A training programme to build cancer research capacity in low- and middle-income countries: findings from Guatemala

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**Problem** Guatemala is experiencing an increasing burden of cancer but lacks capacity for cancer prevention, control and research.

**Approach** In partnership with a medical school in the United States of America, a multidisciplinary Cancer Control Research Training Institute was developed at the Instituto de Cancerología (INCAN) in Guatemala City. This institute provided a year-long training programme for clinicians that focused on research methods in population health and sociocultural anthropology. The programme included didactic experiences in Guatemala and the United States as well as applied training in which participants developed research protocols responsive to Guatemala’s cancer needs.

**Local setting** Although INCAN is the point of referral and service for Guatemala’s cancer patients, the institute’s administration is also interested in increasing cancer research – with a focus on population health. INCAN is thus a resource for capacity building within the context of cancer prevention and control.

**Relevant changes** Trainees increased their self-efficacy for the design and conduct of research. Value-added benefits included establishment of an annual cancer seminar and workshops in cancer pathology and qualitative analysis. INCAN has recently incorporated some of the programme’s components into its residency training and established a research department.

**Lessons learnt** A training programme for clinicians can build cancer research capacity in low- and middle-income countries. Training in population-based research methods will enable countries such as Guatemala to gather country-specific data. Once collected, such data can be used to assess the burden of cancer-related disease, guide policies for reducing it and identify priority areas for cancer prevention and treatment.

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**Introduction**

A disproportionate burden of the recent global increase seen in cancer incidence and mortality is shouldered by low- and middle-income countries (LMICs). This is due in part to population ageing in LMICs, but shifts in the prevalences of modifiable risk factors – such as smoking and obesity – have also played a role. The United Nations and the Pan American Health Organization (PAHO) cite cancer surveillance, research and capacity building in LMICs as critical elements in the prevention and control of cancer worldwide. The World Health Organization (WHO) has emphasized the importance of capacity building that reaches beyond the development of infrastructure and resources to include the strengthening of in-country capacity for conducting high-quality research. Potter & Brough developed a “capacity model” that addressed the building of infrastructures, systems, skills and tools, particularly in LMICs. In this article, we illustrate one application of this “Potter–Brough” model that is responsive to the cancer needs of Guatemala – a lower-middle-income country in Latin America.

**Guatemala: context for capacity building**

Although cancer is the third leading cause of mortality in the country, Guatemala lacks a population-based surveillance system and only has limited services for cancer prevention and control. According to WHO – which has used Guatemala as an example of a country with a critical need to incentivize health research – the retention of “clinician researchers”, research that informs policy and systems changes, and institutional commitment are all key to building cancer research capacity in the country and addressing the country’s cancer needs.

The Instituto de Cancerología (INCAN) in Guatemala City serves as the point of referral and service for Guatemala’s cancer patients. Access to adequate medical care in general – and oncological care in particular – is so poor in many areas of Guatemala that most cancers are not diagnosed until they are advanced. More than 70% of INCAN’s patients present with late-stage disease. The country’s oncologists are keen to develop strategies to reduce the late-stage diagnoses and improve outcomes. Although INCAN focuses on diagnosis and treatment and collects no population-based data, its medical records currently provide the best data available for estimating the national cancer burden in Guatemala. Recently, INCAN’s administration expressed an interest in collecting better, population-based data on which more accurate estimates of the country’s cancer burden – and more effective initiatives for cancer prevention and control – could be based. INCAN is slowly developing into a resource for the development of agendas for the future prevention and control of cancer in Guatemala.

**Training programme**

In a partnership between INCAN and the School of Medicine of Washington University in Saint Louis (Saint Louis, United States of America), a cancer control training institute was developed at the Instituto de Cancerología in Guatemala City. This institute provided a year-long training programme for clinicians that focused on research methods in population health and sociocultural anthropology. The programme included didactic experiences in Guatemala and the United States as well as applied training in which participants developed research protocols responsive to Guatemala’s cancer needs.

