

The state of cardiac surgery in Ethiopia



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ABSTRACT

Objectives: Six billion people globally do not have access to cardiac surgical care. In this study, we aimed to describe state of cardiac surgery in Ethiopia.

Methods: Data on status of local cardiac surgery collected from surgeons and cardiac centers. Medical travel agents were interviewed about number of cardiac patients who were assisted to travel abroad for surgery. Historical data and number of patients treated by non-governmental organizations were collected via interviews and by accessing existing databases.

Results: Patients access cardiac care via 3 avenues: mission-based, abroad referral, and care at local centers. Traditionally, the first 2 have been the main mode of access; however, since 2017, an entirely local team has begun performing heart surgery in the country. Currently, surgical cardiac care is provided at 4 local centers: a charity organization, a tertiary public hospital, and 2 for-profit centers. Procedures at the charity center are provided for free, whereas in others, patients mostly pay out of pocket. There are only 5 cardiac surgeons for 120 million people. More than 15,000 patients are on waitlist for surgery, mainly because of lack of consumables and limited numbers of centers and workforce.

Conclusions: There is a change in the trend from non-governmental mission- and referral-based care toward care in local centers in Ethiopia. The local cardiac surgery workforce is growing but still insufficient. The number of procedures is limited with long wait lists due to limited workforce, infrastructure, and resources. All stakeholders should work on training more workforce, providing consumables, and creating feasible financing schemes. (JTCVS Open 2023;14:261-9)



Cardiac Center Ethiopia, where the first heart surgery by full local team was done.

CENTRAL MESSAGE

In Ethiopia, there is no public center that performs cardiac surgery without interruption. The workforce is very low. Stakeholders should strive to create sustainable cardiac care in the country.

PERSPECTIVE

Ethiopia is an African nation of 120 million people. Cardiovascular diseases are the leading cause of morbidity and mortality in the country. However, access to cardiac care is still very limited. Patients must wait for surgery, pay out of pocket to get treatment at private centers, or get treated abroad.

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Cardiovascular diseases (CVDs) are a leading cause of mortality worldwide.¹ Approximately one-third of patients with CVDs will require surgical or interventional care during their lifetime.² However, approximately 6 billion people globally, mainly in low- and middle-income countries (LMICs) do not have access to cardiac surgery.³ Congenital heart disease (CHD), rheumatic heart diseases (RHDs), and ischemic heart diseases represent the largest share of the global burden of CVDs that require surgical intervention.

The burden of CHD worldwide is relatively constant at 2.2 to 14 cases per 1000 live births.⁴ In high-income countries (HICs), about 8 cardiac operations per 1000 live

Abbreviations and Acronyms

CCE	= Cardiac Center of Ethiopia
CHD	= congenital heart disease
CVD	= cardiovascular disease
HIC	= high-income countries
LMIC	= low- and middle-income countries
MOH	= Ministry of Health of Ethiopia
NGO	= non-governmental organization
RHD	= rheumatic heart disease
TASH	= Tikur Anbessa Specialized Hospital

births are done for CHDs.^{5,6} In low-income countries (LICs), this number is unknown; however, the need for congenital heart surgery can be estimated by dividing the crude birth rate by 0.4 per million population.⁴

RHD is the most common cause of acquired heart disease in children and young adults in LICs. It affects 33.4 million people worldwide, and nearly 97% of these patients live in LMICs.⁷ However, only about 10% have access to cardiac surgery.⁴ Considering the prevalence and economic impact of RHD, cardiovascular experts involved in the Addis Ababa Communique on the eradication of RHD in Africa recommended 7 key actions to be considered by African governments, one of which was to “establish Centers of Excellence for cardiac surgery, which will sustainably deliver state-of-the-art surgical care, train the next generation of African cardiac practitioners, and conduct research on endemic cardiovascular diseases, including RHD.”⁸ Ethiopia is an LIC located in East Africa with population of about 120 million.⁹ The national population age distribution data show that ages 0 to 14 years, 15 to 65 years, and older than 65 years make up 39.6%, 56.8%, and 3.5% of the total population, respectively.¹⁰

It is estimated that 300 to 400 cardiac operations per million population per year are needed in LICs.⁴ Despite this huge demand for cardiac interventions, such care is limited in sub-Saharan Africa.^{11,12} The literature on the status of cardiac surgery in Ethiopia is still scant. Although favorable outcome of 290 patients operated in 3 local centers was reported, the usual case volume, waiting lists, and modes of access to such care have not been reported.¹³ Understanding the current state can provide evidence-based recommendations for policy makers to develop sustainable cardiac surgery programs. This study describes the current state of and access to surgical cardiac care in Ethiopia.

