Starting digestive endoscopy in a lower middle-income country in Africa: Training, creating an endoscopy facility and developing telemedicine


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Abstract:
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Starting digestive endoscopy in a lower middle-income country in Africa:

Training, creating an endoscopy facility and developing telemedicine

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ABSTRACT

Introduction: The prevalence of digestive diseases seems to be high in African countries. Nonetheless, the human and material resources are scarce. The aim of the Portuguese volunteering project described in this report was to develop the area of digestive endoscopy in Sao Tome and Principe, a lower-middle-income country in Africa. Methods and Results: Beginning by assessing the local needs and available resources and managing immediate issues related to this field, we aimed to provide the tools necessary to improve gastroenterological and endoscopic care in the country. The first step included training of the local teams, through the development and accomplishment of an adapted curriculum for a 3-year medical gastroenterological fellowship and a short-term nursing fellowship, both in Portugal, and the organization of regular gastroenterological and endoscopic theoretical and practical sessions in Sao Tome and Principe.
Secondly, the endoscopy facilities of the Unit were significantly optimized. Thirdly, a web platform was designed to provide telemedicine incorporating real-time endoscopic imaging available remotely. Discussion: Through these sequential steps achieved in collaboration with Portuguese and local teams, this 5-year project provided the basis for Gastroenterology care in this country. At the present time, Sao Tome and Principe has an autonomous, efficient and skilled team and unit for approaching patients with digestive diseases needing endoscopic procedures.

INTRODUCTION

Sao Tome and Principe (STP) is an island country located in the Gulf of Guinea, off the western equatorial coast of Central Africa. It consists of two archipelagos around the two main islands of STP. It has a population of around 200,000 inhabitants [1]. It is a former Portuguese colony which achieved independence in 1975. Ever since, STP has remained one of the most stable and democratic countries in Africa.

The prevalence of gastrointestinal (GI) diseases seems to be high in Africa and the most frequently observed pathologies in endoscopy are portal hypertension due to hepatitis B and schistosomiasis, gastroduodenal ulcers due to Helicobacter pylori infection and upper GI malignancies [2]. Regarding lower intestinal tract, hemorrhoidal pathology, infectious colitis and lower GI cancer are also a concern [3]. All of these diseases, if not adequately diagnosed and treated, can be responsible for significant morbimortality.

Nonetheless, in sub-Saharan area of the continent, Gastroenterology (GE) and digestive endoscopy are scarcely developed as the medical and technical resources are very limited. In STP, there are two hospitals, the main one being the Dr. Ayes de Menezes Hospital, in the capital (Figure 1) [4].

The healthcare workforce of physicians is estimated to be 107 medical doctors and 462 nurses (0.5 doctors and 2.3 nurses per 1000 habitants) [5], compared to 28822 medical doctors and 45444 nurses (5.4 doctors and 74 nurses per 1000 habitants) in Portugal (PT) [6]. Physicians with a medical specialty are rare in STP and, at the time of the beginning of this project, there were no medical doctors specialized in Gastroenterology.

The estimated high prevalence of digestive diseases and the human and technical scarcity justified the need to create an adequate endoscopy facility and capacitiate the healthcare staff to focus on GE and Digestive Endoscopy.
Instituto Marques de Valle Flôr (IMVF) is a foundation for development and cooperation that started its activity as a Non-Governmental Development Organization (NGDO) in 1988 in STP. Health is a priority intervention for IMVF and, of the several projects this NGDO develops, the “Health for All” is one of the key programs. This project aims to contribute to universal access to quality healthcare in the country, and, since 2009, has a main goal of promoting the improvement, autonomy, and progressive sustainability of the provision of specialized secondary and tertiary healthcare. Short-term missions of Portuguese specialist doctors are carried out regularly to solve problems locally and train healthcare staff in STP and accomplish the abovementioned goal [7].

GE MISSIONS

The program “Health for All” has been made possible thanks to the joint efforts of various entities, with an outstanding role of Central of Portuguese Cooperation through Camões - Institute for Cooperation and Language, IP and the Directorate General for Health of Portugal, as the main funders; and the support of several partners, as Santa Casa da Misericordia de Lisboa and PT Innovation / Altice Labs, and the long-standing partnership with the Ministry of Health of STP.

In 2016, included in the “Health for All” program, it was also possible to obtain funds to start organizing short-term GE volunteering missions in STP.

