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MephidA e.V., Enhancing Radiotherapy Service and Cancer Care in Low-Resource Countries

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Abstract

Low and middle-income countries (LMIC) have only 5% resources but account for up to 80% global cancer burden, with patients mostly diagnosed with cancer at their late stages. Radiotherapy, which has been identified to benefit up to 50% of cancer patients with either a curative intent or palliative end-point, remains inaccessible to over 90% of patients in LMIC. This disparity of cancer treatment access results from lack of infrastructural and financial resources, trained medical and technical professionals, training programs, geopolitical and economic instabilities, and lack of sustainability. In order to tackle these issues from the base, cultural and behavioural barriers must be broken to enable practicable cancer preventive measures through lifestyle as well as encouraging early diagnosis and participation in screening and immunization programs. Medical physicists in diaspora for Africa (MephidA e.V.) is a non-profit organization aimed at turning the brain-drain to brain-gain with vantage from the diversity of the professions of its members made up of experts in medical physics, radiation oncology, information technology, journalism, etc. Our activities encompass:

1. Organizing and distributing donated medical equipment in adherence with WHO recommendations.
2. Consulting in establishing radiotherapy departments by promoting up-to-standard treatment delivery techniques and the use of innovative electric power solutions such as solar energy.
3. Use of information communication techniques (ICTs) to facilitate tele-diagnosis, help in treatment, education and training.
4. Reconnecting and assisting professionals trained abroad to return and deliver cancer care in Africa.
5. Collaborating with partners and stakeholders to catalyze cancer care via basic training in forums, as well as developing and establishing accredited teaching courses to train professionals at high educational institutions.

As co-organizers of the Global Health Catalyst Summit in Harvard, we identify the event as a unique platform to network and gain more partners in the quest towards closing disparities in cancer access world-wide. Several challenges lie ahead but with MephidA e.V, we hope to address these issues.

Keywords: Radiotherapy; LMIC; Brain drain to Brain gain; Networking; MephidA e.V.

Introduction

The global response to malaria, tuberculosis, HIV and AIDS has led to the creation of institutions such as the Global Fund to Fight AIDS, Tuberculosis and Malaria. Cancer continues to claim even more lives worldwide, especially in developing countries where the local cancer control programs are paying little or no attention to radiotherapy. Radiotherapy provides an effective method of cancer therapy and is predicted to be required by more than 50-60% of cancer patients. Until date, there exist no radiotherapy services in 31 out of 54 African countries [1]. The role of radiotherapy must hereby be highlighted, as it may serve either as a stand-alone option for treatment or may be used in conjunction with surgery and chemotherapy to improve on cancer control effectiveness.

In a recent report, LMIC were reported to possess only about 5% of necessary worldwide oncology resources, whereas they contribute up to 80% of the global cancer burden. From the United Nations Development Program (UNDP) Human Development

	Population (thousands)	GNI per head* (US$)	New cancer cases in 2008 † ($\times 10^3$)	Patients who need radiotherapy ‡ ($\times 10^3$)	Machines needed §	Existing machines	Teletherapy per million people	Additional machines needed
North Africa								
Egypt	81 527	1800	68-805	44-035	98	76	0.93	22
Libya	6294	12 380	**5045**	3-229	7	5	079	2
West Africa								
Cote D'Ivoire	20 591	980	11-485	7-350	16	0	0	16
Nigeria	151 212	1170	101-797	65-150	145	7	0.05	138
Central African								
Cameroon	**19 088**	**1120**	**11688**	**7-480**	17	0	0.16	**14**
Democratic Republic of the Congo	**64257**	150	33.746	21-597	48	0	0	48
East Africa								
Kenya	38 765	730	27897	17854	**40**	**2**	**0.05**	**38**
Uganda	31 657	420	27-116	17354	39	1	0.03	38
Indian Ocean Islands								
Madagascar	19 111	420	14-487	9.272	21	1	0.05	**20**
Mauritius	**1269**	**6720**	**1-522**	0.974	**2**	3	2-36	-1
Southern Africa								
South Africa	4 8 793	5870	74-688	**47-800**	**106**	**92**	**1.89**	**14**
Zimbabwe‖	**12 463**		**11915**	**7-626**	**17**	**2**	**0.16**	**15**

Countries are grouped according to the regions defined by the US Centers for Disease Control and Prevention (appendix).[6]*Gross national income (GNI) per head is based on the World Bank Atlas method.[8] †New cancer cases in 2008 are based on data from GLOBOCAN.[11] ‡Radiotherapy need is calculated as 64% of incident cases in 2008. §Number of machines needed is based on the assumption that one machine treats an average of 450 patients per year (machines needed is listed as 0 if fewer than 450 patients per year need radiotherapy). ¶No GLOBOCAN data were available for Sao Tome and Principe. ‖No World Bank data were available for Somalia and Zimbabwe.

