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REVIEW

Barriers and facilitators to implementation of cancer treatment and palliative care strategies in low- and middle-income countries: systematic review

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Abstract

Objectives To appraise improvement strategies adopted by low- and middle-income countries to increase access to cancer treatments and palliative care; and identify the facilitators and barriers to implementation.

Methods A systematic review was conducted and reported in accordance with PRISMA statement. MEDLINE, CINAHL, and the Cochrane Library databases were searched. Bias was assessed using the Standards for Quality Improvement Reporting Excellence, and evidence graded using the Australian National Health and Medical Research Council system.

Results Of 3069 articles identified, 18 studied were included. These studies involved less than a tenth (n = 12, 8.6%) of all low- and middle-income countries. Most were case reports (58%), and the majority focused on palliative care (n = 11, 61%). Facilitators included: stakeholder engagement, financial support, supportive learning environment, and community networks. Barriers included: lack of human resources, financial constraints, and limited infrastructure.

Conclusions There is limited evidence on sustainable strategies for increasing access to cancer treatments and palliative care in low- and middle-income countries. Future strategies should be externally evaluated and be tailored to address service delivery; workforce; information; medical products, vaccines, and technologies; financing; and leadership and governance.

Keywords Neoplasms · Surgery · Radiotherapy · Chemotherapy · Palliative care · Low- and middle-income countries

Introduction

Many low- and middle-income countries (LMICs) are ravaged by significant socioeconomic and healthcare challenges, including a rapid escalation in non-communicable diseases (NCDs), particularly cancer (Meara et al. 2015). Between 1990 and 2013, the 70% increase in cancer mortality occurred in LMICs, with 196.3 million disability-adjusted life years lost (Global Burden of Disease Cancer Collaboration et al. 2015). Globally, cancer incidence is projected to increase to 22.2 million new cancer cases by 2030, and LMICs will bear the major burden (Bray et al. 2012).

To date, the focus has been on cancer prevention and screening strategies in LMICs (Hanson et al. 2015; Raesima et al. 2015). But to improve survival and quality of life, equitable access to cancer treatment and palliative care are imperative (Knaul et al. 2011). However, many LMICs lack: national policies, infrastructure, skilled workforce, financial resources, technology, and information system for quality cancer treatment and palliative care (Knaul et al. 2011; Ngwa and Ngoma 2016). Currently, 90% of cancer patients in low-income countries are unable to access quality surgical care (Meara et al. 2015; Sullivan et al. 2015) and a third of LMICs have no functional radiotherapy services (Abdel-Wahab et al. 2017), while a fifth of

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those that do have only one radiotherapy machine per five million or more population (Abdel-Wahab et al. 2017; Atun et al. 2015; Datta et al. 2014). In most LMICs, late-stage presentation is common and the only treatment option is palliative care (Knaul et al. 2011; World Health Organisation (WHO) 2007b). Yet, many LMICs are not able to provide the 52 cancer medicines and 22 pain and palliative care medicines on the WHO's List of Essential Medicines (Vanderpuye et al. 2017; Wirtz et al. 2017). Consequently, 80% of people living in LMICs have little or no access to pain relief (Knaul et al. 2017). Given these challenges, innovative, cost-effective, and applicable improvement strategies are urgently needed.

High-income countries (HICs) able to develop, implement, and sustain scale-up strategies have made progress in expanding access to cancer treatment and palliative care. Several systematic reviews focusing on access to cancer treatment and palliative care in HICs have documented: (1) facilitators such as drive for quality clinical outcomes, strong political commitment, continuity of care, financial resources, educational opportunities, and patient need for care; and (2) barriers such as lack of knowledge, lack of awareness and support, competing priorities, and pervasive misconceptions about treatment quality (Chamberlain et al. 2016; Luckett et al. 2013; Obeidat et al. 2011; Thompson et al. 2017).

Understanding barriers and facilitators across policy, healthcare organisation and community are essential to inform access strategy implementation (WHO 2002a). Few systematic reviews in this area have focused on LMICs, which continue to hamper strategy implementation required to optimise cancer treatment and palliative care efforts. Accordingly, the aims of this systematic review were to: appraise improvement strategies adopted by LMICs to increase access to cancer treatment and palliative care; and identify the facilitators and barriers to implementation.

Methods

A systematic review conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Moher et al. 2009).

