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# Digital health and telehealth in cancer care: a scoping review of reviews



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The COVID-19 pandemic necessitated remote cancer care delivery via the internet and telephone, rapidly accelerating an already growing care delivery model and associated research. This scoping review of reviews characterised the peer-reviewed literature reviews on digital health and telehealth interventions in cancer published from database inception up to May 1, 2022, from PubMed, Cumulated Index to Nursing and Allied Health Literature, PsycINFO, Cochrane Reviews, and Web of Science. Eligible reviews conducted a systematic literature search. Data were extracted in duplicate via a pre-defined online survey. Following screening, 134 reviews met the eligibility criteria. 77 of those reviews were published since 2020. 128 reviews summarised interventions intended for patients, 18 addressed family caregivers, and five addressed health-care providers. 56 reviews did not target a specific phase of the cancer continuum, whereas 48 reviews tended to address the active treatment phase. 29 reviews included a meta-analysis, with results showing positive effects on quality of life, psychological outcomes, and screening behaviours. 83 reviews did not report intervention implementation outcomes but when reported, 36 reported acceptability, 32 feasibility, and 29 fidelity outcomes. Several notable gaps were identified in these literature reviews on digital health and telehealth in cancer care. No reviews specifically addressed older adults, bereavement, or sustainability of interventions and only two reviews focused on comparing telehealth to in-person interventions. Addressing these gaps with rigorous systematic reviews might help guide continued innovation in remote cancer care, particularly for older adults and bereaved families, and integrate and sustain these interventions within oncology.

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## Introduction

Before the COVID-19 pandemic, digital health and telehealth were uncommon in standard, global oncology care. Within clinical research, there has been over a decade of interest on leveraging technology to increase care accessibility, scalability, and cost-effectiveness. Delivering interventions by telephone and internet—via phone calls, videoconferencing, mobile applications, and web pages—can reduce the time burdens of cancer treatment<sup>1</sup> and extend access to evidence-based interventions for cancer prevention and control, surveillance, supportive care, treatment decision making, and more. As research in remote cancer-care delivery has grown rapidly over the past decade, with an abrupt acceleration during the pandemic, we sought to characterise the current state of the evidence by synthesising and summarising existing literature reviews in this field.

There are multiple formal definitions of both digital health and telehealth that often overlap. Digital health is defined as using “digital technologies for health, such as the internet of things”,<sup>2</sup> and “computing platforms, connectivity, software, and sensors for health care and related uses”.<sup>3</sup> Telehealth has been defined by the US Health Resources and Services Administration as “the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health, and health administration”.<sup>4</sup> Although this definition is inclusive of digital health, telehealth is often used more narrowly to describe synchronous interactions between health-care providers and patients (eg, an appointment done via encrypted videoconferencing). In this Review, the terms digital health and telehealth are

used together to represent the full spectrum of remotely delivered, technology-supported, health-care interventions.

For a comprehensive summary of the science on remote cancer care, this scoping review extends the previous findings from an overview of reviews on telehealth interventions for post-treatment cancer survivors<sup>5</sup> in three ways. First, the previous overview of reviews suggests that future research specifically addresses cancer prevention and health promotion. This scoping review addresses this need by summarising review literature on the use of telehealth across the cancer trajectory, from cancer prevention to end of life and bereavement. Second, this scoping review also provides the first compilation of reviews of digital health in cancer, which is important given the expansion of reimbursement coverage to include asynchronous electronic communication (ie, via patient portals) during the pandemic.<sup>6</sup> Moreover, digital health practices are rapidly evolving and hold considerable promise for scaling interventions to be more accessible and cost-effective by reducing reliance on health-care personnel. The third extension of previous reviews is that this scoping review includes interventions for cancer health-care providers and family cancer caregivers. Digital health and telehealth practices hold promise for facilitating more collaborative care across health-care disciplines, and for overcoming many of the barriers family caregivers face to accessing their own health care.

