OXFORD

A Systematic Review of Patient Education Strategies for Oncology Patients in Low- and Middle-Income Countries

Karryn Christiansen[1], Lori Buswell[2], iD **, Temidayo Fadelu**[*,2,3,] iD

[1]Center for Global Health, Colorado School of Public Health, Aurora, CO, USA
[2]Division of Population Sciences, Department of Medical Oncology, Dana-Farber Cancer Institute, Boston, MA, USA
[3]Harvard Medical School, Boston, MA, USA
[*]Corresponding author: Temidayo Fadelu, MD, MPH, Dana-Farber Cancer Institute, 450 Brookline Avenue, MA-1B-17, Boston, MA 02215, USA.
Tel: +1 617 632 6401; Email: temidayo_fadelu@dfci.harvard.edu

Abstract

Introduction: Patient education can facilitate early cancer diagnosis, enhance treatment adherence, and improve outcomes. While there is increasing cancer burden in low- and middle-income countries (LMICs), there is little research to inform successful patient education in these regions. This systematic review summarizes the existing literature on oncology education and evaluation strategies in LMICs, identifies best practices, and highlights areas which require further investigation.

Methods: The review was conducted using PRISMA guidelines and an a priori protocol. Four databases (Ovid Medline, Cochrane Libraries, Embase, and Cabi) were searched in December 2021. Two independent reviewers evaluated studies for inclusion. Using a coded data extraction form, information was collected about the study site, intervention characteristics, and evaluation methods.

Results: Of the 2047 articles generated in the search, 77 met the inclusion criteria. Twenty-four countries were represented; only 6 studies (8%) were in low-income countries. The most common education methods included technology-based interventions (31, 40%) and visual pamphlets or posters (20, 26%). More than one education method was used in 57 (74%) studies. Nurses were the most frequent educators (25, 33%). An evaluation was included in 74 (96%) studies, though only 41 (55%) used a validated tool. Patient knowledge was the most common measured outcome in 35 (47%) studies.

Conclusions: There is limited empiric research on oncology patient education in LMICs. The available data show heterogeneity in education approaches and gaps in evaluation. Further research to determine successful patient education and evaluation strategies is urgently needed to improve treatment cancer outcomes in LMICs.

Key words: cancer education; patient education; education materials, LMICs.

Implications for Practice

As the cancer burden rises in low- and middle-income countries (LMICs), it is imperative to implement effective patient education strategies to facilitate early cancer diagnosis and support treatment adherence. This systematic review summarizes the status of the literature on oncology patient education in LMICs. Education and evaluation strategies were heterogeneous across the 77 studies identified. Several gaps were noted, including lack of representation from low-income countries; limited use of an undergirding theory or framework in development of patient education programs; and insufficient rigor of evaluation. Future studies are required to address these gaps in order to improve LMIC cancer outcomes.

Introduction

Cancer is the second leading cause of death globally with almost 10 million deaths in 2020, nearly 70% of which occurred in low- and middle-income countries (LMICs).[1,2] As cancer incidence and cancer-related mortality continue to rise in LMICs, these countries with weak economic and healthcare infrastructure will be further burdened by premature mortality and lost years of productivity.[3,4] Consequently, developing strategies to address this growing burden is an urgent global public health priority. In order to achieve the sustainable development goals target of reducing premature mortality from non-communicable disease by one-third by

2030, improving cancer management and outcomes in LMICs is paramount.[5]

Numerous studies have examined the factors associated with higher cancer mortality rates in LMICs compared with high-income countries (HICs). Some of these factors derive from the environmental context, such as low access to healthcare services, low capacity to diagnose or treat in-country, lack of skilled workforce, and poor medical infrastructure.[6,7] Other factors are attributable to individual behaviors, such as delays in seeking healthcare for new symptoms, often resulting in late-stage cancer diagnoses.[8] Reports show that over 50% of people diagnosed with breast cancer in LMICs have

advanced stages of disease at diagnosis, which is associated higher mortality rates.[9] Late cancer presentation may occur for a number of reasons, such as lack of awareness of cancer symptoms or screening resources, fatalist beliefs, fear of a cancer diagnosis, and societal stigma against people living with cancer.[10,11]

Knowledge gaps are also a key factor impacting an individual's ability to manage their cancer diagnosis, treatment, and side effects. Ultimately, these gaps may also contribute to poorer outcomes. Health behavior theories suggest that people are more likely to adhere to treatment protocols when they understand the disease and treatment.[12] Elements from 2 health behavior theories, the Health Belief Model and the Integrated Behavior Model, were adapted into the framework shown in Fig. 1 to show how knowledge may impact patient behaviors such as participation in cancer screenings and adherence to treatment protocols.[13,14] The framework demonstrates how knowledge affects an individual's perceptions of the severity and threat of an illness, as well as how the individual perceives others with the disease. These perceptions may impact an individual's intent to engage in a health-related behavior. An individual's intention to engage in a behavior is also affected by their knowledge of the treatment process. When patients are knowledgeable about a treatment, they often have increased confidence in their ability to receive treatment and increased perceived control during the process. The model also shows how the other factors, both internal (such as personal habits) and external (such as transportation), can moderate the path from intention to engagement, and ultimately lead to performance of a desired behavior.

Patient education is a potentially modifiable aspect of cancer care delivery that could contribute to better treatment outcomes and improved quality of life. However, very little is known in LMICs about optimal oncology patient education strategies, such as format of education, duration, type of educator, and technology use, or about the impact of patient education on care process and outcomes.

