Ontario Health
Cancer Care Ontario

Evidence Summary 30-1

A Quality Initiative of the
Program in Evidence-Based Care (PEBC),
Ontario Health (Cancer Care Ontario)

Virtual Care in Patients with Cancer: A Systematic Review

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Report Date: March 31, 2021

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PEBC Report Citation (Vancouver Style): Singh S, Fletcher GG, Yao X, Sussman J. Virtual care in patients with cancer: A systematic review. Toronto (ON): Ontario Health (Cancer Care Ontario); 2021 March 31. Program in Evidence-Based Care Evidence Summary No.: 30-1, available on the OH (CCO) website at https://www.cancercareontario.ca/en/guidelines-advice.

PUBLICATION FROM THIS REPORT
Singh S, Fletcher GG, Yao X, Sussman J. Virtual Care in Patients with Cancer: A Systematic Review. Curr Oncol. 2021;28:3488–3506.

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Evidence Summary

THE PROGRAM IN EVIDENCE-BASED CARE

The Program in Evidence-Based Care (PEBC) is an initiative of the Ontario provincial cancer system, Ontario Health (Cancer Care Ontario). The PEBC mandate is to improve the lives of Ontarians affected by cancer through the development, dissemination, and evaluation of evidence-based products designed to facilitate clinical, planning, and policy decisions about cancer control.

The PEBC is a provincial initiative of OH (CCO) supported by the Ontario Ministry of Health (OMH). All work produced by the PEBC is editorially independent from the OMH.

INTRODUCTION

Virtual care in cancer care in Ontario existed in a limited fashion before the COVID-19 pandemic mostly driven by geography. The global pandemic has required dramatic shifts in health care delivery including cancer care. While in-person care had traditionally been considered the "gold standard" of interaction between patients and physicians, there are several components of in-person care that may be delivered with equivalent effectiveness using non-in-person or virtual platforms.

There has been rapid adoption of virtual care (remote care, telemedicine, teleoncology, phone or videoconferencing) replacing in-person visits between patients and clinicians due to the COVID-19 pandemic. There was an urgent and rapid need of adoption of virtual care to ensure compliance with Infection Prevention and Control (IPAC) standards within cancer centres. Multiple other priority drivers are also perceived to exist, including complexities and risks associated with patient travel, limitations for caregiver participation, and expectations of challenges to patient compliance.

This transition to virtual care has occurred in the absence of evidence as to its equivalency to traditional care. Evidence on virtual care is emerging but there remain numerous unknowns that will need to be addressed to guide health care systems and cancer clinicians, as well as patients and caregivers, in understanding the potential for virtual care to substitute for in-person care. There are questions regarding efficacy and quality, as well as the system- and patient-level resources required.

The following questions were identified as being of interest:

- When is virtual care appropriate for cancer patients?
- What are the clinical outcomes associated with virtual care?
- What are the best practices with cancer virtual care?
- What are the optimal resources and technological requirements required for virtual care?
- What are the patient, disease and system factors that are associated with good virtual care?
- What types of visits are appropriate for virtual cancer care?
- How to integrate allied health team/delivery of multi-disciplinary and specialty care with virtual platforms?
- How to ensure health equity in delivery of virtual care?
- What are the optimal models of compensation for virtual care?

It was determined that a systematic review of clinical studies would be developed to help address a subset of these questions. Others would be better informed by technical reports, real-world evidence, or other types of information and therefore are only briefly addressed in this document. This review was registered with PROSPERO and assigned registration number CRD42020202871.

RESEARCH QUESTIONS

The following research questions were developed to direct the search for available evidence on the use of virtual care in patients with cancer:

- What evidence is there to support the delivery of virtual cancer care?
- What are the patient and disease factors that are associated with provision of effective virtual cancer care?
- What guidance is available regarding optimal delivery of virtual cancer care regarding technical requirements, equity, inter-professional care, and health-care provider compensation?

TARGET POPULATION

The evidence summary was prepared to inform treatment of patients with cancer in Ontario; however, no restriction was placed on patient or treatment location in determining inclusion/exclusion of clinical trials.

INTENDED PURPOSE

This review will be one of the sources of information used to help inform the rollout of virtual cancer care in Ontario both during the pandemic and beyond through the development of standards and quality guidelines.

INTENDED USERS

Intended users are cancer care providers, healthcare policymakers, and cancer system stakeholders in Ontario.

METHODS

This evidence summary was developed at the request of the Person-Centred Care Program at OH (CCO). The Working Group consisted of a medical oncologist and a radiation oncologist, both with an interest in survivorship and patient-centred care, and two health research methodologists.

The Working Group was responsible for planning the review, reviewing the identified evidence, and drafting the summary. Conflict of interest declarations for all authors are summarized in Appendix 1 and were managed in accordance with the *PEBC Conflict of Interest Policy*.

A search of systematic reviews in PROSPERO, preliminary evaluation of known reviews and guidelines, and subject area knowledge of the Working Group members indicated that a search of primary literature was required, and a systematic review was conducted related to the first research question. Clinical trials, systematic reviews, guidelines, and other documents were obtained from the database search, as well as separate searching of known guideline developers (see next sections).

Several documents providing information on technical considerations were identified from the systematic review for clinical trials, systematic reviews, and guidelines, as well as being suggested by the sponsor and authors and targeted searches of organizations mentioned in other publications. The search strategy, however, was designed primarily to find documents in medical journals and guideline developer websites related to cancer; to address technical and legislative issues more thoroughly it is acknowledged that publications in other medical areas as well as non-published technical reports would also need to be consulted.

Population, Intervention, Comparators, and Outcomes of Interest (PICO)

This literature review included patients diagnosed with cancer who were undergoing treatment or follow-up. The intervention of interest was virtual care, defined as interaction between patient and clinician that was not in person (not in the same room). This is also commonly referred to as remote care, telemedicine, or teleoncology, and is a subset of eHealth. The comparison was in-person care (face-to-face) between the patient and the same clinician (or team of clinicians) that conducted virtual care. Preferred (critical) outcomes were recurrence, survival, or other long-term objective outcomes. Patient experience outcomes, including acceptance of virtual care, symptoms, and quality of life, were considered important outcomes. Physician experience was not initially identified as an outcome of interest; however, for studies that met the inclusion criteria we reported results related to physician/clinician experience when available. Publications reporting questionnaires or surveys of clinicians but without patient outcomes were not included.

Literature Search Strategy

Embase, APA PsycInfo, Ovid MEDLINE, EBM Reviews - Cochrane Central Register of Controlled Trials, and EBM Reviews - Cochrane Database of Systematic Reviews were searched on August 6, 2020 and CINAHL was search on July 29, 2020. Results were limited to publications from 2015 or later. Citations had to include both concepts of virtual care and cancer. The full search strategies are reported in Appendix 2.

Twenty-seven guideline websites were searched on August 13 to September 27, 2020 for existing relevant guidelines. The Epistemonikos website was searched for relevant systematic reviews on September 11, 2020. The websites searched and terms used are reported in Appendix 3. Only guidelines or systematic reviews with free access were included; guidelines had to be published after June 2017. Clinicaltrials.gov was searched on November 5, 2020 for additional ongoing trials not included in the above databases. The website clinicaltrials.gov was searched for ongoing trials in separate searches for each of the terms in-person, virtual care, telemedicine, and telephone.

Study Selection Criteria and Process

For Embase, PsycInfo, MEDLINE, Cochrane, and CINAHL databases, review of the titles and abstracts was conducted by GGF. For studies that warranted full-text review, GGF reviewed each study. In case of uncertainty, the full working group made a determination of inclusion or exclusion. Websites and other databases of guidelines or systematic reviews were initially searched and reviewed by XY, and clinicaltrials.gov was initially searched by FM (see acknowledgements) and XY; studies of potential interest were further reviewed by GGF. Additional studies cited in reviews or trials were evaluated using the same criteria.

For trials to be included, they had to be studies of patients with cancer which compared virtual care versus in-person care by a member of the same team. Studies in which a subset of in-person visits were replaced by virtual visits, or in which normal in-person visits were modified to include alternating virtual visits if the normal care was only in-person visits were included. Studies had to be full text publications in English or French with at least 30 patients per group

and published in 2015 or later. Non-comparative studies with more than 100 patients receiving virtual care were also included if they met all other criteria.

Excluded were trials that studied other interventions such as reduction in frequency of appointments; phone or text reminders; use of mobile or online apps, educational materials, lifestyle adaptation; or replacement of in-person care from one professional or treatment team/unit (e.g., oncologist + nurse) with virtual or in-person care by a different profession/team (e.g., community nurse or general practitioner). Publications of conference abstracts or other non-full text reports, editorials, opinions, comments or commentaries, notes, or news articles were also excluded. Trials of telemedicine for prevention, screening, diagnosis, inter-professional consultation, multidisciplinary team meetings, or training of clinicians were excluded. Studies that were primarily surveys, questionnaires, computer tests, or interviews were excluded unless soliciting direct feedback comparing patients' experiences in a trial of virtual versus in-person care. Most studies of diet, exercise, and weight loss/control were excluded as they did not directly compare the same intervention virtually and in-person.

Several trials investigated patient-reported outcomes (PROs) or patient-reported outcome measures (PROMs). After further discussion among the authors, it was determined that these studies did not meet the inclusion criteria, primarily because the PROs/PROMs were being evaluated or were an additional care item confounding the comparison of virtual versus in-person care. For in-person visits, PROs may be collected prior to the appointment with remote-monitoring devices, or regular reporting of symptoms and adverse effects by phone or electronic reporting, or in a diary to be brought to the next appointment. They may be collected within the same appointment on paper or electronic forms (a common method in the Ontario cancer system), orally with nurses or other staff prior to the physician encounter, or through direct discussion with the patient and physician. In designing a virtual care program, mechanisms for collection and actioning of PROs must be incorporated.

The same criteria were used for evaluation of reviews, guidelines, or other reports; however, such documents on virtual care not specific to cancer were retained provided that if specific diseases were noted then cancer was one of the major ones included, chronic diseases were within scope, and cancer was not specifically excluded.

Data Extraction

All included primary studies underwent data extraction by GGF, with all extracted data and information audited subsequently by an independent auditor (FM, see acknowledgements). Ratios, including hazard ratios, were expressed with a ratio of <1.0 indicating the experimental arm was preferable to the control arm. In cases where publications did not follow this convention, the ratios were recalculated prior to being reported in the data tables.

Synthesizing the Evidence

Due to the limited number of studies and lack of homogeneity of design and outcomes, no meta-analysis was planned or conducted.

Assessment of the Certainty of the Evidence

The risk of bias for randomized studies was assessed per outcome and per study by MS (see acknowledgements), XY, and GGF using methods outlined in the Cochrane Handbook for Systematic Reviews of Interventions [1]. This handbook uses the term bias, defined as "a systematic error, or deviation from the truth, in results" [2], and outlines items to consider in evaluating risk of bias for randomized controlled trials (RCTs) [3] and non-RCTs [4]. The Cochrane risk-of-bias (RoB) tool (revised version RoB 2) for RCTs and ROBINS-I for non-RCTs are described in this handbook. The current review considered risk of bias, inconsistency,

indirectness, imprecision, and publication bias (modified GRADE approach [5]) in evaluating the quality of evidence.

RESULTS

Literature Search Results

The literature search resulted in 11,307 citations, of which 11 were identified from the website/systematic review search and 38 were identified by the authors or cited in other publications found in the search. One ongoing trial was found from the search of clinicaltrials.gov. After applying inclusion and exclusion criteria, there were 39 publications representing 23 different completed clinical trials or studies plus 5 ongoing trials. An additional 70 publications of reviews or guidelines were retained, as well as 5 publications with background information. Results of the literature search are represented pictorially in the PRISMA flowchart in Appendix 4.

Results of Search for Clinical Trials or Studies

The trials found have been divided into those that provide psychosocial or genetic counselling and those that provide or assess medical and supportive care.

Certainty of the Evidence

The certainty of the evidence per outcome and per study for RCTs was assessed, taking into account risk of bias using the RoB2 tool [6] and other domains such as inconsistency, indirectness, imprecision, and publication bias. A summary of the results of the risk of bias assessment is reported in Appendix 5. The overall risk of bias for the RCTs was considered low for two studies and high for eight studies. After also considering other domains (inconsistency, indirectness, imprecision, and publication bias), the overall certainty of evidence per outcome and per study was evaluated as moderate to very low for RCTs. The risk of bias for non-RCTs ranged from moderate to critical risk using the ROBINS tool [7]. After also considering other domains (inconsistency, indirectness, imprecision, and publication bias), the overall certainty of evidence per outcome and per study was evaluated as low or very low for non-RCTs; details for assessing risk of bias are therefore not reported.

General Counselling and Genetic Counselling

Table 1 [8-23] includes 16 publications of 10 studies, grouped as either general or genetic counselling. For general counselling, there was one RCT in each of psychotherapy [8], cognitive behavioural therapy [9], and weight-loss counselling [10] and a survey of patients receiving psycho-oncology counselling [11]. The second set of studies involves genetic counselling and includes three RCTs ([12,13], [14-16], [17-20]), one quasi-RCT [21], and two non-randomized studies [22,23].

Table 1. General or genetic counselling.

