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Teleoncology in sub-Saharan Africa: A literature review

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ABSTRACT

Purpose: Despite the emerging incidence of cancer, sub-Saharan African countries (SSAs) show the lowest cancer survival among the low-middle income countries while the access to cancer care is still unbalanced and unbearable compared with high-income countries. The aim of this literature review is to highlight the possible role, critical issues, and challenges linked to the implementation of teleoncology projects in SSAs.
Methods: Screened studies with primary data, literature and systematic reviews reported in peer-reviewed publications were retrieved through two databases (PubMed and Google Scholar) and manual search.
Results: Reported teleoncology projects were mainly related to cervical and breast cancers, and lymphoproliferative disorders performed in a small number of SSAs, using different digital tools, equipment, and information technology platforms. Although the teleoncology experiences were limited and scattered, the results are promising. A list of key success factors such as suitable telepathology and tele-radiotherapy supports and several recommendations have been identified. Beyond technical shortcomings of bandwidth, network coverage, power supply, training of healthcare professionals and financial sustain human obstacles may hinder the development of teleoncology programs.
Conclusions: Teleoncology experiences in SSAs suggest the importance of identifying best practices for each local setting. Tailored teleoncology projects should be integrated into whole oncological services to amplify screening, diagnosis, therapies, and palliative care.

1. Introduction

Despite the emerging incidence of cancer in low-middle income countries (LMICs), access to cancer care and cancer survival is still unbalanced and unbearable compared with high-income countries (HICs) [1–3]. According to the United Nations, the sub-Saharan African countries (SSAs), located south of the Sahara desert [4], encompass 33 of the 48 poorest countries in the world [5], and show the lowest cancer survival rates among the LMICs [6]; for example, the 5-year-survival for any cancer types is not superior to 22% in Gambia, or for diagnosed breast cancer is less than 50% in Uganda compared with 90% in the United States [7].

In some African countries, not only national healthcare systems and plans of cancer control are lacking but also medical, surgical, and therapeutic centres as a point of reference for oncology are missing even for an entire nation [2,8].

Infection-related cancers such as cervix and liver cancer, breast, prostate and Kaposi sarcoma are reported to be the prevalent cancers in SSAs [9].

The paucity of validated registries makes cancer esteems undervalued and hinders from monitoring outbreaks, defining strategies, urging political decisions about the burden of cancer [10,11], and shades the differences among different SSAs.

Cancer care requires complex management that involves multidisciplinary teams, trained staff, equipment and infrastructures which should be harmonized with local contexts [5,12]. Delayed awareness of patients and health providers about diseases, geographic, socio-economic and political barriers hampers the access to healthcare and prevent from the early detection of cancer [13–15].

While telemedicine in HICs has gained interest for extending health service to rural areas and reducing healthcare expenditure [16,17], the main object of telemedicine in LMICs is creating or increasing the access to healthcare assistance wherever healthcare services are needed [8]. Teleoncology is aimed at reducing disparities in cancer care [18], accelerating diagnosis and therapy, facilitating the follow up and favouring health professionals' growth by exchanging experiences and

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opinions.

The aim of this literature review is to highlight the possible role, critical issues, and challenges linked to the implementation of teleoncology projects in SSAs.

2. Methods

A literature search was performed using two databases (PubMed and Google Scholar), and selecting the items with the following criteria:

- Limits: humans, time window: 2011–2018.
- Inclusion criteria: clinical trials, observational studies (prospective or retrospective cohort studies, case-control studies, and case series studies), systematic and narrative reviews, qualitative and quantitative analyses of every kind of cancer.
- Exclusion criteria: not-English language studies, case reports, letters, editorials, and grey literature.

The citations retrieval was performed by the following Boolean terms:

- Telemedicine AND low-middle income countries (LMICs)/SSAs.
- Teleoncology AND low-middle income countries (LMICs)/SSAs.
- Mobile health AND low-middle income countries (LMICs)/SSAs.

An additional manual literature search was based on the reference lists of articles that matched the eligibility criteria in two steps; the first step addition was based on titles and abstracts, whereas the second step was dependent on the assessment of the full-text publications.

The process of literature screening and the output obtained for this review is showed in Fig. 1.

3. Results

Of the 45 initially abstracts screened, 7 articles were based on primary data, 29 publications were literature and systematic reviews, and 1 publication was a commentary.