Eligibility criteria

Included studies were: all conducted in countries categorised by the World Bank Group (2017) Classification as being 'low income', 'middle income', 'developing', 'less resourced' or 'limited resourced'; published in an English peer-reviewed journal since 1990; reporting empirical data related to the impact of a strategy, intervention, or programme designed to improve access to cancer surgery, radiotherapy, cancer medicines, and/or palliative care. An 'access improvement strategy' was defined as any programme, plan, intervention, or policy implemented to ensure cancer surgery, radiotherapy, chemotherapy, other essential cancer medicines, and/or palliative care services which were more available, accessible, adequate, affordable, and appropriate. Studies focusing exclusively on cancer prevention or early detection were excluded.

Information sources and search strategy

Search terms were devised from relevant Cochrane Reviews (Dudley and Garner 2011; Kredo et al. 2013). A combination of Medical Subject Headings (MeSH) and keywords for LMICs, cancer, treatment modalities, and healthcare delivery were used. Table ESM 1 in the Online Resource shows the detailed search strategy.

Between 4th April and 6th May 2017, three electronic databases—MEDLINE (EBSCO), CINAHL (EBSCO), and the Cochrane Library, were searched for relevant articles. These were selected, as they provide indexing for extensive international journals and regularly updated with relevant resources covering health topics. Reference lists of relevant articles were hand-searched to identify additional articles. Articles were exported to, and managed in, EndNote X8 software.

Study selection

After the removal of duplicates, all titles and abstracts were screened against the eligibility criteria (AD). Ten per cent of the articles were screened by a second reviewer (TL), with 98.5% agreement being reached. Ineligible articles were removed. Full text of all potentially relevant articles was retrieved, and further eligibility and quality assessments were undertaken by AD alone, with discussions among the wider team as necessary.

Data items and collection process

Data were extracted into a standardised data collection form using Microsoft Excel 2016 (AD) guided by a modified Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) tool (Ogrinc et al. 2016).

Quality assessment

The quality of the studies was also assessed based on SQUIRE (AD). The Australian National Health and Medical Research Council-approved rating system was used to rank the level of evidence.

Synthesis

The multi-level WHO Innovative Care for Chronic Conditions (ICCC) framework was adopted as the analytical framework for this review (WHO 2002a). This framework details the essential building blocks for action at the: micro-levels (patient and family), meso-levels (healthcare organisation and community), and macro-levels (positive policy environment) for developing and re-designing healthcare systems globally (refer Fig. 1; WHO 2002a). The ICCC framework also integrates the six building blocks identified by the WHO as being necessary for strengthening health systems globally, namely service delivery; health workforce; information; medical products, vaccines, and technologies; financing; and leadership and governance (stewardship) (WHO 2007a).

Due to the range of designs and outcomes involved, a narrative synthesis using approaches described by Popay and et al. (2006) was adopted. Included studies were independently coded by two reviewers (AD and TL) to map strategies against the ICCC framework levels. Any discrepancies were resolved through discussion.

Results

The initial search identified 3063 articles, with another six identified during hand searching. After removal of duplicates and screening, 138 articles underwent a full-text review. Nineteen articles met inclusion criteria, with one study reported across two publications (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009; refer Fig. 2).

Study characteristics

Evidence on strategies for increasing access to cancer treatments and palliative care came from 12 different LMICs, mostly African nations. Table ESM 2 in the Online Resource shows the strategies in the included studies.

The majority of studies (61%, $n = 11$) focused on increasing palliative care access (Ali 2016; Banerjee 2009; Boit et al. 2014; Gafer and Elhaj 2014; Herce et al. 2014; Krakauer et al. 2015; Lal et al. 2015; Paiva et al. 2012; Shamieh and Hui 2015; Tapsfield and Bates 2011; Wang et al. 2013), while a fifth (22%, $n = 4$) focused on strengthening radiotherapy services (Agrawal et al. 2011; Efstathiou et al. 2016; Einck et al. 2014; Galalae et al. 2015). A tenth (11%, $n = 2$) focused on improving integrative cancer care (Brown et al. 2017; Nwogu et al. 2016), and only one study focused on improving anti-cancer drug access (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009).

