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Global Cancer Consortiums: Moving from Consensus to Practice

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ABSTRACT

Purpose and Design. The failure to translate cancer knowledge into action contributes to regional, national, and international health inequities. Disparities in cancer care are the most severe in low-resource settings, where delivery obstacles are compounded by health infrastructure deficits and inadequate basic services. Global cancer consortiums (GCCs) have developed to strengthen cancer care expertise, advance knowledge on best practices, and bridge the cancer gap worldwide. Within the complex matrix of public health priorities, consensus is emerging on cost-effective cancer care interventions in low- and medium-resource countries, which include the critical role of surgical services. Distinct from traditional health partnerships that collaborate to provide care at the local level, GCCs collaborate more broadly to establish consensus on best practice models for service delivery. To realize the benefit of programmatic interventions and achieve tangible improvements in patient outcomes, GCCs must construct and share evidence-based implementation strategies to be tested in real world settings.

Review and Conclusions. Implementation research should inform consensus formation, program delivery, and outcome monitoring to achieve the goals articulated by GCCs. Fundamental steps to successful implementation are: (1) to adopt an integrated, multisectoral plan with local involvement; (2) to define shared implementation priorities by establishing care pathways that avoid prescriptive but suboptimal health care delivery; (3) to build capacity through education, technology transfer, and surveillance of outcomes; and (4) to promote equity and balanced collaboration. GCCs can bridge the gap between what is known and what is done, translating normative sharing of clinical expertise into tangible improvements in patient care.

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Global statistics demonstrate major inequalities in worldwide cancer survival for the most preventable and/or treatable cancers. For example, 5-year survival for women diagnosed with breast cancer is greater than 80 % in the United States, compared to only 32 % in in sub-Saharan Africa.[1,2] Even when adjusted for stage, early stage breast cancer has a 17 % higher survival when diagnosed in more developed countries.[3] Why two women in different settings with the same stage of breast cancer have such disparate survival potential calls attention to significant variations in the provision of services and determinants of health. What to do to achieve the best possible outcomes may be known, but how to do it is not, particularly when optimal health resources are not universally available.[4]

Consensus guidelines regarding evidence-based interventions (i.e., what to do) have been developed in high-resource settings by groups such as the National Comprehensive Cancer Network (NCCN). These guidelines could potentially serve as a framework for developing resource-adapted treatment protocols in limited resource settings.[5] However, the existence of evidence-based guidelines does not ensure their adoption by clinical providers or their acceptance as standards of care in the medical community, particularly when the necessary resources are not available.

In the United States, persistent outcome disparities among different racial and socioeconomic groups illustrate that further efforts are necessary to promote change in clinical practice and improve access to specialized services to yield improved cancer outcomes among all groups.[6] Socioeconomically disadvantaged people are less likely to visit a cancer specialist, they have a lower likelihood of undergoing appropriate state-of-the-art operative treatment of malignancy, they are less likely to receive indicated adjuvant therapy, and they have a 10 % lower overall survival across all cancer types even when adjusted for

TABLE 1 Definitions of key terms

Term	Definition
Consortium	An alliance of organizations that is formed around a common purpose or theme. Objectives are shaped by an overarching goal or output, articulated through a mission statement and set of implementation strategies (e.g., clinical care pathway). Participants may have different type of expertise with roles that evolve over time.[65]
Partnership	Health collaboration that bring together a set of participants for specified projects to improve the health of populations based on mutually agreed roles. Different types of partnerships exist (e.g., coalitions, networks, collaboration, cooperation, and sponsorship).[66]
Health research	Any data generated that can contribute to health knowledge and evidence-based intervention.
Evidence-based intervention	Conscientious, explicit, and judicious use of current best health knowledge for making decisions related to the care of patients and/or populations.[67] These interventions commonly prove most effective when supportive evidence involves multiple settings, target populations, and approaches.[68]
Care pathway	A mechanism for health systems and facilities to achieve stepwise, coordinated, resource-appropriate improvements in cancer care. Health system advancement can be achieved by optimizing existing use of resources and/or acquiring new resources.
Implementation	Process of putting to use or integrating evidence-based interventions within a setting.[68]
Dissemination	An active approach of spreading evidence-based interventions to the target audience using planned strategies.[68,69]

income level.[7,8] Although poverty and demographic factors have been known to contribute to worse cancer outcomes in high-resource countries for almost 30 years, significant disparities in access to quality cancer care persist.[8]