The extensions we include in this scoping review are necessary to understand the broader science on digital health and telehealth practices across cancer care. Identifying whether the summarised primary literature

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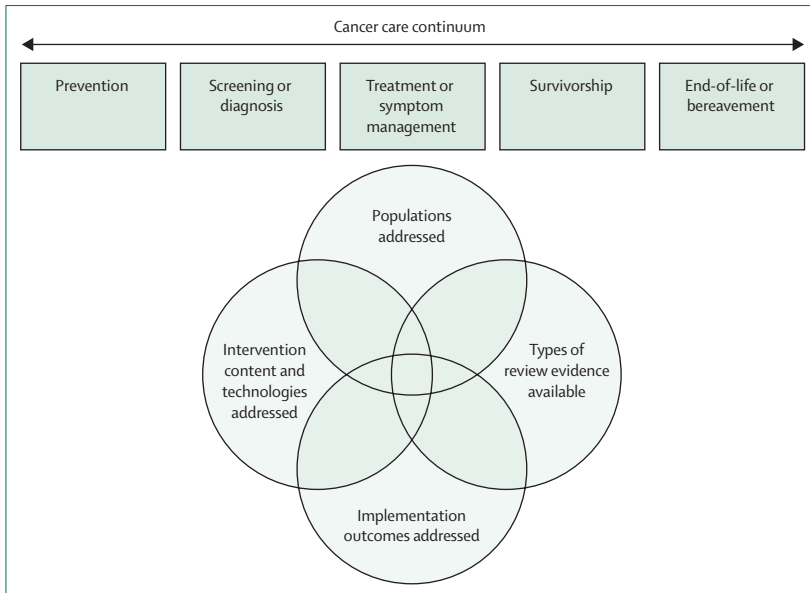


Figure 1: Framework of the scoping review

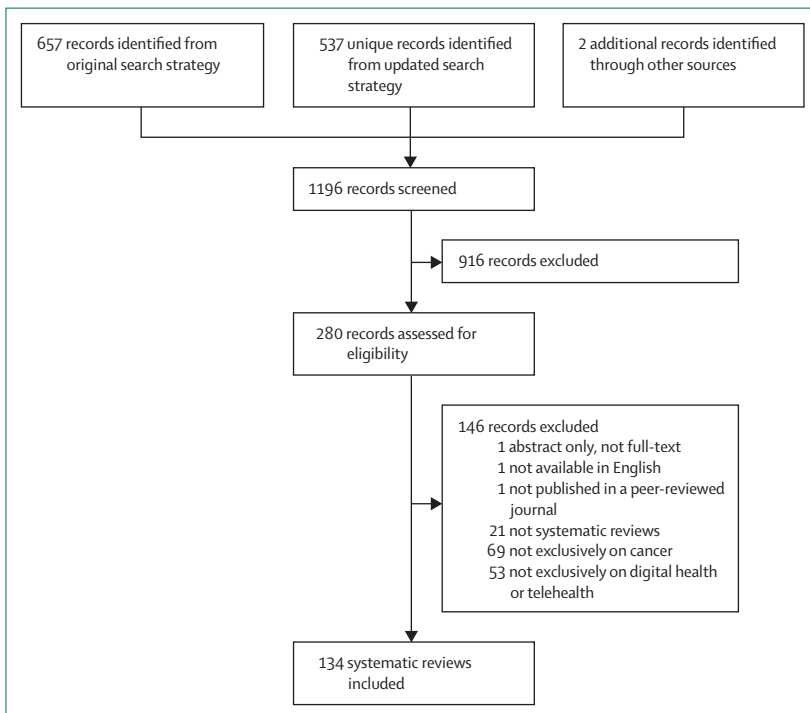


Figure 2: PRISMA flowchart

is inadequate or out of date is important to direct where research is most needed to improve cancer care delivered by digital health and telehealth. Describing trends in, and the available evidence for, digital and telehealth interventions and practices in cancer care can also help direct third-party payment for empirically supported services. Therefore, we identify and summarise

systematic reviews of digital health and telehealth across the cancer care continuum to detail the state of this science, and to identify important gaps to guide future reviews (figure 1).

### Methods

A comprehensive electronic literature search was conducted for peer-reviewed systematic reviews published from database inception to May 1, 2022. The protocol was registered (INPLASY protocol 3635)<sup>7</sup> and we adhered to PRISMA for Scoping Reviews guidelines.<sup>8</sup> No funding source specifically supported this Review.

### Eligibility criteria

The included reviews were required to meet a priori eligibility criteria: English-based or English-translated literature, published in a peer-reviewed journal, and met the population, intervention, comparison, outcome, and study design criteria as detailed.<sup>9</sup> When possible, these criteria were built into the search strategies for each database, but all studies were reviewed manually to establish eligibility. There were no exclusion criteria based on geographical locations, participant sex or ages (ie, studies with children, adolescents, and young adults were eligible for inclusion), or reported outcomes.

