRT-D charge ($ US)	ICD charge ($ US)
Nigeria	2028	12000	15000	12000
Tanzania	1051	11304	11300	6080
Cameroon	1527	8934	13400	13400
Kenya	1711	8000	14500	9000
Morocco	3238	7817	22334	16751
Cote d'Ivoire	1716	7258	10609	8000
Tunisia	3447	7000	15000	13000
Uganda	643	7000	11000	11000
Sudan	977	6000	12000	10000
Senegal	1522	5919	13735	12876
Burkina Faso	731	5025	n/a	n/a
Algeria	4279	4467	6142	3350
Democratic Congo Rep.	562	n/a	n/a	6000

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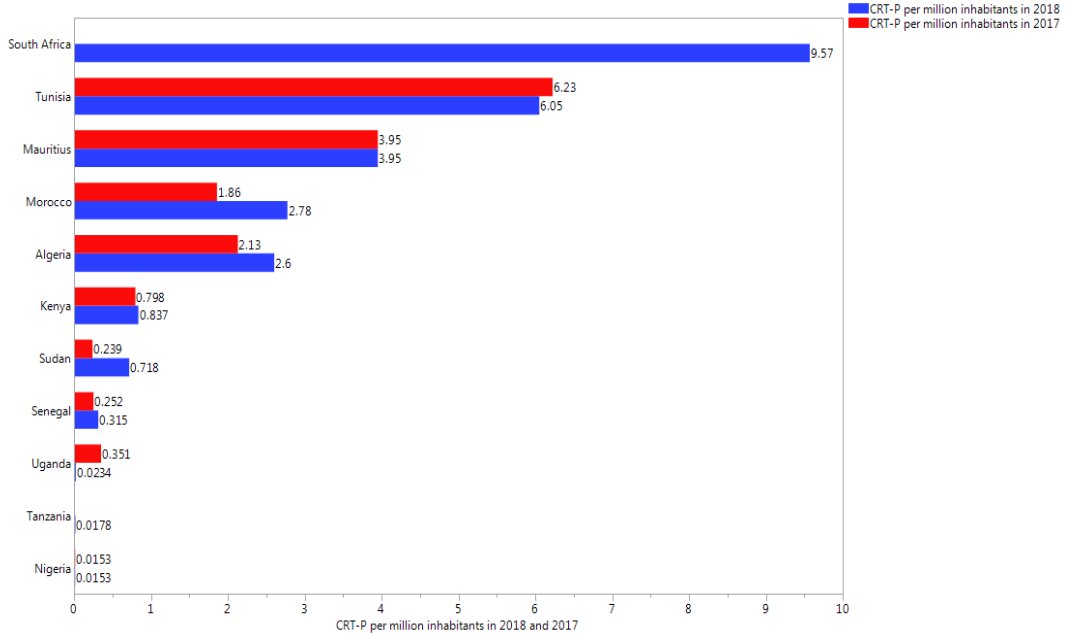
CRT-P Implanted in 2018 and 2017 per million of inhabitants across the countries



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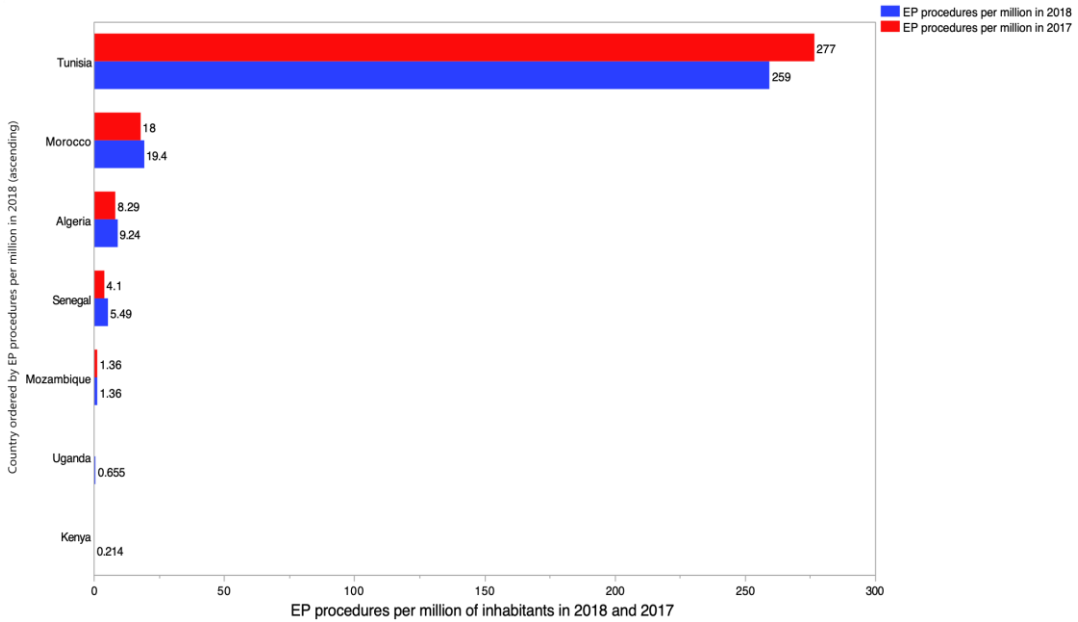
EP procedures per million of inhabitants in 2018 and 2017