In low- and middle-income countries (LMICs) where resource deficits are more common, the divide between standardized clinical protocols and actual clinical outcomes are even more profound.[9] Statistics suggest that if the highest achievable standards of cancer care currently delivered in high-resource countries were attained across countries at all economic levels, approximately 1.5 million cancer deaths could be avoided each year.[10]

Global cancer consortiums (GCCs) are groups with a shared mission and common objectives that collaborate to advance some broad aspect of global cancer control (Table 1). Rather than focusing on individual programs or specific in-country projects as might occur in traditional interinstitutional partnerships, GCCs provide an overarching framework for advancing cancer control through defined common goals and/or evidence-based strategies (Table 2). Some GCCs may address a specific global task, such as genomic data collection and/or cancer tissue banking at the global level. For example, the International Cancer Genome Consortium has declared its unifying goal to be to obtain a comprehensive description of common genetic changes in common tumors of clinical and societal importance across the globe.[11] Other GCCs may focus on cancer control planning, such as the development evidence-based protocols to strengthen service delivery at the local, national, and global levels. The Breast Health Global Initiative (BHGI) is a consortium of organizations and partners that collaborated to develop, implement, and study evidence-based, economically feasible, and culturally appropriate guidelines for international breast health and cancer control for LMICs to improve breast health outcomes.[12] A general feature of GCCs is that they facilitate communication among members and provide a forum for coordination with the objective of maximizing efficiency to understand, prevent, treat, and/or palliate cancer at the global level. For the purposes of this review, we focus on GCCs that address cancer control planning and care delivery models specifically related to LMICs.

CONSENSUS FORMATION

Health research has generated improvements in modern cancer care and the emergence of consensus on the prevention, diagnosis, and management of cancer. Randomized clinical trials performed in high-resource settings shape the accepted standards of cancer care by providing a strong foundation of evidence-based practice.[13] However, the common belief that biomedical advances will directly translate into clinical practice has proven untrue; health care delivery and resources matter. In regions where insufficient health care systems research has been performed, where cancer expertise is limited or unavailable, where the health budget is inadequate, and/or where organized health systems are still evolving, the global cancer community can and should address how to best align itself with the mission to improve cancer outcomes at the population level.

GCCs can provide a structure for addressing cancer care by organizing existing information in ways that permit systematic reviews and scientific consensus regarding strategic policy making and implementation. For example, the International Cancer Control Partnership (ICCP) is a group of international organizations engaged in cancer control planning that seeks to create synergies to maximize efforts directed toward national cancer control plan development, implementation, and evaluation.[14]

TABLE 2 Types of participants, partnerships, and consortiums

	Examples
Types of participants	
International agencies	World Health Organization (WHO), International Agency for Research in Cancer (IARC), International Atomic Energy Agency (IAEA)
Governmental agencies or ministries	National ministries of health, national cancer institutes, U.S. National Cancer Institute Center for Global Health (NCI-CGH)
Nongovernmental organizations	American Cancer Society (ACS), International Cancer Research Partnership, Livestrong, Norwegian Cancer Society, Susan G. Komen for the Cure, Union for International Cancer Control (UICC)
Academic societies and member organizations	African Organisation for Research and Training in Cancer (AORTIC), American College of Surgeons (ACS), European School of Medical Oncology (ESMO), National Comprehensive Cancer Network (NCCN), Surgeons OverSeas (SOS)
Hospital-affiliated international programs	St. Jude International Outreach Program; MD Anderson Global Academic Program
Private sector foundations	Exxon Mobile Healthy Community Initiative
Types of partnerships	
Academic institutions with national governments	The BOTSOGO collaborative partnership (Botswana with three U.S. Academic Partnerships)
Multinational collaborations	International Cancer Benchmarking Partnership (6 country collaboration); Network for the Coordination and Advancement of Sub-Saharan Africa–European Union Science and Technology Cooperation (CAAST-Net), Red de Institutos Nacionales de Cancer (RINC)
International agencies with governments	WHO-IARC collaborative with Sri Lanka
Types of consortiums	
Academic	Medical Education for Services to All Ugandans (MESAU), Consortium of Universities for Global Health (CUGH)
Disease management	Breast Health Global Initiative (BHGI); Alliance for Cervical Cancer Prevention (ACCP); Consortium for NCD Prevention and Control in Sub-Saharan Africa (CNCD-Africa)
Informatics or research	International Cancer Genome Consortium (ICGC); Advanced Technology Consortium for Radiotherapy; International Cancer Research Partnership (ICRP)
Health care systems	International Cancer Control Partnership (ICCP)*; Alliance for Surgery and Anesthesia Presence (ASAP) Today