3.1. Telemedicine and teleoncology definitions

According to the World Health Organization (WHO), telemedicine is "the use of medical information exchanged from one to another site via communication to improve the patient's health" [19]. The term "teleoncology" is referred to the oncology services provided at a distance for diagnosis, treatment, and follow-up by information and communication technology (ICT) exchanging video, images, and texts [20].

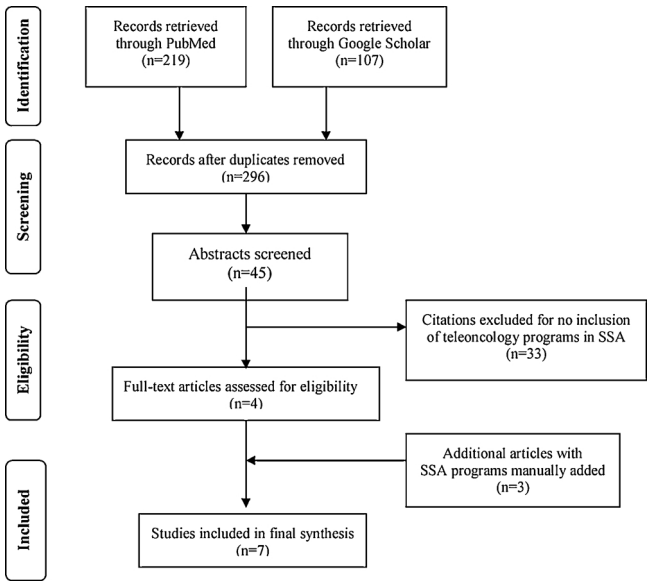

Fig. 1. Flow chart for the review studies selection.

Telemedicine may use mobile devices or fixed teleconsulting systems. Teleoncology applies telemedicine methods to oncology and can be classified in two main groups: a) synchronous (real-time), based on interactive communication such as videoconferencing, and b) asynchronous or store-and-forward method by non-real time interaction. In general, the asynchronous method is the most diffused and based on email consultations, teleconferencing and online educational programs [21].

Telemedicine may be applied at an international level among medical centres located in different countries but also within the same country, typically among city and district hospitals or medical services placed in remote areas.

3.2. Telepathology

In oncology, the pathology support is undeniable, thus every teleoncology project cannot disregard a parallel and adequate telepathology service. Many SSAs have less than 1 pathologist per one million people compared with nearly 57 pathologists in the United States [22,23].

Most of the telepathology information is transmitted by static, digitalized images or real-time pictures. The tele-transmission of histological and cytological images during tele-consultation is focused on diagnosis alongside professional training [24]. Therefore, the telepathology benefits may overcome the costs and disadvantages of shipping human tissues samples [25]. Suitable for many applications, telepathology may play an essential role in the early diagnosis when the laboratory provides tissue slides of sufficient quality, and it can be fruitfully associated with other telemedicine applications. Telepathology platforms may also be dynamic using robotic systems, especially for real-time tele-microscopy [25], but the current cost limits their diffusion.

Telepathology solutions such as store-and-forward or digital Internet connected microscope are used only in some SSAs [24]. In general, the simplest technological solutions are preferable; for example, the International Network for Cancer Treatment and Research (INCTR) project started in Kenya, Tanzania and Nigeria, and included a user-friendly telepathology web application such as iPath-network.

A simple e-mail system is among the most frequent tools used in teleoncology thanks to its low cost and the availability of Internet connection [21].

3.3. Tele-radiology

Encouraging results were obtained in a pilot study performed in Togo by Adambounou et al. with a low-cost tele-radiology platform for diagnostic purposes [26]. The real-time tele-consultation occurred among a remote medical facility, one radiology department of a hospital located in the Togo capital and another radiology centre located in France. A low-bandwidth Internet connection provided an acceptable quality of the radiological images as assessed by experts radiologists [26].

3.4. Teleoncology experiences

The RAFT (Réseau en Afrique Francophone pour la Télémedicine) network, launched in 2001 in Mali and in other Francophone countries, was then extended to some English and Portuguese speaking countries [27]. The RAFT network usually connects central, universities and district hospitals; hence, the network sites are located mainly in urban areas. It has a specific focus on educational activities and tele-expertise for healthcare professionals by dedicated software tools that can use