METHODS**Study Design**

This was a mixed-methods study. Through a preliminary search of the literature and in discussion with local contacts, avenues for accessing

cardiac surgery in Ethiopia were determined to include service through local centers, non-governmental organization (NGO) groups, and referral to centers abroad. Thus, qualitative and quantitative data were gathered from NGOs, an online questionnaire, semistructured interviews with local centers, surgeons, medical travel agents, and the Ministry of Health of Ethiopia (MOH) between January 2022 and August 2022.

Data Collection

Local cardiothoracic surgeons were identified using a registry maintained by the MOH. The number of patients who have requested support documents to acquire surgical cardiac care abroad was acquired from the MOH.

NGO Database

Information on active NGOs working to increase access to surgical cardiac care in Ethiopia was acquired through a database developed in 2021 by Vervoort and colleagues.¹⁴ This database was developed by consolidating data from Ng-Kamstra and colleagues¹⁵; the [Idealists.org](https://www.idealists.org) website; and the databases of the American College of Surgeons Operation Giving Back, Society for Pediatric Anesthesia Volunteer Medical Services Abroad, and International Medical Volunteer Association between December 2019 and May 2020. During March 2022, the websites of these NGOs were searched for any updates since the development of the database.

Online Questionnaire

Qualitative and quantitative information regarding local cardiac surgery care was collected from cardiothoracic surgeons and centers in Ethiopia using an online questionnaire. This questionnaire was developed using the formal needs assessment tool developed by Forcillo and colleagues in 2019¹² and endorsed by the Program in Global Surgery and Social Change¹⁶; however, not validated by other studies. The tool was used as a guide to develop a succinct questionnaire, consisting of 34 questions, evaluating the administrative structure; human resources; types of cardiac surgeries; background of the surgeons; international referral base; physical infrastructure of the center; and 13 questions to cardiothoracic surgeons addressing their training, challenges, and proposed solutions ([Online Data Supplement](#)). At each stage of development, the questionnaire went through an iterative review process by each author before it was distributed through a Google Form (Google Inc) survey.

Data Analysis

The findings were summarized in tables. Prevalent topics; for example, in answers describing causes for delayed or canceled cases and most common types of cases, were organized into categories.

Ethical Considerations

Before initiation, the project underwent a review by the Institutional Review Board at Northwestern University (Chicago, IL) and was deemed not to be human research requiring further review by the committee.

RESULTS**Cardiac Surgery Workforce**

According to MOH, there are a total of 15 cardiothoracic surgeons registered in the country. Four of them have left the country and 2 retired. Five surgeons practice cardiac surgery, whereas the remainder focus on thoracic surgery. Four surgeons practicing heart surgery, and 4 surgeons who are not practicing heart surgery were interviewed. Four of those performing cardiac procedures were fully trained in India, whereas 1 was trained in Ethiopia, with

Cardiac Surgical Centers in Ethiopia

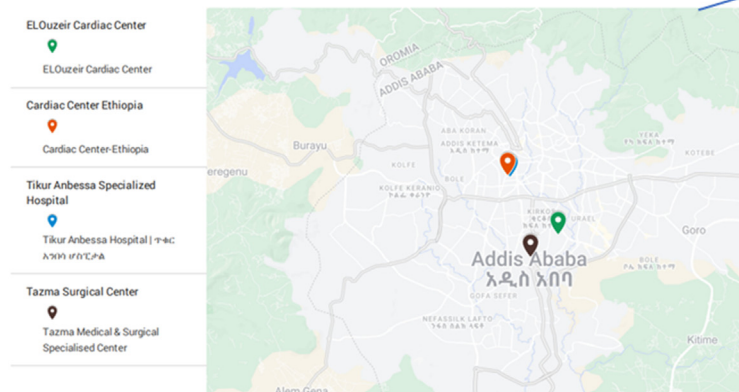


FIGURE 1. Map of cardiac services.

additional short-term trainings in India and South Korea. Those not practicing cardiac surgery were mainly trained locally.