* Some alliances list themselves as a partnership, but technically they are more accurately described as a consortium as defined in this review

Rather than advocating for or against rigid one-dimensional prescriptive guidelines, GCCs can establish consensus and develop adaptable care pathways that can predictably define successful programs delivery through effective implementation, quality, safety, and cost-effective interventions.[15] For example, the "yes/no" cancer screening debates (mammography, testing for prostate-specific antigen, colonoscopy) that dominate high-income country cancer control discussions can be bypassed in the setting of LMICs where high cost, major infrastructure requirements, and late-stage disease presentation make these screening discussions largely irrelevant. There can be a difference of perspective between clinical researchers, most commonly from high-income countries, who desire high degrees of certainty and seek broad generalizability regarding tools they are studying, and implementers, who emphasize local relevance and realistic applicability within real-world resource constraints.[16] GCCs can define adaptable strategies for improved early clinical detection, diagnosis, and treatment considered within the context of variable existing and renewable resources.[17]

THE SCIENCE OF IMPLEMENTATION AND DISSEMINATION RESEARCH

Implementation research focuses on translating clinical knowledge into programmatic development through scientific applications and policy strategies to promote systematic uptake of clinical research findings.[18] Implementation research, known better in the past as outcomes research, has evolved since the 1960s and 1970s when studies were first performed to understand why national initiatives were failing to achieve their intended outcomes (e.g., President Kennedy's New Frontier, President Johnson's Great Society and War on Poverty).[19] Implementation and dissemination science principles have emerged as imperatives to effectively translate policies and care pathways into achievable outcomes.

Communicable diseases, such as HIV/AIDs, have posed a formidable public health threat but have achieved significant gains in health outcomes over the past 20 years though effective implementation and quality improvement programs.[1,20] By contrast, national and international initiatives in global cancer care were declared by the World Health Organization (WHO) more than a decade ago, but only modest improvements in cancer outcomes have been achieved in LMICs despite increased health knowledge and expertise.[21] GCCs have the potential to facilitate program success by delineating implementable programmatic models that address local health care delivery barriers such as disjointed services, prohibitive financial costs, political factors, and human resource limitations.[22,23] Once models are defined and applied, effectiveness analysis is needed to identify characteristics of successful programs and to adapt similar programs in other regions of like economic, political, and cultural structure.[18]

CONSENSUS FORMATION AND IMPLEMENTATION

High-Resource Settings

Maximal efficacy of evidence-based interventions has not been realized even in high-resource settings. More than 50 % of the existing burden of cancer could be reduced with universal deployment of accepted interventions, but only about half of accepted medical and public health innovations are currently used in practice.[24,25] Adherence rates to NCCN guidelines in the United States is 97 % for surgical procedures but only 63 % for systemic adjuvant treatment and 77 % for radiotherapy.[26] Multiple interacting factors affect why evidence-based interventions are not routinely adopted into clinical practice related to characteristics of the intervention (e.g., high cost), research design (inadequate internal validation), and/or failure to evaluate implementation fidelity and quality control on scale-up.[27] Additionally, there are disparate cancer outcomes between socioeconomic populations living in similar high-resource settings, reflecting the complexities of service delivery and social determinants of health.[2]

Low-Resource Settings

An obstacle to cancer control planning in LMICs is the insufficient population-specific data needed to create internally validated evidence-based standards of care. Sub-Saharan Africa produces less than 1 % of biomedical publications as a result of research resource constraints, meaning that cancer management approaches must largely be extrapolated from studies performed in high-resource settings.[28,29] GCCs can support the establishment of evidence-based standards of care as a short-term substitute, such as the recent international adaption of guidelines by NCCN.[5] In addition, challenges to service implementation and delivery arise from resource limitations and poor health system infrastructure. GCCs can develop principles and methods to strengthen health care system efficiency by augmenting infrastructure, improve the quality of care, achieve targets of trained personnel, and realize a sustainable funding model.[1,23]