Each GE mission lasted one week. The Portuguese team started with two Portuguese gastroenterologists and one nurse with expertise in digestive endoscopy. To date, eight missions have been carried out (January 2016, November 2016, August 2018, January 2019, June 2019, October 2019, June 2021, September 2021). The organization of the missions were dependent on several factors, such as funding, personnel availability and some unpredictable problems as COVID-19 pandemics. In these missions, we counted with the participation of seven Portuguese gastroenterologists and five Portuguese GI nurses. In addition, in the local team, three medical doctors, four nurses and one assistant with interest and growing knowledge in GE and digestive endoscopy have participated.

The first mission aimed to provide diagnostic approach and therapeutic guidance of patients with digestive symptoms screened as priority and assess the material and human resources in the country in the field of GE and Digestive Endoscopy. Progressively, goals have been established taking into account the real needs of the country: provide adequate training to physicians and nurses, optimizing the local endoscopy facility and develop a structure to enable real-time communication between teams in PT and STP. Activities were then developed during the following missions to fulfill these goals and a significant improvement in GE and
Digestive Endoscopy healthcare has been registered in STP. The sequential steps and actions that have been taken to accomplish these goals are explained below (Figure 2).

Figure 2: Summary of the activities performed during the timeline of the project (2016-2021).

Step 1: Assessment of local resources and needs and management of immediate issues

During each mission, the Portuguese IMVF team directed their efforts to approach patients with GI diseases.

Flowcharts of triage, based on clinical history, were primarily developed to help the local general physicians identify the more complex cases that needed to be addressed during GE missions, both for consultation or an endoscopic procedure.

Critical local medical and non-medical personnel interested in GE were identified, and a local team was created to assist IMVF team in achieving their activities.

An average of 95 endoscopic diagnostic and basic therapeutic procedures (upper endoscopy, colonoscopy and proctology) were performed per mission. In addition, an average of 75 GI consultations were also completed per mission. During the eight missions, 128 therapeutic procedures were performed (endoscopic variceal band ligation, endoscopic hemostasis of bleeding ulcers, polypectomy, sclerotherapy of hemorrhoids and surgical treatments for anal fistulas and fissures). Therapeutic procedures were scheduled for the first days of each mission, to ensure due time for post procedure surveillance. To date, no major complications occurred.

The summary of interventions performed in the GE missions are summarized in Figure 3:

Figure 3: Number of GE interventions performed each mission.

Endoscopy was mainly performed due to dyspepsia, heartburn and constipation and the major endoscopic findings were esophagogastroduodenal varices, gastroesophageal reflux disease, esophageal candidiasis, erosive gastritis and peptic ulcer disease (sometimes complicated by bleeding or by pylorobulbar stenosis), colon diverticulosis and polyps. In STP, very large ulcers and large esophageal varices with red signs requiring more than 6 bands at the first session of endoscopic treatment are still a frequent reality.
The principal reasons for consulting GE are similar to those in western countries: dyspepsia, gastroesophageal reflux, constipation and benign anal pathology.

The number of procedures (with the exception of proctology) and consultations performed from the 2nd to the 6th mission were superior compared to the last two missions, both performed in 2021. The number of proctological evaluations has remained high as it is an area that the GI team of STP is still developing.

In addition, the IMVF team was asked to accompany STP colleagues during ward rounds for gastroenterology patients, exchange ideas on diagnosis and treatments.

Given the shortage of medications in the country, donations from several pharmaceutical companies (e.g., Norgine, Jaba Recordati, Vitória Lab, Generis) were crucial to carry out treatment of several patients.

To patients with more complex or severe diseases (e.g., neoplastic diseases) evacuations to PT were recommended to proceed with appropriate therapeutic orientation.

Step 2: Training local healthcare personnel

After creating a team with interest in developing GI in STP and structuring the daily clinical practice of an Endoscopy unit, focused complementary training in GE was crucial. Undeniably, the long-term sustainability of this project had to be ensured by the development of permanent specialized support for GE care in STP.

A 3-year GE curriculum was developed based on the Portuguese curriculum of specialty in GE, organized by the College of Gastroenterology of the Portuguese Medical Association, and adapted to the national needs. It focused in basic diagnostic and therapeutic upper and lower endoscopy and proctology, but also included daily work in GI ward and regular attendance in the emergency department. Conducting and participating in clinical studies was also encouraged. This curriculum was then approved to become the national certification in GE by the Medical Association of STP.

A medical doctor with great interest in the area of GE was selected for the fellowship, which was funded by IMVF and carried out in the GE department of Centro Hospitalar Universitário de Coimbra, a large academic hospital in PT. At the end of the fellowship, a final formal evaluation comprising theoretical and practical sections was performed with a jury of experts from both PT and STP.