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**Abstract** in العربية, 中文, Français, Русский and Español at the end of each article.
States of America), the Cancer Control Research Training Institute was developed at INCAN in September 2010. This was in response to Guatemala’s increasing cancer burden and INCAN’s recognition of the need to train clinician researchers in population health methods – so that such individuals can study and address Guatemala’s cancer needs. The long-term goal is to establish a sustainable training programme to develop capacity for research that could improve cancer-related policy health systems and disease management. Key features of the year-long programme described here included multidisciplinary training, didactic sessions, a mentored dyadic experience and applied training through the development of research protocols that are responsive to Guatemala’s needs (Fig. 1).

For the first, year-long training programme, 10 clinicians – five from the United States and five from Guatemala – were selected to participate, via a competitive application process. Participants engaged in training sessions – in English – in biostatistics, epidemiology, research methods, data collection and management, ethics and anthropology. The participants were separated into five pairs – each comprising a clinician from Guatemala and one from the United States – and each pair was matched with a mentor who was a member of the academic staff at the School of Medicine of Washington University in Saint Louis. Via e-mails and voice-over-Internet-protocol conversations, each pair and its mentor developed an early-stage research project that addressed a cancer need in Guatemala.

### Capacity-building model

#### Structures and systems

At the “ground level” of the Potter-Brough model are the structures, systems and roles that address information flow and the authority to make decisions. A key component of the Cancer Control Research Training Institute was the “buy-in” from INCAN’s leadership and the Liga Nacional Contra el Cáncer Guatemala – INCAN’s sponsor. Also crucial was a train-the-trainer model, in which a member of INCAN’s staff who had decision-making authority participated in the training programme. As INCAN does not have an institutional review board, it was arranged for a Guatemalan university – the Universidad Francisco Marroquín – to review the research protocols that were produced in the training programme. Although this arrangement set the foundation for research in the near future, INCAN’s administrators recognized the importance of establishing their own institutional review board to sustain the research capacity that they aim to build.

#### Staff and infrastructure

The second level of the Potter-Brough model addresses the presence of facilities, resources and staff to support the work being done. Our training programme relied on on-site training in two countries and Internet-based communications. These activities required

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**Fig. 1. Building cancer research capacity, Guatemala, 2012**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Inputs</th>
<th>Activities</th>
<th>Outputs</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing cancer burden, accounting for 11% of the country’s deaths</td>
<td>Funding</td>
<td>Didactic sessions: epidemiology, biostatistics, ethics, data collection and management, sociocultural anthropology</td>
<td>Research protocols</td>
<td>Short-term</td>
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<td></td>
<td>Institutional support</td>
<td>Participant–mentor meetings via VoIP</td>
<td>IRR agreement between INCAN and local university</td>
<td>Increased self-efficacy for design and conduct of research</td>
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<tr>
<td>Limited cancer prevention and control activities</td>
<td>Expertise in population-health research and anthropology</td>
<td>Identification of research questions in cancer prevention and control</td>
<td>Annual cancer seminars</td>
<td>Intermediate</td>
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<tr>
<td>No population-based cancer registry or surveillance</td>
<td>Training materials in English</td>
<td>Development of cancer research protocols responsive to Guatemala’s needs</td>
<td>Cancer pathology workshop</td>
<td>Development of an IRB at INCAN</td>
</tr>
<tr>
<td>Lack of training in population health research methods</td>
<td></td>
<td>Translation of teaching materials into Spanish</td>
<td>Qualitative methods workshop</td>
<td>Generation of basic epidemiological data to inform future population health studies on cancer</td>
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<td>INCAN journal club</td>
<td>Continued training of additional INCAN clinicians and staff</td>
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<td></td>
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<td></td>
<td>Incorporation of epidemiology materials into INCAN’s residency training</td>
<td>Use of epidemiological data to guide programmes and policies on cancer prevention and control</td>
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<td></td>
<td></td>
<td></td>
<td>Development of a national cancer registry and surveillance system</td>
<td>Long-term</td>
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INCAN, Instituto de Cancerología; IRB, institutional review board; VoIP, voice over Internet protocol.