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
General counselling studies						
Videoconference vs. in-person psychotherapy	Lleras de Frutos, 2020 [8] Barcelona, Spain NCT03010371 2016-2019	269 of which 225 (108 + 117) randomized and 44 (16 + 28) selected their group	Adult women with cancer diagnosis (81% breast cancer) and emotional distress after primary oncological treatment	Pragmatic RCT Online videoconference vs. face-to-face group positive psychotherapy for cancer survivors; 12 weekly group sessions. Online group had 11 sessions plus 1 in-person session	Used validated tools and ITT analysis • HADS for anxiety and depression (change in ≥2 points is the clinical cutoff) and the • PCL-C for post-traumatic stress (cut-off score of 44 to detect a clinical case). • PTGI Emotional distress (anxiety and depression), post-traumatic stress symptoms improved in both groups, no significant difference between groups. Post-traumatic stress still above cut-off after treatment No significant difference in attrition, integrity, or effectiveness after adjusting for baseline differences Online counselling is not superior, both may be effective	Adjusted for age, education, and work status due to significant baseline differences. Significant difference in baseline depression was not corrected for 25 + 29 treatment dropouts and 13 + 37 lost to follow-up but included in ITT analysis Assessment: risk of bias due to portion which self-selected, treatment dropout or lost to follow-up, and baseline differences. No non-treatment control group
Telephone vs. in-person cognitive behavioural therapy	Watson, 2017 [9] Psychological Care Service, Royal Marsden Hospital, Sutton, UK ≈2015-2016	118 (60 + 58) randomized 78 analyzable (43 + 35; including 5 + 6 who switched arms)	Cancer patients (except non-melanoma skin cancer) with high psychological needs for mental health and coping referred for psychological care	Equivalence RCT Telephone-delivered cognitive behavioural therapy (T-CBT) to face-to-face (treatment as usual) therapy (TAU-CBT). Median 4 sessions	PROs self-assessed by pre-validated postal questionnaires: HADS, MAC H/H, CLCC, CCQ. Assessment at baseline and after therapy. Additional post-therapy study-specific questionnaire to evaluate satisfaction, benefits, or disadvantages Both arms had significant improvement in anxiety, depression, HADS Total score, cancer ($p<0.01$) In-person but not telephone group had significant improvement in helpless/hopeless scale ($p=0.13$ and $p=0.015$) Stress and worry improved and were equivalent between groups Authors indicated that based on confidence intervals they did not demonstrate full equivalence of the two arms. In the discussion they indicate the 2 arms were	Initially powered to recruit 124 patients to each group based on the primary end point of the combined change in anxiety and depression score compared to baseline with $\alpha = 5\%$ and power = 80% Analysis on ITT basis Assessment: risk of bias due to low proportion of analyzable patients and those who completed allocated treatment; underpowered (67 completed as

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
					equally effective and telephone care was non-inferior, but equivalence was not observed.	allocated vs. 248 planned); no non-treatment control
Telephone vs. in-person weight loss counselling	Harrigan, 2016 [10] 5 hospitals in Connecticut; Yale University and Yale Cancer Center The Lifestyle, Exercise, and Nutrition (LEAN) Study 2011-2012	100 (34+33+33) 6-month data 24+ 30 + 31 12-month data: 15+ 22 + 19	Breast cancer survivors with BMI ≥25.0 kg/m^2, diagnosed in the 5 years before enrollment with stage 0 to 3 breast cancer, who had completed chemotherapy and/or radiation therapy ≥3 months before enrollment	3 arm RCT: telephone vs. in-person weight-loss counselling (nutrition, exercise, and behavior strategies based on social-cognitive theory; 11 sessions over 6 months (vs. usual care (brochures and referred to survivorship clinic which offers a 2-session weight management program and an in-person counselling session). Participants in all arms received LEAN book (used in counselling groups to guide sessions) and LEAN Journal to record food intake and activity.	Baseline to 6-month changes in body composition, physical activity, diet, and serum biomarkers. Weight change at 6 months: 4.8 kg (-5.4%), 5.6 kg (-6.4%), 1.7 kg (-2.0%); p=0.46 telephone to in-person, p=0.009 telephone to usual care; p=0.001 in-person to usual care. Self-reported weight loss at 12 months was not significantly different between groups Reduction in % body fat was significant for in-person (p=0.05) but not telephone (p=0.37) compared to usual care; difference between telephone and in-person care not significant (p=0.35) Increase activity: 96±154 min vs. 114±130 min vs. 17±110 min (p<0.05) Change in number of steps per day: 948 vs. 1847 vs. -330 (p<0.05) Counselling adherence (all sessions) was 47% vs. 61%; 71% and 88% attended 80% or more. Weight loss was greater for those who attended all sessions (7.3% and 7.9% vs. 2.6% and 4.2%)	Counselling by experienced Registered Dietitian who was a Certified Specialist in Oncology Nutrition and trained in exercise physiology and behavior modification counselling 93% power with 30 patients per group for primary outcome of weight change at 6 months of 3.5 kg difference between at least one intervention and control group or between the two interventions Analyzed by ITT Assessment: risk of bias due to lower adherence and data to analyze for telephone group; low response rate at 12 months; underpowered to detect difference between the 2 treatment groups
Psycho-oncology video-consults due to COVID-19 restrictions	Van der Lee, 2020 [11] Helen Dowling institute, the Netherlands Mar – Apr 2020	209 patients 30 therapists	Cancer out-patients or their family members	Survey of patients who received psycho-oncology counselling via video-consults instead of in-person due to COVID-19 restrictions Survey of 34 psychologists and 2 psychiatrists giving video-consults	Patients reported being grateful for continued care, video-consults as more distant (lack of non-verbal communication and signs of distress), harder for some to express feelings, missed travel time as time to prepare and process afterwards, having place outside home to leave their distress (neutral space). Others found video from home as quieter and relaxed; less stress due to travel and face-to-face contact	When in-person care is allowed again, about half of clients prefer to use video-consults about one-third of sessions (e.g., when too ill/fatigued to travel) Number of surveys distributed and therefore response rate was not reported

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
					Therapists missed non-verbal communication and informal physical contact that helps turn towards difficult emotions and release tension; had to work harder and felt more exhausted; all willing to continue video-consults if requested by patients. Preference for in-person sessions for more complex therapies	Survey used open-ended questions, not validated instrument
Genetic counselling studies						
Genetic counselling (prior to genetic testing), videoconference vs. in-person	Buchanan, 2015 [12]; Datta, 2011 [13] 4 rural clinics affiliated with Duke Cancer Network, Durham, NC, USA 2008-2011	162 (81 + 81) randomized (59 + 71 analyzed)	People referred to CGC in 4 rural oncology clinics and who preferred CGC locally instead of at the academic medical centre. Counties served had higher proportion of traditionally underserved by CGC (African Americans, American Indians, Hispanics) than state or national average	RCT of standard-of-care CGC at their local oncology clinic via telegenetics or in-person Same genetics counsellor for both groups Study not designed to test inferiority or equivalence of telegenetics vs. in-person counselling	Patient satisfaction survey used 2 validated scales: Visit-Specific Satisfaction Questionnaire (VSQ) and the Genetic Counselor Satisfaction Survey 9GCSS0 administered by telephone one week after the CGC Patients who were not analyzed did not attend the consultation (n=18 and n=9) or were lost to follow-up (n=4 and n=1) Cost to health care system: $106 vs. $244/patient Patient satisfaction high and did not differ between groups CGC attendance: 79% vs. 89%, p=0.03. Lower computer comfort and low attendance were associated, p=0.02. Of telegenetics group, 98% were comfortable with system, but 32% would have preferred in-person visit	Report of new program: 15% of telegenetics consults were hampered by technical problems; 7% had to be rescheduled Majority of participants had breast or ovarian cancer; also accepted those with family history of cancer or risk of other hereditary cancer (e.g., Lynch syndrome) Assessment: high risk of bias due to patients not receiving assigned treatment; but preliminary study of new program, no sample size calculation as more of a descriptive study
Genetic counselling (prior to genetic testing; optional afterwards), telephone vs. in-person	Steffen, 2017 [14]; Kinney, 2016 [15]; Chang, 2016 [16] Risk Education and Assessment for Cancer Heredity (REACH) [brief title] Bridging Geographic Barriers: Remote	502 + 510 randomized; 464 + 437 eligible and received counselling; 402 + 379 analyzed [14]	Population-based sample of breast (91.5%) and ovarian cancer (8.1%) survivors at increased hereditary risk for BRCA1/2 mutations identified through the Utah Population Database. Personal or	Randomized controlled equivalency/ noninferiority trial of telephone (TC) vs. in-person counselling (IPC)	Genetic testing uptake between groups did not differ at low levels of distress (27% vs. 30%) and risk (23.8% vs. 29.8%); at high distress uptake was 26.3% TC vs. 44.3% IPC (OR = 0.45, 95% CI=0.27 to 0.76) and at high perceived risk was 33.9% vs. 50.5% (OR=0.50, 95% CI=0.29 to 0.87) At 1-yr follow-up, TC was non-inferior to IPC for all psychosocial and informed decision-making outcomes	Data collectors were blinded to intervention assigned Validated scales used Non-inferiority criteria reported in method; reported > 80% power to detect non-inferiority in distress and anxiety at 1 year

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
	Cancer Genetic Counseling for Rural Women [official title] NCT01346761 University of Utah Randomized 2010-2012	493 + 495 [15]	family history suggestive of HBOC meeting NCCN criteria for genetic counselling. 14 primary care clinics in Utah (5 urban and 9 geographically remote [16]; also reported as 6 urban and 8 rural [14])		(anxiety, cancer-specific distress, perceived personal control, decisional conflict). Telephone counselling cost: $120 (range $80-$200) vs. $270 (range ($180-$400) per person	with α=0.05 based on 988 patients Sensitivity analysis for testing outside study; multiple imputation method for missing observations Assessment: some concerns regarding risk of bias for psychosocial outcomes and high for genetic test uptake
Genetic counselling (prior to genetic testing), telephone vs. in-person	Jacobs, 2016 [17]; Peshkin, 2016 [18]; Schwartz, 2014 [19]; Butrick, 2015 [20] NCT00287898 Telephone-Based Genetic Counseling or Standard Genetic Counseling in Women at Risk of Carrying the BRCA1 or BRCA2 Mutation 4 cancer centres in New York, Boston, Vermont, Washington DC 2005-2012	669 (335 + 334) randomized; 554 (272 + 282) completed baseline and 2-week follow-up interview Due to study modification, the first 75 participants did not have genetic counsellor questionnaire (GCQ) [17] and were excluded from this particular analysis (n=479; 236 + 243 for GCQ)	Women with BRCA 1/2-associated hereditary breast/ovarian cancer who contacted the clinical genetics counselling programs. Excluded metastatic cancer or new diagnosis within 4 weeks. Allowed women with documented BRCA 1/2-mutation in biological relative	Non-inferiority RCT of telephone genetic counselling (TC) vs. usual care (UC; in-person genetic counselling) by trained genetic counselor. Follow-up telephone interview approximately 2 weeks later to assess perception and satisfaction with pre-test counselling. Questionnaire of genetic counsellor (GCQ) about perceptions of delivery	Used validated instruments/scales: • Breast Cancer Genetic Counseling Knowledge Scale • Decisional-Conflict Scale (DCS) • Impact of Event Scale (IES) to measure distress • SF-12 Mental Component Summary (MCS) and Physical Component Summary (PCS) to measure quality of life Face-valid measures for satisfaction, convenience, ability to maintain attention, emotional support, counselor ability to recognize participant emotions TC noninferior to UC on all outcomes: knowledge, decision conflict, cancer distress, perceived stress, genetic counseling satisfaction No difference and TC non-inferior in pretest and post-test survey for satisfaction (83.1% vs. 86.8% very satisfied, p=0.22), knowledge, perceived stress. UC group had more decisional conflict but within non-inferiority bounds TC more convenient (OR=4.78, 95% CI=3.32 to 6.89) but with lower perceived support (52.9% vs. 66%, p=0.002; OR=0.56, 95% CI=0.40 to 0.80) and emotional recognition (55.5% vs. 68.8%, p=0.001; OR=0.53, 95% CI=0.37 to 0.76).	Non-Hispanic white participants had higher satisfaction and perceived support and greater uptake of genetic testing compared to minorities TC more cost effective, especially for patients farther from a clinic Reported statistical analysis, limits to establish noninferiority, sample size calculations (n=554 with >80% power to detect noninferiority; n=544 for secondary outcome of test uptake to detect equivalence) Conducted sensitivity analysis for several variables Assessment: low risk of bias, missing data (responses) explained and similar between groups

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
					80.9% of TC preferred TC or had no preference; 84.2% of UC preferred UC or had no preference; p=0.3. TC group had less uptake of subsequent BRCA 12 testing (84.2% vs. 90.1%; logistic regression model OR=1.65, 95% CI 1.00 to 2.72) Genetic counsellors score did not differ overall (p=0.910). Scores did not differ by group, but were lower for minorities	
Genetic counselling (prior to genetic testing plus afterwards if tested), video-teleconference at clinical site vs. in-person	Mette, 2016 [21] 4 clinical sites in Texas-Mexico border region, administered by University of Health Science Center at San Antonio 2012-2014	353 surveys, 119 responses (56 + 63)	Underserved primarily Hispanic population (95%). High risk based on their personal and/or family medical histories and meeting NCCN guidelines for genetic counselling	Cancer genetic risk assessment and counselling through telemedicine with certified genetic counselor or oncologist experienced in cancer genetic risk assessment at clinical sites by video-teleconferencing vs. in-person. In-person appointments about once a month at each center (otherwise it was by video) and patients had no input on type of visit	Questionnaire to assess satisfaction with the program. There were no differences between the two groups for satisfaction, comfort talking, felt listened to, enough time, understood information, information valuable, information helped to make health decision, would recommend program No mention of statistical analysis in methods Questionnaire response rate was 34%	Assessment: high risk of bias due to method of randomization, low response rate to questionnaire, no preplanned statistical analysis
Genetic counselling (prior to genetic testing plus afterwards if tested), videoconference from remote clinic vs. in-person	Solomons, 2018 [22] Maine Medical Center (MMC) Cancer Risk and Prevention Clinic (CRPC) in Scarborough, Maine and 2 remote sites in Maine 2013-2015	174 (106 + 68) 158 (90 + 68; 85% + 100%) returned pre- and post-counselling surveys 65 (41 + 24; 46% + 35%) returned 1-month surveys	New patients with personal or family history suggestive of HBOC susceptibility. All sites serve rural patients Groups matched by gender, race, health insurance status	Non-randomized Live-interactive videoconferencing from remote clinic vs. in-person. Group was determined mainly by geographic proximity to site. Counselling by board-certified cancer genetic counselor and medical oncologist experienced in cancer genetic counselling	9 HBOC-related knowledge questions were adapted from a National Human Genome Research Institute Cancer Genetics Studies Consortium tool; 4 other questions on hereditary colorectal cancer were exploratory and not included in this analysis Depression and anxiety assessed with Patient Health Questionnaire for Depression and Anxiety (PHQ-4) (validated questionnaire) Questions on access to technology, travel distance, transportation, ease of telecommunication use, quality, confidentiality adapted from previous validated survey instruments	Groups similar for gender, race, and health insurance status. Groups were unequal regarding age, personal history of cancer and type of cancer, and education. 16 patients noted equipment problems or loss of internet connection but 90% of these were adequately addressed. Assessment: High risk of bias due to non-randomized patient grouping and baseline difference