In the field of nursing, intensive on-site hands-on training and workshops were provided during the missions. In addition, a grant from IMVF for a one-month internship was awarded to one of the nurses to go to a
Portuguese unit dedicated to digestive endoscopy to deepen her knowledge in basic diagnostic and therapeutic endoscopy and endoscope reprocessing, and later spread it with the rest of the team.

During all missions, several clinical meetings (Figure 4) were also organized to extend training in the field of GE to the rest of the healthcare teams and promote the updating of knowledge in this area. Various topics have been debated and algorithms for clinical practice have been proposed, taking into account the characteristics of the country and the limitations of existing resources.

Step 3: Optimizing facilities – the renovation of GI Unit

Taking into account the high prevalence of GI diseases and the gradual training of healthcare staff in this area, the reconstruction of the GI Unit was deemed to be very useful.

The existing endoscopy facility was assembled in 2003 (Figures 4A, 4B). It was a very limited space, characterized by one room where endoscopy (Figure 4C) and endoscope reprocessing (Figures 4D) of the scopes took place. Only one old gastrovideoendoscope and a PENTAX EPK-700 videoprocessor were available. To accomplish these missions, endoscopes had to be rented and endoscopic material had to be bought. Some medical enterprises (e.g., Boston Scientific) aided by donating endoscopic material.

Although very limited, this Endoscopy Unit benefited from some positive features such as the location. It was located in the same building as the Operating room and it had water, electricity and pipes for oxygen, vacuum and compressed air supply.

With an important financial contribution from IMVF’s partners Santa Casa da Misericórdia de Lisboa and Central of Portuguese Cooperation, the renovation of the Unit occurred during 2020, after evaluating the space conditions and the needs. The unit was renamed “Gastroenterology Unit Dr. José Eduardo Pina Cabral”, in honor of one of the pioneering doctors of this project.

The unit was amplified (Figure 5A) and designed, with the valuable contribution of a Portuguese architect, to have an endoscopy room (Figure 5B), endoscope reprocessing room (Figure 5C), recovery room, toilet, consultation room (Figure 5D), storage room and waiting room.
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The new endoscopy unit was equipped with: two PENTAX EG-2990i gastroendoscopes, one PENTAX EC-3890Li colonoscope, one PENTAX EPK i5000 videoprocessor, one Nds radiance video monitor and one ERBE VIO200S 10140-400 electrosurgical unit. In addition, endoscopic devices were provided. Some reduction of expenses was possible by using reusable equipment. The supply of repaired scopes and accessories has been assured by IMVF and donations, allowing the Unit to maintain its regular activity.

The existence of a separate purpose-designed reprocessing room is a basic requirement of any endoscopy unit to minimize the risk of infection and contamination, protect from chemicals used in cleaning and disinfection and protect from cross-contamination [8]. This area was designed to have separation of dirty and clean areas and a one-way flow from one to another. A specific protocol for cleaning, disinfection and reprocessing using an endoscope-washer-disinfector (Scope:Cleaner Endotechnik 7000-S10), drying and storage was developed. The staff was fully trained to ensure appropriate and adequate endoscope reprocessing.

The consultation room also works as a medical office.

Step 4: Maintaining capability – TeleGastro project

After optimizing the GI knowledge and endoscopic skills of the STP local team and updating the Endoscopy Unit, regular support by the IMVF team to local team had to be assured to continue capacitating the local team.

Telemedicine is one of the tools that can be helpful in these cases. Medigraf, from Altice Labs, is an integrated web platform for Telemedicine that provides remote healthcare services, enabling communication between two institutions that are geographically distant, through videoconference and real-time sharing of images and clinical data for discussion and sharing of knowledge. Of the various characteristics of this equipment, the following stand out:

- Compatibility with any web environment computer, equipment or means of medical diagnosis;
- Low cost;
• Need for Internet with a bandwidth of only 2 Mbps;
• Incorporation of clinical files, including file of exams;
• Internal communication tools through internal email and chatroom;
• Possibility of sharing of consultations in various parts of the world simultaneously;
• Integration of equipment, transmitting real-time monitoring of vital signs, ultrasound exams, echocardiography, mammography, breast ultrasound, conventional radiography, among others.