Locally trained surgeons reported that their training was insufficient to make them perform cardiac procedures independently. Therefore, their scope is limited to thoracic procedures and closed heart procedures such as decortication of constrictive pericarditis and patent ductus arteriosus ligation. They also reported international collaborations that can provide them with hands-on training could be very helpful, but are not widely available.

Local Cardiac Centers

Currently, 4 centers provide cardiac surgery service. These centers are Cardiac Center of Ethiopia (CCE), Tikur Anbessa Specialized Hospital (TASH), Tazma Hospital, and ELOuzeir Cardiac Center, all of which are located in Addis Ababa (Figure 1). All 4 cardiac centers have participated in the questionnaire (Table 1).

CCE is a charity organization that has 2 operating rooms and 4 surgeons. All services are free and the center is funded mainly through donations. Traditionally, surgery used to be done only when experts came from abroad with consumables. Since 2017, the center has started to operate with an entirely local team. On average 1 to 2 surgeries are done per week, most typically valve surgeries and patent ductus arteriosus ligations. Most of its patients (50%-75%) are pediatric (younger than age 15 years). CCE has echocardiography and a catheterization laboratory. They

refer 20 to 50 patients every year to centers in Israel or India through nonprofits.

ELOuzeir cardiac center is a private center that was opened in 2016 where 1 to 2 open-heart surgeries are done per week, usually for RHD, CHD, and ischemic heart diseases. Less than 10% of the patient population at ELOuzeir is pediatric.

The third center is at TASH, which is the largest public teaching hospital in the country, has 5 cardiothoracic surgeons. All had 3 years of training locally with 6 months of exposure to cardiac surgery in India. One surgeon had additional training in South Korea and is currently conducting cardiac surgery with a fully local team. Typically, cardiac procedures are conducted when surgical mission groups visit bringing consumables. Currently, a full Korean cardiac team visits the center from Seoul National University Hospital once or twice per year. During 1 mission, 8 to 10 patients are typically operated on in 1 week. When visiting teams are not present, on average only 1 to 2 less-complicated surgeries are performed per month. The low number of procedures is mainly because of lack of consumables and limited capacity of the cardiac team. TASH has echocardiography, a catheterization laboratory, a computerized tomography scanner, 1 cardiac operating room, and a 12-bed cardiac intensive care unit.

Tazma Hospital, established in 2009, is another private center. The center has 2 cardiopulmonary bypass machines and 4 intensive care unit beds; however, it does not have a

TABLE 1. Local cardiac surgery centers

	Cardiac Center Ethiopia	Tikur Anbessa Specialized Hospital	Tazma	ELOuzeir
Year established	2009	1964	2009	2016
Nature of the center	Charity organization, affiliated with public hospitals	Public	Private	Private
No. of cardiac surgeons*	4	1	4	2
Cardiologist	3	8	5	1
Cardiac anesthesiologist	3	2	5	2
Perfusionist	2	2	4	2
Nurses	10	8	10	5
No. of open-heart surgeries per week	1-2	Mission based, and rarely by local team when consumables are available	6	2
Cardiopulmonary bypass machines	2	2	2	1
Operating rooms	2	1	2	1
Intensive care unit beds	10	12	4	4
Catheterization lab present	Yes	Yes	No	No
Waiting list	>6000	>8000	Usually none	None
Cost of open-heart procedure for patients	Free	\$200-\$400†	\$4000-\$5000	\$40,000-\$50,000

*Some cardiac surgeons operate in multiple hospitals; in total, 5 local surgeons perform heart surgery in Ethiopia. †Patients pay for ward service, some medications, and lab tests only.

catheterization lab. The usual cost of procedures in Tazma and ELOuzeir centers range between \$4000 and \$5000. Typically, patients pay out of pocket.