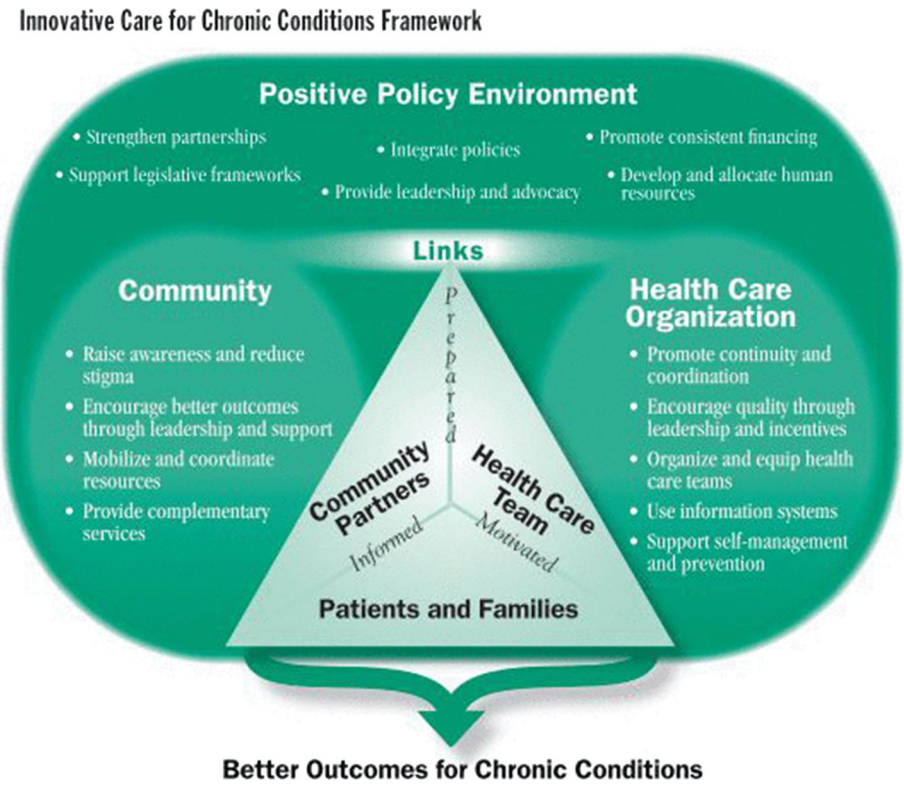

Fig. 1 Innovative care for chronic conditions framework adapted with permission granted by WHO (2002a)