For the population criteria, the exposure of interest was cancer, whether as an individual at risk for cancer, a patient undergoing cancer care, a cancer survivor, a family cancer caregiver, or a health-care provider involved in cancer care delivery. Reviews that included any studies focused on health conditions other than cancer were excluded.

For the intervention criteria, reviews were included if all studies evaluated a digital health or telehealth intervention or health-care practice, as defined by the US Health Resources and Services Administration.<sup>4</sup> Reviews that focused on technologies that collect and transmit health data (ie, remote patient monitoring) without an explicit tie-in to intervention or improving health-care outcomes were excluded. For comparison and outcome criteria, there were no restrictions (eg, reviews including single-arm pilot trials were eligible for inclusion).

For the study design criteria, all included records were literature reviews that used a systematic search method. In addition to formally identified systematic reviews labelled as scoping, narrative, or integrative were systematic reviews otherwise labelled, which were eligible for inclusion if they specified a systematic literature search of electronic databases. We considered limiting our search to only systematic reviews adhering to PRISMA guidelines; however, to identify reviews summarising pertinent literature more broadly to digital health and telehealth in cancer care, we chose to include all reviews specifying a systematic search strategy.

### Search strategy and selection criteria

The authors created search strategies with a medical librarian (CJ) to identify published systematic reviews on

	Reviews, n (%)
<b>Population data*</b>	
Targeted individuals	
Patients	128 (95.5%)
Family	18 (13.4%)
Health-care personnel	5 (3.7%)
Cancer types	
Brain	1 (0.7%)
Breast	17 (12.7%)
Colorectal	5 (3.7%)
Gynecological	7 (5.2%)
Haematological	4 (3.0%)
Lung	3 (2.2%)
Prostate	4 (3.0%)
Skin	6 (4.5%)
Multiple or not specified	95 (70.9%)
Cancer care continuum	
Prevention	5 (3.7%)
Screening or diagnosis	12 (9.0%)
Treatment or symptom management	48 (35.8%)
Survivorship	29 (21.6%)
End-of-life or bereavement	2 (1.5%)
Multiple or not specified	56 (41.8%)
<b>Intervention data†</b>	
Telehealth components	
Synchronous telehealth	78 (58.2%)
Text messaging or short messaging service	37 (27.6%)
Email or secure messaging	39 (29.1%)
eHealth	87 (64.9%)
Mobile application	78 (58.2%)
Types of intervention or care	
Health behaviour change	24 (17.9%)
Psychosocial support or distress management	18 (13.4%)
Disease detection or management	14 (10.4%)
Medical decision making	2 (1.5%)
Multiple or not specified	73 (54.5%)
Provider involvement	
Health-care professional	9 (6.7%)
Fully automated or self-guided	1 (0.7%)
Multiple or not specified	124 (92.5%)

(Table continues in next column)

	Reviews, n (%)
(Continued from previous column)	
<b>Review design data</b>	
Meta-analysis	
Yes	29 (21.6%)
No	105 (78.4%)
Comparator (if required)	
Usual care	11 (8.2%)
In-person	2 (1.5%)
Any	18 (13.4%)
Other telehealth modality	0 (0%)
None required	103 (76.9%)
Quality or bias assessment	
Yes	90 (67.2%)
No	44 (32.8%)
<b>Implementation outcome data (Proctor et al. classification)†</b>	
None	83 (61.9%)
Acceptability	36 (26.9%)
Adoption	8 (6.0%)
Appropriateness	6 (4.5%)
Feasibility	32 (23.9%)
Fidelity	29 (21.6%)
Cost	8 (6.0%)

The median number of studies included per review was 16 with a range from 0–121. Albino de Queiroz and colleagues<sup>21</sup> included two reviews within the single publication (N1=121 and N2=15). Each sample was included separately for the computation of these statistics. \*Reviews might be reflected in more than one category (eg, can include interventions for both patients and family members, or report more than one kind of implementation outcome; except for multiple or not specified, or none).