While there have been prior reviews of oncology patient education strategies, they have focused primarily on HICs with limited representation of LMICs.[15-17] Other reviews that have included LMICs have focused on a specific element (for example, pain or fatigue) or on one cancer type (breast, cervical, or colorectal cancer).[18-22] For example, a 2021 systematic review was limited to digital health strategies for cervical cancer.[18] Hence, the goal of this systematic review is to comprehensively summarize the literature on oncology patient education strategies specific to LMICs and to identify gaps in order to set priorities for future research. This review includes all cancer types and may involve any stage of the cancer continuum, from prevention and early detection to survivorship. We also aim to capture implementation details of the educational interventions, including evaluation methods.

Materials and Methods

This systematic review was conducted following the Preferred Items for Systematic Reviews and Meta-Analyses-Protocol (PRISMA-P) guidelines and an a priori protocol was registered on PROSPERO (2022 CRD42022295995).[23,24]

Search Strategy

Four databases were searched for this review: Ovid MEDLINE, Embase, the Cochrane Library, and CABI Global Health. The search included all publications from the inception of the databases up to when the search was conducted, on December 3, 2021. The search strategy was developed with assistance from a medical librarian using Medical Subject Headings related to oncology, patient education, and LMICs; a detailed search strategy is included in Appendix I.

Eligibility Criteria

Eligible studies included all published studies that discussed a specific education intervention that targeted oncology concepts across the cancer continuum, including screening, active treatment, palliation, and survivorship. To be eligible for inclusion, the study had to occur in an LMIC, as defined by the 2019 World Bank classification.[25] Abstracts, editorials,
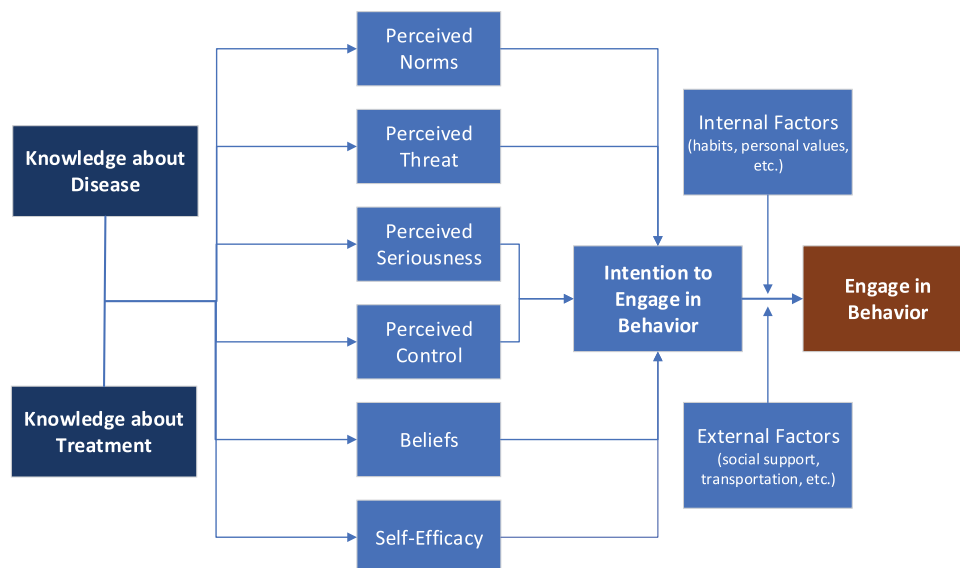

Figure 1. Patient knowledge framework adapted from health behavior models.

and reviews without original data were excluded. Studies that were not available in English were also excluded from the review.

Screening, Data Extraction, and Reporting

After the initial search, all records were uploaded to Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia), at which point duplicate studies were removed. Two reviewers independently evaluated 10% of the studies' abstracts and compared inclusion decisions to ensure concordance between reviewers exceeded a predetermined threshold of 90%. The 2 reviewers then continued, independently evaluating the remaining abstracts to determine eligibility. After this primary screening, a secondary screening using the same process was conducted to review the full texts to determine final inclusion in the review.

A data extraction tool was developed in Research Electronic Data Capture (REDCap), which 2 reviewers used to extract data from the included records.[26,27] The REDCap tool was revised by the authors after conducting a pilot test with 6 studies. Similarly, 2 reviewers independently extracted data from 10% of the articles and compared with ensure agreement. The 2 reviewers then continued independently extracting data from all the remaining articles. The first category of data collected was information about the publication, including year, country where the study took place, and type of cancer diagnosis. Second, data were also collected about the intervention, including: method of education; who provided the education; audience (such as patient, spouse, or family member); where the education was provided; when along the cancer continuum the education was offered; whether the intervention was based on theory; and other intervention features. If more than one method, educator, or audience was mentioned, all were included in data collection. The third category of data collection was around evaluation if one was conducted, including the type of evaluation performed, what outcomes were assessed, the timing of the evaluation, and the evaluation results. The results were summarized in tables using descriptive statistics. This summary report follows the PRISMA 2020 checklist (Appendix II).[28]

Results

Search Results

A total of 2635 articles were located during the database search: 890 from Ovid MEDLINE, 974 from Embase, 99 from Cochrane Library, and 672 from CABI Global Health. Upon importing the records into Covidence, 588 duplicates were removed, leaving 2047 articles to be screened. As shown in the PRISMA flow diagram (Fig. 2), after the primary screening of abstracts, there were 124 articles remaining for potential inclusion. After a secondary screening of full-texts, 77 articles remained for data extraction. Primary reasons for excluding articles at the secondary screening stage included wrong intervention (19), unavailability of a full text (16), and wrong setting (4). The dual review process resulted in a 92.7% agreement for the primary abstract screening, and a 100% agreement for the secondary full text screening.