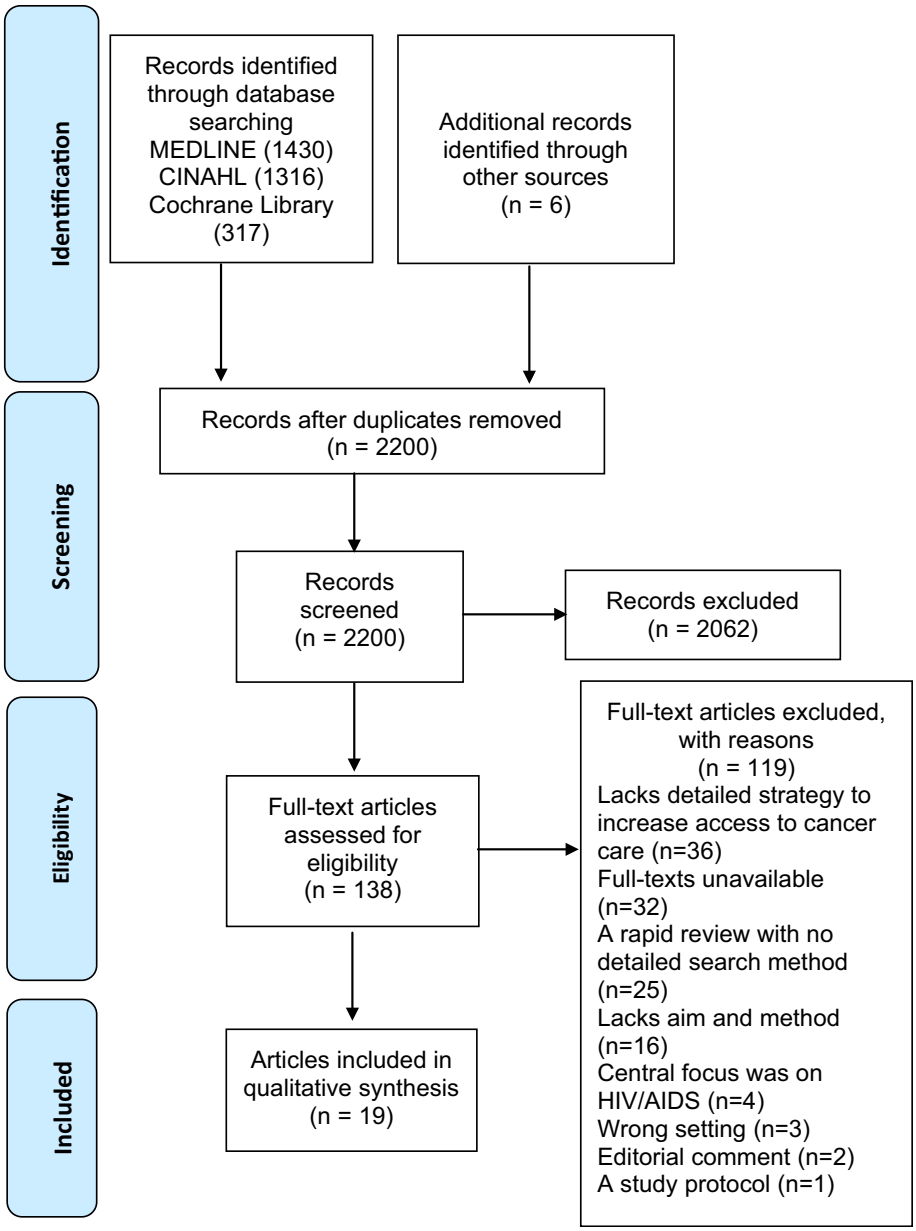

Fig. 2 Flow diagram illustrating study search and selection in the systematic review on barriers and facilitators to implementation of cancer treatment and palliative care strategies in low- and middle-income countries

Quality assessment

Apart from one (Wang et al. 2013) randomised controlled trial (RCT), with high cross-group contamination, the studies all generated low-level evidence predominately from case reports (n = 11, 61%; Agrawal et al. 2011; Ali 2016; Boit et al. 2014; Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015; Krakauer et al. 2015; Nwogu et al. 2016; Shamieh and Hui 2015). Overall, the studies were of poor quality. None were underpinned by a conceptual framework or theory; two-thirds (67%, n = 12) did not evaluate the strategy (Ali 2016; Banerjee 2009; Boit et al. 2014; Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014; Garcia-Gonzalez et al. 2015; Krakauer et al. 2015; Nwogu et al. 2016; Shamieh and Hui 2015; Tapsfield and Bates 2011); 44% (n = 8) did not describe the methods (Boit et al. 2014; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015; Krakauer et al. 2015; Shamieh and Hui 2015); and less than a third (n = 5) had secured ethics approval (Galalae et al. 2015; Herce et al. 2014; Paiva et al. 2012; Tapsfield and Bates 2011; Wang et al. 2013).

Positive policy environment facilitators and barriers

Seven main positive policy environment facilitators emerged as being crucial to the successful implementation of the access improvement strategies (refer Table 1). Stakeholder engagement (Agrawal et al. 2011; Ali 2016; Banerjee 2009; Boit et al. 2014; Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015; Herce et al. 2014; Kanavos et al. 2009; Krakauer et al. 2015; Nwogu et al. 2016; Tapsfield and Bates 2011) and financial support (Agrawal et al. 2011; Ali 2016; Boit et al. 2014; Brown et al. 2017; Efstathiou et al. 2016; Gafer and Elhaj 2014; Garcia-Gonzalez et al. 2015; Herce et al. 2014; Kanavos et al. 2009; Nwogu et al. 2016; Tapsfield and Bates 2011) were identified as critical facilitators across all access improvement strategies implementation. Embedding a shared understanding of the project importance and the proposed action(s) and facilitating a sense of co-creation and ownership were the key primary focus of the stakeholder engagement strategies implemented across the projects. Through the co-creation of a cancer centre, there was an estimated 17% average annual increase in cancer patients accessing care which was observed between 2014 and 2016 (Nwogu et al. 2016).

Five key positive policy environment barriers that impeded the implementation of the planned access improvement strategies were identified. Across four studies, lack of human resources was the most critical barrier to the implementation of access improvement strategies (Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014). Several studies acknowledged financial constraints and lack of political commitment as major barriers to implementation (Ali 2016; Nwogu et al. 2016). Collectively, these identified barriers contributed to: strategy implementation delays (Ali 2016; Gafer and Elhaj 2014), high health professionals workloads (Efstathiou et al. 2016; Einck et al. 2014), and patients experiencing long waiting times to be seen by health professionals (Brown et al. 2017; Nwogu et al. 2016).

Healthcare organisation facilitators and barriers

Of the eight healthcare organisation facilitators identified, creating a supportive learning environment was key to increasing integrated cancer care, radiotherapy, and/or palliative care access. Thirteen studies with varying levels of evidence reported creating a supportive learning environment for health professionals to develop specialist and generalist knowledge and skills (Agrawal et al. 2011; Ali 2016; Banerjee 2009; Boit et al. 2014; Brown et al. 2017; Gafer and Elhaj 2014; Herce et al. 2014; Krakauer et al. 2015; Lal et al. 2015; Nwogu et al. 2016; Paiva et al. 2012; Shamieh and Hui 2015; Tapsfield and Bates 2011). The RCT reported a significant increase in patients' knowledge of cancer pain and pain control by employing task-shifting strategy ($p < 0.05$; Wang et al. 2013). Few studies targeted financial hardship and treatment adherence by offering free access to essential cancer and palliative care medicines (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009; Lal et al. 2015). While a significant increase in survival could not be determined in a retrospective review of the outcome of the free drug donation strategy, a three-year survival rate of 66% was reported among 13,568 patients (Kanavos et al. 2009). Access improvement strategies tailored to local resources and conditions generated better acceptance of the changes (Einck et al. 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015).