**Table: Descriptions of 134 included reviews from 2010 to 2022**

the topic of digital health, telehealth, and cancer. By use of a combination of medical subject headings, text phrases, keywords, and other database-specific terminologies, strategies were developed to find relevant review articles. The databases searched were PubMed, Cumulative Index to Nursing and Allied Health Literature, American Psychological Association PsycINFO, Cochrane Reviews, and Web of Science. Reference lists of related literature were also reviewed for pertinent records. Review articles selected for the initial screening included a title or abstract with at least one subject heading, phrase, or keyword related to cancer and

to digital health and telehealth. Unpublished and grey literature were not pursued. Literature was initially searched on Sept 1, 2021, with an update on May 2, 2022, to include published reports before this date. As part of the peer review process, a phrase (“intervention” and “telephone”, “online”, “digital”, “mobile”, “Internet”, “technology”, “application”, or “text”) was added to the search strategy. The final search with this updated strategy was done on Sept 19, 2022, with additional search terms to identify any remaining pertinent records published up to May 1, 2022. Complete search strategies, including demarcation for the search strategy update, and database information are reported in appendix 1 (pp 1–3).

### Selection and screening process

Unique records were compared with the eligibility criteria with Rayyan,<sup>10</sup> an online review tool. Coders were not masked to journals or authors during screening. Before the first screening round, a screening guide was created to train all reviewing authors on the eligibility criteria. In the first round, study titles and abstracts were reviewed by two of three coders (KMS, RU, or JVG). Discrepancies between coders were resolved by

See Online for appendix 1

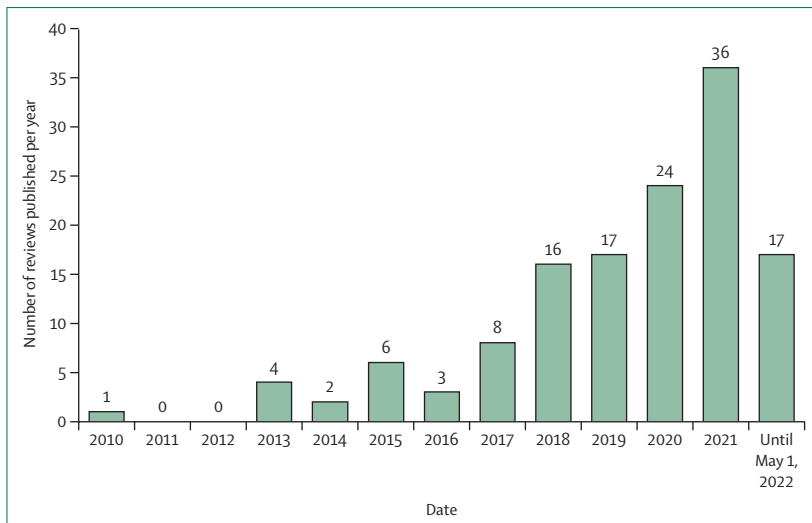


Figure 3: Number of reviews published per year on digital health and telehealth in cancer

For the data on Open Science Framework see <https://osf.io/k47hb>

consensus. All citations that initially met the criteria were included in a second round of full-text article screening. Full-text articles were reviewed by two of eight authors (KMS, KLT, CS, BDG, RU, JVG, RJF, or CAL), with discrepancies resolved by KMS or RU. Reasons for exclusion during the full-text review stage were recorded.

#### Data extraction and summary

Data were extracted from the included records with a standardised, predefined form with Qualtrics, an online survey tool, which was pilot tested by coders. Articles were not blinded during data extraction. Data were extracted independently by two of eight authors (KMS, KLT, CS, BDG, RU, JVG, RJF, CAL), with discrepancies resolved by KMS, RU, or JVG. Coders extracted review metadata and data about the eligible population, intervention characteristics, and study design (appendix pp 4–7). Extraction and categorisation of implementation outcomes according to the terminology used by Proctor and colleagues<sup>11</sup> was completed post-hoc by consensus of KMS, KLT, and CS. Article selection, screening, and data extraction were completed by Oct 4, 2022. Data were tabled and summarised, and gaps in the review literature were identified.

See Online for appendix 3

## Results

In total, 1196 unique records were identified, of which 280 full texts were assessed for eligibility (figure 2). Of these, 146 were excluded (see appendix 2 on screening results for a full list of excluded full text reviews with exclusion reasons). The remaining 134 reviews met eligibility criteria and were included in the synthesis.<sup>12–145</sup> Study information is presented in the table and appendix (pp 8–46). Included reviews were published as early as 2010, with a notable increase beginning in 2018 (figure 3).

See Online for appendix 2

The median number of studies included in the reviews was 16 (range: 0–121). We found no evidence to indicate that any of the reviews were industry sponsored.