Study Characteristics

The 77 records included in this review spanned over 3 decades (1989-2021). Studies occurred in 24 different countries, as shown in Fig. 3. Iran (14, 18%), China (12, 16%), and Turkey
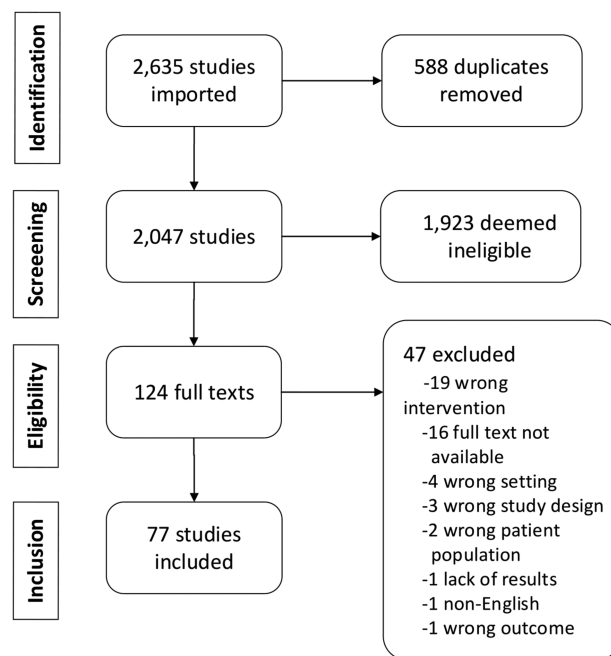
Figure 2. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram.

(10, 13%) were the most common study locations. Most of the studies, 47 (61%), occurred in or after 2015. All but one of the included studies focused on the adult population, and 58 (75%) studies targeted a single type of cancer. Of these, breast cancer was the most targeted type of cancer with 25 (43%) studies, followed by gynecologic cancers (13, 22%). Detailed study characteristics are available in Table 1 and Appendix IV.

Intervention Characteristics

Method

Studies varied on the number of methods used in the education intervention. Twenty studies (26%) used a single education method; 28 studies (36%) used 2 methods; 21 studies (27%) used 3 methods; and 8 studies (10%) used 4 or more methods. The number of methods used in a study were also stratified by country income level, as shown in Appendix III. This table suggests that interventions in upper-middle income countries are more likely to employ more than one education method compared to low-income countries.

Several different methods of providing education were described in the educational interventions included in this review. The most frequently used technique was technology-based interventions in 31 studies (40%). Of these, 20 (65%) were videos, 4 (13%) used a mobile app, and 4 (13%) were through short message service (SMS)/text. Although the 31 technology-based interventions were dependent on the availability of technology, 11 (35%) of the studies did not state whether the device used for the intervention was publicly available, provided to the patient, or dependent on the patient's possession of the technology. Seven of the technology-based intervention studies provided a device, 7 relied on a personal device, and 5 displayed the education in a shared space (such as projected in a clinic waiting room, classroom, or conference room). Additionally, of the 31 studies that used

Income Level (Number of Studies)
Low (5)
Lower Middle (14)
Upper Middle (57)
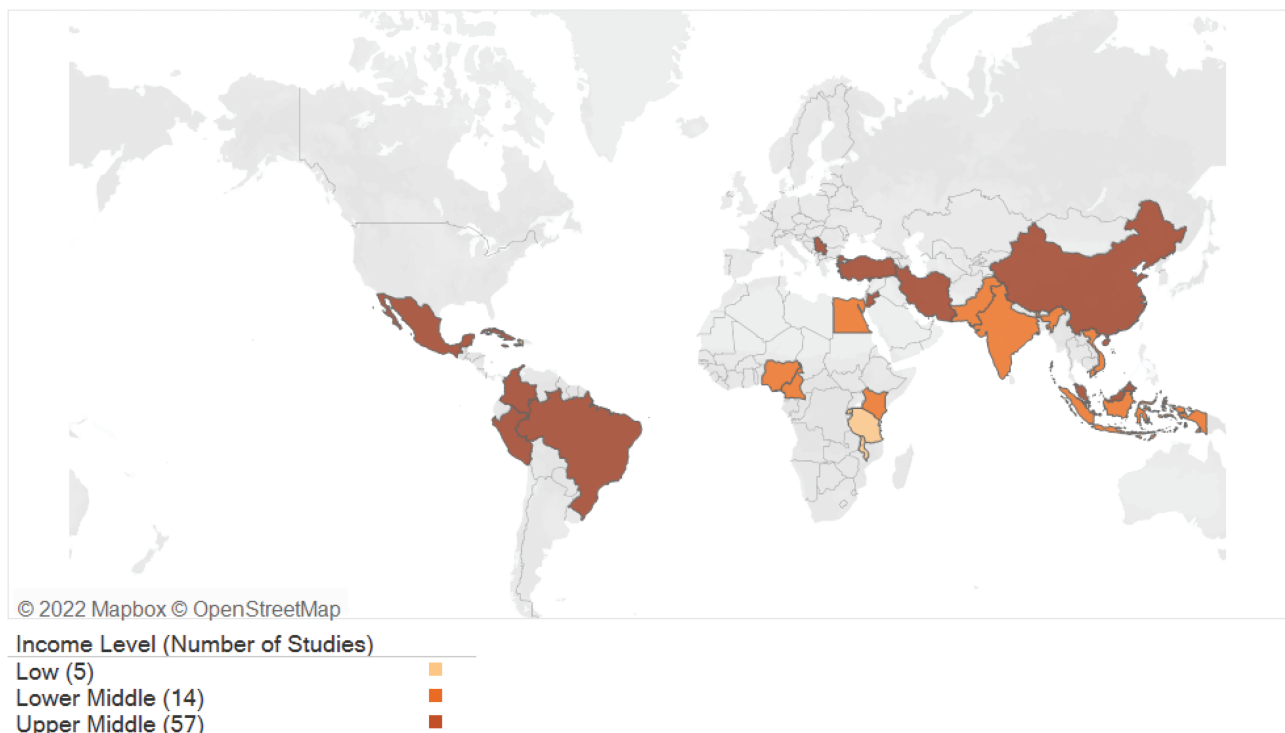
Figure 3. Countries represented in the systematic review.