Ten healthcare organisation barriers to access improvement strategies implementation were identified, with the majority related to radiotherapy access, such as limited physical infrastructure (Efstathiou et al. 2016; Einck et al. 2014), lack of radiotherapy equipment (Efstathiou et al. 2016; Einck et al. 2014), and radiotherapy equipment maintenance difficulties (Efstathiou et al. 2016). Untimely, delivery of appropriate radiotherapy doses was a major negative consequence. The most challenging aspect of chemotherapy access improvement strategies was: poor Internet connectivity, identifying and verifying eligible cancer patients, as well as maintaining communication between strategy providers and health professionals (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009). While a small number of studies suggested that prohibitive cancer treatment cost limited access for cancer patients and their families (Einck et al. 2014; Nwogu et al. 2016), no economic evidence estimating the direct and indirect treatment costs was provided.

Community facilitators and barriers

Two community facilitators that supported the successful implementation of integrative cancer care and palliative care access improvement strategies were identified (Boit et al. 2014; Herce et al. 2014; Nwogu et al. 2016). Across two studies, community networks were important providers of complementary services, such as socioeconomic supports (Boit et al. 2014; Herce et al. 2014). A critical facilitator was mobilising and coordinating community resources. One study acknowledged that establishing a non-governmental organisation (NGOs) offered unique opportunities to mobilised funds and coordinated with other community institutions to foster greater community buy-in of improvement strategies (Nwogu et al. 2016).

Table 1 Summary of the facilitators and barriers to implementation of cancer treatment and palliative care strategies in low- and middle-income countries, 1990–2017

ICCC levels	Facilitators	Barriers
Positive policy environment	Prepared health professionals (Ali 2016; Banerjee 2009; Boit et al. 2014; Brown et al. 2017; Gafer and Elhaj 2014; Herce et al. 2014; Krakauer et al. 2015; Nwogu et al. 2016; Paiva et al. 2012; Shamieh and Hui 2015; Tapsfield and Bates 2011)	Lack of human resources (Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014)
	Financial support (Agrawal et al. 2011; Ali 2016; Boit et al. 2014; Brown et al. 2017; Efstathiou et al. 2016; Gafer and Elhaj 2014; Garcia-Gonzalez et al. 2015; Herce et al. 2014; Kanavos et al. 2009; Nwogu et al. 2016; Tapsfield and Bates 2011)	Financial constraints (Ali 2016; Nwogu et al. 2016)
	Political commitment (Agrawal et al. 2011; Ali 2016; Brown et al. 2017; Efstathiou et al. 2016; Herce et al. 2014; Krakauer et al. 2015)	Limited political commitment (Ali 2016; Nwogu et al. 2016)
	Stakeholder engagement (Brown et al. 2017; Nwogu et al. 2016; Agrawal et al. 2011; Ali 2016; Banerjee 2009; Boit et al. 2014; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015; Herce et al. 2014; Kanavos et al. 2009; Krakauer et al. 2015; Tapsfield and Bates 2011)	Restrictive pharmacovigilance laws and regulations (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009)
	Positive relationships with international organisations (Ali 2016; Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014; Galalae et al. 2015; Krakauer et al. 2015; Nwogu et al. 2016)	Drug importation process challenges (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009)
	Committed champions (Ali 2016; Banerjee 2009; Boit et al. 2014; Gafer and Elhaj 2014; Herce et al. 2014; Krakauer et al. 2015; Nwogu et al. 2016)	
	Strategy aligned with national policy(Efstathiou et al. 2016)	
Healthcare Organisation	Supportive learning environment (Agrawal et al. 2011; Ali 2016; Banerjee 2009; Boit et al. 2014; Brown et al. 2017; Gafer and Elhaj 2014; Herce et al. 2014; Krakauer et al. 2015; Lal et al. 2015; Nwogu et al. 2016; Paiva et al. 2012; Shamieh and Hui 2015; Tapsfield and Bates 2011)	Limited physical infrastructure (Banerjee 2009; Efstathiou et al. 2016; Einck et al. 2014; Gafer and Elhaj 2014)
	Recognition of patients' needs (Banerjee 2009; Brown et al. 2017; Gafer and Elhaj 2014; Garcia-Gonzalez et al. 2015; Herce et al. 2014; Kanavos et al. 2009; Lal et al. 2015; Nwogu et al. 2016; Paiva et al. 2012; Shamieh and Hui 2015; Wang et al. 2013)	Prohibitive treatment costs (Einck et al. 2014; Nwogu et al. 2016)
	Patient symptom management education (Banerjee 2009; Gafer and Elhaj 2014; Herce et al. 2014; Lal et al. 2015; Paiva et al. 2012; Shamieh and Hui 2015; Wang et al. 2013)	Lack of WHO essential pain and palliative care medicines (Gafer and Elhaj 2014)
	Strategy coordinator (Herce et al. 2014; Shamieh and Hui 2015; Tapsfield and Bates 2011)	Fragmented health system (Efstathiou et al. 2016)
	Adherence to evidence-based practice (Einck et al. 2014; Galalae et al. 2015)	Irregular meeting attendance (Agrawal et al. 2011; Brown et al. 2017)
	Strategy tailored to local resources and conditions (Einck et al. 2014; Galalae et al. 2015; Garcia-Gonzalez et al. 2015; Kanavos et al. 2009)	Limited or lack of radiotherapy equipment (Brown et al. 2017; Efstathiou et al. 2016; Einck et al. 2014; Nwogu et al. 2016)
	Information management system (Brown et al. 2017; Nwogu et al. 2016)	Poor Internet connectivity (Agrawal et al. 2011; Garcia-Gonzalez et al. 2015; Kanavos et al. 2009)
	Clearly defined strategy objectives (Agrawal et al. 2011; Brown et al. 2017; Galalae et al. 2015)	Radiotherapy equipment maintenance difficulties (Efstathiou et al. 2016)
		Periodic radiotherapy equipment breakdown (Efstathiou et al. 2016)
		Unstable electricity supply (Efstathiou et al. 2016)

