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Potential for Information and Communication Technologies to Catalyze Global Collaborations in Radiation Oncology

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In response to a world in which cancer is a growing global health challenge, leaders in cancer policy from the United States and 14 economically diverse countries recently concluded that successful campaigns to control cancers and improve current strategies will increasingly depend on concerted international collaborations (1). Highlighting urgency for such collaborations, the 2014 World Health Organization Cancer Report (2) describes the growing cancer burden as alarming and a major obstacle to human development and well-being, with a growing annual economic cost of approximately 1.16 trillion US\$. The report also highlights major global cancer disparities, with more than 60% of 14 million new cases and 70% of 8.2 million deaths per year occurring in low- and middle-income countries (LMICs), some of which, sadly, are the least capable of dealing with cancer without some form of collaboration. These major disparities in cancer deaths are in part a reflection of poignant underlying disparities in radiation oncology services. For example, radiation therapy, which is needed in the treatment of more than 50% of cancer patients (3), is not available in 31 of Africa's 54 countries (4), and 55 of 139 LMICs reportedly (5) have no radiation therapy services at present. Therefore, having cancer in many LMICs often leads to a painful and distressing death.

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A number of recent articles (6–10) in the *International Journal of Radiation Oncology • Biology • Physics* are inspiring greater discussion on global health and strategies, at different levels, that could help address the growing global cancer burden and tragic disparities in radiation oncology. At the 2014 American Association of Physicists in Medicine conference in Texas, one such discussion involved the potential of information and communication technologies (ICTs) in catalyzing global health collaborations in radiation oncology. We believe that key elements are in place for leveraging ICTs to catalyze concerted high-impact collaborations in radiation oncology care, research, and education, involving partners from different nations and diverse economic and cultural backgrounds. The premier key element is the availability of advanced ICTs, with ICTs defined as tools that facilitate the capturing, processing, storage, and exchange of information via electronic means. Advances in ICTs today have potential to enable space–time flexible contributions to radiation oncology global health care, research, and education.

This potential can take advantage of another key element, namely, the major upsurge of interest in global health among radiation oncology health professionals (6–9). Appurtenant to this upsurge in interest, a common issue expressed at global health summits, seminars, or symposia is that people really want to participate in global health but do not know how. This points to the need for a platform for facilitating participation, converting this upsurge in interest into greater concerted action and impact.

Other key elements include the proliferation of institutions with the support structures needed for more effective and sustainable collaborations. For example, in developed countries like the United States, many National Cancer Institute–designated comprehensive cancer centers and hospitals now share the vision to eliminate global cancer disparities and can support such collaborations in radiation oncology cancer care, research, and education. Meanwhile in LMICs, for example in Africa, the African Organization for Research and Training in Cancer, whose mission is to promote cancer awareness and improve cancer diagnosis and treatment, also has a support structure and network of potential collaborators in different institutions. What is missing is a systematic way or platform for bringing potential collaborators together and facilitating initiation of such collaborations, including in a space–time flexible manner. This platform could also facilitate participation by health professionals at smaller institutions/centers lacking the more robust support structure of larger institutions.

One possible platform model discussed at the American Association of Physicists in Medicine conference is the successful collaboration-driven model of Harvard Catalyst, which fosters a culture of collaboration in 31 Harvard-affiliated institutions, hospitals, and community partners. A similar platform could integrate the above key elements in an optimal way to catalyze high-impact global health collaborations focused on radiation oncology. We envision such a global health catalyst (GHC) could incorporate components covering activities in cancer care, research, and education, and involve institutions from both developed countries and LMICs. Table 1 highlights some example ICTs and activities that could be supported by such a platform. If well implemented, some of these activities could have high impact right away with minimal investment in time/effort. This is by no means an exhaustive list but is meant to encourage further discussion, while highlighting the potential

of ICTs for catalyzing international collaborations in radiation oncology care, research, and education.