Table 1. Characteristics of studies in systematic review.

Characteristics	Reviewed studies *N* = 77, *n* (%)
Publication year (1989-2021)	
Before 2015	30 (39)
2015-2021	47 (61)
Number of countries	24
Low income	6 (8)
Lower-middle income	14 (18)
Upper-middle income	57 (74)
Type of cancer involved	
Breast[a]	25 (43)
Gynecologic[a]	13 (22)
Genitourinary[a]	6 (10)
Hematologic[a]	2 (3)
Other[a, b]	12 (21)
Multiple	19 (25)
Median number of intervention participants (IQR)	74 (36, 183)
Study design	
Randomized controlled trial	27 (35)
Quasi-experimental	34 (44)
Single-arm study	5 (7)
Mixed methods	4 (5)
Qualitative	3 (4)

Data are presented as *n* (%).
[a]Percentages calculated from studies that studied a single cancer type (*n* = 58)
[b]Other includes Gastrointestinal (5), Head and Neck (3), and Thoracic (1).

a technology-based intervention, 23 (77%) were published in or after 2015.

Other education methods included: 25 (33%) studies with written materials that either did not have visuals or did not mention whether visuals were included, 26 (34%) consisted of lectures or audiotapes, and 20 (26%) used visual pamphlets (including posters). Detailed intervention characteristics are available in Table 2.

Setting

The setting in which education was provided was also examined. Education was primarily conducted in a clinic setting (53, 72%). Twenty-four studies (31%) included education in a group session, while 26 (34%) described individual teaching sessions, conducted in-person or through phone calls. Nurses were the most common educators in 25 studies (33%), followed by researchers in 11 studies (14%), and doctors in 9 studies (12%). Twenty-three studies (31%) did not specify who provided the education. Other education providers included pharmacists, psychologists, and medical students. Eight studies (10%) described more than one provider role providing education.

Frequency and Duration

Studies were nearly split between educational interventions that were offered one-time (*n* = 41, 56%), and those that consisted of multiple sessions (*n* = 32, 44%). The frequencies of multi-session interventions varied greatly, from 2 sessions, to multiple touch points (daily to weekly) over a span of 6 months, to sessions with each cycle of chemotherapy. The duration of each educational intervention also covered a wide range. Of the 58 studies that stated the duration of the education, 34 (59%) lasted between 30 and 60 min. However, there were some sessions as short as

Table 2. Characteristics of the educational intervention.

Intervention characteristics	Reviewed studies $N = 77$, n (%)
Education method	
Technology based	31 (40)
Lectures/audiotapes	26 (34)
Visual pamphlet/posters	20 (26)
Written materials without visuals mentioned	25 (33)
Individual education session/telephone call	26 (34)
Group education session	24 (31)
Other	17 (22)
Number of education methods used	
1	20 (26)
2	28 (36)
3	21 (27)
4+	8 (10)
Type of technology used[a]	
Video	20 (65)
Mobile application	4 (13)
SMS/text	4 (13)
Other	5 (16)
Intended audience for education[a]	
Patient	60 (79)
Partner/spouse	12 (16)
Family member	9 (12)
Community	12 (16)
Qualification of education provider[a]	
Nurse	25 (33)
Researchers	11 (14)
Doctor	9 (12)
Pharmacist	3 (4)
Medical students	3 (4)
Psychologist	2 (3)
Other	11 (14)
Not mentioned	23 (31)
Stage of cancer continuum when education provided	
Screening/early detection	31 (40)
Time of diagnosis	4 (5)
During treatment	37 (49)
Post-treatment	5 (6)
Not mentioned	3 (4)
Patient received take-home educational material	49 (64)
Intervention was designed based on health theory	24 (32)
Most common health theories used	
Health Belief Model	6 (25)
Trans-Theoretical Model	5 (21)
Self-efficacy Theory	4 (17)
Theory of Planned Behavior	2 (8)
Neuman Systems Model	2 (8)
Health Promotion Model	2 (8)
Population literacy was considered	20 (26)
Frequency of education	
One-time	41 (56)
Multiple times	32 (44)

Data are presented as n (%).
[a]Percentage scores may amount to greater than 100% because categories are not mutually exclusive.
Abbreviation: SMS, short message service.

10 min, and others closer to 2 h. Of note, all 6 of the studies that occurred in low-income countries involved one-time interventions.

Other Intervention Characteristics

Other intervention characteristics included the intervention's design; 24 studies (32%) specified they were driven by a theoretical framework. While numerous theories were referenced, the Health Belief Model, Trans-Theoretical Model, and Self-Efficacy Theory were the most common. Many health behavior theories stress the importance of social supports, so data were also collected about for whom the intervention was intended. The education recipient was the patient only in 46 studies (60%). Seventeen studies (22%) targeted the patient and a family member or spouse. Four studies (5%) targeted family members or a partner without the patient, such as when the intervention was for parents of children with cancer, and one study was exclusively for caregivers. Additionally, 12 studies (16%) were for the general community, such as in screening interventions.

We also examined whether the intervention provided the recipient with material to keep and take home with them, which could include printed pamphlets, DVDs, audiotapes, or other materials. The recipient received education material as part of the intervention in 49 studies (64%). Looking into this further, 3 low-income studies (50%), 9 lower-middle income studies (64%), and 37 upper-middle income studies (65%) included take-home materials for the recipient. A final category included in the intervention profile was when along the cancer continuum the education was provided. Among the 77 studies, 31 (41%) consisted of a screening or early detection intervention; 4 (5%) occurred at the time of diagnosis; 37 (49%) were provided at some point during treatment; and 5 (6%) were after treatment was completed.