TASH and CCE have more than 9000 and 6000 patients waiting for surgery. The private centers usually do not have patients on waiting list because they operate on patients who can afford to pay out of pocket. Local experts reported

that there is no formal, structured wait list, which can make it difficult to estimate and keep track of patients requiring care. lack of consumables—like oxygenators, valves, cardiac medications, cannulation tubes, and sutures—are most common reason for not operating without interruption. In addition, lack of well-trained intensivists and cardiac anesthesiologists is also mentioned as an important challenge,

TABLE 2. Non-governmental organizations (NGOs) actively working to provide increased access to cardiac surgery in Ethiopia

NGO	Country of origin	Founding year	Sub-specialty	Funding sources	Activities
Children’s Heart Fund of Ethiopia	Ethiopia	1989	Congenital	Corporation and individual donations, NGO sponsors	Capacity-building, surgical missions, and fiscal sponsorship
Save a Child’s Heart Foundation	Israel	1995	Congenital	Corporation and individual donations, government funding, NGO sponsors	Capacity-building, fiscal sponsorship, and sponsorship for surgical management in Israel
Chain of Hope	United Kingdom	1995	Adult cardiac, congenital	Foundations, corporations, and individual donations; fundraising	Surgical missions, capacity-building, and establishing infrastructure
Children’s Cross Connection, International	United States	1987	Congenital	N/A	N/A
International Children’s Heart Foundation	United States	1993	Congenital	Foundations, corporations, and individual donations	Sponsorship for surgical management in the United States

N/A, Not available.

especially to manage infants and children. Private centers purchase consumables by themselves, whereas TASH and CCE depend on donations because they have limited budgets to routinely purchase by themselves.

NGOs and Academic Teams

Five NGOs work to provide increased access to cardiac surgery in Ethiopia (Table 2). Two of them are from the United States, whereas the remainder are from Ethiopia, Israel, and the United Kingdom. In total, these organizations have existed for 27 to 35 years and have served at least 11,000 patients, and led to development of at least 2 local cardiac operating rooms, and the training of some local staff.

The 2 oldest of the 5 are the Children's Cross Connection International and the Children's Heart Fund of Ethiopia. Children's Heart Fund of Ethiopia was established in 1989 with the mission of increasing the longevity of lives influenced by heart disease and raising awareness. Since its inception, it has provided care to nearly 10,000 patients. In its early years, the organization focused its efforts on sending patients abroad for management, but, in 2009, it began to facilitate in-country care at CCE through the surgical missions of organizations such as Chain of Hope and other visiting surgical teams. Since 2017, an entirely local surgical team has been operating at the center. Since the COVID-19 pandemic, there has been a significant decrement in missions and donations to CCE through all NGOs.

Chain of Hope was founded in 1995 by Sir Magdi Yacoub. It has focused its efforts in establishing infrastructure, building capacity, and allowing for surgical mission work in several countries, including Ethiopia. Since 2009, Chain of Hope has facilitated the care of more than 1000 patients through the donation of 2 operating rooms at CCE, procurement of equipment, surgical mission work, and training of physicians and nurses.

The Save a Child's Heart Foundation organizes missions to Ethiopia to screen patients requiring cardiac surgery and provide surgical management in Israel. In 2019, they screened 144 patients and provided care for 31 children. Of these 31, 9 underwent heart surgery, whereas 22 underwent cardiac catheterization procedures. The International Children's Heart Foundation sponsors patients to come to the United States for care. It is active in at least 12 other countries and organizes lectures and consultations in many more.

Academic teams from Norway and South Korea collaborate with TASH in capacity-building. Both work by bringing surgical teams for 1 week, usually every 6 months or annually, and occasionally take local team to their centers for 1 to 2 months of observation. There are no other established partnerships between local training centers and centers outside Ethiopia.