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients (patients per group)	Patient Characteristics	Trial Type and Comparison	Outcome	Other
				(same staff for remote or in-person counselling) Questionnaire at pre-counselling, immediately after, 1 month after by mail; plus 4 weeks after test results for those undergoing genetic testing.	Satisfaction Survey developed by National Research Corporation HBOC knowledge improved equally (evaluated only in patients with personal or family history of breast/ovarian cancer). Remote group had higher anxiety and depression pre-counselling; decreased anxiety in both groups; depression improved more in telegenetics group initially but was lower at 1 month in both groups. Telegenetics (remote) reduced transportation need and work absence; patients satisfied with quality 32% of remote patients noted preference for in-person care.	affecting group comparisons but not overall trends
Telephone genetic counselling, prior to genetic testing and post-test (if they choose testing)	Tutty, 2019 [23] Australian familial cancer centre (location not specified), patients throughout Australia (about 65% in Queensland or Vitoria) Counselling 2016-2017 2008-2013 comparison arm	284 counselled, 277 surveys, 107 responses (39%)	Women with high-grade serous ovarian cancer (HGSOC)	Survey of experiences with telephone genetic counselling Telephone genetic counselling prior to testing and after testing if patient decides to be tested. Those with BRCA1/2 variant affecting function (n=26, 9.2%) or significant family history requiring evaluation (e.g., Lynch syndrome) offered further in-person counselling	Patient perspective on telephone counselling Cost from perspective of healthcare system 40% had poor knowledge (<5/7 correct answers) for knowledge of hereditary breast and ovarian cancer syndromes 97% satisfied with timing of telephone call and 94% with information provided 17% would have preferred face-to-face counselling, 34% had no preference Median per patient cost was AUD $91.52 telephone vs. $107.37 in-person	

Abbreviations: BMI, body mass index; BRCA1/2, BReast CAncer gene 1 or 2; CCQ, Cancer Coping Questionnaire; CGC, cancer genetics counselling; CI, confidence interval; CLCC, Checklist of Cancer Concerns; COVID-19, coronavirus disease of 2019; HBOC, hereditary breast and ovarian cancer; HADS, Hospital Anxiety and Depression Scales; ITT, intention-to-treat analysis; NCCN, National Comprehensive Cancer Network; OR, odds ratio; MAC H/H, Mental Adjustment to Cancer Scale: Helpless/Hopeless subscale; PCL-C, Posttraumatic Stress Disorder Checklist-Civilian Version; PRO, patient-reported outcome; PTGI, Posttraumatic Growth Inventory; RCT, randomized controlled trial; vs, versus; yr, year

General Counselling

The group psychotherapy trial [8] studied women with emotional distress after primary oncology treatment. Emotional distress and post-traumatic stress symptoms improved in both groups; there were no significant difference between groups. The study authors concluded that, after adjusting for baseline differences, on-line counselling is as effective and engaging as in-person counselling. However, this RCT included 225 patients who were randomized and 44 with a strong preference who selected either videoconference or in-person psychotherapy, and therefore the full patient population was not randomized. In both groups, 20% of patients did not complete treatment; loss to follow-up was 10% versus 26%. This study is considered to have high risk of bias. There is no mention of sample size calculation, or whether this was designed as a non-inferiority trial. Thus, the certainty of evidence is very low.

A cognitive behavioural study [9] in patients with cancer and high psychological needs for mental health compared telephone and face-to-face therapy. Both arms had significant improvement in anxiety and depression, and equivalent improvement in stress and worry. The trial authors concluded they did not demonstrate full equivalence of the two arms, although both were effective and telephone care was non-inferior. Of the 118 patients randomized, only 78 had analyzable data (72% of telephone group and 60% of control group), and of these, 11 patients switched arms but were included as allocated in the intention-to-treat analysis. The study was underpowered as both the number of patients randomized and analyzable were less than in the power calculation (n=124 per group). The certainty of evidence is considered to be very low.

The LEAN study [10] compared telephone weight-loss counselling versus in-person counselling versus usual care (the third arm being not relevant to the current evidence summary) in 100 breast cancer survivors. Both counselling groups had significant weight loss (4.8 kg and 5.6 kg), increase activity, and number of steps per day compared to usual care (weight loss 1.7 kg), but there were no significant differences between telephone and in-person counselling. The study was powered to detect a difference of 3.5 kg weight loss, and therefore underpowered to detect differences between counselling groups. The telephone group had less adherence to the program (47% vs. 61% completed all sessions). The certainty of evidence is considered to be very low.

A survey of 209 patients with cancer or their family members receiving psycho-oncology counselling using videoconferencing due to COVID-19 restrictions found that patients were grateful that care could be continued, but that it was more distant due to lack of non-verbal communication and signs of distress and harder for some to express feelings [11]. Some patients missed the travel time as a period to prepare in advance and process afterwards and missed having a neutral space outside the home to leave their distress. Therapists also missed non-verbal communication and informal physical contact and felt more exhausted; they were willing to continue videoconferencing if patients requested this but preferred in-person sessions for more complex therapies. Approximately one-half of the patients indicated a preference to use video-consults a portion of the time (e.g., when sick or fatigued) when in-person care is again allowed (COVID-19 restrictions lifted).

Genetic Counselling

The studies on genetic counselling included patients with cancer, mostly limited to those at higher risk for hereditary cancers (especially hereditary breast and ovarian cancer related to *BRCA1/2* gene mutations) and sometimes close family members. These studies tend to involve larger numbers of patients than those for general counselling. Counselling took place prior to genetic testing, with the purpose of providing education and helping patients to decide whether to undergo testing. Some studies were also designed to provide emotional support,

and some provided additional counselling post-test for patients who decided to undergo genetic testing.

The RCT by Buchanan et al. [12] which included 162 patients and the REACH trial [14-16] which included 988 patients both focussed on rural communities, while the other RCT by Jacobs et al. was conducted through cancer centres in four large cities [17-20] and included 554 patients. They all found that virtual care via video [12] or telephone [16,19] was more cost-effective than in-person counselling. Cost analyses were done for the health care system, patients, or society (system + patients). For the system, this was driven mainly by lower overhead (office space) and travel time for staff to attend remote clinics, while for the patient it was due to less travel time and expense, and less time off work. The videoconference trial [12] reported no difference in patient satisfaction. The REACH trial [14-16] reported that at one-year follow-up telephone was not inferior to in-person counselling for all psychosocial and informed decision-making outcomes (anxiety, cancer-specific distress, perceived personal control, decisional conflict). The Jacobs et al. RCT by telephone [17-20] reported that telephone was more convenient, resulted in no difference in knowledge or stress, but with less perceived support and emotional recognition. In this study there was no overall difference in patient satisfaction; differences in satisfaction and uptake of subsequent genetic testing were associated with race (higher in non-Hispanic white participants than for minorities). The study by Buchanan et al. [12] reported on a new program and was not designed to test inferiority or equivalence; it therefore does not report sample size calculations and the certainty of evidence is considered to be very low. The REACH trial [14-16] and the RCT by Jacobs et al. [17-20] reported non-inferiority criteria and sample size required; the REACH trial had deviations from interventions and missing data and is evaluated to have low certainty of evidence, while in the Jacobs et al RCT the certainty of evidence is high.

In the study by Mette et al. [21], patients received in-person care if the genetic counselor or oncologist visited the regional extension centre on the day of their appointment (approximately once per month), otherwise they received counselling by video-teleconferencing at the regional centre. Patients had no choice in type of counselling. Participants who attended at least one session were sent a survey; response rate was 119/353 (34%). While 69% of those counselled underwent genetic testing, the testing rate was 80% in those who responded to the survey. There were also discrepancies in proportions of surveys completed when analyzed by age or race. There were no differences in satisfaction, feeling comfortable talking to the counsellor or listened to, having enough time, understanding information, finding the information to be valuable or that it helped to make health decisions, or whether they would recommend the program. The study authors concluded that video-teleconferencing is an acceptable method of providing cancer risk assessment in a remote, underserved area. The overall certainty of evidence is considered to be low.

The non-randomized study by Solomons et al. [22] compared videoconferencing for 106 patients in two remote sites versus counselling for 68 patients in an in-person clinic, with the grouping mainly determined by geographic proximity to the site. Groups were similar for sex, race, and health insurance status but unequal regarding age, personal history of cancer and type of cancer, and education. Knowledge of hereditary breast and ovarian cancer improved equally, and anxiety decreased in both groups. While videoconferencing reduced transportation needs and work absence, 32% of the patients indicated a preference for in-person care.

The study by Tutty et al. [23] surveyed patients with high grade serous ovarian cancer who had received telephone genetic counselling. Response rate was 107/277 (39%). Most patients were satisfied with timing of the telephone call (97%) and the information provided (94%). Face-to-face counselling would have been preferred by 17% of patients, while 34% had no preference.

Medical or Supportive Care

Randomized Trials

As indicated in Table 2 [24-41], the literature search found four RCTs, with one each for topics of pain management [24,25], solid tumour systemic therapy follow-up [26,27], endometrial cancer follow-up [28-30], and prostate cancer follow-up [31].

The study of videoconferencing versus in-person psychosocial pain management [24,25] included 178 patients and found that videoconference delivery resulted in higher rate of session completion, was noninferior for pain severity and pain interference, and was more feasible (attrition/adherence, time to completion). Both groups had similar patient burden and engagement, and degree of acceptability. A strength of this study was that the videoconference group was given a tablet (iPad) with a data plan; these were also given to those in the in-person group if needed to access the study website for self-assessment and to enter content preferences. Sample size calculations were reported, as were non-inferiority parameters for pain severity and interference; because of withdrawals the study is underpowered for some calculations. Differences in baseline characteristics and withdrawal rates are concerning, and the overall quality of evidence is considered to be low.

In the NCT MOBILE trial (National Center for Tumor Diseases, Germany) [26,27] which randomized 66 patients, those having video follow-up after systemic therapy for solid tumours had significantly greater satisfaction with the interaction and more confidence in the physician, and found it had greater efficiency, punctuality, time saving, and lower cost compared to those having standard in-person visits. Difficulties in the first appointment were mostly due to software incompatibility and internet connections that were resolved for the second appointment. This study has a high risk of bias primarily due to the small sample size and low rate (73%) of completed follow-up and questionnaires. The study authors did not conduct sample size calculations for statistical significance. The overall quality of evidence is low.

The ENDCAT trial [28-30] was a non-inferiority RCT that randomized 259 patients to either telephone follow-up or traditional hospital follow-up after hysterectomy for endometrial cancer. It included a cross-sectional survey analyzed according to randomization group. Mean follow-up was 25 months. Telephone follow-up was non-inferior for psychological morbidity (anxiety). Differences in patient satisfaction, quality of life, being able to ask questions, having questions answered, feeling anxious prior to appointments, feeling reassured, and cost were not significant. Telephone appointments were more likely to be on time and thorough. Recurrence was the same in both groups (4%) and all were symptomatic; patients with recurrence were excluded from further follow-up. Risk of bias is evaluated to be low and the overall quality of evidence is high.

The Mayo Clinic trial [31] randomized 70 men after radical prostatectomy with no urologic concerns to either video or in-office follow-up for one visit. This trial found efficacy (time of visit) was not different. Patients reported no difference or similar trust in the provider, education provided, satisfaction, visit confidentiality, and ability to share personal information. There were significantly lower costs to the patients for video visits. The overall certainty of evidence is very low.

Table 2. Studies except counselling.

