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Evolution of Cardiac Arrythmia Management by Catheter Ablation in Tanzania

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ABSTRACT

In Tanzania, despite the expansion of cardiovascular management through the expansion of health system infrastructure to combat cardiovascular diseases, radiofrequency ablation of cardiac arrhythmias remains a major challenge as the current management with catheter ablation is inaccessible to the majority. Several limitations for developing invasive arrhythmia care are identified: lack of manpower, healthcare resources, health systems challenges, high cost of consumables, healthcare financing challenges and limited antiarrhythmic medications. The proposed solutions to address the unmet are: inauguration of a domestic arrhythmia society with dedicated prioritized academic programs, advocacy for training in the cost-effective conventional approach to arrhythmia ablation, reducing irrational claim deduction from insurers and regulation of central medical store policy, calling the Ministry of Health to implement insurance accreditation of radiofrequency ablation in Tanzania, sensitize the government to offer motivation to candidates pursuing electrophysiology career, the government through the Ministry of Health and education to transform the current training infrastructure to meet current academic needs including radiofrequency ablation services, the creation of training partnerships within Africa to improve local electrophysiology expertise. Radiofrequency ablation using a conventional approach, which is cost-effective, can be adopted to ensure service availability in Tanzania and the Sub-Sahara region. A unique responsibility lies within the government and financers to reinforce the efforts to implement these recommendations and achieve the medical tourism policy in Tanzania.

KEYWORDS: Catheter ablation, Cardiac arrhythmia management, Healthy system infrastructure.

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INTRODUCTION

The Framingham heart study for sex-adjusted confounders showed that arrhythmia was an independent risk factor for mortality, with a relative risk of about 1.5 for men and 1.9 for women[1]. Invasive approaches with catheter ablation of arrhythmia have evolved to treat patients who remain symptomatic from this arrhythmia despite the attempts to control symptoms with medical therapy (pharmacological approach)[2–5]. Therefore, patients who continue to experience symptoms related to arrhythmia while optimally managed with antiarrhythmic medications (rate control ineffective) represent the population with indication for catheter-based treatment (radiofrequency ablation). A significant number of patients had achieved rate control. However, they remained symptomatic, including fatigue, due to failed pharmacological attempts to maintain sinus rhythm[6,7]. The pharmacological approach is increasingly challenged by the invasive electrophysiology approach that abolishes the lifetime need for medications and avoids intolerable side effects associated with atrioventricular (AV) nodal-blocking drugs.

There has been an increase in population growth in Tanzania, as the total population in the country was estimated at 59.7 million in 2020, according to the latest census conducted in Tanzania by the National Bureau of Statistics. This data represents 0.67% of the world's total population, with yearly estimated population growth at 2.9%[8].

As the population increases, the burden of cardiovascular diseases, including arrhythmias, is expected to grow as well. In 2013, all-cause cardiovascular mortality in Sub-Sahara was found to increase. Among all-cause mortality, atrial fibrillation was found to increase by 196%, attributable to population growth due to the adoption of the Western lifestyle leading to a growth in cardiovascular-related noncommunicable diseases, including obesity, diabetes, hypertension, ischemic heart disease and related arrythmias[9]. However, studies have yet to be done in Tanzania to evaluate the contribution of arrhythmia to all-cause mortality.

The management of cardiac electrical disorders (cardiac arrhythmias) by catheter approach in Tanzania was lacking until 2018 due to a lack of resources allocated to the health system for cardiac arrhythmia management through catheter ablation. As a consequence, cardiac arrhythmias have been undertreated and not recognized as a significant public health concern.

In Tanzania, despite the expansion of cardiovascular management through the expansion of health system infrastructure (establishment of electrophysiology infrastructure at Jakaya Kikwete Cardiac Institute in 2019) to combat cardiovascular diseases, cardiac arrhythmias management remains insufficient as arrhythmia treatment by catheter approach, in particular, does not often receive the attention it deserves. There is no national strategy to address the management of cardiac arrhythmias, but interventions by radiofrequency ablation are mainly aimed at reducing the burden of cardiac arrhythmias. The consequence of this lack of care includes repeated hospitalization for tachycardia, tachycardia-induced cardiomyopathy, heart failure complicated by or secondary to arrhythmias and stroke caused by atrial fibrillation.

