

Improving Access to Pediatric Cardiology in Cape Verde via a Collaborative International Telemedicine Service

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Abstract. This paper addresses the role of international telemedicine services in supporting the evacuation procedures from Cape Verde to Portugal, enabling better quality and cost reductions in the management of the global health system. The Cape Verde, as other African countries, health system lacks many medical specialists, like pediatric cardiologists, neurosurgery, etc. In this study, tele-cardiology shows good results as diagnostic support to the evacuation decision. Telemedicine services show benefits while monitoring patients in post-evacuation, helping to address the lack of responsive care in some specialties whose actual use will help save resources both in provision and in management of the evacuation procedures. Additionally, with tele-cardiology collaborative service many evacuations can be avoided whereas many cases will be treated and followed locally in Cape Verde with remote technical support from Portugal. This international telemedicine service enabled more efficient evacuations, by reducing expenses in travel and housing, and therefore contributed to the health system's improvement. This study provides some evidence of how important telemedicine really is to cope with both the geography and the shortage of physicians.

Keywords. Extending access, Telecardiology, Evacuations and follow-up services.

Introduction

The Cape Verde's National Healthcare Service (NHS) provides a basic set of health services, from promotion to treatment and recovery, and regulates and supervises the activities and quality of provision. Given the structure of human resources, the NHS [1] does not have specialists in all areas of medicine, with shortages in some key specialties and lacking also technological responses for diagnosis and treatment of some diseases. This presents an opportunity to study the problem and solutions of medical evacuations.

Miot et al. [2] defines telemedicine as the provision of health services at a distance and as a way to meet the needs of the population, especially that found in remote geographical areas or with poor accessibility to healthcare [3]. The use of telemedicine in providing healthcare in remote areas is an economic, social and human development asset to their communities [4]. According to the WHO [5], telemedicine could provide health services in situations where distance is a critical factor. Telemedicine has been

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providing health services with very effective results, when compared to the benefits under conventional practice [6] and with the support of information systems [7].

Paediatric cardiology (PC) pathology is very constant and broadly spread among the child populations: In statistical terms, in every 1000 born children 8 have cardiopathies of some sort [8]. A significant number of parents live outside Cape Verde's main islands; their children will be born in regional hospitals, not having direct access to PC specialists. A supplementary factor that enhances the potential of telemedicine is that a quick and correct diagnosis of complex cardiopathies is possible and that healing and adjusted follow-up is possible as well. International telemedicine services with Cape Verde started in 1999, when a *modus operandi* between the Hospital Agostinho Neto (HAN) located in Praia and the University Hospitals of Coimbra (UHC) was signed. The main objective was to support and follow the gynaecology and obstetrics course conducted at HAN, with specialist support from the UHC. However, it was pediatric cardiology that took the lead due to pressure from health professionals and parents.

1. Telemedicine Services Opportunity

Today telemedicine is no longer a technical issue but a business one: a sustainable service needs to be properly developed [9]. Still, there are areas of concern like the threat of malpractice due to misdiagnosis, which raises questions over the acceptability of image quality, and the reluctance of physicians to become involved in telemedicine [10].

The resistance to change is significant since telemedicine introduces new, and uncertain, aspects into the services, even more if one thinks on international services that have to cope with regulations and legislative framework of the countries participating [11]. To overcome this, benefits and the real impact on populations' health should be shown. There are also human and economic factors [11]. The human factors are linked with the equipment use, difficulties in adopting telemedicine (i.e., technical support, coordination between sites, etc.) and service customization (i.e., target population, interaction with other organizations, etc.). The economic factors are professional image (i.e., impact on social recognition, use of innovation, etc.), written benefits (i.e., fair relationship between effort and return, understanding costs, less medical error, etc.), service billing (i.e., clear rules for service payment) and healthcare organization (i.e., impact on the interaction of system actors).

Considering physicians, although they show interest they are often afraid of increasing their workload, the patients' hostile response, lack of reimbursement and lack of leadership from the management [12-14]. Patients are usually quite satisfied, mostly due to good communication and to commuting avoidance [15-17]. Teledermatology (first referenced in Medline in 1992) seems to be a much more recent telemedicine application than teleradiology (first reported in 1950). Projects generally served sparsely populated areas, resulting in insufficient patient contacts to provide statistically valid data [18]. Factors that influenced the timing of trials of telemedicine were technology-driven as opposed to needs-based. Most projects have taken place, mainly focusing on technical feasibility, during periods when commercial providers were injecting funding [19].