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
Videoconference vs. in-person psychosocial pain management	Kelleher, 2019 [24]; Winger, 2020 [25] Duke Cancer Center, Durham, North Carolina 2014-2017	178 (89 + 89) randomized 137 (75+62) post-treatment 128 (70 + 58) at 3-month follow-up	Patients with breast, lung, prostate, or colorectal cancer within 6 months to 2 years and 2 clinical pain ratings of 3+ (0-10 scale) at least 3 weeks apart	Noninferiority RCT for pain severity and Aim 2 outcomes. RCT for Aim1. Videoconference vs. in-person psychosocial pain management; 4 sessions. Assessment at posttreatment and after 3 months follow-up Videoconference group given tablet (iPad) with data plan; these were also given to patients in the in-person group if needed to access website. Both groups had access to study website for self-assessment and to indicate preferences for content of next session. Groups not balanced for sex, cancer stage, months since initial diagnosis	Used validated measures of pain; used Client Satisfaction Questionnaire for acceptability; used individual questions items for patient burden (difficulty to complete sessions, fatigued, time and cost, transportation and distance), and engagement (understanding and use of study materials) Aim 1: intervention access (feasibility: attrition, adherence, completion time; patient burden (physical, emotional, financial; engagement; acceptability) Aim 2: primary outcomes: pain severity and pain interference; secondary outcomes: physical well-being and symptoms, psychological distress, self-efficacy for pain management Results for Aim 1: Videoconference group had better feasibility (better adherence and shorter completion time for all 4 sessions); similar patient burden and acceptability in both groups Results for Aim 2: outcomes were improved post-treatment compared to baseline in both groups; continued (more) improvement at 3-months assessment only in the videoconferences group Authors indicate videoconferencing was non-inferior at posttreatment, and (with exception of physical symptoms) at 3 months posttreatment. Pain severity and pain interference differences were below noninferiority margin of 1 however differences in both groups were not clinically meaningful (change of at least 1 point). Physical symptom outcome is not meaningful due to large baseline difference (similar in size to maximum improvement) Completion of all sessions predicted improvement in pain severity, pain interference, and pain self-efficacy; videoconference group was more likely to complete all sessions (83% vs. 65%, p=0.006). Patients near medical	A high proportion of randomized patients did not meet the inclusion criteria for high pain (needed to be ≥3, but median was 3.86/10 and 50 % were ≤3) Withdrawals by 19 vs. 31 patients; reasons reported, including declining health 11 vs. 9; death 0 vs. 6 Baseline differences in cancer stage, months since initial diagnosis suggesting traditional group had more advanced disease but not statistically significant Sample size calculated to be 156 to give 80% power to detect effect of d=0.40 in access variables; non-inferiority calculation for pain severity and interference Assessment: high risk of bias due to difference in baseline patient characteristics, high withdrawal rates, and not meeting inclusion criteria; underpowered due to high withdrawal rate

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
					center, with early cancer, or less comorbidity were more likely to complete in-person sessions.	
Video call vs. in-person follow-up	Walle, 2018, 2020 [26,27] NCT MOBILE DRKS00015788 National Center for Tumor Diseases (NCT) in Heidelberg, Germany Recruited 2017-2019	66 (33 + 33) randomized 48 (22 + 26) evaluable questionnaires	Solid tumours and systemic therapy needing follow-up visit at outpatient clinic in 2-14 days, follow-up for 6 months Patients who owned or were adept at smartphone use	RCT Video call via mobile telephone vs. standard in-person visit	Questionnaire was developed by research team and was based on other validated instrument for patient-physician interaction and self-developed questions adapted from prior assessments of telemedicine outcomes; questionnaire completed immediately after appointment Primary outcome was feasibility (successful completion of follow-up visit) Number of successful appointments for first follow-up: 78.8% vs. 87.9%; p=0.51 Success rate of subsequent video call 91.7% Patient satisfaction greater with video call: confidence in their physician (p=0.006), efficiency (p=0.003) and punctuality (p=0.003), saving time (p<0.0001) and cost (p<0.0001) Physical exam in 2 vs. 8 visits (9% vs. 31%); prescriptions in 9% vs. 50% of patients. Referrals to other professionals in 5% vs. 12%	Failure most commonly due to software incompatibility internet connection, schedule function (mobile); no-show (in-person) Patients in video group saved 170 minutes time, 14.37 Euros in direct costs, and 58.3 Euros in indirect costs (absence from work) Reported planned statistical analyses; no statistical sample size estimation was performed Evaluation: high risk of bias due to small size and missing data (dropouts), did not calculate sample size required)
Telephone vs. hospital follow-up	Beaver, 2017 [28]; Dixon, 2018 [29]; Beaver, 2020 [30] ENDCAT ISRCTN: 75220876 Recruited 2012-2014 North West England	259 (129 + 130) randomized; 111 + 106 analyzed At end of trial, 236 sent questionnaires of which 211 (89.4%) responded (105 + 106)	Completed primary treatment (hysterectomy) for stage I endometrial cancer; only 4% had radiotherapy Recruitment was at 3 to 4 months in 63% and at 6 months for 29% Questionnaire not sent to those with recurrence (n=10) or declined (n=10),	Noninferiority RCT, cross-sectional survey Intent of follow-up is primarily to detect recurrence Nurse-led (gynecology oncology nurse specialist) telephone follow-up (TFU) vs. traditional hospital follow-up (HFU; appointments every 3 or 4 months for the first 2 years post-treatment followed by appointments at decreasing	Psychological morbidity (State Trait Anxiety Inventory, STAI-S) 33.0±11.0 vs. 35.5±13.0, non-inferior Patient satisfaction: a) with information (primary) OR=0.9, 95% CI 0.4 to 2.1, p=0.83; b) with service (secondary) 9.2±1.5 vs. 8.9±1.7, 95% CI -0.5 to 0.3, p=0.58 Recurrence 4%, 5 from each group, all symptomatic and presented as interval events reported to general practitioner or nurse specialist between scheduled appointments The time from randomisation to diagnosis of recurrence: TFU median 307 days, range 48-662 days; HFU 172 days, range 99-436 days.	Sample size based on margin of non-inferiority of 3.5 for effect on the STAI-S. Target was 128 participants per group to give 80% power at 5% significance level and 20% attrition. Sample size also had 80% power to detect OR of at least 2.25 (p=0.05) in patient satisfaction with information Assessment: low risk of bias, response rate high and

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
			withdrawn from study (n=2) or died (n=1)	intervals (6-monthly and annually), up to a period of 3–5 years). TFU was on same schedule as HFU Questionnaires at baseline and immediately after appointments by mail	Cost analysis (secondary outcome): no difference at 6 or 12 months; may free clinic time Preference questionnaire at end of trial: TFU more likely to have appointments on time ($p<0.001$) and thorough ($p=0.011$); no statistically significant differences for being able to ask questions, having questions answered, feeling anxious prior to appointments, and feeling reassured HFU more likely to be kept waiting ($p=0.001$), indicated nurse less likely to be familiar with their case ($p=0.005$) No significant difference in QoL	similar in both groups, met sample size requirements
Video vs. office visit for follow-up after prostatectomy	Viers, 2015 [31] Mayo Clinic 2013-2014	70 (34 + 36) randomized 55 (28 + 27) completed the study	Radical prostatectomy for prostate cancer, at least 90 days after surgery and undergoing surveillance, no active urologic concerns requiring physical examination as determined by pre-visit phone call (fever, unintentional weight loss, urinary retention, hematuria, pain, incision erythema/drainage)	Equivalence RCT Video visit (at home or work) vs. office visits by urologist. Each patient had one visit, either from home/work (remote) or in the urologist office Patient questionnaire immediately after visit with seven-point Likert scale (1 = strongly agree; 7 = strongly disagree). Urologists completed a 12-point questionnaire at the conclusion of each visit	No validated questionnaires were known; used study-specific one designed with help of Mayo Clinic Health Sciences Research department, adopted questions from published questionnaires when appropriate Primary outcome was efficiency (length of visit); equivalency was found 100% of video patients and 96% of office visit patients agreed that they would meet with their provider in the same setting again; when considering cost 83% and 59% would choose remote encounter for subsequent visit No difference in patient trust of the provider (1.0 vs. 1.0), perception of visit confidentiality (1.1 vs. 1.0), or ability to share sensitive/personal information (1.3 vs. 1.0) Similar perceived efficiency (2.1 vs. 1.4), quality of education provided (1.3 vs. 1.4), and overall satisfaction with the encounter (1.2 vs. 1.1) High level of urologist satisfaction in both groups, no difference in quality of medical history, therapeutic management, or perceived patient satisfaction Different distribution of missed visits: video had 3 technical, 1 canceled, 2 medical; office visits had 9 late or no show	Significantly lower costs of video visit patients (travel, missed work, other cost) Reimbursement and state licencing are issues for clinician Powered to detect equivalence in timing efficient at difference of 5 minutes; required 32 patients in each arm at confidence interval of 95% for equivalence Assessment: high risk of bias due to low sample size, missed appointments, incomplete reporting, and methods of evaluation; sample size calculated for outcome of efficiency (length of visit)

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
Remote vs. in-person medical oncologist supervision for chemotherapy	Chan, 2015 [32] Mount Isa Hospital (2007-2012) or Townsville Cancer Centre (TCC); 2009-2010), Queensland, Australia	89 + 117	Chemotherapy patients All patients at Mount Isa Hospital; patients from two 3-month periods at TCC, excluding those with RT or on clinical trials	Non-randomized, quasi-experimental, retrospective chart audit. Mount Isa Hospital (medical oncology support and supervision by teleoncology from TCC; has general physicians, chemotherapy-proficient nurses, allied health professionals, pharmacist) vs. TCC group (in-person). Both groups supervised by same medical oncologists	Dose intensity of chemotherapy and toxicity rate. Serious adverse effects: palliative 5.4% vs. 15%, curative /adjuvant 2.9% vs. 3.6% Grade 3/4 toxicity in palliative patients: neutropenia 21% vs. 23%; diarrhea 0% vs. 12%; Neuropathy 8.8% vs. 0%; fatigue 0% vs. 1.8%; other 8.8% vs. 21% Grade 3/4 toxicity in curative patients: neutropenia 34% vs. 13%; nausea and vomiting 0% vs. 3.3%; diarrhea 1.8% vs. 1.7%; neuropathy 0% vs. 3.3%; fatigue 0% vs. 6.7%; other 16% vs. 30% Hospital admissions: palliative 36% vs. 43%, curative 15% vs. 27% Dose intensity: palliative 97.4% vs. 98.2%; curative 84.4% vs. 88.1%	Methodology indicates powered to detect 20% difference in outcome with 160 patients, however even rates several-fold higher were indicated not significant: study author conclusion of no difference is not supported by data; however, the study was likely underpowered for subgroup analysis (palliative or adjuvant/curative; specific adverse effects)
Telehealth (video or phone) at remote centres connected to cancer centre	Hamilton, 2019 [33] Remote centres and Townsville Cancer Centre (TCC), Queensland, Australia 2011-2015	106 surveys returned (311 charts were audited; survey sent to subset of 231 patients]	Patients who participated in tele-radiation oncology program as identified by billing codes. Patient willing to participate in telehealth, deemed suitable by radiation oncologist or referring specialist. Both new and follow-up appointments eligible	Retrospective audit of records and patient satisfaction survey. Selected every third patient in chronological order (311 out of 833 patients for in-depth analysis Convenience sample of 231 patients for satisfaction survey	Patient satisfaction and feasibility 311 patients had 1416 appointments (43% telehealth, 46% in-person, 11% phone consults) Survey response rate was 106/231 (46%); of the responses 55% preferred telehealth for future appointments, 1% face-to-face, and 35% mixed (telehealth and face-to-face), 9% unknown 80% or more strongly agreed (≥90% agreed or strongly agreed) they could hear doctor clearly, felt privacy and confidentiality were respected, could ask questions easily, easy to establish rapport, and diagnosis and treatment options could be adequately explained. 68% strongly agreed and 15% agreed that they felt reassured there was a nurse or local doctor present	There was an overall benefit in efficiencies in travel, time, and cost, and reduction in disruptions to work and family life. Many noted benefit of family members or carers to be part of telehealth consultation Telehealth was an option for initial consultation and follow-up appointments, but still had to travel for radiation therapy treatment
Video from local centres to contact specialist	Jue, 2017 [34] Veterans Affairs (VA), Florida	296 (755 visits)	In VA Healthcare System in South and Central Florida,	Survey of patient satisfaction; cost analysis Visit via video from local VA centre with centralized	Reduction in patient travel distance by 80.7% (213,008 miles), saved system $155,627 as patients are normally reimbursed for travel expenses 86% of patients believed care was more accessible	Patient satisfaction measured on survey using Likert scale by mail,

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
	2012-2014		referred to surgical oncologist in Miami	surgical oncologist in Miami who directed oncology treatment, physical exam by nurse practitioner under video supervision of surgical oncologist. Only surgery itself (if needed) was done in person by surgical oncologist. Single surgeon who also had medical oncology background for all patients	Average satisfaction scores 4.4 to 4.7 for most categories (effective communication, adequate hearing and vision during visit, understanding of past medical history, reviewed scans and test together, explained treatment clearly, felt comfortable discussing problems, specialist was supportive partner, felt they had input, travel more convenient, easier to receive care) Score of 4.2 for video being more cost and time efficient; 3.8 for preference for next visit to be in-person; 3.6 for believe care would be better in person each visit	1=strongly negative and 5=strongly positive
Remote vs. in-person pain intervention	Li 2016 [35] Xuzhou Central Hospital, Jiangsu, China Resection 2013-2014	81 (41 + 40)	Chronic post-surgical pain (CPSP) after radical resection for lung cancer and no postoperative complications	Retrospective Remote pain intervention (smartphone or internet) vs. conventional care (weekly in outpatient clinic)	36-item Short Form Health Survey (SF-36) for QoL at 1 and 3 months after therapy: groups similar QoL $p>0.05$. Remote group had higher satisfaction, 90.2% vs. 72.5%, $p<0.05$	
Telephone follow-up after prostate radiotherapy (single group study)	Verma, 2015 [36] Mount Vernon Hospital, United Kingdom 2011 to 2013	134 had first review at 6 months, 69 at 12 months, 9 at 24 months	Men who had radiotherapy for localized low to medium risk prostate cancer and had telephone appointment at 6 weeks to access residual acute toxicity, and expressed preference for subsequent telephone follow-up	Remote telephone follow-up by radiographer (single group)	88/134 patients (66%) returned questionnaires at 6 months, all patients did not respond to all questions • 77% reported telephone follow-up as more convenient, 3% not more convenient, 8% no preference • 9% would have preferred in-person visit with radiologist and 15% would have preferred in-person visit with a doctor • For future follow-up, 76% preferred phone, 6% preferred in person, 7% no preference Similar, if not higher, levels of post radiotherapy GI, GU, and sexual toxicity as outpatient clinic appointments [comparison group was a different UK wide CHHIP trial]; study authors suggest this indicates willingness to disclose potentially embarrassing adverse effects (erectile and bowel dysfunction) over the telephone	Study appears ongoing at time of publication (2015) but there are no subsequent publications Patients were highly selected to exclude those with high risk of relapse or with residual toxicity, and then again by patient preference Note that radiographer follow-up is not usual practice
Video vs. clinic assessment	Patil, 2018 [37]	65	Adult patients with intermediate- to high-	Video (VF) vs. clinic follow-up (CF) in same patients. VF	Concurrence in decision to administer TMZ was 100%	Median cost $58.15 US vs. $131.23 US