Table 1: Modified from Abdel-Wahab M., *et al.* 2013

Report 2015, Cameroon for instance with a human development index (HDI) of 0.51 is rank 153 out of 188, and lists as a low HDI country [2,3] (Table 1). The HDI provides a measure of the socioeconomic development, weighted via the education, life expectancy and income level of a country. The profiles of cancer occurrence and mortality correlate with the country's HDI. From data analysis for the year 2012 for low HDI countries, the five most prevailing cancer types with estimated contributions were breast (17%), cervix uteri (12%), liver (5%), prostate (4.5%) and esophagus (4%). Conversely, the cancer occurrence ranking in high HDI countries list approximately in order of prevalence; lung (12.5%), breast (12.5%), colorectal (9.1%), prostate (8%), stomach (7%). These trends are coupled with the life expectancy and prevalence of screening tests such as the prostate specific antigen (PSA) test. Genetic predisposition may also interplay as a risk factor. For instance, communities with predominant black population living far off the equator with less sunlight, who are naturally prone to vitamin D deficiency, have been shown to have an increased prostate cancer occurrence. Other influential risk factors for increased cancer occurrence include reproductive patterns (unprotected sexual intercourse correlates with cervix cancer incidence), tobacco consumption (lung, head and neck cancer), and nutritional factors (unhealthy diet, sedentary lifestyle and obesity, associated with colorectal, breast and possibly prostate cancer).

There is a large-scale deficit in diagnostic and therapeutic services, and even if available, there is lack of skilled and qualified personnel required to provide high quality services. According to the recent IAEA publication 2017, about 5 million people are served by a single radiotherapy machine in low-income countries [4] (Figure 1). Furthermore, financial as well as logistical issues pose serious hurdles with regards to the acquisition, maintenance and sustainability of modern diagnostic and therapy technology devices. One must mention other critical issues requiring attention such as the so-called brain-drain of nationals who seek more lucrative occupations abroad, electric power fall-outs which may compromise the treatment equipment's functioning, its quality and delivery efficiency, as well as the necessity for committed leadership to achieve long-term success in cancer control. Considering the diversity in traditional beliefs, cultural and religious backgrounds as well as the stigma associated with cancer, there is the need to educate communities on basic life-style and behavioral patterns which may significantly reduce cancer occurrence, improve on quality of lives and on the long term lead to an economic benefit. The interplay of all these aspects requires a platform whereby all string-pullers may meet a common agreement.

This emergency situation at hand needs to be tackled by taking into consideration the local socioeconomic, political and cultural climate of each country. Bridging the current gap thereby requires a joint effort, not only of oncology and health care experts, but

also of industrial partners, educational organizations, philanthropists and decision/policy makers.

