UTS UNIVERSITY OF TECHNOLOGY SYDNEY

'Access to Radiotherapy for Cancer treatment (ARC) Project': Guidance for low and middle-income countries establishing safe and sustainable radiotherapy services

By

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the Degree of Doctor of Philosophy

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Certificate of Original Authorship

I, Andrew Donkor, declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy degree, in the Faculty of Health at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution.

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Abstract

Introduction: Efforts to improve access to cancer care, including radiotherapy services in low and middle-income countries (LMICs) is challenging. Many radiotherapy initiatives in LMICs have failed to fully deliver on their promise because of multi-faceted barriers at the systems, organisational and patient levels, leading to significant wastage of scarce resources. Greater guidance on how to assess and build LMICs' readiness for establishing sustainable radiotherapy services is needed to improve cancer care outcomes in LMICs.

Aim: The '**A**ccess to **R**adiotherapy for **C**ancer treatment (ARC) Project' aimed to provide practical guidance to LMICs on establishing safe and sustainable radiotherapy services.

Methods: The mixed qualitative methods ARC Project involved a: systematic review; and two-part qualitative study. The systematic review synthesised strategies adopted by LMICs to improve access to cancer treatment and palliative care. Semi-structured interviews undertaken with global radiotherapy experts explored perceived facilitators and barriers to establishing sustainable radiotherapy services in LMICs. The mid-point meta-inference of the systematic review and semi-structured interview data generated a draft list of requirements, which was circulated to global experts during the second part-of the qualitative study. The final meta-inference was undertaken following the completion of the three studies.

Findings: The systematic review identified that comparatively few studies have focused specifically on improving radiotherapy in LMICs, with no research evaluating effectiveness. The semi-structured interviews identified three key facilitators to establishing sustainable radiotherapy services in LMICs, namely: committing to a vision of improving cancer care; making it happen and sustaining a safe service; and leveraging off radiotherapy to strengthen integrated cancer care. The mid-point meta-inference generated 42 potential requirements, which were organised into four readiness domains: commitment (n=13); cooperation (n=7); capacity (n=17); and catalyst (n=5). The participant validation confirmed 37 of the generated requirements as relevant for inclusion in a radiotherapy service development readiness self-assessment guide for use by LMICs.

The end-point meta-inference of the ARC Project's integrated data presented the '**RE**adiness **SE**lf-**A**ssessment (RESEA) Guide', with 120 questions that may help LMICs at macro and meso level to determine and create action plans to improve their readiness to establish radiotherapy services.

Conclusions: The ARC Project has identified a complex combination of facilitators and barriers that influence the establishment of sustainable radiotherapy services in LMICs. It has developed a RESEA Guide to provide support for LMICs seeking to establish sustainable radiotherapy services. Further work is needed to evaluate the acceptability and feasibility of the RESEA Guide and inform further refinements.

Abbreviations

ARC Project	Access to Radiotherapy for Cancer treatment Project
COREQ	Consolidated criteria for Reporting Qualitative research
GLOBOCAN	Global Cancer
HICs	High-Income Countries
IAEA	International Atomic Energy Agency
ICTS	Information and Communication Technologies
LMICs	Low and Middle-Income Countries
NCDs	Non-Communicable Diseases
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
REASEA Guide	REadiness SElf-Assessment Guide
UICC	Union for International Cancer Control
WHO	World Health Organisation

Glossary of Terms

Access	Access is a complex concept and at least five aspects require consideration: • accessibility is whether the services are effectively available for utilization; • affordability is about a system for financing health services, so people do not suffer financial hardship when using them; • appropriateness indicates services available ought to be relevant to the different parts of a population in terms of their health needs and material and cultural settings so as to ensure that the population would have access to positive health outcomes; • adequacy is whether there is an adequate and continued supply of available services; and • availability is whether services are available in the first place (Souliotis, Hasardzhiev & Agapidaki 2016).
Barriers	The obstacles that impede the effective implementation, sustainability and/or scale-up of cancer treatment and palliative care strategies.
Cancer	It is an abnormal cell divide in an uncontrolled biological mechanism and has the ability to spread into or invade other tissues (Cooper & Hausman 2000).
Capacity	The LMIC's ability to translate commitment and cooperation to achieve sustainable results through effective and efficient management of the implementation process, a prepared workforce, maintenance, governance and information technology
Catalyst	The potential for LMICs to leverage from a radiotherapy service to develop an integrated cancer care service
Cooperation	The effective involvement of relevant international, national and local stakeholders in the planning, commissioning and operationalisation of a new radiotherapy service
Commitment	The LMIC's willingness to put in place the necessary political, policy, funding and regulatory requirements to enable a radiotherapy service to be established
Confirm	When a current study reinforces the findings of the previous study
Enhance	When a current study further improve the findings of the previous study
Facilitators	Enabling factors that support effective implementation, sustainability and/or scale-up of cancer treatment and palliative care strategies.
Radiotherapy	The use of high energy rays in its different forms (X-rays, Gamma rays or particles) to cure or control cancer. Radiotherapy can either be external beam or brachytherapy. External beam radiotherapy is a non-invasive method of delivering targeted radiation to a tumour using equipment such as linear accelerator. Brachytherapy, which is also known as internal radiotherapy, involves implanting radioactive directly into or next to the tumour (Deeley 2013).
Readiness	The preparedness, willingness and response to develop, implement, sustain and/or scale-up improvement strategy (or change) (Holt et al. 2007; Weiner 2009).
Implementation	It is the process that puts strategies, plans and policies into action or effect to achieve desired goals (Saunders 2015).

Requirement	It is any task, decision, procedure or necessary condition that supports the LMIC goal to establish a sustainable radiotherapy service. A requirement ideally needs to be satisfied by the LMIC for establishment a local radiotherapy service.
Stakeholder	Any individual, group or organisation that has an interest in developing, implementing and/or sustaining radiotherapy in low- and middle-income countries. They may be directly or indirectly involved with cancer radiotherapy (Bourne 2016; Fontaine, Haarman & Schmid 2006).
Sustainability	The ability or effort to maintain an improvement strategy (or change) that suits current needs without compromising or jeopardising the needs of future generations (Emas 2015).

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