We sought to discuss the prevailing challenges and the way forward the Jakaya Kikwete Cardiac Institute, and stakeholders have adopted to address the barriers to starting a catheter ablation program for cardiac arrhythmias. Eventually, we aimed to advise the government on how to effectively implement a cardiac arrhythmia management program and possibly establish this as a reason for medical tourism in Tanzania.

CHALLENGES

Manpower challenges

As the burden of arrhythmias in Tanzania continues to expand, the shortage of electrophysiologists and related staff remains a critical challenge to managing cardiac arrhythmias across the country. In Tanzania, it is estimated that there are 28 cardiologists in total. Still, only three (0.1%) attended accreditation in an electrophysiology foundation course in 2020 organized by the African Heart Rhythm Association (AFHRA), covering the concepts of basic arrhythmias and invasive cardiac electrophysiology. The course was conducted online for six months with fortnightly classes. The three cardiologists

who attended the course from Tanzania completed the training and set for the final exam and passed. However, only one participant (equivalent to 0.04% of all cardiologists available in the country) was able to have an opportunity to undergo further training on invasive electrophysiology (advanced electrophysiology with hands-on training) in Shandong province, China, and Cairo, Egypt.

Training opportunity is the main limiting factor due to the absence of postgraduate cardiac electrophysiology training colleges in Tanzania. Even the bordering countries (the Sub-Sahara region at large) lack postgraduate cardiac training centers. Studies have shown a limited number of electrophysiologists available in Africa. Only 22% of African countries were found to have access to radiofrequency ablation, which is offered to a selected population with the financial capacity to gain access to this rare service[10].

The Muhimbili University of Healthy and Allied Sciences (MUHAS) provides fellowship in cardiology, but the absence of an electrophysiology training facility in the college and the whole country is a significant challenge. This lack of training has a profound impact on the generation of manpower with the necessary knowledge and experience to work in the field of electrophysiology. The scarcity of fellowship programs in African countries, coupled with the lack of allocated financial resources, is a major contributor to the poor state of interventional cardiac arrhythmia care in Africa[11].

High-cost consumables

Despite the scarcity of radiofrequency services in nearly all hospitals in Tanzania's health system, the high cost of consumables is a major limitation in providing these therapies to patients with arrhythmias, especially in low-income families. Most patients must be from their pocket to gain access to the service. The cost of equipping a lab is also a barrier to the health system in establishing an arrhythmia management program. Both diagnostic and therapeutic electrophysiology catheters have gained rapid technological sophistication parallel with increased consumable purchase cost, translating a similarly increased burden to the healthcare system. These costs make it challenging to deliver cost-effective health services.

A survey done by the European Heart Rhythm Association among 34 countries showed that 67% of them adopted and used reprocessed cardiac electrophysiology consumables to reduce the cost of the service to the public. This reprocessing approach saved American hospitals € 372 million in 2020 alone[12].

Healthcare financing challenges

T'This is an essential component of the public health care delivery system[13]. The public is in high demand for affordable healthcare services. The government must implement sustainable healthcare delivery systems/strategies to meet public demand[14]. The strategic implementations include the expansion of health insurance in the country. Tanzania has four publicly owned insurance schemes: the National Health Insurance Fund (NHIF), Social Health Insurance (CHF), Social Health Insurance Benefit, and Tiba Kwa Kadi. Apart from the public-owned insurance schemes, seven private schemes are registered with the Tanzania Insurance Regulatory Authority.

Despite the expansion of healthcare funding firms, the insurance coverage among the Tanzanian population remains critically low. In 2019, only 32% of Tanzanians had health insurance coverage, with the majority relying on direct payment from their pockets. This lack of universal access to healthcare coverage policy in Tanzania creates healthcare service delivery inequity, denying the poorest access to healthcare services, including radiofrequency ablation.

Despite the critical limitation of insurance under-coverage, the number of beneficiaries from these schemes, including NHIF, who need to access radiofrequency ablation is severely limited. This is because the service is not accredited, further exacerbating the issue of healthcare access in Tanzania.

The costs of establishing an arrhythmia management program, the lack of accredited delivery systems and adequate health insurance participation are all significant barriers to African patients receiving proper care of arrhythmias.