All extracted data are also available in sortable worksheets available at the Open Science Framework. These worksheets serve as comprehensive and complete evidence maps, which readers are encouraged to use to further examine how populations, intervention content and technologies, types of review evidence, and implementation outcomes addressed by reviews differ across the cancer-care continuum, among other questions of interest.

#### Populations

128 (95.5%) of 134 included reviews addressed patient-level intervention studies. 18 (13.4%) of 134 reviews included caregiver-level intervention studies and only five focused exclusively on caregivers. Five reviews (3.7%) addressed provider-level interventions that aimed to improve patient cancer care experiences through provider continued education or enhanced intra-provider collaboration.

95 reviews (70.9%) did not restrict study inclusion on the basis of cancer type. Of reviews that addressed one or more specific cancer types, 17 were on breast cancer, seven were gynaecological, six were on skin cancer, five were on colorectal cancer, four were on prostate cancer, four were haematological, three were on lung cancer, and one was on brain cancer. Ten reviews (7.5%) focused on paediatric, adolescent, or young adult patients with cancer or their caregivers. None of the reviews focused on older adult patients with cancer or caregivers.

56 (41.8%) of 134 studies did not restrict inclusion (or did not specify) on the basis of the stage of the care continuum, although they tended to focus on interventions delivered during active treatment through survivorship. Among the reviews that focused on one or more specific stages of the continuum, 48 (35.8%) addressed the active treatment phase. Two reviews addressed studies of care for patients at the end of life, but none addressed caregiver bereavement.

The frequencies of reviews targeting patients, family members, or health-care providers across the stages of the cancer care continuum are summarised in a visual evidence map in figure 4. Readers can explore additional cross-tabulations of interest with the sortable worksheets of extracted data in appendix 3 on review details.

#### Interventions

Rather than focus on a single intervention delivery method, reviews tended to include studies of interventions across digital health and telehealth delivery methods. 87 (64.9%) included studies of interventions delivered entirely or in part by eHealth interventions, 78 (58.2%) of synchronous telehealth, and 78 (58.2%) of mobile applications. Reviews less commonly included studies of interventions that used email or secure asynchronous messaging platforms (n=39; 29.1%) or

text or short messaging services (n=37; 27.6%). Other delivery components included use of wearable devices (n=12; 9.0%), social media (n=8; 6.0%), virtual reality (n=8; 6.0%), automated phone calls or interactive voice response calls (n=7; 5.2%), store-and-forward image transfer (n=6; 4.5%), electronic health records or patient portals (n=5; 3.7%), active or video games (n=4; 3.0%), and interactive robot-assisted therapy (3; 2.2%).

73 (54.5%) reviews did not restrict inclusion (or did not specify) on the basis of intervention type. Among reviews that addressed one or more specific types of interventions, 24 (17.9%) addressed health behaviour change, followed by 18 (13.4%) of psychosocial support or distress management, and 14 (10.4%) of disease detection or management. In addition, 124 reviews (92.5%) did not restrict (or did not specify) inclusion on the basis of the type of provider involvement in delivery. Only one review clearly specified inclusion of only fully automated programmes (ie, no human involvement), regarding the use of artificial intelligence (AI) for diagnosing skin cancer or melanoma from skin lesion pictures.<sup>22</sup>

### Review design

29 reviews (21.6%) included a meta-analysis of all or a subset of their included studies. Among these 29 meta-analyses, digital health and telehealth interventions were compared with any comparator in 14 meta-analyses (48.3%) or to usual care in nine meta-analyses (31.0%). One meta-analysis compared genetic counselling delivered by telehealth versus in-person, determining that telehealth was not inferior to in-person counselling on the two evaluated outcomes of cancer-specific distress and knowledge. Across meta-analyses, the most examined outcome was quality of life: 11 meta-analyses reported positive effects of interventions relative to control and six reported null findings. Meta-analyses also frequently reported positive findings for interventions for outcomes including depression (nine positive effects, four null effects), anxiety (eight positive, three null), self-efficacy (five positive, no null), physical activity (four positive, one null), and cancer screenings (four positive, no null). The evidence was mixed for other outcomes like fatigue (five positive effects, five null effects), pain (three positive, four null), and distress (two positive, two null). Many reviews indicated that a meta-analysis was not done due to heterogeneity of methods and outcomes.<sup>13,15,18,21,23,29,40,45,46,49,60,65,69,74,75,86,88–90,97,100,104,110,116,118,131,134</sup>

113 reviews (84.3%) were termed systematic review; seven (5.2%) included the term scoping, and five (3.7%) included the term integrative. Methodological quality or risk of bias assessment is considered an essential reporting element for systematic reviews<sup>146</sup> and 81 of the 113 systematic reviews (71.7%) reported such an assessment.