To this TeleGastro project, Medigraf was adapted to transmit real-time endoscopy images (Figure 6), enabling GE teams from PT and STP to collaborate together remotely on the approach to GI patients. Since June 2021 this platform has been used regularly. In addition to the collaboration in the area of endoscopy, this facility has also enabled the completion of some educational workshops for the medical and the nursing teams.

Figure 6: Example of a real-time video image taken during an endoscopy procedure via TeleGastro.

Since this tool is available in the Unit, telemedicine has been used on demand, with an average of two days per month of support. The cases are initially approached by the Gastroenterologist in STP, and whenever diagnostic or therapeutic doubts arise, a telemedicine session is scheduled with the Portuguese medical team.

Step 5: Independent practice

After fulfilling the human and material resources, this Endoscopy Unit has started to work autonomously since the beginning of 2021.

Currently, STP local team consists of a medical doctor, three nurses and one assistant.

During the year 2021, there have been performed the following diagnostic procedures in total (including GE missions): 408 upper endoscopies, 46 diagnostic total colonoscopies and 184 proctological procedures.

In addition, 130 therapeutic procedures were performed during this period of time. The main indications were either due to a GI bleeding (e.g., 16 cases of hemostasis of non-variceal upper bleeding and 14 cases of band ligation of esophageal varices) or to a proctological disease (80 cases of hemorrhoids sclerotherapy with polidocanol or rubber band ligation and 10 surgical cases of fissurectomy, fistulotomy and perianal abscess drainage).
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Seven polypectomies and three cases of foreign body extraction were also performed.

DISCUSSION

This report highlights the experience of starting an endoscopy unit in an emerging country. It summarizes a 5-year project of cooperation between PT and STP in the field of GE and digestive endoscopy with the main goals of teaching basic digestive endoscopy, targeted to the most prevalent diseases in the country, and creating an environment of autonomy through the development of a GE certification, the renovation of an endoscopy facility and development of telemedicine. An extended time period was needed to evaluate the local needs, find key personnel, involve national entities, ensure political support, evaluate funding sources and build a realistic project that was appropriate for local healthcare resources and demand to fulfill the abovementioned goals.

The motivation for this project rose from the finding of a high frequency of digestive diseases in STP requiring an endoscopic approach. The prevalence of hepatitis B virus infection (HBV) in Sub-Saharan African is among the highest in the World [9] and HBV and alcoholism are still major causes of liver cirrhosis and portal hypertension. In STP, it is estimated that 9.3% of men and 6.1% of women have contracted HBV infection [10]. Although HBV vaccination has been available to newborns since 2003, there are no established national screening or surveillance programs or access to antiviral therapy for both HBV. On the other hand, Helicobacter pylori infection prevalence reach as high as 80% in African countries and gastritis and peptic ulcer disease are the most common manifestations [9,11,12]. Although diseases related to infectious etiology are more prevalent in Africa, GI neoplasias are being increasingly observed [9,13,14]. Approaching these diseases shall be a health priority as all of these diseases are associated with significant morbimortality. The associated GI bleeding complications, in case of portal hypertension and peptic ulcer disease, can be fatal, and timely diagnosis is vital for better prognosis in oncological cases. In this context, the use of GI endoscopy has shown to result in improved clinical outcomes and savings in economic and human resources [15].

Success in an endoscopy unit is highly dependent on the experience and knowledge of both doctors and attending nurses and the availability of adequate equipment and facilities. A recent survey from European Society of Gastrointestinal Endoscopy (ESGE) showed that many African countries have few GI endoscopy centers with adequate resources and the shortage of endoscopy training, lack of national endoscopy societies and a deficiency of equipment and basic infrastructure, as well as poor water and power supplies, are the probable reasons [9]. This is especially valid in sub-Saharan Africa [9,16,17]. Mwachiro et al [17] have recently analyzed GI
endoscopic volume in Eastern Sub-Saharan Africa and showed a limited endoscopy capacity to meet the burden of digestive diseases. An overall capacity of 0.12 endoscopists, 0.12 gastroscopes and 0.09 colonoscopes per 100,000 inhabitants was calculated. Adjusted maximum upper gastrointestinal and lower gastrointestinal endoscopic capacity were 106 and 45 procedures per 100,000 persons per year, respectively, which correspond to 1% to 10% of those reported from high-income countries.

A key aspect of this project was the selection of healthcare personnel committed in contributing to improve the provision of health care for the local population of STP.