International Referral

Once patients get referred for abroad treatment, they typically contact the MOH and medical travel agents for further processing. Sometimes, patients go abroad directly, get diagnosed, and receive treatment independently if they already have a visa and family in the treating country. Therefore, it was difficult to quantify exactly how many Ethiopian patients get treatment abroad. All patients are self-funded.

Data from MOH showed that 32 patients were referred abroad from October 1, 2020, until March 30, 2022. Two medical travel agencies reported facilitating abroad treatment for 30 and 18 patients over 7- and 3-year periods, respectively. According to these agents, patients usually pay \$6500 to \$7000 for heart procedures abroad, excluding visa, transportation, and accommodation. The most common destinations are India and Turkey.

DISCUSSION

Despite CVDs being the most common cause of morbidity and mortality, still about 6 billion people globally do not have access to safe, timely, and affordable cardiac surgery care.⁴ Access to such services is also disproportionately low in LICs.² Although there is growing effort to provide cardiac care in LICs, there are still limited numbers of centers, workforce, and financing. This study also reflected that the state of cardiac surgery in Ethiopia is still at its infancy stage, where the workforce, infrastructure, and financing mechanisms are not in place to provide sustainable care. After decades of missions and referral-based care, local cardiac surgery teams who had the opportunity to be trained abroad are shifting the trend to local treatment with favorable outcomes.¹³

Although local teams are now fully capable of handling cardiac conditions, their number is still very low. With 5 cardiac surgeons for a country with a population of 120 million, the cardiac surgeon to population ratio is at 1 per 24 million (0.04 per 1 million).⁹ This is comparable to some LICs, which have reported 0.04 adult cardiac surgeons and 0.03 pediatric cardiac surgeons per million population, significantly lower than the cumulative surgeon to population ratio in sub-Saharan Africa (1 surgeon to 3.3 million), and in stark contrast when compared with HICs such as the United States, which has 11.54 adult cardiac surgeons per million population; the highest density was reported to be 181.82 adult cardiac surgeons per million in Monaco.^{3,17}

Shortage of consumables was reported as the number-1 reason for not performing cardiac procedures without interruption, resulting in thousands of people on waiting lists. The issue is further exacerbated at centers that provide care free of charge, such as CCE, due to limited funds for the acquisition of consumables.¹³

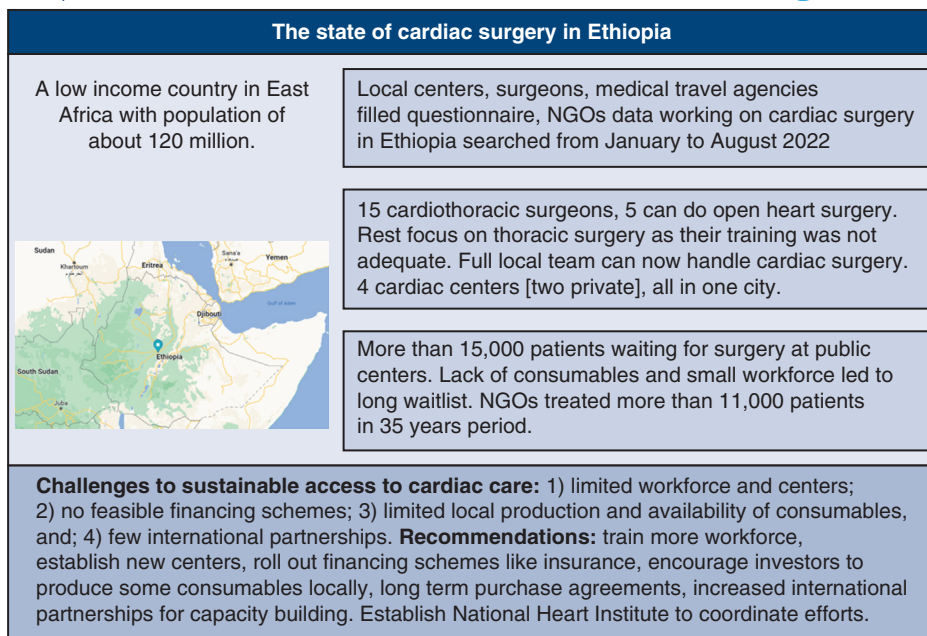


FIGURE 2. The state of cardiac surgery in Ethiopia. *NGO*, Non-governmental organization.