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
	Mumbai, India 2017		grade (grade II-IV) glioma on adjuvant temozolomide (TMZ) for 2+ cycles	on day 24 from previous CF; decision regarding continuation of TMZ (yes/no), supportive medications (yes/no), need for imaging (yes/no), need for molecular testing (yes/no), and need for rehabilitation (yes/no) were documented. About 4 days later was in-person exam in same patient to determine agreement of decision Two groups of 3 clinicians did assessment and patient was randomized as to which group did assessment	Patient satisfaction rate (somewhat or extremely) was 100% post-VF and was 98.5% post-CF.	
COVID-19 switch to phone consults; survey of patient preference	Smrke, 2020 [38] Royal Marsden Hospital (RMH) Sarcoma Unit March-April 2020	108 patient surveys returned (70 + 34) 18 clinician surveys	Patients with sarcoma	Retrospective case series. Data extracted from patient records for planned appointments; looked at those converted to telemedicine (phone) due to COVID-19 and those face-to-face. Anonymous patient experience survey and clinician survey	Patient satisfaction: 8.99/10 vs. 8.35/10. 80% indicated they would like at least some future appointments to be by telemedicine for reasons of travel time (42%), travel expense (20%), convenience (30%); 48% would not want bad news over the phone. Of those who preferred face-to-face, 42% felt it more reassuring and 20% treatment plan clearer Clinicians: 78% found appointments shorter by phone; 89% felt it did not increase workload; affected ability to perform exams sometimes (44%) or often (17%); most favoured telemedicine for active surveillance or stable dose oral medication	Most phone patients were on active surveillance (46%) or oral therapy (28%). Face-to-face common for IV systemic therapy (31%), results indicating disease progression (30%), assessment of performance status (16%). Due to difference in patient groups, direct comparison between groups is not appropriate
COVID-19 Patient Preference	Rodler, 2020 [39] Uro-oncology outpatient unit in tertiary care hospital of the Ludwig Maximilian	101 (92 responded)	Advanced genitourinary cancer and systemic therapy switched to virtual treatment (phone or video) where possible due to COVID-	Survey of all patients during one week by email, phone, or in-person; single cohort (non-comparative)	Majority value continuation of therapy higher than COVID-19 prevention measures; 77.2% unwilling to postpone a staging exam; 44.6% afraid of progression (61.8% chemotherapy; 33.3% immunotherapy) and do not want to delay or interrupt treatment	Anxiety, perceptions, and expectations were assessed on 10-item Likert scales (0-3 low; 4-6 medium; 7-10 high). Acceptance of future telehealth applications was

Topic	Author and Source; Trial Name; recruitment or follow-up period	# Patients	Patient Characteristics	Trial Type and Comparison	Outcome	Other
	University, Munich, Germany April or May 2020		19 pandemic [visits limited to therapy application]		Acceptance of virtual discussion of staging results and therapy decisions median 8 (IQR 5-9); referral to secondary care oncologists for therapy median 2.5 (IQR 0-6.75); telehealth beyond pandemic median 4 overall (IQR 2-7; 3 on immunotherapy and 5 on chemotherapy) 62.6% prefer in-person care after pandemic. High acceptance of external laboratory controls (60.9%) but lower for online visit management (48.9%), remote treatment planning (44.6%), referral to secondary care oncologists (17.4%)	classified from 0 to 5 (low) or as 6 to 10 (high)
Video-based follow-up due COVID-19	Layfield, 2020 [40]; Triantafillou, 2020 [41] University of Pennsylvania, Philadelphia, Pennsylvania Mar-Apr 2020	100	New (6%) or returning (94%) otolaryngology patients who had telemedicine visits with head and neck surgeons, including preoperative discussions, postoperative visits, and oncologic surveillance. 73% malignant, 9% premalignant	Questionnaire of patients who had video-based telemedicine visits, using telehealth usability questionnaire (TUQ) with Likert-scales (1=strongly disagree to 7=strongly agree) Qualitative comments from subset of 56 patients	Mean scores ±SD: Usefulness 6.10 ± 0.50; Ease of use 6.21 ± 0.13; Effectiveness 6.20 ± 0.60; Reliability 4.86 ± 0.84; Satisfaction 6.29 ± 0.32 Concerns were related to limitation on physical exams and lack of touch 29% required technical assistance from family or caregiver; 32% expressed relief they could receive care during COVID-19; 25% indicated telemedicine was more convenient (transportation, traffic, time required, cost of gas and parking, anxiety)	New video-consult program, used BlueJeans (n=58; preferred by hospital), Doximity (n=20), Apple FaceTime (n=22; last resort). 78% used smartphones, 13% laptops, 7% tablet, 2% desktop

Abbreviations: CHHIP, conventional or hypofractionated high dose intensity modulated radiotherapy for prostate cancer; CI, confidence interval; COVID-19, coronavirus disease of 2019; GI, gastrointestinal; GU, genitourinary; IQR, interquartile range; IV, intravenous; OR, odds ratio; QoL, quality of life; RT, radiotherapy; SD, standard deviation; vs, versus

Non-Randomized Studies

Nine non-randomized studies involved supervision of chemotherapy administration [32], radiation oncology consultations [33], cancer surgery [34], chronic post-surgical pain after lung resection [35], prostate cancer follow-up [36], glioma follow-up [37], sarcoma out-patient appointments [38], systemic therapy in advanced genitourinary cancer [39], and otolaryngology patients (preoperative, postoperative, surveillance) [40,41]. Most of these non-randomized studies were small (65-296 patients) and in most cases the comparative group, if any, was not equivalent. As is generally the case for non-randomized studies, the risk of bias is high and quality of evidence from these trials is considered low to very low. They do suggest, however, that most patients were satisfied with virtual care.

The study of 206 patients at Mount Isa Hospital by Chan et al. [32] compared remote supervision of chemotherapy by medical oncologists at Townsville Cancer Centre (Australia) to in-person supervision at the cancer centre using retrospective chart audits. The remote and in-person groups did not have similar distribution of curative and palliative patients, and results were therefore reported according to these two categories. It is one of few studies that measured clinical effects, and overall found lower rates of serious adverse effects in the remote group; however, when looking at specific adverse events there were inconsistent results. The study was not powered for subgroup analysis (curative or palliative, specific adverse effects).

A study in the same geographic area reported by Hamilton et al. involving remote centres and Townsville Cancer Centre [33] surveyed 231 participants with video or phone radiation oncology consultations (new and follow-up appointments); response rate was 46%. Patients were seen at the remote centre, with a nurse or local doctor present, and connected to the radiation oncologist at the cancer centre. Most patients indicated they could hear clearly, privacy and confidentiality were respected, questions were answered, there was good rapport, and diagnosis and treatment options were adequately explained. For future appointments, 55% preferred telehealth, 1% face-to-face, and 35% preferred a mixture of these; 9% did not indicate a preference.

In a study of 296 patients receiving care by a surgical oncologist and reported by Jue et al. [34], patients attended the local Veterans Affairs centre and had remote video visits with a central surgical oncologist. A nurse practitioner conducted physical examinations at the local centre under supervision of the remote oncologist. Patient travel was reduced by 81% and saved the system $155,627, as these costs are normally reimbursed. Patient satisfaction scores were high for most categories (4.4 to 4.7 out of 5 for effective communication, adequate hearing and vision during visit, understanding of past medical history, reviewed scans and test together, explained treatment clearly, felt comfortable discussing problems, specialist was supportive partner, felt they had input, travel more convenient, easier to receive care) and 86% believed care was more accessible. Preference for type/place of visits was less uniform; some patients still preferred in-person visits (score 3.8) and thought care would be better if in person each visit (3.6).

A survey by Li et al. of 81 patients with lung cancer and chronic post-surgical pain [35] found similar quality of life in remote and in-person groups, but higher patient satisfaction in the remote group (90.2% vs. 72.5%, $p<0.05$).

The study by Verma et al. [36] involved 134 men with low- to medium-risk prostate cancer with no residual acute toxicity and who preferred telephone follow-up; as such it was a highly selected group of patients. It was a single group study and reported that most patients found telephone follow-up convenient and preferred this; this result is expected as patients self-selected into telephone follow-up. The study authors indicate that adverse effects were similar or higher than in the UK-wide CHHIP trial and interpreted this to mean that patients were comfortable disclosing erectile and bowel dysfunction over the telephone.

The study by Patil et al. [37] involved video assessment in 65 patients with glioma to evaluate whether or not to continue administration of temozolomide and other related care, followed by in-person assessment of the same patients. Video assessment was more cost effective and there was 100% concurrence between video and in-person assessment in whether to continue administration. All patients were somewhat or extremely satisfied with video follow-up.

The other three non-RCTs involved virtual care due to the COVID-19 pandemic and reported only outcomes of feasibility or patient acceptability, preference, or satisfaction with the virtual care. The study of 108 patients at Royal Marsden Hospital Sarcoma Unit reported by Smrke et al. [38] reported higher patient satisfaction with telephone consultations than in-person visits. Most patients (80%) preferred at least some future appointments to be by telemedicine for reasons of travel time (42%), travel expense (20%), or convenience (30%). Clinicians reported phone consultation sometimes (44%) or often (17%) affected the ability to perform examinations but most favoured this for active surveillance or stable-dose oral medication. The comparison in-person group consisted mostly of patients who needed urgent start of therapy or performance status assessment and is not considered equivalent.

The other two studies were surveys or questionnaires of patients who received telemedicine care and there were no comparison groups. In 101 patients with advanced genitourinary cancer [39], most patients wanted therapy continued despite COVID-19 risks. They accepted virtual discussion of staging results and therapy decisions but had lower acceptance of referral to secondary care oncologists for therapy. In 100 otolaryngology patients [40,41], video-based telemedicine was rated high for usefulness, effectiveness, and satisfaction, but lower on reliability due to concerns with limitations on physical examinations and lack of touch. Technical assistance was required by 29% of patients, and the majority (78%) used smartphones, followed by laptops (13%), tablets (7%) and desktop computers (2%).

Ongoing, Unpublished, or Incomplete Studies

Five ongoing studies were found in the literature search and details are summarized in Table 3 [42-46]. Four studies are RCTs comparing videoconferencing to in-person or standard care and the other is a single group study of telehealth (phone or video). The REACH PC study involves palliative care in patients with non-small cell lung cancer [42] and will compare mood, quality of life, quality of communication, and health care utilization. A trial of CARING [43] in patients with head and neck cancer who completed treatment will compare nurse-led supportive care and measure outcomes of unmet needs, quality of life, patient perceptions of telemedicine, and cost effectiveness. A study of palliative care in those with life-limiting illnesses (including, but not restricted to cancer) [44] will measure rates of clinical symptoms (sleep, nausea, pain, fatigue, breathing problems, bowel problems), quality of life, and Karnofsky Performance Status, with secondary outcomes including emergency department visits, user experience, hospital admissions, and evaluation by health professionals. The fourth RCT involves supportive care for patients with cancer, with the outcome being health-related quality of life [45]. The other study [46] involves a single group undergoing radiation oncology during COVID-19 and receiving telehealth care (phone or video), with the primary outcome being patient and provider experience and perceptions of telehealth, and secondary outcomes including numbers of missed visits, unplanned emergency department visits or hospital admissions, and acute care visits. Secondary outcomes will be compared to values in an earlier quality improvement project.

Table 3. Ongoing trials.

Author and Source; Trial Name; recruitment or follow-up period	# Patients anticipated	Patient Characteristics	Trial Type and Comparison	Outcome	Other
Chau, 2019 [42] REACH PC NCT03375489 Massachusetts General Hospital + 19 other sites 2018-2022 (estimated)	1250 patients Up to 1250 caregivers if patient chose to invite them	Advanced non-small cell lung cancer within 12 weeks of diagnosis and being treated with non-curative intent. Recruited through 20 Palliative Care Research Cooperative institutions in USA. Patients may invite caregiver (family or friend who lives with them or contact at least twice a week) to participate with them.	RCT. Telehealth by videoconferencing early palliative care (monthly) vs. in-person early palliative care (monthly) by specialty-trained experienced or board-certified PC physicians or advanced practice nurses who provide care in the outpatient oncology setting. Initial visit for both groups is in-person	QoL, mood, and quality of communication with oncologists at baseline before randomization and at 12, 24, 36, and 48 weeks Health care utilization, including length of stay in hospice, will be collected from patients' health records	Patients in telehealth arm without videoconference capability will be provided cellular-enabled iPad for the study. Video test call prior to the first appointment. Vidyo platform.
Telemedicine Nurse-Led Intervention for Rural Cancer Survivors (CARING) [43] NCT04267627 University of Virginia 2020-2025 (estimated)	450	Patients with head and neck cancer at any stage who completed treatment within the last 6 weeks or anticipated to be within 3 months of end of treatment Plan to oversample rural patients	RCT (3 arm) Nurse-lead supportive care (CARING) by telemedicine videoconferencing vs. CARING in-person vs. usual care	Unmet needs, QoL (FACT-HN) Cost effectiveness Patient perceptions of telemedicine	
Telehealth for palliative care patients in metropolitan and rural settings [44] ACTRN12618001007224 HREC/18/MonH/348 2018-2020 (anticipated) Monash, Victoria, Australia	140	Patients admitted to an associated community palliative care service, a Monash Health inpatient palliative care unit, or engaged with a Monash Health palliative care consult service or the Monash Health Oncology Supportive Care Outpatient Clinic. Diagnosed with life-limiting illness (cancer, cardiovascular, musculoskeletal, neurological)	RCT. Telehealth videoconference with palliative care physician and nurse facilitation at 2 weeks then as required for 3 months vs. standard care (usual care provided including community palliative care, other community services, hospital services, specialists, and general practice)	Clinical symptoms (sleep, nausea, pain, fatigue, breathing problems, bowel problems), QoL, Performance Status (Karnofsky), Secondary outcomes: emergency department attendances, teleconference efficiency (setup), user experience, health professional score of symptom severity (pain, other symptoms, psycho-spiritual distress, carer distress), QoL (family), Hospital Anxiety and Depression Scale, hospital admissions, home visit duration	
Supportive Care Delivered by Telemedicine to Cancer Patients at Home [45]	466	Cancer; planned for Supportive Care Service, resident of New York, New Jersey, or Connecticut	RCT, non-inferiority pilot trial Supportive palliative care specialist in –person for first visit then follow-	Health-related QoL (FACT-G) at baseline and week 14	Due to COVID-19 pandemic, patients in the in-person group received telemedicine visits