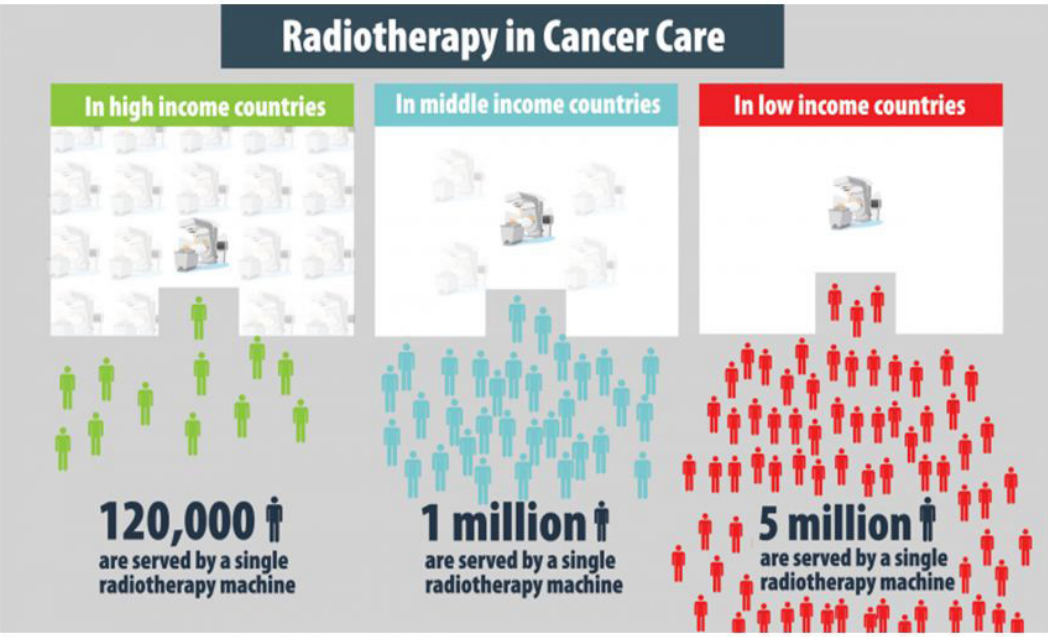

Figure 1: Radiotherapy in Cancer Care - Facing the Global Challenge (IAEA Publication 2017)

Main Body

Medical physicists in diaspora for Africa, MephidA e.V, created in 2015 with seat in Germany, is a non-governmental (NGO), non-profit making organization (NPO). Its members are made of experts in medical physics, radiation oncology, information technology, journalism, just to name a few, around the globe. Its vision is to improve on the availability of Radiotherapy services in Africa through five major approaches:

1. Organizing and distributing donated medical equipment in adherence with WHO recommendations [5].

MephidA utilizes the extra advantage of its expert members residing in the donor countries working in the various fields to inspect the donated equipment. The non-functional equipment are rejected for donation while the functional equipment are analyzed to make sure they are certified and up to standard. Also, the proper use of such donated equipment in the recipient country is ensured by training the staff on the ground. Usually, a member or team of experts travel to the recipient country and ensure the staff is well trained to operate such equipment.

2. Consulting in establishing radiotherapy departments.

Consultation can also be provided to obtain state-of-the-art solutions to establish radiotherapy departments. MephidA experts do have long term experience with the various radiotherapy machines and connections to the various machine vendors. MephidA also provides assistance in not only doing the shielding calculations for the radiation treatment room but also identify the equipment crucial in setting up and operating such radiotherapy departments.

3. Use of information communication techniques (ICTs) to facilitate tele-diagnosis, education and training.

MephidA does implement ICTs to engage and facilitate knowledge transfer mainly through teleconferences e.g. tumor boards. Such ICTs act as a low-cost solutions for the experts to provide education and training in a fast and effective way. This in some cases circumvents the time and cost intensive travelling to and from the recipient country. It is very crucial to note, most members are full-time employees with little time left to invest in MephidA activities. Such ICTs solutions offer an inexpensive and fast way to effectively put to use the little time the members have to invest. Also, with ICTs solutions, it is possible to mobilize a larger group of members to provide their expertise.

4. Reconnecting and assisting professionals trained abroad to return and deliver cancer care programs in Africa.

Through MephidA ReConnect, an attempt is being made to combat the brain drain in Africa. The approach here is to encourage medical physicists and other trained health professionals in the diaspora to reconnect and provide their services in their respective countries of origin. Usually, relocating back to the country of origin is challenging after spending years studying, working, living and learning the culture of the respective country in the diaspora. As a group, MephidA assists not only members but others in the African diaspora to relocate and provide their services (mainly radiotherapy) in their respective country of origin. Close connection to the ReConnect persons is kept to ensure professional support whenever necessary. This is one approach we find to gradually brain gain from brain drain.

5. Collaborating with partners and stakeholders to catalyze cancer care.

The approach here is not only to implement ICTs for education and training but to provide support in establishing accredited teaching courses to train medical physics professionals at higher education institutions. Here, the first approach is for a team of members to visit the respective African country and offer on the ground training. Experience shows certain bottle necks can better be understood when present on the spot and this provides the best situation to access and find respective solutions. The second approach is to provide assistance to respective candidates through short term training and internships in the host country. Each approach presents its advantages and disadvantages. Usually, when the need arises, the situation is analyzed to provide the more preferable approach of the two.

Conclusion

Much work has been done to combat cancer in the African continent. Usually, most work in this domain has been achieved through international institutions mostly led by citizens from overseas with a different cultural background. MephidA e.V provides an approach where Africans in the diaspora collaborate not only with each other but with the host country and the respective LMICs to fight against cancer in the African continent. Through the five main approaches mentioned above, MephidA e.V hopes to assist in gradually changing the brain drain narrative to brain gain in combating cancer in the African continent and to reduce the disparities in radiation oncology.

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