### Implementation outcomes

83 (61.9%) of 134 reviews did not report implementation-related outcomes. This finding could either be because



Figure 4: Evidence map illustrating frequencies of reviews by individual targeted by intervention across the cancer care continuum

studies included in reviews did not report these outcomes or because reviews did not extract this information from studies. Among reviews that extracted implementation-related outcomes, 36 (26.9%) fell into the categories of acceptability, 32 (23.9%) of feasibility, and 29 (21.6%) of fidelity. None of the reviews extracted mid-stage to late-stage implementation outcomes like penetration or sustainability.

### Discussion

To our knowledge, we conducted the first scoping review of literature reviews on the use of digital health and telehealth interventions across the cancer continuum for



patients, caregivers, and health-care providers. The spread of digital health and telehealth in cancer care during the COVID-19 pandemic necessitated an overview of the state of this science, to identify gaps in what is known about remote cancer care delivery. Our scoping review revealed an extensive and recent body of review literature on digital health and telehealth interventions in cancer care. Overall, most reviews focused on interventions delivered to patients with cancer in the active treatment and survivorship phases using eHealth programs, synchronous calls by telephone or video-conferencing, and mobile applications. Common conclusions drawn by reviews were that digital health and telehealth interventions were feasible and effective, but the need for larger-scale and robust efficacy testing remains.

This scoping review identified several major gaps in the review literature in digital health and telehealth in cancer care. Specifically, there are opportunities to improve the knowledge base related to populations, interventions, review designs, and implementation outcomes. Systematic reviews addressing these gaps can help improve digital health and telehealth cancer care for all individuals by establishing the extent of the primary research and potential efficacy of interventions across the broad scope of remote cancer care.

### Opportunities in populations

Most of the included reviews addressed digital health and telehealth interventions for individuals at risk for cancer (ie, cancer prevention), those receiving treatment (ie, patients), or those recovered from cancer (ie, survivors); however, several subpopulations were missing. For example, none of the reviews focused on older patients with cancer, which is a considerable gap given that more than half of individuals diagnosed with cancer are aged 65 years or older.<sup>147</sup> Although often assumed that digital health or telehealth interventions are a poor fit for older adults, there is substantial promise for this type of care to support independent ageing.<sup>148</sup> The adoption of digital technologies among older adults continues to rise,<sup>149</sup> and digital health and telehealth interventions can help alleviate common health-care barriers faced by older adults, such as rurality<sup>150</sup> and poverty.<sup>151</sup> Moreover, one study of patients with uro-oncological cancer suggests similar interest in remote patient monitoring with digital technologies between older and younger patients, with older patients even reporting to be willing to engage with digital technologies as part of trials more frequently than younger patients.<sup>152</sup>

Three reviews addressed telehealth interventions for individuals facing advanced cancer, including those at the end of life.<sup>17,23,73</sup> Characterising the use and benefits of digital health and telehealth interventions for these populations is important as many patients with terminal cancer and their families prefer palliative care delivered at home versus a health-care facility.<sup>153</sup> Although

bereavement care for families is traditionally a component of comprehensive palliative care and was included in several of the digital health and telehealth palliative care programs covered in reviews (eg, Dionne-Odom and colleagues and Pearce and colleagues),<sup>154,155</sup> none of the reviews specifically addressed family caregiver bereavement. This finding reflects the restricted focus on family cancer caregivers across reviews overall. Reviews have been conducted on digital health and telehealth bereavement care outside of oncology.<sup>156,157</sup> As caregivers' health-related needs and grief reactions differ by disease context,<sup>158,159</sup> it is necessary to explore the availability, efficacy, and acceptability of digital health and telehealth interventions for cancer-related bereavement.