Author and Source; Trial Name; recruitment or follow-up period	# Patients anticipated	Patient Characteristics	Trial Type and Comparison	Outcome	Other
NCT04136340 2019-2021 (estimated) Rockefeller Outpatient Pavilion, Memorial Sloan Kettering Cancer Center, New York			up care by in-home video telemedicine vs. in-person at clinic. At least 3 follow-up visits over 14 weeks		
Assessing the System for High-Intensity Evaluation During Radiotherapy During Changes in Response to COVID-19 (CORONA-SHIELD) [46] NCT04357574 Duke Cancer Center, Durham, North Carolina, USA 2020-2021 (estimated)	1000	Patients undergoing radiation oncology during COVID-19 outbreak; no concurrent systemic therapy	Patients during COVID-19 outbreak and their healthcare provider experience Comparison of rates of acute care for telehealth (telephone or video) vs. prior rates	Healthcare provider perceptions of telehealth Rates of acute care (emergency department visits and hospitalizations)	

Abbreviations: COVID-19, coronavirus disease of 2019; PC, palliative care; QoL, quality of life; RCT, randomized controlled trial

Systematic Reviews, Guidelines, and Technical Reports

The second and third questions of this review raised the issues of patient and disease factors that are associated with provision of effective virtual cancer care, and the need for guidance regarding optimal delivery of virtual cancer care in regard to technical requirements, equity, inter-professional care, and health-care provider compensation. At the start of the project, it was acknowledged that these would not likely be covered by a systematic review of primary clinical studies, but that other documents may be of use and interest to the reader. A list of technical documents, reviews, and guidelines, along with an indication of whether they address technical considerations, equity, interprofessional care, and compensation, is compiled in Appendix 6.

During the review it also became apparent that several institutions, hospitals, or health care systems have accumulated significant real time experience in use of virtual care/telemedicine due to rapid adoption during the pandemic. Many of these works have been consensus based with little published evidence to guide recommendations or system level implementation. As empirical experience with virtual cancer grows, this body of work must not only recognize the gaps in evidence but should extend beyond a health system need perspective to a more comprehensive person-centered model of service delivery to support optimal quality, safety, and sustainability. A list of some of these is compiled in Appendix 7. While some have published research articles or reviews of their experience, or have information on the organization websites, further information on others may need to be obtained by direct contact.

DISCUSSION

The publications reviewed during preparation of this evidence summary indicate that use of virtual patient care is being tested in many fields of medicine, including cancer. Published comparative studies in cancer to date have focussed on pre-treatment discussions, monitoring for adverse events during treatment, counselling, and long-term follow-up. Trials to date have not addressed the primary questions of interest, which relate to the active provision of anticancer therapy and the associated supportive care necessary during this time frame. This review determined that oncology studies with direct comparison between virtual and in-person care are limited and generally provide low to very-low-quality evidence with the exception of RCTs on genetic counselling and endometrial cancer follow-up. This is not surprising given the conduct of RCTs testing virtual care strategies are susceptible to high risk for bias.

In the general field of psychological counselling, virtual or remote counselling has been reported in several reviews to be equivalent to in-person counselling [47-52]. In the current review focussed on patients with cancer, two RCTs [8,9] used counselling to treat anxiety, stress, depression, or other adjustment issues. Both studies suggest virtual counselling and in-person counselling may have similar effectiveness, although quality of evidence in these studies is low. A survey of patients and therapists involved in psycho-oncology counselling video-consults [11] found that approximately one-half of the patients expressed preference for video-consults in the future for a portion of sessions. While therapists were willing to provide video counselling if requested, they preferred in-person sessions especially for more complex issues. These studies indicate that individual situations and patient preferences need to be considered.

In the area of genetic counselling, the study by Jacobs et al. [17-20] was considered to provide the evidence with greatest certainty. It reported that telephone counselling was noninferior to usual care for all outcomes (knowledge, decision conflict, cancer distress, perceived stress, genetic counseling satisfaction) and was more convenient. On the negative side, there was lower perceived support and emotional recognition. Several of these results are supported by the other studies reported in this review (see Table 1); some studies also

found lower costs to the patient or system for virtual counselling. Genetic counselling is a very specific field, usually limited to a pre-test appointment, and sometimes a follow-up appointment for patients choosing to undergo genetic testing. This model typically involves a few interactions between patients and providers with little long-term follow-up, in contrast to many other areas of cancer care. As such, results from this study may not be transferable to other types of clinician-patient interaction. Of particular note, the combined evidence from all the counselling studies suggests that visual cues (body language, expression) available with in-person or video sessions may be more important for in-depth counselling, and therefore video methods have advantages over telephone use.

Another area where virtual care appears to have extensive use is in long-term follow-up for asymptomatic patients. The ENDCAT trial [28-30], evaluated as high quality, was conducted in patients with stage I endometrial cancer. It found high patient satisfaction and non-inferior psychological morbidity for telephone versus in-person follow-up. All recurrences were symptomatic and detected between scheduled virtual or in-person visits, suggesting that virtual follow-up in early-stage endometrial cancer does not place patients at increased risk. Most other studies measured outcomes of patient satisfaction, feasibility, and cost, and one studied pain management, but they did not include long-term outcomes. Except for the ENDCAT trial, the evidence was found to be of generally low to very low quality. Overall, the results were consistent in showing feasibility and patient acceptance of virtual care. Patient selection may be an important consideration.

Ongoing trials (see Table 3) will hopefully provide further evidence to better understand the appropriate use of virtual care. Outcomes that are planned to be reported in these studies include quality of life, mood, patient perceptions, rates of acute care, cost effectiveness, and health care utilization. It is noted that long-term outcomes are again lacking, including survival outcomes which are usually gold standards in cancer care delivery trials.

To date it appears the current published evidence (besides psychosocial and genetic counselling) is insufficient to inform the use of virtual cancer care to fully replace in-person care but does help identify key features and outcomes to consider in model design and implementation during the current pandemic. Ideally, trials should be conducted to directly compare in-person to virtual care with not only survival but person-centred quality endpoints. This is not practical during a pandemic. Virtual care has been widely implemented in response to an emergency health crisis. While this will limit the opportunity to conduct prospective comparative trials there is an opportunity to conduct large, well-designed observational studies with well-defined inclusion criteria and endpoints. Applying currently accepted quality standards to large cohorts of cancer patients with a robust and comprehensive evaluation framework guided by the published comparative evidence will support the ongoing development of virtual cancer care in Ontario.

There are a number of gaps in the evidence and thus our understanding of virtual cancer care that must be recognized. Most of the studies reviewed used virtual care for counselling or non-active treatment such as long-term follow-up. Virtual care with an intermediary such as a less-specialized clinic which patients attended and connected remotely to a specialist was used in a few studies and is a model used in Ontario prior to the COVID-19 pandemic. Beyond the lack of survival and efficacy data as described above there are considerable gaps in evidence of patient/caregiver and provider experience and preferences as well as patient-reported outcomes in the delivery of cancer care by virtual platforms. Although assumptions can be made regarding patient and caregiver perspectives, we must encourage evidence to help deepen understand of the patient experience with virtual cancer care as well as unexpected consequences. This approach will require not only evidence and trials but considerable engagement with patients, families, and caregivers. To date the driving force behind virtual cancer care has been limitations based on geography rather that patient centered principles.

Ideally the evidence from virtual cancer care will help inform a larger values-based framework with multiple stakeholders.

This systematic review has some limitations. First, since our literature search period is from 2015, some relevant earlier publications may have been missed. However, virtual care technology has developed rapidly in recent years, and the pace of change has accelerated with the onset of the global pandemic in 2020. Technology older than five years may be outdated, and we believe this systematic review with comprehensive literature search strategies has captured current relevant research papers. Second, although ten RCTs met our pre-planned study selection criteria, eight of them were of low to very low quality. It is realized that the conduct of RCTs testing virtual care strategies are susceptible to high risks for bias for the measurement of patients reported outcomes. Third, only one eligible study reported recurrence rate, which we consider to be a critical outcome. Even in ongoing trials from clinicaltrial.gov search (Table 3), no trials will report recurrence or survival outcomes.

Another limitation in our current understanding of virtual care is that the delivery platforms are rapidly evolving. Telephone and models of virtual care where patients need to travel to a geographically closer health centre have been traditionally studied models of virtual care. However, this is rapidly changing to new delivery platforms with patients engaging in care on home devices and the desire for asynchronous virtual care (e.g., texting, email, etc.). The rapidly changing environment makes a traditional model of data collection and evidence generation within the context of comparative trials very challenging. One option is to consider regional demonstration projects with common data collection elements that map to traditional quality frameworks. This can be constructed on the backbone of the internationally recognized quality performance framework in Ontario and may support more timely and systematic analysis and adoption of the most promising approaches.

Issues regarding preferences and accessibility for marginalized populations were limited in the clinical studies (noted in studies conducted in the United States and Australia), although addressed in some of the technical documents and reviews from elsewhere. Factors may be specific to different geographic, political, social, and health care systems and therefore information specific to Ontario is necessary but may be limited. In earlier studies, telephone or computer access was a major issue; whereas in later studies cell phones (but not necessarily smart phones with video capability) were noted as being extremely common even among the most disadvantaged in some countries. Availability of internet service and personal computers is still limited especially in remote areas and for those of lower socioeconomic status; cellular service is more widespread but can be expensive to use for appointments. Video-conferencing by phone requires a data plan that is even more expensive and less widely available. Some studies overcame this by providing patients with tablets or phones with prepaid cellular data. Patients, especially those without their own devices, often need training or assistance with their use.

This review has been appropriately conducted within the rigorous and well accepted methodology of the Program in Evidence-Based Care. It gives a clear indication of the randomized and comparative studies published in the peer-reviewed medical journals. The limited clinical study evidence meeting the inclusion criteria does not address the system needs as most is not generalizable to the current urgent need of acute cancer care delivery. Further evidence from other fields and non-comparative studies may be required. This may be an area of interest for further examination as the feasibility of conducting RCTs during the pandemic and beyond is very low.

Perhaps of more immediate value is information related to the other set of research questions introduced at the start of this review, namely, patient and disease factors associated with provision of effective virtual cancer care, and available guidance on optimal delivery of virtual cancer care in regard to technical requirements, equity, inter-professional care, and

healthcare provider compensation. Documents that address some of these are listed in Appendix 6. It is also suggested that review of well-established virtual care/telemedicine programs such as those listed in Appendix 7 may be instructive. It is beyond the scope of this document to provide a thorough analysis of technical issues, but suggest that the following points are important themes or considerations:

- Many of the early trials and telemedicine programs used telephone as the only medium of communication. With widespread use of video communication via cellular phones, tablets, and computers there are some different issues with availability, use of technology, and personal connection/non-verbal communication between these.
- Some access issues with video may have changed; smartphone use does not necessarily depend on socioeconomic class.
- Need to ensure patients have technology for video; clinicians, hospitals, or communities may provide these.
- Consider availability and cost of internet; may need cell phone data in some areas where internet service is poor or not available. Some studies provided a tablet with a data plan for the study.
- As part of patient selection, may exclude those for video who are not comfortable or who do not have suitable devices.
- Training of clinicians and patients for video may be needed.
- Prior to the first video consultation, patients should be instructed to connect with the clinic to test out the software and hardware. Most difficulties can be dealt with; in the case where they cannot, a visit could be rescheduled by phone or in-person. This requires clerical and IT infrastructure that is currently not in place; this is equivalent to the process of putting patients into an examination room.
- A traditional in-person visit provides ancillary services such as smoking cessation and other counselling, referral to psychosocial oncology, and monitoring of PROs. Replacing only the physician portion of the visit with virtual care, especially when directed at a single issue or most urgent needs, reduces the overall value of the appointment.
- Video communication allows more interaction, sense of communication, and non-verbal cues; however, some patients may prefer telephone consults. Reasons may include embarrassment of the home environment, lack of privacy, lack of familiarity with technology, expense of phone data or internet service, no available internet or phone service in their area, or no availability of suitable devices.
- Patients with vision, hearing problems, language, or other specific health or cognitive issues may not be able to participate in virtual care independently. In these patients, physical examination may be crucial. However, virtual care does offer opportunities for other relatives or caregivers to provide assistance, relay health concerns, provide translation, and be involved in discussions, and this was reported as a strength in some studies. This may raise privacy issues that need to be dealt with.
- Patients with difficulty in obtaining transportation, social anxiety, time limitations, or limited economic means may strongly prefer virtual care. This may apply especially to those who do not have appropriate medical services in their own community or who live in remote areas and need to travel for hours or days to attend their appointment. However, even costs such as parking at hospitals or clinics are often prohibitive to visits within the patients' own community.
- In the case of specialty services, patients attending local clinics and communicating from there (instead of from home) may be suitable. In some studies, nurses or family physicians could conduct the physical examination (if required) and help communicate with a remote specialist.

- Reimbursement of clinicians depends on government policy and insurance companies. Consultation where the physician and patient are in different jurisdictions (provinces, countries, and states) may not meet payment criteria. Some relevant issues for Ontario are included in the documents in Appendix 6
- Licensing may not apply across provincial, state, or country boundaries.
- Some hospitals have offered virtual care as a service, even if not reimbursable, although this may not be sustainable as use increases.
- Australia, rural areas of the United States, and parts of Canada have implemented widespread virtual care. This is especially valuable to reduce transportation time and cost, or to access specialists that practice only in major centres. Examples in Appendix 7 may be especially relevant.