Cancer Care

In cancer care, a GHC platform could integrate ICT software (eg, Profiles [11]) to enable any interested health care professional to easily start or find and participate in collaborative global cancer care activities. Examples of care activities include remote treatment planning with the help of ICTs like VelocityGRID (Velocity Medical, Atlanta GA). VelocityGRID is a cloud-based, Health Insurance Portability and Accountability Act–compliant image collaboration and exchange tool, which could help circumvent bandwidth problems (slow Internet) affecting many LMICs. Such ICTs could enable radiation oncologists and other cancer care team members to work together securely on a patient's treatment planning, evaluation, and delivery across institutions or countries. Other activities include international tumor boards (eg, the Botswana-Harvard tumor boards [12]); providing remote consultation/mentorship working with partners in LMICs; using mobile health applications (ie, using mobile devices such as cell phones and tablets) for collecting and securely transmitting patient data or information to health care practitioners for remote interpretation or evaluation; and using advanced ICTs like Google Glass and FaceTime for, for example, remote support of radiation therapy machine quality assurance and lower cost maintenance to minimize machine downtime, which is a major issue for many LMICs.

Research

In research, a GHC platform could also enable investigators to, for example, easily find collaborators across institutions, share tools and technologies, share electronic research resources (eg, a research database), find mentors, access free consultations and cross-cultural research interaction training, find research resources or pilot funding to embark on new areas of investigation, or develop/update cancer registries. Successful approaches such as crowdfunding, the practice of funding projects by raising monetary contributions from a number of people or groups, typically via the Internet, could also be incorporated. This would allow, for example, a US investigator to partner with an investigator in Tanzania to get crowdfunding from diaspora groups for joint research and publish together. The potential impact could be huge for investigators in many LMICs who otherwise have little or no funding, and where relatively modest funds could enable many years of fruitful research. Co-advising/supervision of research trainees in LMIC institutions could help build more local capacity and enable new advances in the fight against the growing burden of cancer. Advances in ICTs like WebEx (video-conferencing software) could be used to enable remote participation at LMIC conferences, or vice versa, providing opportunities for greater interaction to begin or nurture scientific collaborations. A recent Nigeria Prostate Cancer Conference is an example: US radiation oncology faculty, who could not travel because of the Ebola virus, still successfully participated via WebEx, with great appreciation by the local Nigerian participants. More of such ICT-powered participation could complement face-to-face annual meetings.

Education/Training

On education, a GHC could incorporate electronic learning (e-learning) as a powerful way to enable space–time flexible teaching or lower-cost access to training, continuing education, or new knowledge. Such e-learning could use ICTs such as edX (13), CourseSites (14), or the International Atomic Energy Agency (IAEA) Program of Action for Cancer Therapy (PACT)’s VUCCnet (15), with multimedia enhanced course modules and radiation oncology educational videos (including currently hundreds available from YouTube). This could allow even modest contributions, for example by retiring faculty teaching a course module, transferring vital knowledge to LMIC trainees to help build capacity. Chart rounds, online discussions, and recitation sessions could also be enabled through this approach to enhance or broaden learning for both developed-country and LMIC participants. E-learning could complement GHC-supported summer workshops and practical training at IAEA PACT model sites, as well as other face-to-face learning global health initiatives. In many countries, local capacity to train and mentor practitioners is often insufficient to ensure sustainable cancer control and to counter the effects of “brain drain.” Education or training, for example via VUCCnet, could help alleviate this problem. Harmonized/adaptive curriculum development could help enhance the quality of education. More than 89% of residents surveyed recently (7) indicated positive interest in participating in global health; their participation in tumor boards powered by ICTs like Adobe Connect could broaden their training or perspective, preparing them to be the next generation of global health leaders.

Outreach

A GHC outreach component could help strategically grow international participation, foster a culture of collaboration and innovation across other complementary cancer care areas (eg, prevention, medical oncology, surgery), promote continuous learning between global health initiatives, promote advocacy and community engagement, and mobilize support from society, including from foundations, funding agencies, policy makers, industry, and diaspora organizations. Outreach involvement of the diaspora would, arguably, spawn and catalyze stronger collaborations and help turn brain drain into brain circulation. The diaspora’s passion for contributing to their sending countries, better appreciation of both Western and sending country cultures, and substantial human resource and financial potential (eg, more than \$50 billion per year in remittances by the African diaspora [16]) could be a significant asset, including in supporting crowdfunding. More concerted outreach involvement by policy makers could also facilitate greater investment in infrastructure and workforce development. Active outreach to nongovernmental organizations and industry in the GHC network would also facilitate transfer of new knowledge, translating innovations to practical health care solutions, economic growth, and sustainable development.