CORE IMPLEMENTATION ELEMENTS

In 2005, the WHO's 58th World Health Assembly passed a resolution urging member states "to establish or strengthen mechanisms to transfer knowledge in support of evidence-based public health and health-care delivery systems, and evidence-based health-related policies."[30] This resolution was founded on the recognition that to improve health outcomes, program design and implementation should be designed according to local health priorities, disease burden, and resource availability (Table 3). The World Health Assembly resolution was followed by the WHO *Bamako Call to Action on Research for Health and Disease Control Priorities,* which promotes fundamental steps to effectively implement health programs: (1) adopt comprehensive approaches using intersectoral and interdisciplinary approaches; (2) set priorities based on national health policies; (3) build capacity through education, technology transfer, and monitoring of outcomes; and (4) ensure equity.[31,32] These core objectives are expanded below as they pertain to cancer care (Fig. 1).

Establish Consensus for Implementation

GCCs should include multisectoral representation by participants who share the common goal of effective program implementation (Table 2). Local researchers and institutions should be core contributors, shaping the mission

TABLE 3 Key steps for program design and implementation[17]

1. Assess burden amenable to planned program
2. Identify prevalence of risk factors and disease burden
3. Define target population for program
4. Identify gaps and barriers to implementation
5. Estimate implementation costs of programs
6. Determine existing capacity for program development
7. Generate investments from stakeholders including advocates
8. Implement program or programs
9. Survey programs including quality assurance and patient safety
10. Reassess and modify programs based on measured outcomes

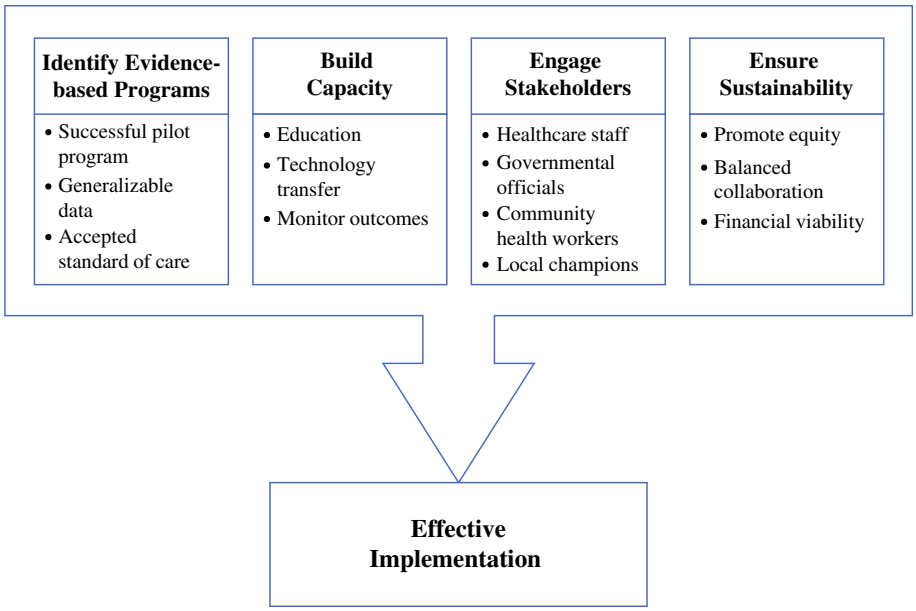

FIG. 1 Core steps required for effective implementation. Based on principles from World Health Organization, *The Bamako Call to Action on Research for Health and Disease Control Priorities,* 3rd edn (Volume: 6, Cancer; Chapter: 12)[31,32]

and serving as principal investigators and funding recipients. Local stakeholder involvement strengthens local buy-in and participation, which is necessary for effective knowledge dissemination, service integration, and program propagation.[33,34] For example, the Medical Education for Services to All Ugandans is a consortium of universities in Uganda formed through the Medical Education Partnership Initiative (MEPI) as funded by the U.S. president's Emergency Plan for AIDS Relief. MEPI supports institutions in Africa to develop core educational curricula and training programs through shared priorities with local partners.[35]

Define Shared Implementation Priorities

GCCs can work with local partners to identify essential interventions, design programs according to resource availability and local culture, and determine a stratification scheme for health service prioritization. The concept of a step-by-step implementation plan was introduced by the WHO in 2002, when it categorized health systems by low, medium, and high level of resources to reflect levels of complexity within a health system and/or health facility.[21] BHGI advanced the concept of resource-stratified guidelines by enumerating an instructive framework for coordinated decision-making.[36] The care pathways defined through resource stratification helps ensure that health programs optimize resource utilization efficiency and are integrated broadly within health systems.