Table 1 (continued)

ICCC levels	Facilitators	Barriers
Community	Strong community networks (Boit et al. 2014; Herce et al. 2014)	Culturally related beliefs, attitudes, and practices towards cancer and treatment modalities (Efstathiou et al. 2016; Gafer and Elhaj 2014)
	Mobilisation and coordination of resources (Nwogu et al. 2016)	

ICCC Innovative Care for Chronic Conditions

Culturally related beliefs, attitudes, and practices towards cancer and treatment modalities were the only community-level barrier identified which adversely impacted on communities or individuals' non-acceptance of the radiotherapy and palliative care access improvement strategies on offer (Efstathiou et al. 2016; Gafer and Elhaj 2014).

Discussion

Unfortunately, there is no high-level evidence to recommend any particular strategy to increase access to cancer treatments or palliative care in LMICs. Most strategies have focused on increasing palliative care, and none on increasing access to surgical care, the mainstay of curative cancer care (Sullivan et al. 2015).

No strategies to date have been robustly evaluated or have included a health economic evaluation. None have made use of an implementation framework. However, despite limitations in the quality of the studies, the literature yields valuable insights of relevance to policy-makers, financiers, and researchers.

The included studies revealed numerous facilitators and barriers affecting the successful implementation of access improvement strategies at all three levels of the ICCC framework. These facilitators and barriers were complex and overlapping, concerned with: stakeholder engagement, financial support, supportive learning environment, strong community networks, lack of human resources, financial constraints, and limited infrastructure. These results confirm the complexity of implementing healthcare change, which requires an understanding of: processes of implementation; factors affecting implementation; the introduction of solutions, scale-up, and longer-term sustainability (Nilsen 2015; Peters et al. 2013).

Financing, partnership, legislative frameworks, policy integration, leadership and advocacy, development and allocation of human resources are key requirements of a positive policy environment (WHO 2002a). This review has highlighted the importance of acquiring the necessary financial support before embarking on any access improvement strategy. Financing of access improvement strategies determines who provides funds and who exercises influence over the funds. International donors increasing their financing priority have been the key driving force for strengthening palliative care services in LMICs (Ali 2016; Boit et al. 2014; Gafer and Elhaj 2014; Herce et al. 2014; Tapsfield and Bates 2011), while locally based NGOs ability to established international ties is central to mobilising international funds for other cancer treatment initiatives (Nwogu et al. 2016). Donor funding approach for a specific purpose restricts strategy scope and limits the sponsors' ability to address unique local needs. This mismatch contributes to poor strategy acceptance at the local level.