Although the MOH has issued a 5-year strategic plan to increase access to surgery named Saving Lives Through Safe Surgery, specific interventions aimed at strengthening cardiac surgery are not mentioned.¹⁸ In addition, patients suffer from out of pocket expenditure because the currently widely used insurance scheme, Community Based Health Insurance, is available only to indigent people who have no sustainable income and are not employed by a government or private institution. Plus, it does not cover care at private centers.¹⁹

Over the course of 35 years, NGOs have provided cardiac surgery care to more than 11,000 patients (Table 2). In the absence of other forms of access, surgical missions are a common and necessary start; however, there is increasing criticism of this model in the literature. Systematic reviews have found limited and low-quality reporting of surgical outcomes from missions because they often prioritize output over safety and outcomes.^{20,21} Thus, there has been a movement within NGOs toward an emphasis on capacity-building, promotion of local priorities, and development of local infrastructure²¹⁻²³ (Table 2). Such evolutions in the missions of NGOs promote the development of sustainable long-term solutions for LMICs.

Moreover, most common funding mechanism in these NGOs is through donations. However, sustainability of these sources has been questioned in light of decreasing and changing aid patterns.²⁴ Eventually, the longevity of these NGOs will depend on their ability to obtain funds.

Nevertheless, the aspiration in the long run is that local health systems would develop sufficiently to become self-sustainable.

The final leg of the multi-venue approach to care is medical tourism. The CCE reported referring abroad 20 to 50 patients annually, whereas the MOH reported supporting 32 patients to be able purchase foreign currency for care abroad when they presented with referral paperwork from recognized hospitals (because of the severe foreign currency shortage in Ethiopia, patients must present support letters to banks to buy foreign currency). Data are lacking as most patients seeking medical tourism for surgical cardiac care are referred through fragmented means (ie, NGOs, personal references, and referral from local centers) and do not typically report to an organized database.

Way Forward: Recommendations for Sustainable Cardiac Care

The challenges in providing uninterrupted cardiac surgical care in Ethiopia may be summarized as follows: a small number of workforce and centers, lack of financing schemes, limited local production and availability of consumables, and few international partnerships (Figure 2). Solving these problems can be achieved by drawing from success stories and challenges of other LICs with similar economic status to Ethiopia (gross domestic product per capita in US dollars for 2021 were Ethiopia (\$925), Mozambique (\$491), Sudan (\$751), Rwanda (\$822), Uganda (\$884), Cameroon

TABLE 3. Recommendations for sustainable cardiac care

Stakeholder	Challenge	Recommendations
Ministry of Health	No financing scheme for patients	Roll out sustainable insurance schemes for the population
	No strategic plan to make cardiac surgery accessible and affordable	Targeted work to address cardiac surgical service within existing national health policies
	Fragmented investment at different facilities (ie, no equal or representative resource allocation)	Centralization/regionalization of cardiac surgical care
	Lack of international partnerships	Establish centers in other parts of the country than the capital city
	No sustainable, affordable source of consumables	Solicit international partnerships for training, capacity building, and material procurement
	Lack of a body to coordinate efforts	Encourage investors to produce consumables locally
Local centers and workforce	Lack of collaboration and teamwork	Establish long-term supply agreement with international suppliers
	Poor data registry	Establish National Heart Institute with full authority
Academic institutions, societies, and training centers in high-income countries	Lack of access to full hands-on training for local team	Build strong teamwork, shared utilization of resources, and public-private partnerships
	Few partnerships	Establish a database that can be used for research, policy planning, budget, and other purposes
International donors	Cardiac surgery not prioritized for donations	Facilitate opportunities for full hands-on training
		Participate in long-term collaborations with local centers for capacity building, trainee exchange, and research
Local professional societies (eg, Cardiac Society of Ethiopia and Surgical Society of Ethiopia)		Consider monetary/equipment donations to local centers
		Solicit global partners, facilitate development and implementation of projects like training, local capacity building, and research