Limited antiarrhythmic options

Antiarrhythmic medications are scarcely available because they are either not registered or the demand needs to be higher, as the knowledge to use them or the access to them is not available. This scarcity of antiarrhythmic medications

limits the physician's ability to treat a particular arrhythmia, or else the physician or a patient must prescribe/use a drug with low efficacy and low safety margin profile. Africa (Tanzania, among them) is well known to suffer inadequate supply and access to healthcare resources such as anticoagulants, oral and intravenous antiarrhythmic medications, and other essential supplies limiting the management of arrhythmias[16].

Health system challenges

The health care system is the visionary motherhood and part of a political/governmental body that governs and reinforces the implementation of health policy in Tanzania. While some progress has been made in strengthening health systems, a lot more still has to be done, such as offering subsidized services by refunding the hospitals the resources exhausted by the exemption policy pa, particularly for high-cost services, including radiofrequency ablation.

Recently, in Tanzania, we have experienced irrational insurance service claim deduction, incapacitating smooth service delivery and the central medical store claiming share return from the hospitals even in the gain not funded by the central medical store (Table 1, Figs. 1 and 2).

Table 1. Jakaya Kikwete Cardiac Institute roadmap to address radiofrequency ablation in Tanzania.

Challenge	Solution offered	Outcome
Lack of trained personnel	Promote local training using different trainees–Egyptian mission, Madactari Africa, Shandong province initiative and Indian mission	Local team started doing diagnostic procedures independently
Shortage of radiofrequency ablation	Reinforce the government to establish the electrophysiology infrastructure in both conventional and three-dimensional mapping system by creating awareness to the government on the burden of arrhythmias in causing or complicating heart failure and SCD	Both three-dimensional mapping and conventional can be done at Jakaya Kikwete Cardiac Institute. Local team started to diagnose arrhythmia using the electrophysiology system.
High-cost consumables	Collaborate with conventional radiofrequency offering centers and individual electrophysiologists	• Adopting conventional approach, except when it is a complex ablation like atrial fibrillation; • Developing re-use protocol through reprocessing that entails cleaning, disinfection, sterilization, and repacking. This approach reduced the burden of service provision and assured the sustainability of the health care service that is rendered accessible to majority of patients
Training	Encourage continued medical training to it staffs	EPS program is running after giving chance the staffs to train

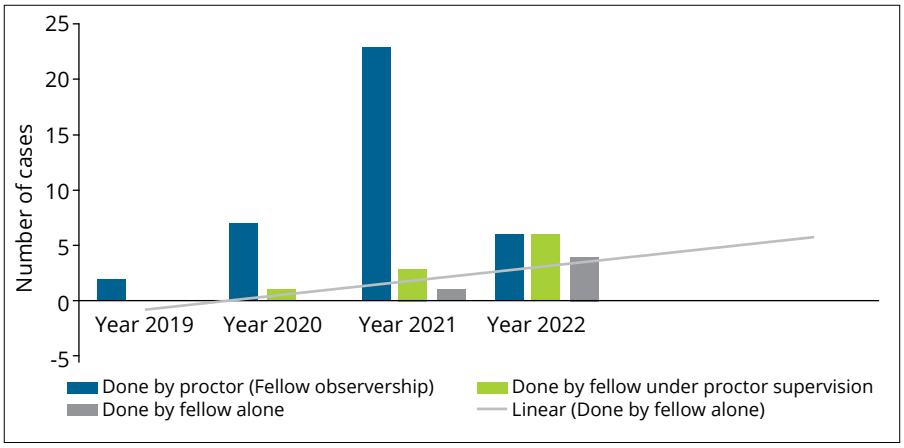


Figure 1. The number of electrophysiology procedures done at Jakaya Kikwete Cardiac Institute by fellow alone, fellow under proctor supervision and done by proctor.