Evaluation Characteristics

Seventy-four studies (96%) included an evaluative component. Of these, 65 (88%) used quantitative methods, such as questionnaires, or pre- and post-surveys. Three studies (4%) used a qualitative evaluation approach, and 6 (8%) used mixed methods. Additionally, 41 studies (55%) stated using at least one validated tool for their evaluation. The most referenced tools were the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire, the Hospital Anxiety and Depression Scale, the State-Trait Anxiety Inventory, and the Functional Assessment of Cancer Therapy Scale. Altogether, about 30 different tools were used. The studies assessed a range of outcomes in their evaluations. Patient knowledge was the leading evaluated outcome in 35 studies (47%). Other outcomes included quality of life, mental health (depression, anxiety, etc.), screening uptake, symptom management, patient satisfaction with the intervention, self-efficacy, perceptions/attitudes, coping mechanisms, and reported pain (Table 3).

The timing of the evaluations was also collected. Twenty-nine studies (40%) included a single evaluation at the immediate end of the intervention. Twenty-eight studies (38%) had a single evaluation but delayed by varying amounts of time from the end of the intervention. The remaining 16 studies (22%) had multiple points of evaluation. The timing of the evaluations varied greatly for studies that had single or

Table 3. Evaluation characteristics for studies that included evaluations.

Characteristics	Reviewed studies with evaluations, N = 74, *n* (%)[a]
Method used in evaluation	
Quantitative	65 (88)
Qualitative	3 (4)
Mixed methods	6 (8)
Outcomes evaluated[b]	
Patient knowledge	35 (47)
Quality of life	16 (22)
Mental health	16 (22)
Screening uptake	15 (20)
Symptom management (other than pain)	13 (18)
Patient satisfaction	12 (16)
Self-efficacy	10 (13)
Perceptions/attitudes	9 (12)
Coping mechanisms	6 (8)
Reported pain	5 (7)
Intent to screen	5 (7)
Theoretical constructs[c]	4 (5)
Other	4 (5)
Validated tool used in evaluation	41 (55)
Most common tools used	
EORTC-QOL Questionnaire	10 (24)
HADS	7 (17)
STAI	3 (7)
FACT [d]	3 (7)
Timing of evaluation	
One time, at intervention's end	29 (40)
One time, delayed from intervention's end	28 (38)
Multiple times	16 (22)
Intervention's results	
Outcome improvements	56 (76)
Mixed outcomes	14 (19)
No baseline assessment	3 (4)
No change	1 (1)

[a]Data from the 74 studies that included an evaluation.
[b]Percentage scores may amount to greater than 100% because categories are not mutually exclusive.
[c]Includes perceived benefits, subjective norms, perceived barriers, etc.
[d]Includes disease-specific versions.
Abbreviations: EORTC, European organization for research and treatment of cancer; QOL, quality of life; HADS, Hospital anxiety and depression scale; STAI, State trait anxiety inventory; FACT, Functional assessment of cancer therapy scale.

multiple evaluations at a later point, ranging from 24 h after the intervention to 12 months later.

Finally, most of the studies reported positive results of the impact of the interventions. Fifty-six (76%) of studies reported outcome improvements and 14 (19%) reported mixed outcomes. Of the 4 other studies, one found no change and 3 did not have a baseline assessment from which to measure changes. More detailed evaluation characteristics are summarized in Table 3.

Discussion

In summary, while the systematic review yielded 77 studies for inclusion, only 6 articles were from low-income countries. These numbers show the relative lack of empiric research on oncology-focused educational interventions in LMICs. The included studies revealed that while technology-based interventions were the most used, other traditional methods such as pamphlets, lectures, and visuals were also prominent. The studies also showed variations in who provided the education, with nurses and researchers as the most common. Similar to the education approaches, the evaluation methods in these studies were very heterogeneous. The studies evaluated several outcomes, from patient knowledge to quality of life to mental health. Additionally, nearly half of the evaluations did not use a validated tool, highlighting a relative lack of rigor to many of the evaluations.

Of note, during the study screening process, there were many studies that were ineligible for inclusion in the review because, while they reported on the lack of patient knowledge of various cancers and highlighted the importance and need for education, they did not include implementation of an intervention to improve knowledge. Some of these studies also discussed cancer awareness. While awareness is critical to early detection, this review focused on oncology-specific education interventions, and thus excluded studies only about raising awareness. This review suggests that although there is ample research in LMICs highlighting the need for cancer-related education and awareness, there is relatively little research on how to provide patient education, or on the impact of education on outcomes. This lack of research is especially true among low-income countries, which comprised only 8% of studies in this review.

Regardless, this review reveals some trends among the interventions. For example, technology-based interventions were the most prevalent education method, with educational videos as the most used type of technology. Mobile technology has become increasingly prevalent over the past decade, with an estimated 5 billion people owning mobile devices as of 2018.[29] Although the spread of mobile technology has not been equal across all income groups, a recent study in 11 middle-income countries found that the vast majority of adults had access to mobile technology as of 2019, with over 50% of their populations having access to a smartphone with an internet connection.[30] Thus, it is not surprising that 77% of the technology-based methods were used during or after 2015. As educational videos continue to become more common patient education tool, effective methods of creating, distributing, and evaluating them should be further studied. One technology-based education style that has been proven to effectively improve patient knowledge in HICs is through interactive video computer systems, which allow patients to engage with information that matches their preferences and needs.[16] Implementation science approaches should be used to access technology-based interventions and to ensure they are feasible and acceptable in low-resource settings.[31] Additionally, leveraging the benefits of technology and other modes of community knowledge dissemination, for example with community health workers has the potential to create an even more effective grassroots method for providing mass cancer education.[32]

Written materials (including educational booklets, pamphlets, or posters) were also a common source of education seen in these

studies. However, there was little uniformity in the content and style of these materials. For example, only about half of the written materials described including a visual component. Research has shown that visuals can greatly improve patients' experience with, and comprehension of, written materials.[33] Visuals are especially impactful for populations with limited literacy, which are prevalent in LMICs. The World Bank reported an adult literacy rate of 60% in low-income countries, and health literacy is likely to be much lower.[34] Therefore, literacy level should always be considered when designing written education materials by including visuals, using simple language, or other evidence-based methods.