### Opportunities in interventions

Digital health and telehealth interventions can range in their purpose to support "long-distance clinical health care, patient and professional health-related education, public health, and health administration".<sup>4</sup> Most identified reviews focused on long-distance cancer care, patient education, and public health (ie, cancer prevention interventions), with less focus on professional health-related education and administration. Synchronous telehealth services for long-distance cancer care were perhaps most commonly reviewed, in part due to a record of reimbursement before (and expanded upon during) the COVID-19 pandemic. In the example of US states and territories, telehealth services before the pandemic were reimbursed by government and private health insurance payers, although typically with requirements such as patients must have had previously received services in a licensed health-care facility. These requirements were largely dropped during the COVID-19 pandemic, and reimbursement policies continue to evolve. Monitoring professional reimbursement policy changes will be crucial to optimise the use and dissemination of telehealth services moving forward.

Five reviews did specifically address digital health and telehealth practices to support interdisciplinary collaboration and continuing education for oncology providers, with the end goal of improving cancer care for patients.<sup>25,49,82,109,127</sup> However, no reviews addressed tools for oncology health-care provider wellbeing. Given the serious toll of the COVID-19 pandemic on health-care workers,<sup>160</sup> there is an opportunity to establish viable digital health and telehealth interventions to mitigate occupational-health effects under the ongoing pandemic conditions.

Relatively few reviews included interventions with emerging technologies (eg, serious games and virtual reality) or integration with the internet of things (eg, wearable devices and smart speakers). One notable exception was a review by Albino de Queiroz and colleagues,<sup>55</sup> which comprehensively described the utility and results of applying the internet of things to cancer care. Given the rapid evolution of the technical capacity

of digital health, continually updating summaries of this literature will be crucial for the field to stay current and identify emerging opportunities to improve digital health interventions in cancer care.

There was also only one review focusing on digital health programs delivered without the input of any support personnel: a study of mobile applications that use AI to diagnose skin cancer or melanoma from skin lesion pictures, which concluded that evidence was insufficient (by the time of the review) to rely on AI to identify all diagnoses.<sup>22</sup> No reviews specifically focused on entirely self-guided psychological, behavioural, or educational interventions delivered without the support of any personnel. Although there were reviews of interventions that could plausibly be fully automated,<sup>12–14,18,21,36,38,52,66</sup> eligibility criteria did not require full automation, and incorporation of clinical support was unclear. Kiss and colleagues<sup>89</sup> focused on self-guided interventions but included those with minimal facilitation. The public health effects of including professional guidance should be carefully weighed. Digital health interventions that include some guidance tend to result in greater improvements than stand-alone interventions.<sup>161,162</sup> Conversely, fully automated interventions provide greater scalability, accessibility, and cost-effectiveness.<sup>163</sup> Rigorous reviews regarding this topic could help ascertain the benefits and costs of including professional guidance to better decide when more or less clinician support is warranted.

### Opportunities in review designs

Approximately one-fifth of the reviews included a meta-analysis, and of those, most compared digital health and telehealth interventions with usual care or any kind of comparator. Only one meta-analysis compared telehealth with in-person care delivery. This unique review by Bracke and colleagues<sup>34</sup> concluded that telehealth genetic counselling did not differ from in-person counselling regarding patients' cancer-related distress or knowledge. Further reviews establishing how digital health and telehealth interventions intended for remote care delivery compare with in-person interventions on clinically salient outcomes might be important in ensuring that digital health and telehealth care becomes reimbursable,<sup>164</sup> or remains reimbursable following expiration of COVID-19 public health emergency policies. Comparison with in-person care, however, is not pertinent for every research question. For example, payers might want to know whether it is equally beneficial to see a provider in-office versus by videoconference call, whereas consumers might be more interested in information to better choose between two or more digital health and telehealth programs. Importantly, none of the reviews attempted to compare different digital health and telehealth interventions to one another.

Another gap in the meta-analysis literature is that there were no meta-analyses identified that tested the effects of

digital health or telehealth on real-world health-care utilisation data. Meta-analyses tended to focus on self-reported symptom questionnaires, which might reflect the primary literature tending to have self-reported endpoints. There were three meta-analyses that addressed objective clinical outcomes like range-of-motion and lymphoedema,<sup>14,50,52</sup> with all three focusing on patients and survivors of breast cancer. Future meta-analyses regarding the effects of digital health and telehealth intervention on patient morbidity, mortality, and health-care utilisation factors (eg, office visits, use of emergency services, and hospitalisations) would provide crucial information to inform reimbursement and coverage decisions. Such reviews would also reveal the extent to which primary literature in digital health and telehealth has examined these outcomes, potentially revealing where gaps in the primary literature exist.