Implementation and Capacity Building

A well-constructed and adaptable framework for stakeholder engagement is needed to delineate the roles of invested parties and achieve sustainable development from planning to feedback and assessment. At an early stage, GCCs should prioritize training programs for participants and educational outreach to the community in order to engage and empower key stakeholders. Sustainable service delivery then relies on the use of resources and technologies that are reliable, cost sensitive, and accessible to stakeholders. Finally, long-term programmatic success requires soliciting continued stakeholder input through surveillance and monitoring of outcomes.[37]

Training and Education GCCs can develop core educational materials to be adapted at the local level for critical education and training programs. Adapted communication strategies are needed for different populations based on access to services, levels of health literacy, socioeconomic status, cultural sensitivities, and other factors. Global experience with antiretroviral therapy for HIV demonstrated that when the public has little perceived hope for treatment success, people will not come forward to be tested or screened.[20] The celebrated Brazilian National AIDS Program utilized focused strategies to improve health literacy and access to services rather than investing solely in "cost-effective prevention"—an approach that is also valid in cancer care.[17,38]

GCCs can provide guidance on educational implementation strategies with local partners. Effective knowledge dissemination techniques include training the trainer, media campaigns, and opinion leader informational sessions.[39] Advocacy and education are an indispensable component of program implementation in settings where health literacy is limited, particularly as it relates to cancer.[20] A primary objective of the Consortium for NCD Prevention

and Control in Sub-Saharan Africa (CNCD-Africa) has been to strengthen local training and showcase local best practices.[40] Health education must extend to health professionals, particularly with the rapidly changing landscape of research knowledge and available interventions. Successful program implementation can be inadvertently disrupted by health care workers who are inadequately informed on new approaches and techniques.

Effective Use of Technology and Resources GCCs can help address implementation obstacles by identifying key equipment for programmatic cancer program development. The introduction of cost-effective esophageal stents in East Africa to provide essential palliation for patients with obstructing esophageal cancers validated the potential for collaborative high-technology projects that could be facilitated or coordinated through GCCs.[41] GCCs can create linkage between local partners and private sector collaborators to facilitate access and sustainable funding.[42] For example, the Alliance for Cervical Cancer Prevention, which consists of five partners, including the International Agency for Research on Cancer (IARC), the Pan American Health Organization (PAHO), and Program for Appropriate Technology in Health (PATH), received $US 50 million from the Bill and Melinda Gates Foundation to improve cervical cancer prevention and screening technologies globally.[43] Commercial and philanthropic partners can be invaluable collaborators in a GCC, having the potential to reduce costs of essential medications like chemotherapeutic agents, as they have done successfully with antiretroviral therapy in the fight against HIV/AIDS.[1]

Technologic advancements can also be introduced in infrastructure-poor settings achieving technology leaps that bypass intermediate acquisitions and resource costs. For example, cell phone technology and access to a mobile network is available to at least 90 % of the global community and 80 % of rural populations. The networks can be used to leverage improved cancer care delivery from prevention to palliation and coordination of services.[44] Mobile phones and biosensors have facilitated the early detection of cervical cancer in Zambia through "digital cervicography" obtained by trained nurses with mobile phones and reviewed remotely by regional consultants, which has facilitated early and effective treatment.[45] GCCs can promote other technology-intensive global research efforts. The Childhood Leukemia International Consortium and International Cancer Genome Consortium are investing in DNA technologies to better understand the role of environmental and genetic risk factors globally.[46]

With technology-based projects, sustainability is critical to assess before implementation. Advancements in surgical techniques, such as minimally invasive procedures, have accepted, demonstrable benefits but risk being relevant only in high-resource settings where funding and health infrastructure are already available.[47] Technology may be most useful when it supplements health service delivery; it can only rarely serve as a replacement for human resources.[39,48] GCCs can help provide defining principles by which technology applications are selected for given health care delivery environments.