About half of the education methods were delivered one-on-one and half were in group sessions. While there is emerging data from HICs that individual and group approaches may be equally effective, a combination of approaches are frequently used, taking into account local factors.[35,36] Given limited resources in LMICs, additional research into the efficacy and feasibility of individual versus group education is warranted. There was also a wide variety of professionals who provided the health education. Nurses were the most frequent educators, but they were used only in 25 (33%) studies. Researchers were the second most common educator (*n* = 11, 14%). Using researchers as educators could be a problematic approach, particularly in cases where the researcher is external to the primary care team or a foreign partner. These researchers may be less familiar with the target patient communities, and therefore may not be trusted by patients. Trust between the community and an educator is critical to effective education.[37] Additionally, the intervention may lack sustainability if the researcher leaves the community after the study is over. Utilizing foreign researchers as educators may perpetuate inequities and remnants of colonialism that persist in global health.[38]

Moreover, recent studies note that nurses have been historically underused in LMICs and suggest that nurses can be empowered to expand their roles to include patient education.[39,40] Other studies in high-income countries also suggest that training nursing specialists or other paramedical staff to provide education could improve patient outcomes.[41,42] Regardless of who plays the educator role, adequate training of the educator is paramount. A well-planned program to train the trainers is feasible and can contribute to sustained improvement in cancer care in low-resourced settings.[43] Future studies of oncology patient education should carefully consider who will provide education to assure the individual is a trusted member of the care team, and that the role is sustainable after the study ends.

Many health behavior theories acknowledge the importance of family and social supports to achieve behavior change. Multiple studies have shown the protective effects of social support on a person's tendencies to seek out healthcare, understand health information, and manage health conditions.[44-46] Yet, most of the interventions in this study targeted only the patient. Future interventions should consider incorporating a family member, friend, or partner in education sessions to help enhance the impact of education interventions. Patient advocates and lay patient navigators could also be leveraged to improve effective patient–doctor communication and patient engagement in decision-making.

Comprehensive evaluations of education methods are critical to understanding efficacy and implementation outcomes, as well as to informing the design future interventions. Although 76% of studies that included an evaluation used a pre-test/post-test design, the timing of the evaluation method can vary significantly depending on the desired outcomes. For example, an evaluation of screening uptake after an intervention would have to be delayed from the intervention's end to allow people time to pursue screening. On the other hand, an outcome like patient satisfaction could be assessed immediately after the intervention. Other outcomes, such as knowledge, could be assessed immediately after an intervention, but

Table 4. Recommendations for future education interventions and evaluations.

Using community-based participatory research (CBPR) approaches

Researchers should gather input with surveys and interviews of local healthcare providers, patient advocates, and patients to determine optimal intervention characteristics (desired outcomes, trusted educator, etc.) for the targeted community.

Incorporating health behavior theory or frameworks in development of education materials

The intervention should be designed according to an evidence-based theory/framework, such as the Health Belief Model or Trans-Theoretical Model. Enhancing training of local staff and researchers in behavioral interventions and implementation science principles is important to ensure sustainability.

Assessing literacy and ensuring pretesting

Education materials must be designed at an appropriate literacy level to increase patient comprehension. Researchers should be knowledgeable about the target community's literacy level and pretest the materials with community members to ensure suitability.

Including patient caregivers/advocates in education interventions

Research and health behavior theories show that comprehension of patient education increases when a support person is present. Thus, inclusion of a patient support person during educational intervention is strongly encouraged. Additionally, patient advocates and navigators that are appropriately trained could be used to promote effective patient-doctor communication and patient decision-making.

Using validated evaluation methods

Evaluations that use a validated tool provide more reliable and reproducible results. There are numerous such tools, including the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life questionnaire, the Hospital Anxiety and Depression scale, and the Brief Fatigue Inventory; these tools can be adapted and translated for use within the local context.

Robust reporting of methods and outcomes

Researchers should share detailed reports of their efforts to help increase transferability of knowledge. Published reports should include details the materials used, and implementation outcomes such as feasibility and acceptability. We also encourage publication of negative studies. This depth of reporting will increase dissemination and implementation of best practices for patient education interventions.

---

with acknowledgment that the results may change if assessed again after a period of time. Therefore, the timing of the evaluation must be tailored depending on the outcome being measured.

Although this review did not collect specific data about cost and cost-effectiveness, it should be noted that very few articles mentioned the costs of their study intervention and implementation. Cost-effectiveness analyses of effective interventions are important to determine which practices are feasible in low- and middle-income settings. Similarly, implementation outcomes such as feasibility, acceptability and appropriateness are important contributors to long-term sustainability for interventions. However, only one study discussed measuring one of these outcomes. Future research on patient education interventions should discuss how the patient education could be incorporated into daily workflow of the patient care team, and measure the success of implementing such interventions in order to enhance sustainability of the practice.

There are several strengths of this review. To our knowledge, this report represents the most comprehensive assessment of oncology patient education in LMICs in the literature. Our comprehensive search strategy, use of PRISMA procedures, and practice of ensuring concordance between the 2 independent reviewers, highlight the rigor of our approach. However, there are some limitations. The included articles are limited to publications available in English, which introduces a language bias and makes the findings less generalizable to non-English speaking LMICs. In addition, given the heterogeneity in the type of studies, it was not possible to meaningfully collate data across studies to draw conclusion about specific educational approaches. Finally, while most of the studies reported a positive outcome, there is likely a literature reporting bias whereby studies with null results may never get published.