2. Cape Verde Reform Challenge

The NHS is organized according to levels of care. Health-centers are the entrance in the system and the gateway to hospital care, which are considered the central structure of care. However, the stock of specialists cannot respond to all health problems of the population, which gives to medical evacuations additional importance, as an ultimate level of the NHS. Telemedicine services could play an important and critical role linking levels of care.

Medical evacuations are a major challenge, financially and socially, for evacuated patients and families. The largest destination for patients from Cape Verde is Portugal, based on a protocol signed between the two countries. In 2010, 341 patients were evacuated: neoplasm (about 24% of cases) and circulatory system diseases (including cardiology and pediatric cardiology), with about 17%, are the main situations.

3. Methodology

Mixed methods were used in this study: qualitative and quantitative analysis, descriptive, using a focus group, semi-structured interview and case study for studying the financial impact of external processes evacuations. Data and reports from the Ministry of Health were also used.

The focus group research technique was applied joining cardiologists from HAN, who participated in sections of telemedicine, and public health physicians responsible for the evacuation process and decision-making [20]. Formal invitations were sent nominal and customized with a week's notice, including copies of the authorization of the ethics committee for the research, for the five doctors in the cardiology of HAN; of the five invited doctors, the study involved three since one doctor was on vacation outside the country of nationality and the other claimed not to have knowledge of Portuguese to participate in the study. The focus group was moderated by one of the researchers, who then explained and informed participants of all details including the objectives of the research, and invited them to sign the terms of consent. The focus group followed a pre-established guide including topics for discussion.

Given that medical evacuation is mostly a clinical issue, an open-ended questionnaire was added to allow respondents to freely express their views and perceptions on different aspects of the subject; and a case study was written to enable better understanding of the costs and benefits involved [21].

4. Technology and Services Description

In 2000, a project in Brava Island (Cape Verde) with the support from the U.S. Embassy, designed an ISDN line platform (with 128KBps of bandwidth) and using *Net Meeting* for communication with the transmission image of X-Rays in JPEG. Despite the quality of the JPEG, the image was not the best, but physicians managed to communicate and often to establish a diagnosis. In 2007 it was organized, supported by the European Community, as a technical action aiming at uniting two central hospitals and a hospital in Spain, to both train physicians and to enable second opinion consultations on Neuroradiology CT-Scan reports. For this purpose a universal platform was used integrating DICOM protocols suitable for the diagnosis of quality pictures

with echo-graphs integration and high-resolution cameras. From this the ISDN communication protocol with eight 1024Kbps of capacity was used.

In 2009, with support from the UHC, and sponsored by both Cape Verde and Portugal Telecom (PT), it was organized as an action aiming at developing PC services. It also included a component of training and post-evacuations follow-up [22]. In 2010, Chinese cooperation had initiated a connectivity project (with a fiber-optic network) to support telemedicine services within Cape Verde. In 2012, a cooperation project started, financed by Slovenia (and entirely in Portuguese), linking all health infrastructures of Cape Verde with the two central hospitals.

Telemedicine service is based on Medigraf equipment, enabling the distance visualization of an eco-cardiogram. All the images and sounds can be recorded in the system database (~1 Mbps per session). The data can be recorded at both places. The system simply requires a 512 Kbps link, or alternatively a VPN integrated in the RIS (Portuguese Healthcare Network). The network now joins the Portugal, Cape Verde, Angola and São-Tomé-e-Príncipe.

Since 2009, the telemedicine service has already validated the evacuation of 31 patients with a PC diagnosis. These patients represent the sample considered in this case study. The patient ages varied between 1 month and 11 years old. The entire evacuation process, of whatever kind, depends on a physician's proposal, and it requires approval by the Board of Public Health (BPH).

A survey was done to validate patient acceptance. Most parents accepted well the use of technology, understanding the impact on costs reduction and added convenience (since 49% had no heart disease diagnosed). When necessary the patient will later go for a face-to-face evaluation (evacuation) in the HUC. In some cases children were treated with diuretics and the tele-consultation was subsequently repeated.

A Tele-consultation viability test was performed in the first year with 78 cases. Most diagnostics were confirmed in a face-to-face consultation, 10% had a surgical indication and only 0,013% of diagnostics (one) were not confirmed.

5. Case Study Results

External evacuations using telemedicine follows a similar workflow process, the difference is that the case had been previously studied and decided by both Cape Verde and Portuguese physicians. These includes patient results from tests performed locally, a tele-cardiology diagnosis and in some cases, a proposed therapy. In these cases the decision to evacuate the patient is facilitated. The BPH have regular meetings to analyze the processes and to authorize evacuations. The process flow chart is virtually the same, with the advantage of allowing the sick leave process to be studied, with the possibility to immediately start receiving treatment. Another advantage is to treat locally many patients relying on the follow up done remotely.