The private sector's financial participation in the health sector in most LMICs has contributed significantly to the availability of radiotherapy (Efstathiou et al. 2016), chemotherapy (Garcia-Gonzalez et al. 2015; Kanavos et al. 2009), and integrated cancer care (Nwogu et al. 2016). However, private sector financing approach in LMICs exposes patients without private health insurance and their families, who make up most of these populations, to extreme financial hardships, making it impossible for them to pay or adhere to care. As universal health coverage is yet to be fully realised in most LMICs (WHO and World Bank 2015), medical expenses related to cancer treatments continue to serve as a barrier to the successful improvement strategies implementation (Einck et al. 2014; Nwogu et al. 2016). There is an urgent need to institutionalise an appropriate financing system at the national level that offers the right financial incentives for providers and protects cancer patients from financial hardships (WHO 2007a).

Policies at the international, national, and regional levels are major issues in the successful implementation of access improvement strategies. This review identified a paucity of evidence about policy development and implementation to improve access to cancer treatments and palliative care. Recently, WHO (2002a, b) has assumed a more central position in providing supports for policy development process in most LMICs, which is crucial to driving in-country reform. A cancer policy framework helps guide critical decisions and systematic course of actions by governments and other stakeholders, both of which are essential to improving cancer control (Adshead and Thorpe 2008). In LMICs, there remains a significant need for:

credible policy agenda setting, realistic policy formulation, timely policy implementation, and periodic policy monitoring and evaluation using a theoretical framework (Exworthy 2008). Successful design and implementation of LMIC cancer control policies require high-quality health services research evidence, long-term commitment of resources, institutional capacity to enhance sustainability and reach of the policy, and co-designed approaches. While most of the cancer control policies developed in HICs offer useful starting points, LMIC policy-makers and supporting partners should consider the context, and power to obtain a full understanding of local policy process (Exworthy 2008).

Our findings are consistent with other literature on the need to gain commitment and buy-in from key stakeholders, especially those in positions of authority (Ramaswamy and Gouillart 2010). Meaningful engagement of key stakeholders plays an essential role in achieving commitment at the political and community levels. Participatory and co-design-driven approach to implementation will assist in structuring health services to deliver effective, safe, and quality cancer treatments and palliative care. Participatory approach offers stakeholders a more active and significant role in: defining their priorities, diagnosing their challenges, securing funds, and implementing appropriate solutions for service improvement (Bate and Robert 2006).

The ICCC framework employs a population health approach including: promoting continuity and coordination, encouraging quality through leadership and incentives, organising and equipping healthcare teams, using information systems, and supporting self-management and prevention (WHO 2002a). The performance of the health workforce drives health system improvement strategies and determines how care is delivered. Developing and strengthening a country-based and country-led health workforce education initiative with appropriate international support is essential (Chen et al. 2004) if a responsive, fair, and efficient health outcome is to be realised. A country-based educational strategy helps reduce the outward migration of skilled health professionals from LMICs to HICs. An essential step towards achieving universal access to quality cancer treatments and palliative care is shifting human resource responsibilities and providing generalist doctors, nurses, allied health professionals, clinical pharmacists and community health workers with the necessary training, assessment tools, and essential medicines to deliver appropriate hospital and home-based care (Knaul et al. 2017; Knaul et al. 2011).

Implementation was largely affected by essential equipment challenges, particularly radiotherapy. Essential medical equipment, such as linear accelerators and high-dose-rate brachytherapy, is of paramount importance in cancer treatments and palliative care. Access to essential medical equipment provides the required assurance of quality, safety, efficacy, cost-effective, and scientific care delivery (WHO 2007a). However, most LMICs: lack essential radiotherapy equipment, are faced with periodic radiotherapy equipment breakdowns, or have poor radiotherapy equipment maintenance culture. Given that radiotherapy equipment is expensive to install, it is imperative to develop and implement specific preventive and corrective maintenance schedules, procedures, and tasks to reduce unnecessary operational interruptions due to breakdowns. These challenges are part of a broader medical equipment problem in most LMICs. Hence, to improve access to essential medical equipment, there is a need to develop simple, quality, and affordable medical technologies. By designing and engineering tools, and techniques less than 500 nm in size, emerging field of nanotechnology offers significant opportunity in overcoming different barriers to cancer treatments (Cuenca et al. 2006). Such technologies can help reduce the size, weight, shielding, and shipping costs of medical equipment. Moreover, the technological advances can lead to a reduction in power consumption necessary for operating the equipment, and limited heat production. There should be greater emphasis on developing solar-powered equipment with high-quality insulation to limit the dependence on national power grid (Atun et al. 2015).