(\$1699), Kenya (\$2081), and Ghana (\$2363). Ultimately, development of sustainable cardiac service despite economic status of the country is cost-effective and will have diverse benefits in addition to addressing health equity. Local centers can also save foreign currency lost due to medical tourism.²⁵ In addition, health system elements that are developed for cardiac surgery could have spillover effects; for example, cardiac operating rooms could support growth of neurovascular and vascular surgeries.²⁶

The government (MOH), local professionals, international partners, and donors all have a part to play to develop sustainable cardiac surgical care in Ethiopia. Rwanda is in transition toward self-sustaining, comprehensive cardiac care by utilizing a combination of government support that involves a private hospital and volunteer expatriate teams delivering care and transferring

knowledge to local teams.²⁷ Strong government support and the commitment of a surgeon has led to establishment of a cardiac center in Ghana that saved substantial foreign exchange; however, it is being challenged because mostly patients pay out of pocket and there is no insurance scheme that covers cardiac care.^{25,28} Therefore, MOH should support initiatives in establishing cardiac centers, provide significant budget to existing ones, and roll out insurance schemes.

Partners from high-income countries can help to address the low workforce in Ethiopia via different models. One model is where local teams get hands-on training in countries with established cardiac systems to then go back to their country to practice. This was been effective in Ghana where a surgeon trained in Germany laid the foundation of cardiac care in his home country. The other

model is to use long-term partnerships where academic teams train locals until they become autonomous.²⁹ A collaboration between an Italy-based NGO and a hospital in Cameroon resulted in building the first and only cardiac center in that country as well as training of local professionals.²⁹ In Kenya, a cardiac service that was started in 2008 at Tenewek Hospital, initially by donations and mission teams, has evolved over 13 years to become a referral center handling more than half of all cardiac procedures in the country and training a capable local workforce.³⁰ North–south and south–south collaborations have also helped Namibia, Zambia, Cameroon, and Uganda to train their surgical workforces.^{12,29}

Donations could initiate continuous care until local policy changes can take over financing.³¹ For example, donations from China resulted in establishment of 96-bed cardiac center in Tanzania.³² Salam Cardiac Center in Sudan, built by an Italy-based humanitarian organization, has operated on more than 8000 patients from 2007 to 2018.³³ However, these efforts are doomed to fail unless local government support ensures sustainability, as is the case with the center in Cameroon.²⁹

Care by local centers can also be expanded by public–private partnerships and teamwork among local staff. Local professional societies should also work on soliciting partnerships and advocacy. Finally, establishment of a national heart institute to coordinate all efforts and ensure sustainability of care, training, and research, as in the case of the Ugandan Heart Institute, is recommended.^{34,35} (Table 3).

Limitations

This study has several limitations. Although the needs assessment tool developed by Forcillo and colleagues¹² provides a thorough assessment, the questionnaire was intentionally limited in length in light of the cumbersome nature of online surveys. Thus, there were details, such as physical and monetary barriers to access to care at local centers, that were passed over in the questionnaire that should be revisited in future studies. Moreover, MOH suspects that most patients cover their expenses for medical tourism out of pocket or through NGOs, and are never registered with the MOH. Therefore, the amount of medical tourism for cardiac surgical care may be drastically underestimated by the data available to the MOH. Lastly, the waitlist mentioned is far from the total patients in Ethiopia who need cardiac intervention because many patients never present to a treating facility in the first place.

CONCLUSIONS

There is a change in trend from NGO mission- and referral-based care toward care in local centers in Ethiopia. Local cardiac teams are growing but still very limited. The number of procedures is very low with long wait lists

because of an insufficient workforce, infrastructure, and consumables. There is no public setup that is handling cardiac procedures without interruption. All centers capable of cardiac surgical care are also located in the capital city, Addis Ababa. The MOH and other stakeholders should work on growing the workforce, establishing new centers in regional cities, and creating feasible financing schemes so that uninterrupted cardiac care can be provided.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

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