Monitoring Outcomes Monitoring, evaluation, and quality assurance may be either a core objective of the consortium (e.g., Advanced Technology Consortium for Radiotherapy) or a component of a larger mission (e.g., CNCD-Africa) and should be introduced to augment the sustainability of any program.[40,49,50] Program monitoring can be conducted using process metrics (or outcome indicators) and other assessment tools such as quality assurance measures, checklists, structured observation, and exit interviews.[22] Process metrics are an important part of global quality assurance and, when possible, should be integrated into the WHO Health Metrics Network (http://www.who.int/healthmetrics/tools/en/).

Programs must be monitored for quality, which results in better outcomes and a more successful cancer control program. In surgical management of breast cancer, improperly performed procedures can increase the locoregional recurrence rate up to five times.[51] It is not enough to simply have a service available; the intervention must meet accepted process metrics.

Promote Equity and Balanced Collaboration

GCCs focusing on care delivery should remain oriented toward disparities in access. Facilities able to provide cancer diagnosis or treatment are usually inaccessible to poor, rural populations. There are significant deficiencies in access to the most basic cancer surgical services in many LMICs. The Alliance for Surgery and Anesthesia Presence brings together surgeons and collaborators from countries of all resource levels with a shared objective to promote strengthened health infrastructure.[52]

Currently, the majority of cancer research and funding in low-resource settings is supported by North American or European institutions.[33] However, nonlocal project leadership risks imbalanced power dynamics related to asymmetric funding or control.[29] The assigning of leadership positions to local physicians and scientists who in turn receive mentorship and guidance from GCC-designated consultants can promote innovative and sustainable programs that remain locally relevant.

CASE STUDY: BREAST HEALTH GLOBAL INITIATIVE

The BHGI philosophy is to improve breast cancer outcomes in LMIC through the collaboration of an alliance of dedicated organizations and individuals. Five successful biennial global summits were held between 2002 and 2012, convening leaders in breast cancer care from around the world, each a milestone in the progression from consensus guideline development processes to complex implementation discussions.

BHGI has served as the hub for linkages and catalysts for international pilot research as well as demonstration and education projects with global partners, producing tangible outputs. Learning laboratories have been developed to define critical in-country methodology for establishing or expanding breast cancer programs in LMICs through a diverse portfolio of implementation science projects, informed by local leadership and priorities. For example, BHGI supported the execution of an implementation study on early detection in Indonesia in which mammography and clinical breast examination were compared. The study found that in this unscreened population of 1,179 women in which 14 cancers were found, 13 were found on clinical breast examination, confirming that screening mammography adds little to cancer detection in previously unscreened LMIC populations like that of Indonesia.[53] Scaling capacity is envisaged by future pilot or demonstration projects to validate the effect of an intervention then scaling up according to resource availability.[54]

This resource stratification model for guideline development has been successfully used in a diverse spectrum of countries around the world.[55–58] The guidelines provide a tool for policy makers on how to identify deficits in resources and to inform management plans based on the status of existing services.[15] This approach has been used in other cancer types, improving health system coordination.[59,60]

ONCOLOGIC SURGERY CONSENSUS AND PRACTICE

Deficits exist in oncologic surgery consensus formation as well as implementation of established practices. Oncologic procedures must be considered a core component of cancer care, as at least 50–60 % of patients with cancer require a major operative intervention.[10,61] The knowledge and service deficits in low-resource settings are critical. Basic surgical biopsies are unavailable in the majority of district hospitals, owing to a lack of skill. Many facilities do not have reliable standards for surgical management or pain relief.

The lack of surgical training exacerbates deficits in procedural advancements such as sentinel lymph node biopsies.[62] There is an urgent need to advance oncologic surgical care by improving access to resources and introducing effective training programs. However, less than 1.5 % of research funds in the United Kingdom are currently devoted to surgical research, and there is a dearth of studies on the implementation of surgical services.[63,64]

GCCs are uniquely poised to harness the energy, generate the support and expertise, and provide the vision to improve cancer care for surgical patients globally.

CONCLUSIONS

The global knowledge and experience exist today to take effective action and improve cancer outcomes in LMICs.[20] The challenge is how to apply that knowledge through a public health framework given existing limitations in resources. Implementation of effective programs requires the formulation of evidence-based policies, the mobilization and appropriate allocation of resources, the active participation of all stakeholders, government commitment to legislation, and international collaboration in support of cancer control.[50] Surgeons, as leaders in cancer care globally, must come together with multisectoral partners, activists, and governments to advocate for action on behalf of our patients around the world.

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