Note: the figure shows a logic model used for a year-long training programme for clinicians. The programme was based at the newly established Cancer Control Research Training Institute – a joint endeavour of the INCAN in Guatemala City and the School of Medicine of Washington University in Saint Louis (Saint Louis, United States).
classrooms, academic staff, computer access and support and Internet connections that supported “online meetings”. We had to identify academic staff who were willing and able to add new responsibilities – trainee instruction and mentoring – to their workloads. A careful examination of existing work schedules was key to solidifying the commitment of academic staff. Administrative support for travel, scheduling and financial logistics was provided by Washington University in Saint Louis.

Skills
The third tier of the Potter–Brough model involves the building of individual-level knowledge, skills and confidence to engage in activities. These aspects of capacity building formed the crux of our training programme. It was a lack of available training in population-based cancer research for oncologists that motivated the programme’s creation. Didactic sessions were developed to build knowledge and skills in epidemiology, biostatistics, research ethics and regulation, data collection and management and sociocultural anthropology. Each of these sessions was led by an instructor with graduate-level training in public health or anthropology.

The trainee’s perceptions of their own research abilities were assessed by using a clinical research appraisal inventory. This tool, which was developed to assess clinician-scientists’ self-efficacy to perform clinical research, has been used to evaluate training programmes in clinical research. Between the initiation and end of our training programme, participants demonstrated substantial improvements in their self-perceived efficacy for study conceptualization, study planning and the ethical conduct of research (data not shown).

Tools
The fourth and final level of the Potter–Brough model describes “performance capacity” – i.e. the availability of resources needed to complete activities. The best-trained clinician researchers cannot work effectively if the resources that are available fail to meet their needs. At this level of the model, the Cancer Control Research Training Institute needed to know if the tools required for our training programme – and those required to sustain any likely future training – were available.

Before our training programme, Washington University in Saint Louis was conducting relevant coursework and activities. For our programme, these were adapted to the Guatemalan perspective. Other components of the programme were developed from scratch. For example, sessions on database management and data collection tools were not only created specifically for the programme but also adapted during the programme – to satisfy the participants’ needs as they developed their own research projects.

At the end of our training programme, it seemed clear that the ability to gather data to further Guatemala’s cancer prevention and control efforts would still be very limited if no more of INCAN’s clinicians could be trained in the relevant research methods. To begin to address this problem, INCAN translated some of the educational materials used in the training programme into Spanish and incorporated them into residency training; purchased relevant textbooks for clinician use; and established a journal club so that research discussions could be incorporated into future training.

Value-added benefits
During and after the training programme, various ancillary activities helped to build and solidify relationships that are likely to be critical to sustaining capacity for research training. In response to a dialogue initiated by the Cancer Control Research Training Institute, for example, annual cancer seminars were established in Guatemala. Each of these seminars has been built around a presentation by researchers from Washington University in Saint Louis. Although these meetings were originally planned only for INCAN’s clinicians, other clinicians from Guatemala as well as some of their counterparts from El Salvador, Honduras and Mexico, have attended recent seminars. One seminar has included a workshop on cancer pathology. At another, an anthropologist from the United States – who had worked in Guatemala – led a workshop on qualitative research and cultural competence. Clinicians from both partners involved in the training programme have met with representatives from the Liga Nacional Contra el Cáncer and the Guatemalan Ministry of Health to discuss priorities for cancer prevention, control and care in Guatemala. By highlighting the Cancer Control Research Training Institute’s activities, the Guatemalan media have helped raise awareness among the Guatemalan people about the country’s cancer burden and the need to strengthen training in cancer research to address ground-level issues such as surveillance, prevention and quality of care.