In response to a world in which cancer is a growing global health challenge, there is now a greater need for radiation oncology health professionals across institutions to collaborate and be more globally engaged in the fight against cancer. The GHC proffers a scalable/adaptable model for catalyzing such collaborations, and the specific examples highlight the potential of ICTs for catalyzing high-impact international collaborations in radiation oncology care, research, and education. Overall, cognizant of the challenges of making radiation therapy

accessible in LMICs (3), we believe ICTs present enormous opportunities for facilitating participation that can have a significant impact right away, enhancing greater effectiveness of ongoing radiation oncology global health initiatives and converting the upsurge in global health interest at different levels into greater concerted action, toward improved health outcomes, saved lives, and the elimination of global cancer disparities.

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Table 1

Examples of ICTs and ICT-powered activities to catalyze radiation oncology (RadOnc) global health collaborations

Examples of ICTs and ICT-powered activities	Potential outcome examples
Cancer care	
GHC-integrated ICT software (eg, Profiles) to help practitioners easily find partners and collaborate	Make it easier to participate in global health, increased participation, convert upsurge in global health interest to greater concerted action
ICTs for RadOnc telemedicine: eg, VelocityGrid for remote treatment planning and evaluation; Adobe Connect for tumor boards and remote consultations, GHC-powered chart rounds	Space–time flexible remote support in treatment planning, quality assurance, evaluation; remote patient consultations, chart rounds, tumor boards with broader participation, including by residents
GHC-supported mHealth applications, FaceTime, Google Glass, etc, to facilitate remote support, eg, for machine quality assurance and maintenance	More RadOnc care infrastructure established in partnership with the IAEA PACT, lower cost maintenance, less machine downtime
Research	
GHC-integrated ICT software (eg, Profiles) to help investigators find each other and form collaborating teams, or find mentors across international institutions	Enhanced ability to find each other and form teams: complementary collaborators/mentors, across institutions in different countries
GHC-enabled sharing of e-research resources and tools, eg, research database, research analysis software tools, etc	More research collaboration across institutions in different countries, more productivity, more innovation
GHC-supported WebEx to provide consultations on research, eg, on biostatistics, clinical trials, ethics, etc, or enable virtual/hybrid scientific meetings	More publications, more grants, faster clinical translation of innovations, space–time flexible participation in scientific meetings
GHC-supported searchable seed funding for research collaborations, including via crowdfunding	More funding, more collaborations, preliminary data, joint publications, lower cost technologies for cancer treatment, etc
Education/training	
GHC-linked ICTs: EdX/CourseSites/VUCCnet for e-learning with learning modules, multimedia, online teaching/learning tools	Lower costs and enhanced access to education and capacity building, more space–time flexible participation in teaching/learning
GHC-supported conferences and symposia with continuing education credits, certificates	Increase in workforce development and international experience, maintenance of certification
GHC educational resources: eg, multimedia library, tablet computers with educational content: books, Task Group reports, archived lectures, etc	Enhanced access to electronic education materials, practice guidelines, and journal articles; extended lectures beyond the classroom
GHC-supported curriculum development, harmonization of international certification working, eg, with the IOMP	Increased quality in education/training and continuous learning, increased number of board-certified professionals in LMICs
Outreach	
GHC-supported partnerships with medical oncologist, surgeons (eg, during tumor boards), cancer prevention professionals, etc	Greater effectiveness in providing cancer care and cancer prevention
GHC-supported social media outreach and advocacy to policy makers, diaspora, and grass roots organizations, industry, nonprofit organizations, foundations, and other global health initiatives	Improved LMIC cancer control policies, support from diaspora, conversion of brain drain to brain circulation, increased community engagement, conversion of new knowledge to practical health care solutions, economic growth, and sustainable development

Abbreviations: GHC = global health catalyst; IAEA = International Atomic Energy Agency; ICTs = information and communication technologies; IOMP = International Organization for Medical Physics; LMIC = low- and middle-income countries; mHealth = mobile health applications; PACT = Program of Action for Cancer Therapy; VUCCnet = Virtual University for Cancer Control.