CONCLUSIONS

According to current but limited evidence, virtual care is not inferior to in-person care for patient-reported outcomes for the limited areas/models of care that were studied. From the perspective of a patient with cancer, it may be optimal for patients to have the option to choose either virtual care or in-person care based on their own preference, disease situation, and other consideration (availability or feasibility of virtual care, cost etc.) to fully realize patient-centred services. From a healthcare provider's perspective (including clinicians and hospital), it may initially be time-consuming and less efficient to offer both options in parallel. New clinic processes are required to support virtual visits including having patients ready for the clinical interaction with their physician, and incorporating services like patient-reported outcome monitoring into the new virtual workflow.

The current pandemic has necessitated rapid adoption of virtual cancer care without strong evidence or systematic stakeholder engagement. This evidence review was unable to provide guidance on active provision of anticancer therapy and associated supportive care needs. It points out areas for which comparative clinical trial evidence is available, with the inference that guidance must be sought from other types of evidence for the rest. It also points out several issues that must be considered for implementation of virtual care programs in any field. Despite these limitations, the current environment offers a unique opportunity for gathering data and evidence at both the patient and cancer system levels. Studies of virtual care must focus on critical outcomes and safety. Currently collected data are available to inform larger value-based frameworks as well as drive engagement with patients, families, and caregivers along with the clinicians that provide cancer care.

Although this evidence-based review cannot address the appropriate roll out of virtual care in the province, it is the first step. It provides a status report on the type of traditional clinical trial evidence available. The threshold of methodologic rigour has limited the ability to provide pragmatic advice for current real-world issues. Subsequently other methodologies such as a Delphi process to enable best practices may be valuable subsequent steps.

INTERNAL/EXTERNAL REVIEW and ACCEPTANCE BY THE SPONSOR

The evidence summary was reviewed by Craig Earle, Colleen Fox, Elaine Meertens, Ralph Meyer, Sara Urowitz, Meaghan Wright, and Sheila McNair (Managing Director of the PEBC). The Working Group was responsible for ensuring any necessary changes were made.

The document was reviewed by representatives of the Person-Centred Care Program at OH (CCO) during the internal/external review process. As there were no substantial changes due to the reviewer comments, acceptance of the evidence summary was obtained at the time of submission of review comments by email on March 24, 2021.

ACKNOWLEDGEMENTS

The Person-Centred Care Program and the Working Group would like to thank the reviewers named above and the following individuals for their assistance in developing this report:

- Sarah Kellett, Sheila McNair, Cindy Walker-Dilks, and Caroline Zwaal for providing feedback on draft versions.
- Faith Maelzer for searching the clinicaltrials.gov database of ongoing trials and conducting a data audit.
- Megan Smyth for assessing the risk of bias for RCTs.
- Sara Miller for copy editing.

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Appendix 1: Affiliations and Conflict of Interest Declarations

Working Group Member	Affiliation	Conflicts declared
Simron Singh	Provincial Head, Person-Centred Care, OH (CCO) Medical Oncologist & Affiliate Scientist, Odette Cancer Centre, Sunnybrook Health Sciences Centre, Toronto, ON	None
Glenn Fletcher	Health Research Methodologist, PEBC, Hamilton, ON	None
Xiaomei Yao	Health Research Methodologist, PEBC, Hamilton, ON	None
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In accordance with the PEBC Conflict of Interest (COI) Policy, the evidence summary authors and reviewers were asked to disclose potential conflicts of interest. The authors (Working Group members) reported that they had no conflicts of interest. Ralph Meyer indicated consulting and honoraria as a member of the Data and Safety Monitoring Committee (DSMC) for GLyPharma (not related to topics of this review), managerial responsibility for the Juravinski Cancer Centre Clinical Trials Department (not overlapping with this topic), and an unrestricted grant from Roche Canada for the study of cancer care models of care, including home monitoring and biometry. The other reviewers did not report any conflicts of interest.

Appendix 2: Literature Search Strategy (Databases)

Database(s): Embase 1996 to 2020 August 06, APA PsycInfo 1987 to July Week 4 2020, EBM Reviews - Cochrane Central Register of Controlled Trials June 2020, EBM Reviews - Cochrane Database of Systematic Reviews 2005 to July 31, 2020, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) 1946 to August 06, 2020

#	Searches	Results
1	exp Telemedicine/ or Remote Consultation/ or exp Teleconsultation/ or exp Telerehabilitation/ or exp Telehealth/	86831
2	exp Consultation/ or exp Disease Management/ or exp Patient Monitoring/ or exp Follow up/ or exp Patient Care/ or exp "Evaluation and Follow up"/ or exp Medical Examination/ or exp Physical Examination/	7619641
3	exp Mobile Phone/ or exp Cell Phone/ or exp Mobile Application/ or exp Smartphone/ or exp Teleconference/ or exp Videoconferencing/	153534
4	1 or (2 and 3)	120953
5	(Telemedicine or Remote Consultation or Teleconsultation or Telerehabilitation or Telehealth or eHealth or e-Health or mHealth or m-Health or E-oncology).ti,ab.	60684
6	((virtual or distance or distant or remote or video or phone or smartphone or cellphone or cell phone or mobile or digital or teleconferenc: or videoconferenc: or computer or internet or online) adj3 (consult: or manage: or monitor: or follow-up or care or evaluat: or exam: or treat: intervene or intervention: or assess: or diagnos: or navigat: or "after-care" or deliver: or service: or contact:)).ti,ab.	275535
7	4 or 5 or 6	389680
8	exp Neoplasms/ or exp Neoplasm/ or exp Tumor/ or exp Cancer/ or (Cancer: or Tumor: or Tumour: or Neoplas: or Oncolog: or Metasta: or Malignan: or Carcinom: or Andenocarcinom: or Leukemia: or Leukaemia: or Lymphoma: or Sarcoma: or Melanoma:).ti,ab.	9350508
9	7 and 8	51349
10	limit 9 to yr="2015 -Current"	23160
11	10 not (abstract or "conference abstract" or news: or case report:).pt.	17165
12	limit 11 to english language [Limit not valid in CDSR; records were retained]	15698
13	limit 11 to no language specified [Limit not valid in APA PsycInfo,CDSR; records were retained]	1498
14	limit 11 to French [Limit not valid in CDSR; records were retained]	89
15	12 or 13 or 14	16665

16	limit 15 to yr="2015-2016"	4705
17	limit 15 to yr="2017-2018"	5876
18	limit 15 to yr="2019"	3166
19	16 or 17 or 18	13747
20	15 not 19	2918
21	remove duplicates from 16	2921
22	remove duplicates from 17	3703
23	remove duplicates from 18	2025
24	remove duplicates from 20	1803
25	21 or 22 or 23 or 24	10452

Database(s): EBM Reviews - Cochrane Database of Systematic Reviews 2005 to July 31, 2020
Search Strategy:

#	Searches	Results
1	(Telemedicine or Remote Consultation or Teleconsultation or Telerehabilitation or Telehealth or eHealth or e-Health or mHealth or m-Health or E-oncology).ti,ab.	23
2	((virtual or distance or distant or remote or video or phone or smartphone or cellphone or cell phone or mobile or digital or teleconferenc: or videoconferenc: or computer or internet or online) adj3 (consult: or manage: or monitor: or follow-up or care or evaluat: or exam: or treat: intervene or intervention: or assess: or diagnos: or navigat: or "after-care" or deliver: or service: or contact:)).ti,ab.	116
3	(Cancer: or Tumor: or Tumour: or Neoplas: or Oncolog: or Metasta: or Malignan: or Carcinom: or Andenocarcinom: or Leukemia: or Leukaemia: or Lymphoma: or Sarcoma: or Melanoma:).ti,ab.	1279
4	1 or 2	130
5	3 and 4	16

CINAHL, July 29, 2020

	Search Terms	Actions
S1	(MH "Telehealth") OR (MH "Telemedicine+") OR (MH "Telerehabilitation") or (MH "Telenursing") or (MH "Remote Consultation")	(6,890)
S2	(((virtual or distance or distant or remote or video or phone or smartphone or cellphone or cell phone or mobile or digital or teleconferenc: or videoconferenc: or computer or internet or online) N3 (consult: or manage: or monitor: or follow-up or care or evaluat: or exam: or treat: intervene or intervention: or assess: or diagnos: or navigat: or "after-care" or deliver: or service: or contact:)) OR AB (((virtual or distance or distant or remote or video or phone or smartphone or cellphone or cell phone or	(6,013)

	mobile or digital or teleconferenc: or videoconferenc: or computer or internet or online) N3 (consult: or manage: or monitor: or follow-up or care or evaluat: or exam: or treat: intervene or intervention: or assess: or diagnos: or navigat: or "after-care" or deliver: or service: or contact:))	
S3	TI ((Telemedicine or Remote Consultation or Teleconsultation or Telerehabilitation or Telehealth or eHealth or e-Health or mHealth or m-Health or E-oncology)) OR AB ((Telemedicine or Remote Consultation or Teleconsultation or Telerehabilitation or Telehealth or eHealth or e-Health or mHealth or m-Health or E-oncology))	(4,716)
S4	((MH "Oncologic Nursing+") OR (MH "Oncologic Care+") OR (MH "Cancer Patients") OR (MH "Oncology+") OR (MH "Neoplasms+")) OR TI ((Cancer: or Tumor: or Tumour: or Neoplas: or Oncolog: or Metasta: or Malignan: or Carcinom: or Andenocarcinom: or Leukemia: or Leukaemia: or Lymphoma: or Sarcoma: or Melanoma:)) OR AB ((Cancer: or Tumor: or Tumour: or Neoplas: or Oncolog: or Metasta: or Malignan: or Carcinom: or Andenocarcinom: or Leukemia: or Leukaemia: or Lymphoma: or Sarcoma: or Melanoma:))	(135,700)
S5	S1 OR S2 OR S3	(13,959)
S6	S4 AND S5	(790)

Above is limited to 2015- 2020, and excludes citations from Medline

Appendix 3: Literature Search Strategy for Additional Guidelines and Systemetic Reviews

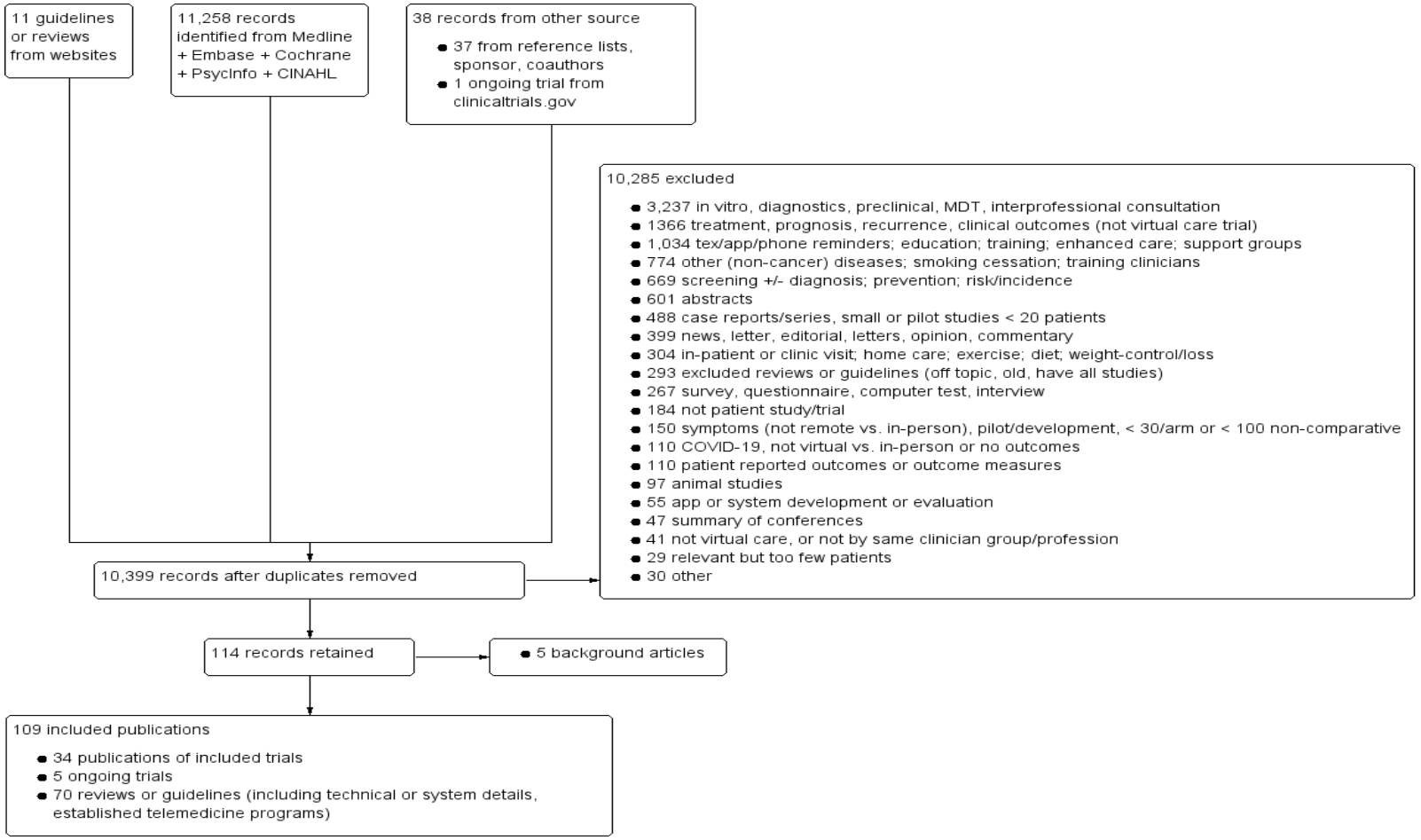
Website name and website link	Search date	Relevant document
Existing guidelines[a]		
ECRI Database: https://guidelines.ecri.org/	August 13, 2020	None
NICE Evidence Search: https://www.evidence.nhs.uk/	August 13, 2020	None
CPAC Database: https://www.partnershipagainstcancer.ca/	August 13, 2020	Virtual care in Canada: Environmental scan: https://www.partnershipagainstcancer.ca/topics/virtual-care-canada/
CMA Infobase: https://www.cma.ca/En/Pages/clinical-practice-guidelines.aspx	August 13, 2020	None
AHRQ (US): https://www.ahrq.gov/research/findings/evidence-based-reports/search.html?search_api_fulltext=mhealth	August 31, 2020	#216. Telehealth for acute and chronic care consultations. April 2019 https://effectivehealthcare.ahrq.gov/sites/default/files/pdf/cer-216-telehealth-final-report.pdf
NIHR (UK) HTA: https://evidence.nihr.ac.uk/browse-content/?_sf_s=virtual+care	September 1, 2020	None
CADTH (Canada): https://www.cadth.ca/search?keywords	September 3, 2020	None
BC Cancer Agency (http://www.bccancer.bc.ca/health-professionals/networks/family-practice-oncology-network/guidelines-protocols)	September 3, 2020	None
Alberta Health service, cancer guidelines: https://www.albertahealthservices.ca/info/cancerguidelines.aspx	September 3, 2020	COVID-19 Scientific Advisory Group Rapid Evidence Report: virtual vs. in-person care https://www.albertahealthservices.ca/topics/Page17074.aspx
Saskatchewan Cancer Agency http://www.saskcancer.ca/index.php?option=com_content&view=article&id=53%3Aclinical-practice-guidelines&catid=25%3Aclinical-resources-category	September 3, 2020	None
Cancer Care Manitoba: https://www.cancercare.mb.ca/search/index.html?lq=ehealth&reloaded=&q=ehealth&sort=score+desc&facet_search.subsite_exact=For+Health+Professionals&facet_search.subsite_exact=Research+%26+Education	September 3, 2020	None
Cancer Care Nova Scotia: http://www.cdha.nshealth.ca/cancer-care-program	September 3, 2020	None
NICE (UK) https://www.nice.org.uk/guidance/published?type=apg,csg,cg,cov,mpg,ph,sg,sc,dg,hst,ipg,mtg,qs,ta&title=Telemedicine	September 18, 2020	None
SIGN (UK) https://www.sign.ac.uk/our-guidelines/	September 22, 2020	None