The ICCC framework assigns significant emphasis to the community, acknowledging both the individuals living in a place and the place itself (WHO 2002a). Informed and prepared community resources help to promote awareness and reduce stigma, provide leadership and support, and deliver complementary services to ensure better outcomes for chronic care conditions (WHO 2002a). Recognising that community agencies, organisations, institutions, opinion leaders, and concern citizens are major stakeholders in strengthening cancer treatments and palliative care delivery will require promoting acceptance and understanding of the notion of community involvement in health and development (Kahssay and Oakley 1999). The community development literature may prove useful in designing and implementing access improvement strategies. By definition, community development contributes to resource mobilisation, local empowerment, capacity development, and growth of political action through a network of relationships to help include the perspective and experience of grassroots (Helling et al. 2005).

Identified gaps

Investing and expanding surgical and radiotherapy capacity ought to be an important priority for all LMICs. Well-established knowledge of the minimum standards for

quality cancer surgery and radiotherapy already exist and include: establishing or adopting national accreditation systems, scaling up surgical and radiotherapy workforce, providing competency licence, and aligning surgical and radiotherapy access with universal health coverage (Atun et al. 2015; Meara et al. 2015; Sullivan et al. 2015).

Another gap relates to the lack of incentives and rewards available for health professionals in LMICs. Incentives and reward systems should be created for motivating health professionals. Both financial and non-financial incentives are essential to encourage health professionals to effectively perform, and engage in innovative clinical practice (WHO 2002a).

While there is an urgent need to increase the access to best evidence-based cancer care for people living in LMICs, this review highlights the importance of access to: universal health insurance, so that more people who need cancer care can afford to access the care they need; and essential cancer and palliative care medications, as per the WHO lists.

Future directions

There are opportunities to draw valuable lessons from the experience in developing and implementing HIV/AIDS strategies in LMICs, as well as cancer treatment and palliative care strategies in HICs. Key among these lessons are: global mobilisation and investment funds, engagement of pharmaceutical companies, development of simply health technologies, strengthening health workforce capacity, development of a supportive national policy framework, connecting health system with community resources, and community participatory in strategy development (Khumalo-Sakutukwa et al. 2008; Knaul et al. 2011; Muthee et al. 2018; Narayan et al. 2011). Recognising the importance of national policies in cancer control; dedicated financial budgets supporting cancer control; high level of advocacy and community involvement in strategy design; strong political support and acceptability of cancer control strategies; progress in cutting-edge technological advancements; and promoting high-quality cancer research and evidence-based treatment are critical to taking cancer care in LMICs to the next stage of their development (Knaul et al. 2011; Obeidat et al. 2011; Thompson et al. 2017).

Applying existing implementation research theories to future strategy designs will assist in strengthening the work undertaken to improve access to cancer treatments and palliative care in LMICs. Further research assessing LMICs' readiness to develop access improvement strategies as an essential precursor to an effective adoption is an important next step. A readiness assessment provides strategy implementers with a preliminary understanding of the barriers and facilitators they are likely to encounter when implementing improvement strategies (Helfrich et al. 2009). To help prioritise actions and mitigate implementation barriers, increased focus on readiness is needed so that evidence base for LMICs capacity, preparedness, commitment, and willingness to support cancer treatment and palliative care strategy implementation, sustainability, and scale-up is available to assist policy-makers. Such focus is of particularly importance to expanding access to cancer treatment and palliative care in LMICs.

Strengths and limitations

The systematic search of articles and application of an internationally recognised framework are strengths of this review. While this review distilled various facilitators and barriers to the successful implementation from the studies, these were not systematically or explicitly investigated using primary research techniques. The results should be interpreted with caution because the studies included were low-level evidence, at the descriptive level except for one randomised control trial (Wang et al. 2013). None of the studies referenced the ICCC framework, which may not be an ideal 'fit' for some countries' health systems.

Conclusion

While modest progress has been made to increase access to cancer treatments and palliative care in LMICs, some major gaps still exist. In taking this work forward, LMICs are advised to adopt internationally recognised frameworks, such as the ICCC or the WHO's action framework intended to strengthen health systems to improve health outcomes to assist leaders to assess local population needs and integrate initiatives systematically, engage with the appropriate stakeholders, and secure the necessary financial support. It is essential to include an evaluation plan and budget during the development of the access improvement strategy. Needs assessment and design evaluation should be undertaken by an independent evaluator to ensure that a reliable blind outcome-based analysis is generated.

Authors' contributions All the authors contributed to the study design, manuscript development, editing, and completion of the manuscript. The article search and management were performed by AD. Article screening was completed by AD, and TL independently screened 10% of the articles. Quality assessment and study description were performed by AD. Coding of studies to the ICCC framework was performed by AD and TL. Data reduction was performed by AD and consensus discussions and finalising with JP, TL, and SA. Table design was completed by AD, JP, and TL.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article is based on a secondary analysis of the existing literature and does not contain any studies with human participants or animals performed by any of the authors. Good scientific standards have been followed according to the PRISMA statement.

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