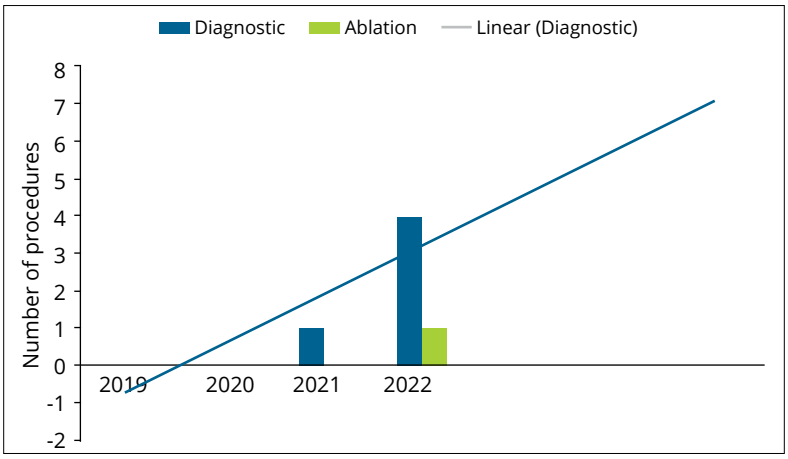


Figure 2. The number of electrophysiology procedures done at Jakaya Kikwete Cardiac Institute done by fellow alone (local team).

PROPOSED SOLUTIONS TO ADDRESS THE UNMET

• Where there is no government policy to address cardiac arrhythmia management, the local professional rhythm association, in collaboration with AFHRA, is expected to address catheter ablation challenges. This will develop domestic professional capacity building by training domestic cardiologists to become competent in catheter ablation;

• Advocacy to training in the cost-effective conventional approach to arrhythmia ablation;

• Having our own Tanzania arrhythmia training curriculum;

• Hospitals with infrastructure capacity should have autonomy/accredited and be powered to offer certified training with hands-on certification;

• Healthcare access needs to be improved through the expansion of NHIF to cover cardiac arrhythmia catheter-based management;

• The system should develop autonomy to control insurance schemes that irrationally deduct significant claims without consideration of expensive consumables expenditure and costly infrastructure that need rehabilitation to enable the sustainability of the service provision by the health facilities;

• The health system (Ministry of Health) has to reinforce the insurers, particularly public insurance schemes, to implement accreditation of new health services like radiofrequency ablation and nature the growth of this service as the nation advocacy medical industry tourism in Tanzania;

• The system has the autonomy to foresee and expand its manpower by motivating more candidates to undergo further training in electrophysiology through school fee coverage and providing sustained subsistence incentives to encourage cardiologists to train in this field, which needs strong dedication and time-consuming,

• The lack of electrophysiology fellowship programs in Tanzania is one of the main reasons for stagnant arrhythmia management. The policymakers (national assembly) and the government, through the Ministry of Health and Education, have to put medical education at the top of their agenda to improve medical colleges like MUHAS and hospitals with good infrastructure to offer fellowships in electrophysiology. The education sector has to review medical colleges and update the teaching curriculum to suit the current medical demand by omitting unnecessary curriculum to provide a vacuum for medical candidates to train in electrophysiology early in their life careers;

• Electrophysiology expertise can be improved by creating training partnerships within Africa, where North Africa, and countries like Egypt, with better arrhythmia care and management, can provide training opportunities for physicians in Tanzania to train either through their medical colleges or clinical attachment (mentorship). This approach shouldn't be underrated as it can render electrophysiology services sustainably available in Tanzania and the Sub-Sahara region (Tables 2 and 3). To maintain the sustainability of the training program, post-training mentorship of fellows should maintain tracking of the trained fellows to ensure they keep practicing electrophysiology, particularly regular hands-on practice. Post-training mentorship programs should maintain regular onsite visits at least twice annually. Regular visits will keep the fellows constantly supported and responsible.