Current status
Since the end of our training programme, INCAN has established a research department and begun research collaborations with the United States National Cancer Institute, the Swiss Federal Technological Institute and the Nutrition Institute of Guatemala. Today, several of INCAN’s clinicians are engaged in research projects – on cervical and breast cancer and Mayan concepts of medicine and cancer – or, at least, applying for research grants. Most importantly, perhaps, INCAN’s administrators – in conjunction with the Guatemalan government, the International Agency for Research on Cancer, the Union for International Cancer Control and PAHO – are in the early stages of developing a national cancer registry. INCAN’s leadership credits the Cancer Control Research Training Institute with raising research interest and engaging the stakeholders needed to support the incorporation of research into INCAN’s activities.

Lessons learnt
The main lessons learnt are summarized in Box 1. Participants in our training programme,

<table>
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Lessons from the field
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This research was supported by the Fogarty International Center of the National Institutes of Health (under award number P30CA091842-11S1) and the National Cancer Institute of the National Institutes of Health (under award number R24TW008820-01). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Competing interests: None declared.

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Conclusion
INCAN’s Cancer Control Research Training Institute illustrates one approach to building capacity for cancer research, prevention and control in a low- or middle-income country such as Guatemala. By training local clinicians in research methods in population health, LMICs will be able to gather country-specific data to assess disease burden, identify priority areas for prevention and treatment, and guide policy – a critical component to addressing the global burden of cancer.12 The desired long-term outcomes specific to cancer in Guatemala include building systems to gather data for advocating for resources, guiding clinical practice, advocating for cancer prevention and control policies and monitoring the role of cancer in the health of the Guatemalan people.

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BACKGROUND

In 2014, the Guatemalan Ministry of Health and the Guatemalan Cancer Research Institute (INCAN) launched a Cancer Control Research Training Institute (the training institute will be referred to as INCAN) to train local clinicians in population health research methods to assess the burden of cancer in Guatemala. This institute was established in response to a request by the Guatemalan government. INCAN is a US-Guatemala collaborative institute that provides research training in cancer and other non-communicable diseases. The cancer control research training institute in Guatemala is funded by the National Institutes of Health (NIH) and was developed in partnership with a US academic institution.

METHODS

The training institute is a 1-year program with two main components: classroom instruction and practical field work. Classroom instruction is delivered at INCAN’s offices in Guatemala City and includes 400 hours of instruction, with 90% in Spanish and 10% in English. The classroom instruction covers research methods, including study design, sample size, data collection, statistical analysis and reporting. Practical field work includes field visits to cancer clinics and hospitals in Guatemala to observe and participate in the conduct of cancer care. The practical field work is conducted with a local clinic and includes 600 hours of field work, with 90% in Spanish and 10% in English.

RESULTS

The training institute has trained 120 local clinicians in Guatemala. Most of the participants are clinical medical doctors. The training institute has trained three cohorts of clinicians, with each cohort consisting of 40 clinicians. The training institute has received positive feedback from the participants. The participants have reported that they have improved their research skills and that they are better able to conduct research in their home countries.

CONCLUSION

The training institute has successfully trained local clinicians in Guatemala in research methods. The training institute has improved the research capacity of local clinicians in Guatemala and has contributed to the development of research capacity in Guatemala. The training institute has also contributed to the development of research capacity in other countries in the Americas through partnerships with other countries.

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Lessons from the field

Résumé

Un programme de formation pour renforcer la capacité de recherche sur le cancer dans les pays à revenu faible et intermédiaire: résultats du Guatemala

Problème Le Guatemala connaît actuellement une charge accrue de morbidité liée au cancer, mais le pays n’a pas la capacité suffisante en matière de prévention, de suivi et de recherche pour lutter contre cette maladie.