Conclusion

This systematic review sets the stage for the development of future oncology patient education interventions in LMICs. The review highlights the lack of consensus on how to provide such education and points to specific areas that should be the focus of further research. These areas include: assessing the efficacy of various education methods, settings and providers; determining which outcomes are most desired by patients; and choosing appropriate tailored evaluation methods. The review also shows that some elements that are proven to enhance patient education have not been consistently deployed, including involving a support person and using visuals. Moving forward, researchers should utilize community-based participatory research approaches to adapt intervention content and delivery approaches to enhance their contextual appropriateness and impact. Also, the importance of embedding educational interventions within a health behavior framework and utilizing validated evaluation methods cannot be overemphasized. We provide a list of recommendations for development and evaluation of future oncology patient education materials in LMICs in Table 4. Ultimately, implementing effective oncology patient education strategies in LMICs will play an important role in improving clinical outcomes and reducing global cancer disparities.

Conflict of Interest

The authors indicated no financial relationships.

Author Contributions

Manuscript writing: K.C., T.F. Conception/design, provision of study material or patients, collection and/or assembly of data, data analysis and interpretation, and final approval of manuscript: All authors.

Data Availability

No new data were generated or analyzed in support of this research.

Supplementary Material

Supplementary material is available at *The Oncologist* online.

References

1. Torre LA, Siegel RL, Ward EM, Jemal A. Global cancer incidence and mortality rates and trends—an update. *Cancer Epidemiol Biomarkers Prev*. 2016;25(1):16-27. https://doi.org/10.1158/1055-9965.EPI-15-0578.
2. Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin* 2021;71(3):209-249. https://doi.org/10.3322/caac.21660.
3. Bray F, Laversanne M, Weiderpass E, Soerjomataram I. The ever-increasing importance of cancer as a leading cause of premature death worldwide. *Cancer* 2021;127(16):3029-3030. https://doi.org/10.1002/cncr.33587.
4. Fadelu T, Rebbeck TR. The rising burden of cancer in low- and middle-Human Development Index countries. *Cancer* 2021;127(16):2864-2866. https://doi.org/10.1002/cncr.33586.
5. Bennett JE, Kontis V, Mathers CD, et al. NCD Countdown 2030: pathways to achieving Sustainable Development Goal target 3.4. *Lancet* 2020;396(10255):918-934. https://doi.org/10.1016/s0140-6736(20)31761-x.
6. Cazap E, Magrath I, Kingham TP, Elzawawy A. Structural barriers to diagnosis and treatment of cancer in low- and middle-income countries: the urgent need for scaling up. *J Clin Oncol*. 2016;34(1):14-19. https://doi.org/10.1200/JCO.2015.61.9189.

7. Shah SC, Kayamba V, Peek RM, et al. Cancer control in low- and middle-income countries: is it time to consider screening?. *J Glob Oncol* 2019;5:JGO.18.00200.

8. Espina C, McKenzie F, dos-Santos-Silva I. Delayed presentation and diagnosis of breast cancer in African women: a systematic review. *Ann Epidemiol*. 2017;27(10):659-671.e7. https://doi.org/10.1016/j.annepidem.2017.09.007.

9. Barrios CH. Global challenges in breast cancer detection and treatment. *Breast* 2022;62:S3-S6.

10. Nnaji CA, Kuodi P, Walter FM, Moodley J. Timeliness of diagnosis of breast and cervical cancers and associated factors in low-income and middle-income countries: a scoping review protocol. *BMJ Open* 2021;11:e044093. https://doi.org/10.1136/bmjopen-2020-044093.

11. McCutchan G, Weiss B, Quinn-Scoggins H, et al. Psychosocial influences on help-seeking behaviour for cancer in low-income and lower middle-income countries: a mixed-methods systematic review. *BMJ Glob Health* 2021;6(2):e004213. https://doi.org/10.1136/bmjgh-2020-004213.

12. Amico KR, Mugavero M, Krousel-Wood MA, Bosworth HB, Merlin JS. Advantages to using social-behavioral models of medication adherence in research and practice. *J Gen Intern Med*. 2018;33(2):207-215. https://doi.org/10.1007/s11606-017-4197-5.

13. Fishbein M. The role of theory in HIV prevention. *AIDS Care*. 2000;12(3):273-278. https://doi.org/10.1080/09540120050042918.

14. Becker M. The health belief model and sick role behavior. *Health Educ Monogr* 1974;2(4):409-419.

15. Du S, Hu L, Dong J, et al. Patient education programs for cancer-related fatigue: a systematic review. *Patient Educ Couns*. 2015;98(11):1308-1319. https://doi.org/10.1016/j.pec.2015.05.003.

16. Gysels M, Higginson IJ. Interactive technologies and videotapes for patient education in cancer care: systematic review and meta-analysis of randomised trials. *Support Care Cancer Off J Multinatl Assoc Support Care Cancer* 2007;15(1):7-20.

17. Champarnaud M, Villars H, Girard P, et al. Effectiveness of therapeutic patient education interventions for older adults with cancer: a systematic review. *J Nutr Health Aging*. 2020;24(7):772-782. https://doi.org/10.1007/s12603-020-1395-3.

18. Rossman AH, Reid HW, Pieters MM, et al. Digital health strategies for cervical cancer control in low- and middle-income countries: systematic review of current implementations and gaps in research. *J Med Internet Res*. 2021;23(5):e23350. https://doi.org/10.2196/23350.

19. Blake KD, Thai C, Falisi A, et al. Video-based interventions for cancer control: a systematic review. *Health Educ Behav Off Publ Soc Public Health Educ* 2020;47(2):249-257.