Regardless of the research question addressed by a systematic review, about 30% of the identified systematic reviews identified in our search did not conduct a methodological quality rating of the included studies, which is essential for interpreting findings. This outcome is consistent with an earlier meta-review of telehealth in cancer care<sup>5</sup> that also identified a need to ensure consistent adherence to PRISMA guidelines, another opportunity for future improvement of this literature base.

### Opportunities in implementation outcomes

About two in five reviews reported implementation-related outcomes. Of particular interest, because reimbursement and coverage of digital health and telehealth services remains in flux, only eight reviews directly addressed economic outcomes, with three specifically discussing these findings in a dedicated section.<sup>61,68,90</sup> Across all eight reviews, the proportion of primary studies including health economic outcomes ranged from 0% (0/8)<sup>20</sup> to 31% (6/19)<sup>90</sup> of included studies, with outcomes including direct costs, cost minimisation, and cost-effectiveness (eg, on quality-adjusted life-years). As with mortality and health-care utilisation outcomes, more synthesised data on the various economic effects of digital health and telehealth interventions will be helpful to decision makers when considering coverage and implementation of such interventions.

Most of the implementation outcomes data were extracted from early-stage research studies, with few reviews focusing on the implementation of digital health and telehealth interventions into routine care. With a shift toward remotely delivered care precipitated by the COVID-19 pandemic, there might be opportunities to review studies focused on the use of digital health and telehealth practices within standard care, and eventual opportunities to describe mid-range to long-range implementation outcomes related to reach and sustainability of these practices. One of the earliest identified reviews,



Sanchez and colleagues' 2013 review, stands out in its application of implementation frameworks to their review of internet-based cancer prevention and control interventions.<sup>124</sup> This review highlighted the need for more pragmatic trial designs to accelerate the implementation of effective digital health and telehealth interventions into routine care. Unfortunately, it seems that the field of cancer-related digital health and telehealth interventions is still struggling to implement this finding almost a decade later, given that reviews since that time frequently concluded that findings were preliminary and more robust, larger-scale studies were needed.

### Limitations

Given that we conducted a scoping review of reviews, the identified gaps in the literature only establish that a review was not identified in a given area of remote cancer care, which might not generalise to the primary literature. Because we restricted the scope of our review to cancer, there could be reviews pertinent to identified gaps that are disease-agnostic. In addition, we did not extract review information pertinent to health equity, such as the racial or ethnic composition of samples or rurality. Several reviews indicated the generalisability of the included literature was restricted due to study samples comprising largely non-Hispanic White, highly educated, or breast cancer participants;<sup>44,78,111</sup> however, there were reviews specifically focused on underserved populations and studies in low-income and middle-income countries.<sup>57,109,120,131,142</sup>

### Conclusions

In this first-of-its-kind comprehensive scoping review of reviews on digital health and telehealth interventions across the cancer continuum, we summarised the existing review literature and identified several gaps. We identified an absence of review literature for older adults in cancer care, cancer-related bereavement, oncology provider wellness, and mid-range to long-range implementation outcomes. Additionally, there were few meta-analytic comparisons to traditional in-person care or between multiple digital health and telehealth programmes. Establishing the state of the science in these areas with high-quality reviews might help guide continued innovation in remote care delivery, particularly for older adults and bereaved families, and support the integration and sustainability of these interventions within standard oncology practice. This work will support continued growth in the reach and effects of digital health and telehealth interventions to reduce cancer risk and improve cancer care for all individuals.

### Contributors

KMS led all aspects of the Review: conceptualisation, data curation (title and abstract screening, full-text screening, and data extraction), formal analysis, project administration, supervision, validation, and writing (original draft, review, and editing); KLT, CS, and BDG were involved in data curation (full-text screening and data extraction), validation, and writing (review and editing); RU and JVG were involved in data curation (title and abstract screening, full-text screening, and data extraction),

validation, writing, and review; RJF was involved in conceptualisation, data curation (full text screening and data extraction), and writing (review and editing); CJ is the medical librarian and was responsible for devising (in collaboration with KMS) and executing the search strategy for this scoping review, and was involved in writing (original draft and writing, review, and editing); CAL was involved in conceptualisation, data curation (full text screening and data extraction), validation, writing (original draft), and writing (review and editing). All authors have had full access to the data and accept responsibility to submit for publication.

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