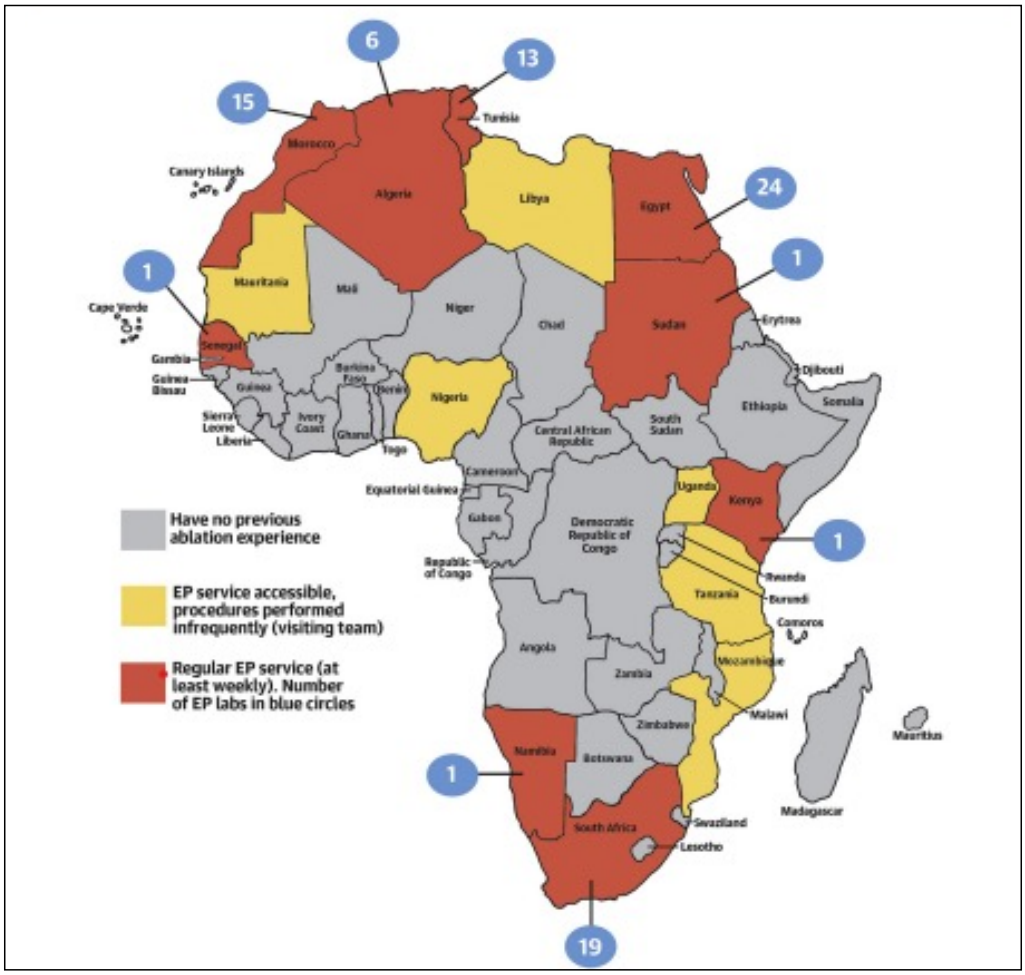
IMPACT OF ADDRESSING THE CHALLENGES OF CARDIAC ARRHYTHMIA IN TANZANIA

AAddressing the challenges of adequately treating cardiac arrhythmias in Africa in general, and Tanzania in particular, will enable us to tackle at least two issues:

• Reduce the burden of arrhythmia morbidity and premature arrhythmia deaths;

• Get timely rhythm disturbance treatment domestically and alleviate overseas travel and dependence.

The Sub-Sahara region faces a critical scarcity of electrophysiology services, as highlighted by the map in Fig. 3, published as part of the Africa Rhythm Survey for Electrophysiology Services in Africa. The JKCI can be the hub for electrophysiology training in the Sub-Saharan region. It also provides radiofrequency ablation services to the Sub-Saharan population and other African countries in general, which had a great gap between need and access to radiofrequency ablation in 2020[1].



EP: electrophysiology.

Figure 3. Africa Heart Rhythm Association Survey of Cardiac Electrophysiology Services in Africa in 2020.

CONCLUSION

Radiofrequency ablation using a conventional approach, which is cost-effective, can be adopted to ensure service availability in Tanzania and the Sub-Sahara region. The government and financers have a unique responsibility to reinforce efforts to implement these recommendations and enable the medical tourism policy in Tanzania to be achieved.

FUNDING

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DATA AVAILABILITY STATEMENT

All data set were generated/analysed in the current study.

AUTHORS' CONTRIBUTION

Mathew Sackett, Mervat Aboulmaaty, Amy Bonny, Khuzeima Khanbhai, Henry Mayala, and Smitha Bhalia did critical review of the manuscript. Mohamed Elalfy, Mathew Sackett and Mervat Aboulmaaty were the proctors for the electrophysiology procedure. Mohamed Janabi was a JKCI executive director provided the conducive environment for the development of electrophysiology program at JKCI.

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