20. Lee YJ, Hyun MK, Jung YJ, et al. Effectiveness of education interventions for the management of cancer pain: a systematic review. *Asian Pac J Cancer Prev APJCP* 2014;15(12):4787-4793.

21. Schliemann D, Ramanathan K, Matovu N, et al. The implementation of colorectal cancer screening interventions in low- and middle-income countries: a scoping review. *BMC Cancer* 2021;21:1125. https://doi.org/10.1186/s12885-021-08809-1.

22. Noman S, Shahar H, Abdul Rahman H, et al. Effectiveness of an educational intervention of breast cancer screening practices uptake, knowledge, and beliefs among Yemeni Female School Teachers in Klang Valley, Malaysia: a Study Protocol for a Cluster-Randomized Controlled Trial. *Int J Environ Res Public Health*. 2020;17(4):1167. https://doi.org/10.3390/ijerph17041167.

23. Christiansen K, Buswell L, Svoboda L et al. A systematic review of patient education strategies for oncology patients in low- and middle-income countries. Available at https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022295995.

24. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1. https://doi.org/10.1186/2046-4053-4-1.

25. World Bank Country and Lending Groups. World Bank. Available at https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups. Accessed May 5, 2022.

26. Harris PA, Taylor R, Thielke R, et al. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform*. 2009;42(2):377-381. https://doi.org/10.1016/j.jbi.2008.08.010.

27. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: building an international community of software platform partners. *J Biomed Inform*. 2019;95:103208. https://doi.org/10.1016/j.jbi.2019.103208.

28. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. https://doi.org/10.1136/bmj.n71.

29. Silver L. Smartphone ownership is growing rapidly around the world, but not always equally. *Pew Res. Cent. Glob. Attitudes Proj.* 2019. Available at https://www.pewresearch.org/global/2019/02/05/smartphone-ownership-is-growing-rapidly-around-the-world-but-not-always-equally/. Accessed. April 27, 2022.

30. Silver L, Smith A, Johnson C, et al. Mobile connectivity in emerging economies. *Pew Res. Cent. Internet Sci. Tech.* 2019. Available at https://www.pewresearch.org/internet/2019/03/07/mobile-connectivity-in-emerging-economies/. Accessed. April 27, 2022.

31. Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q* 1989;13(3):319-340.

32. Mittra I, Mishra GA, Dikshit RP, et al. Effect of screening by clinical breast examination on breast cancer incidence and mortality after 20 years: prospective, cluster randomised controlled trial in Mumbai. *BMJ* 2021;372:n256. https://doi.org/10.1136/bmj.n256.

33. Njabulo M, Dada S, Kirsty B, et al. A scoping review of the use of visual aids in health education materials for persons with low-literacy levels. *Patient Educ Couns*. 2021;104(5):998-1017. https://doi.org/10.1016/j.pec.2020.11.034.

34. World Bank. Literacy rate, adult total for low income countries. FRED Fed. Reserve Bank St Louis. 2021. Available at https://fred.stlouisfed.org/series/SEADTLITRZSLIC. Accessed April 21, 2022.

35. Grønning K, Rannestad T, Skomsvoll JF, Rygg L, Steinsbekk A. Long-term effects of a nurse-led group and individual patient education programme for patients with chronic inflammatory polyarthritis – a randomised controlled trial. *J Clin Nurs*. 2014;23(7-8):1005-1017. https://doi.org/10.1111/jocn.12353.

36. Mannucci E, Giaccari A, Gallo M, et al. Self-management in patients with type 2 diabetes: Group-based versus individual education. A systematic review with meta-analysis of randomized trials. *Nutr Metab Cardiovasc Dis*. 2022;32(2):330-336. https://doi.org/10.1016/j.numecd.2021.10.005.

37. Dawson-Rose C, Cuca YP, Webel AR, et al. Building trust and relationships between patients and providers: an essential complement to health literacy in HIV care. *J Assoc Nurses AIDS Care JANAC*. 2016;27(5):574-584.

38. Bauer I. More harm than good? The questionable ethics of medical volunteering and international student placements. *Trop Dis Travel Med Vaccines* 2017;3:5. https://doi.org/10.1186/s40794-017-0048-y.

39. Fadelu TA, Buswell L, Anderson BO. Improving adherence to adjuvant endocrine therapy in Sub-Saharan Africa: challenges and innovative nurse-driven solutions. *Oncologist* 2022;27(8):607-609.

40. Challinor JM, Galassi AL, Al-Ruzzieh MA, et al. Nursing's potential to address the growing cancer burden in low- and middle-income countries. *J Glob Oncol* 2016;2(3):154-163. https://doi.org/10.1200/JGO.2015.001974.

41. Griffiths P, Simon M, Richardson A et al. Experience? Cross-sectional study (Short title: Cancer Specialist Nurses and Patient). *J Health Serv Res Policy*. 2013;18(1 Suppl):39-46.

42. Webster A, Hafeez S, Lewis R, et al. The development of therapeutic radiographers in imaging and adaptive radiotherapy through clinical trial quality assurance. *Clin Oncol* 2021;33(7):461-467.

43. Chite Asirwa F, Greist A, Busakhala N, Rosen B, Loehrer PJ. Medical education and training: building in-country capacity at all levels. *J Clin Oncol*. 2016;34(1):36-42. https://doi.org/10.1200/JCO.2015.63.0152.

44. Harvey IS, Alexander K. Perceived social support and preventive health behavioral outcomes among older women. *J Cross-Cult Gerontol*. 2012;27(3):275-290.

45. Minkler M. Applications of social support theory to health education: implications for work with the elderly. *Health Educ Q* 1981;8(2):147-165. https://doi.org/10.1177/109019818100800202.

46. Reblin M, Uchino BN. Social and emotional support and its implication for health. *Curr Opin Psychiatry*. 2008;21(2):201-205. https://doi.org/10.1097/YCO.0b013e3282f3ad89.