The focus group first addressed beneficial and cost issues. There is a general opinion that communication costs are still high: on average € 5,000/month for two sessions per week, lasting between 1-to-2 hours, with an average of 3-4 patients. The communication quality is good, however from time to time with some technical interruptions. As strong points are the strength, the quality and unconditional support from PC team at UHC. It was recognized that telemedicine services have avoided numerous evacuations, reducing the financial and social consequences. Several participants also revealed that the evacuation processes with telemedicine were faster

than without telemedicine. Both experts from the hospital and the BPH pointed out the difficulties in arranging consultations in Portugal after the evacuation decision was taken, in which patients have to cope with waiting lists for surgery.

There is the perception, by several participants, that almost 100% of the evacuation diagnoses are confirmed in Portugal, establishing the technical quality of the process. Telemedicine also helps on issuing a second opinion especially when there are uncertainties; it helps the decisions for cases that evacuation is the unique solution available and also contributes to enrich the experiences and technical approach of HAN physicians. One participant mentioned that, with cases of evacuation of patients to Coimbra with telemedicine, the treatment and return to Cape Verde were faster.

The interview results were not very different from the focus group. The participants demonstrated collaboration and total openness to talk about all issues. There was some difficulty in getting different opinions. The whole evacuation process is done by the BPH map that should be approved by the Minister of Health. It goes through the following steps after approval:

- Contact with the Consular Section of the Embassy of Cape Verde in Portugal;
- Request for travel tickets directly to social services of the Ministry of Health;
- Application for visa at the Consular Services of the Embassy of Portugal;

If the evacuation is of utmost urgency it goes directly through an emergency service. For the non-urgent evacuation cases, interviewees were unanimous in considering that most processes were swift in Cape Verde, but they would find difficulties in communicating with the Portuguese health structures. The participants concluded that the formal institutionalization of telemedicine in the process of evacuation would be beneficial in allowing an effective control of patients evacuated.

6. Business Services Benefits

The evacuation process is a fundamental feature of healthcare in Cape Verde. Whenever the constraints of the country relating to the lack of technical resources, human, material, means of diagnosis and treatment endanger the lives and safety of the patient. Of the 31 patients studied, 45% had a family member accompanying and a nurse. There is a fee for specific transportation of medical evacuations: the cost of transportation can vary between 1500 and 2500 € per evacuation [23]. Other costs (like allowances for health professionals and patients and their companions, etc.) could reach € 300 month, not mentioning medicine costs [23]. The cost of the treatments performed, according to the evacuation protocol, is to be taken by the Portuguese NHS.

Telemedicine services, by reducing several evacuations, avoid all these costs, not to mention the family and social issues of living abroad; and if we take into account that the NHS already has the equipment for teleconsultation, the cost of operation is perfectly manageable and benefits justified. The cost reduction is even more noticeable when it comes to follow up where the patient does not need to move, receiving their treatment in their home environment saving the financial and social costs caused by family separation.

Conclusion

Despite some limitations, the evacuation procedure is an important asset and cost-effective service that can be used in diagnosis, treatment and follow-up, bringing benefits and improvements to the NHS both in terms of access to quality services and in terms of costs. Nevertheless with the increasing cost of the provision of healthcare, the deficit of professionals, allied financial difficulties to finance the technology to perform heart surgery in Cape Verde telemedicine has brought a reduction in the time for accessing services and decreasing cases of evacuation, as well as minimizing the costs to follow up with consequences at the level of costs associated with the process.

This study also highlights that telemedicine can be important for Cape Verde in other areas (ophthalmology, dermatology, etc.), given the need to offer specialized care that the country does not have, neither the technical level of the central hospitals and reference even less locally where demand is growing as a result of changing epidemiological profile, as well as the issue of geographical dispersion, there is an urgent need to seek solutions to resolve these issues. Telemedicine is the only solution already experimented with tangible results both nationally and internationally.

Several reports have recommended the need for effective coordination of medical evacuations from Cape Verde [23], not merely on the bureaucracy but also focusing on a more interventionist, pro-active monitoring and controlling processes.

Telemedicine needs to be addressed as organizational and business service. The MOMENTUM approach is now been used to further address this issue. There are clear clinical advantages, such as inter-changes between hospitals, better use of equipment and distance teaching and learning. There are also advantages for the patients, such as quick clinical diagnostics, better waiting list control, costs reduction and access to pediatric cardiology consultation from remote places. This study proves how important telemedicine really is to cope with both the geography and the shortage of physicians.

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