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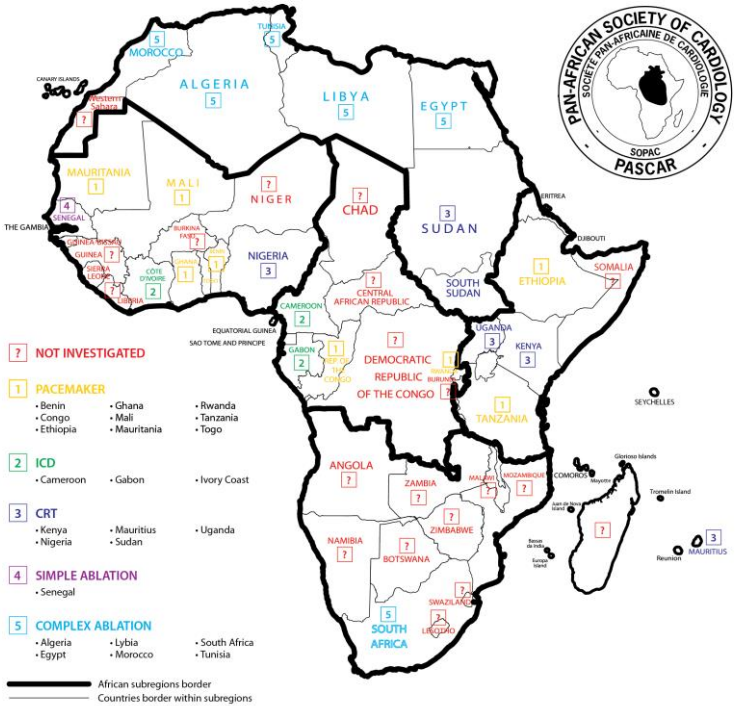
Availability of arrhythmias service and drug therapy in Africa



Source: EP Europace 2018, V 20, Issue 9:1513–1526

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Drug therapy in Africa - Key Message

1. Vitamin K antagonists (VKAs), digoxin and amiodarone were available in all countries. Non-vitamin K oral anticoagulants (NOACs), rivaroxaban, dabigatran, apixaban and doxaban were available in 90%, 45%,22% and 0% out of 23 countries.
2. No NOACs was present in Tunisia, whereas 4 (17%) countries (Democratic Republic of Congo, Morocco, Sierra Leone, and South Africa) introduced all 3 main NOACs in their markets.
3. None of the countries offered all available anti-arrhythmic

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Summary of the results

Main findings

Non-VKA oral anticoagulants (NOACs) were poorly available in the African market, none of countries having edoxaban and only 17% of countries used all 3 other NOACs (apixaban, dabigatran, rivaroxaban).

Apart from digoxin and amiodarone which are available in all countries, flecainide (80%), sotalol (75%), propafenone (22%), quinidine (17%), and mexiletine (4%) are unequally afforded.

About 20% of countries did not implant pacemakers, leaving hundreds of millions of people without access to the treatment of heart blocks.

The mean cost of single- and dual-chamber pacemaker implantation is $1,778 and $2,379, which exceeds the yearly earnings of the average citizen in lower-income and middle-income countries.

Only 3 countries (Algeria, Mauritius and Sierra Leone) in this survey offered free healthcare for CIED in the public sector.

Apart from South Africa, none of sub-Saharan countries offers complex ablations requiring the use of 3-D mapping

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Discussion

- This second survey confirms previous reports that the treatment of arrhythmias in Africa is far from optimal.
- The barriers to promote good practices in managing arrhythmias are numerous :
  - ✓ (i) economic reasons,
  - ✓ (ii) lack of facilities (cardiac catheterization laboratories and electrophysiology equipment),
  - ✓ (iii) lack of political wills in many countries to treat non-communicable disease like arrhythmias,
  - ✓ (iv) shortage of trained cardiologists and EP physicians,
  - ✓ (v) high cost of the CIEDs implantation procedures in the context of out-of-pocket healthcare.
- The mean cost of single- and dual-chamber pacemaker implantation is $1,778 and $2,379, which exceeds the yearly earnings of the average citizen in lower-income and middle-income countries.
- The massive costs of pacemakers, ICDs, CRT-Ps, and CRT-Ds relative to the per capita GDP provides the appropriate context within which to view cost as a barrier to the implantation of these life-saving therapies.
- Only 3 countries (Algeria, Mauritius and Sierra Leone) offered free healthcare for CIED in the public sector.

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Conclusion

- This survey clearly demonstrates that access to cardiac arrhythmia treatments was more challenging in sub-Saharan Africa where hundreds of millions of people remain at risk of dying from heart block.
- Increased economic and human resources as well as investment in infrastructure are the critical targets for improving cardiac arrhythmia services in all of Africa.
- To improve access to modern arrhythmia therapy, we recommend that governmental institutions and stakeholders will need to join forces to provide adequate implantation facilities, adequately trained personnel, and implement sustainable measures to reduce out-of-pocket expenditure via complete reimbursement through universal insurance schemes.
- South-South and South-North collaboration through fellowship and other programs are warranted

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THANK YOU FOR YOUR ATTENTION

Any questions