Training was also a prominent feature of this project. PT medical and nursing volunteers were crucial to provide structured and adequate education of GE and digestive endoscopy. A GI curriculum with adapted endoscopic competencies provided training and certification of the first Gastroenterologist in STP. A fellowship was completed in a high-income country to acquire the basic skills more rapidly but the integration of the knowledge into local reality was crucial. This is the reason why the GE missions were maintained, to help adjusting practices to resources available. We can already see the results of having done these GE missions and this training and secured a GI team that provides permanent support to the population by observing the increasing numbers of diagnostic and therapeutic procedures performed overtime. The decrease of procedures (with the exception of proctology) and consultations from the 6th mission to the last two missions, both performed in 2021, is also justified by the same fact of having, since the end of 2020, a stable GI team in STP. Since this period, there is a regular and specialized medical care in the country and a possibility of performing a more efficient screening, which enables the triage of the most complex cases to be addressed during the PT missions. The number of upper endoscopies is much higher than the number of colonoscopies due to the higher rate of upper GI diseases. The high rate of proctological cases that have been approached so far is related, not only to its high frequency in the country, but also to the possibility of having a valuable collaboration from Portuguese Gastroenterologists with proctological expertise.

Having covered teaching, we had to assure that this team gathered the proper conditions to perform their tasks. It was possible to renovate the endoscopy unit and acquire new scopes and endoscopic devices. An important consideration regarding endoscope reprocessing in the endoscopy unit has to be made. As already discussed, there is a high prevalence of transmissible viruses, such as hepatitis B virus, and adequate disinfection and reprocessing of endoscopes and ancillary reusable devices is absolutely essential. In low-income countries, automatic washing machines are frequently unavailable [9], but an adaptation using semi-automated equipment was possible and strict cleaning and disinfection policy, according to international rules, were updated and consolidated.
Telemedicine is a term used broadly to provide healthcare without the need for in-person encounters [18]. There are some reports of telemedicine in the field of GI, but mainly utilized for postgraduate teaching, with case presentations, theory courses and sharing status pictures [16], or found useful for live demonstrations of procedures performed by experts [19], or for conducting tele-visits or tele-consultations [20]. In the endoscopy setting, telemedicine has been used to exchange endoscopic images or videoclips, but collaborative live endoscopy transmissions with tele-cooperation by experienced staff when carrying out more endoscopic procedures, had been seldom reported. There is an interesting report from Sweden [21] corroborating the role of having tele-guidance in low-volume centers from high-volume centers to improve the quality of endoscopy care and this benefit has even been proved in economic terms [22]. To the best of the authors’ knowledge, TeleGastro enabling of live endoscopic imaging sharing was a pioneer project worldwide enabling real-time communication between two continents and a promising solution for other countries facing the same limitations.

At the present time, STP has an autonomous, efficient and skilled team and unit for approaching patients with digestive diseases needing endoscopic procedures. To measure the success of the Project a strong indicator of success is the endoscopy activity performed since the beginning of this year.

This project has also been very positive for those volunteering. Indeed, despite not receiving any fees or honoraria from the project for their work, PT volunteers found it to be an extremely fruitful collaboration. Besides the possibility of contributing of training and sharing knowledge, these professionals also benefited from increased experience finding solutions for unforeseen problems, intercultural discovery and development of human relations and, most importantly, having a significant impact in a country’s health care improvement.

A special remark has to be done. This project was only possible thanks to IMVF that, through its availability, receptivity and strong commitment, provided all the necessary means for the development and implementation of this project.

This report was an excellent opportunity to reflect on what we have achieved and what we intend to accomplish in the future. With this project, this Endoscopy Unit is capable of providing a level II of resources [9] as it includes, not only the possibility of performing basic diagnostic procedures and fundamental monitoring abilities (from level I), but also minor endoscopic procedures (as endoscopic hemostasis). The number and quality of therapeutic options is progressively increasing (e.g. polypectomy) with the availability of an anesthesia back-up and acquisition of an electrosurgical unit (level III). Future goals include: passage to an enhanced level (level III) [9], through the acquisition of resources and development of skills to perform advanced endoscopic procedures (e.g.
endoscopic dilation and stenting, biliopancreatic endoscopy); maintenance of communication, education and autonomy through organization of TeleGastro conferences and GE missions; larger coverage of GI bleeders; organization of missions to Principe, the second island of the country; reduction of costs over time due to evacuations; reinforcement of the medical local team; organization of short-term exchange GE fellowships between PT and STP; and promotion of research in the field.

In sum, this 5-year project, achieved in collaboration with PT and local teams, provided the grounds for Gastroenterology care in this country and can serve as an example for developing this area in other countries under similar conditions.
REFERENCES