Approche En partenariat avec une faculté de médecine située aux États-Unis d’Amérique, un institut multidisciplinaire de formation et de recherche dans la lutte contre le cancer a été créé à l’Instituto de Cancerología (INCAN) dans la ville de Guatemala. Cet institut a fourni un programme de formation d’un an aux cliniciens, qui mettaient l’accent sur les méthodes de recherche dans le domaine de la santé de la population et de l’anthropologie socioculturelle. Ce programme incluait des expériences didactiques au Guatemala et aux États-Unis d’Amérique, ainsi qu’une formation pratique au cours de laquelle les participants ont développé des protocoles de recherche répondant aux besoins en matière de cancer du Guatemala.

Environnement local Bien que l’INCAN soit le point de référence et de service pour les patients atteints de cancer au Guatemala, l’administration de l’institut cherche également à augmenter la recherche sur le cancer en mettant l’accent sur la santé de la population. L’INCAN est donc une ressource pour renforcer la capacité dans le contexte de la prévention et de la lutte contre le cancer.

Changements significatifs Les stagiaires ont augmenté leur propre efficacité en matière de conception et de conduite de recherche. Les bénéfices à valeur ajoutée comprenaient l’instauration d’un séminaire annuel sur le cancer et d’ateliers de travail portant sur la pathologie du cancer et l’analyse qualitative. L’INCAN a récemment intégré certains éléments du programme dans la formation de ses internes et a créé un département de recherche.

Leçons tirées Un programme de formation pour cliniciens peut renforcer la capacité de recherche sur le cancer dans les pays à revenu faible et intermédiaire. La formation aux méthodes de recherche axées sur la population permettra aux pays tels que le Guatemala de recueillir des données spécifiques au pays. Une fois collectées, ces données peuvent être utilisées pour évaluer la charge de morbidité liée au cancer, pour orienter les politiques dans la lutte contre la maladie et pour identifier les zones prioritaires dans les domaines de la prévention et du traitement du cancer.

Resumen

Un programa de capacitación para aumentar la capacidad de investigación del cáncer en los países de bajos y medianos ingresos: hallazgos de Guatemala

Situación Guatemala tiene una incidencia de cáncer cada vez mayor, pero carece de la capacidad para la prevención, el control y la investigación del cáncer.

Enfoque En asociación con una escuela de medicina de Estados Unidos de América, se ha creado un instituto de investigación multidisciplinar para el control del cáncer en el Instituto de Cancerología (INCAN) de la
La ciudad de Guatemala. Este instituto ofreció un programa de formación de un año a médicos que se especializaban en los métodos de investigación en materia de salud pública y antropología sociocultural. El programa incluyó las experiencias didácticas en Guatemala y Estados Unidos, así como la formación aplicada en la cual los participantes desarrollaron protocolos de investigación que respondían a las necesidades de cáncer de Guatemala.

**Marco regional**
Aunque INCAN es el punto de referencia y de servicios para los pacientes con cáncer de Guatemala, la administración del instituto también está interesada en aumentar la investigación del cáncer, centrándose en la salud pública. INCAN es un recurso para desarrollar la capacidad en el contexto de la prevención y el control del cáncer.

**Cambios importantes**
Los participantes aumentaron su propia eficacia en el diseño y la realización de la investigación. Los beneficios de valor añadido incluyeron el establecimiento de un seminario de cáncer anual y talleres sobre la patología del cáncer, así como un análisis cualitativo. Recientemente, INCAN ha incorporado algunos de los elementos del programa en su capacitación residencial y ha establecido un departamento de investigación.

**Lecciones aprendidas**
Un programa de capacitación para los médicos puede aumentar la capacidad de investigación del cáncer en los países de bajos y medianos ingresos. La capacitación en los métodos de investigación basados en la población permitirá a países como Guatemala recopilar datos específicos de cada país. Tras obtener los datos, pueden utilizarse para evaluar la incidencia de las enfermedades relacionadas con el cáncer, orientar las políticas para reducirla e identificar las áreas prioritarias para la prevención y el tratamiento del cáncer.

**References**