ASCO https://www.asco.org/research-guidelines/quality-guidelines/guidelines	September 22, 2020	• Consensus guideline: Greater Coverage, Patient Education, and Research for Telemedicine Needed During Pandemic and Beyond ASCO Position Statement Recommends Specific Actions for Applying Telemedicine in Cancer Care August 14, 2020 https://www.asco.org/practice-policy/policy-issues-statements/asco-in-action/greater-coverage-patient-education-and • ASCO special report: A guide to cancer care delivery during the COVID-19 pandemic, May 19, 2020 https://www.asco.org/sites/new-www.asco.org/files/content-files/2020-ASCO-Guide-Cancer-COVID19.pdf
National Health and Medical Research Council https://www.clinicalguidelines.gov.au/portal	September 24, 2020	None
British Association of Dermatologists https://www.bad.org.uk/healthcare-professionals	September 24, 2020	Consensus guideline: COVID-19: Clinical guidelines for the management of dermatology patients remotely https://www.bad.org.uk/healthcare-professionals/covid-19/remote-dermatology-guidance
Cancer Council Australia https://wiki.cancer.org.au/australia/Guidelines	September 24, 2020	Clinical practice guidelines for teleoncology https://wiki.cancer.org.au/australia/COSA:Teleoncology
Geneva Foundation for Medical Education and Research https://www.gfmer.ch/	September 24, 2020	None
World Health Organization https://www.who.int/publications/guidelines/en/	September 25, 2020	None
The Cancer Council Australia https://www.cancer.org.au/online-resources/trusted-resources	September 27, 2020	None
National Cancer Control Initiative (AUS) https://www.canceraustralia.gov.au/publications-and-resources/clinical-practice-guidelines	September 27, 2020	None
State Government of Victoria, Australia https://www.vic.gov.au/search?q=guideline	September 27, 2020	None
Peter MacCallum Cancer Centre (Australia) https://www.petermac.org/research/publications	September 27, 2020	None
Medical Oncology Group of Australia https://www.moga.org.au/about-moga	September 27, 2020	None
Cancer UK https://www.cancerresearchuk.org/about-us	September 27, 2020	None

NHS (UK) https://www.nhs.uk/search/?query=telemedicine&collection=nhs-meta&profile=_default	September 27, 2020	None
Existing relevant Systematic Reviews from Epistemonikos https://www.epistemonikos.org/en/advanced_search[b]		
The impact of the COVID-19 pandemic on genitourinary cancer care: re-envisioning the future. Eur Urol. 2020 Sep 3;S0302-2838(20)30676-X. https://doi.org/10.1016/j.eururo.2020.08.030		

[a]The following search terms were used one by one for every website searched: virtual, telemedicine, ehealth, remote consultation, teleconsultation, teleconference, telerehabilitation, telehealth, telephone, mobile, smartphone, phone, video, online, in-person, distance, distancing.
[b]Search strategies are consistent with those for the Medline search (Appendix 2).

Appendix 4: PRISMA Flow Diagram



Appendix 5: Summary Table for Risk of Bias Assessment for Randomized Controlled Trials

Study	Outcome	Domain 1: Randomization Process	Domain 2: Deviation from Intervention	Domain 3: Missing Outcome Data	Domain 4: Measurement of Outcome	Domain 5: Reported Results	Overall Risk of Bias	
							Per outcome	Per study
Lleras de Frutos, 2020 [8]	Emotional distress	Some concerns	Some concerns	High	Low	Low	High	High
	Post-traumatic stress	Some concerns	Some concerns	High	Low	Low	High	
	Post-traumatic growth	Some concerns	Some concerns	High	Low	Low	High	
Watson, 2017 [9]	Anxiety and depression	Low	Some concerns	High	Low	Low	High	High
	Mental adjustment to cancer	Low	Some concerns	High	Low	Low	High	
	Cancer concerns	Low	Some concerns	High	Low	Low	High	
	Cancer coping questionnaire	Low	Some concerns	High	Low	Low	High	
Harrigan, 2016 [10]	Body composition	Some concerns	High	High	Low	Low	High	High
	Physical activity	Some concerns	High	High	Low	Low	High	
	Diet	Some concerns	High	High	Low	Low	High	
	Serum biomarkers	Some concerns	High	High	Low	Low	High	
Buchanan, 2015 [12]; Datta, 2011 [13]	Cost	Low	Low	Low	Low	Low	Low	High
	Satisfaction	Some concerns	High	Low	Low	Low	High	
	Attendance	Some concerns	High	Low	Low	Low	High	
Steffen, 2017 [14]; Kinney, 2016 [15]; Chang, 2016 [16]	Psychosocial	Low	Some concerns	Low	Low	Low	Some concerns	High
	Genetic testing uptake	Low	Some concerns	High	Low	Low	High	
	Counselling moderators of genetic testing[1]	Low	Some concerns	High	Low	Low	High	

[1] Cancer-specific distress, perceived risk of a genetic mutation compared to population risk, counselor patient-centeredness, cost barriers, decisional conflict, education, social support, family history of cancer

Study	Outcome	Domain 1: Randomization Process	Domain 2: Deviation from Intervention	Domain 3: Missing Outcome Data	Domain 4: Measurement of Outcome	Domain 5: Reported Results	Overall Risk of Bias	
							Per outcome	Per study
	Cost	Low	Low	Low	Low	Low	Low	
Jacobs, 2016 [17]; Peshkin, 2016 [18]; Schwartz, 2014 [19]; Butrick, 2015 [20]	Knowledge	Low	Low	Low	Low	Low	Low	Low
	Patient satisfaction	Low	Low	Low	Low	Low	Low	
	Decision conflict	Low	Low	Low	Low	Low	Low	
	Distress	Low	Low	Low	Low	Low	Low	
	Genetic counsellor questionnaire	Low	Low	Low	Low	Low	Low	
Kelleher, 2019 [24]; Winger, 2020 [25]	Access[2]	Low	High	Some concerns	Low	Low	High	High
	Pain[3]	High	High	Some concerns	Low	Some concerns	High	
	Symptoms, distress[4]	High	High	Some concerns	Low	Some concerns	High	
Walle, 2018, 2020 [26,27]	Feasibility	Low	Low	Low	Low	Low	Low	High
	Patient cost	Some concerns	Some concerns	Some concerns	Low	Low	High	
	Patient time	Some concerns	Some concerns	Some concerns	Low	Low	High	
	Satisfaction	Some concerns	Some concerns	Some concerns	Low	Low	High	
	Physician-patient relationship	Some concerns	Some concerns	Some concerns	Low	Low	High	
Beaver, 2017 [28]; Dixon, 2018 [29]; Beaver, 2020 [30]	Psychological morbidity	Low	Low	Low	Low	Low	Low	Low
	Satisfaction	Low	Low	Low	Low	Low	Low	
	Quality of life	Low	Low	Low	Low	Low	Low	
	Recurrence	Low	Low	Low	Low	Low	Low	
Viers, 2015 [31]	Efficiency (duration of visit + waiting)	Some concerns	Some concerns	Some concerns	Some concerns	Low	High	High

[2] Aim 1: intervention access (feasibility [attrition, adherence, completion time], patient burden [physical, emotional, financial], engagement, acceptability)

[3] Aim 2: primary outcomes: pain severity and pain interference

[4] Aim 2: secondary outcomes: physical well-being and symptoms, psychological distress, self-efficacy for pain management

Study	Outcome	Domain 1: Randomization Process	Domain 2: Deviation from Intervention	Domain 3: Missing Outcome Data	Domain 4: Measurement of Outcome	Domain 5: Reported Results	Overall Risk of Bias	
							Per outcome	Per study
	Satisfaction	Some concerns	Some concerns	Some concerns	Some concerns	Low	High	
	Patient cost	Some concerns	Some concerns	Some concerns	Some concerns	Some concerns	High	

Appendix 6: Reviews, Guidelines, and Technical Documents

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
Environmental Scan on Virtual Care						
Virtual care in Canada: Environmental scan	Canadian Partnership Against Cancer, 2019 [53]	(Yes)	(Yes)	No	(Yes)	Current state of virtual care in Canada (as of 2019) in both the public system and private/commercial offerings
Guidelines or Guidance on Virtual Care						
Virtual care: COVID-19 guide	Ontario Medical Association, 2020 [54]	(Yes)	No	No	Yes	
Telemedicine and virtual care guidelines (and other clinical resources for COVID-19)	Royal College of Physicians and Surgeons of Canada, 2020 [55]	No	No	No	No	Links to provincial or Canadian virtual care guidelines and resources
Virtual care: Recommendations for scaling up virtual medical services	Virtual Care Task Force, a joint project of the Canadian Medical Association, Royal College of Physicians and Surgeons of Canada, the College of Family Physicians of Canada, 2020 [56]	Yes	No	No	Yes	Focuses on physician-related issues: interoperability and governance, licensure and quality of care, payment models, medical education
Virtual care playbook for Canadian physicians	Canadian Medical Association, The College of Family Physicians of Canada, Royal College of Physicians and Surgeons of Canada, 2020 [57]	Yes	No	No	No	Hardware; scope of virtual practice (types of visits/evaluations), mostly geared to primary care physicians
Virtual care in Canada: Discussion paper	Canadian Medical Association, 2019 [58]	No	(Yes)	No	Yes	Barriers, provincial boundaries, licensing; no mention of non-physicians or specialists
COVID-19 tip sheet for cancer programs	Person-Centred Care, Ontario Health, 2020 (Cancer Care Ontario) [59]	Yes	No	Yes	No	Offer virtual care were appropriate, ensure patients have tools and resources needed

[5] Items in parentheses indicate some but limited mention of the topic. Equity includes items such as rural versus urban, community with or near specialist/cancer centre versus not, race or ethnicity, socioeconomic status. Compensation may be to the clinician, hospital, or health system, and also includes costs to patients.

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
Preliminary guidance: Tip sheet for cancer program providers & hospital administrators	Surgery, Radiation and Systemic Treatment Programs, Ontario Health (Cancer Care Ontario), 2020 [60]	Yes	No	Yes	No	Cancer focus during/after COVID-19
Adopting and integrating virtual visits into care: Draft clinical guidance for health care providers in Ontario	Ontario Health Quality, 2020 [61]	Yes	No	No	No	Practical considerations for physicians starting to use virtual care; includes list of Virtual Care Guidelines as appendix
Virtual visits: Solution requirements	Ontario Health OTN, 2020 [62]	Yes	No	No	No	General functional and non-functional requirements for digital solutions
Billing for virtual physician services and technical guidance	Digital Health Division, Ontario Ministry of Health, 2020 [63]	(Yes)	No	No	Yes	Temporary fee codes during COVID-19
Virtual care program – billing amendments to enable direct-to-patient video visits and modernize virtual care compensation	Digital Health Division, Ontario Ministry of Health, 2019 [64]	No	No	No	Yes	Direct-to-patient video visits enabled in Ontario (November 2019)
Ontario expanding digital and virtual health care. Giving patients more options part of province's plan to end hallway health care	Government of Ontario, 2019 [65]	No	No	No	Yes	New funding and access to virtual care in Ontario (November 2019)
Ontario taking another step to integrate the health care system	Government of Ontario, 2020 [66]	No	No	No	No	Transfer on Ontario Telemedicine Network to Ontario Health (April 2020)
Virtual care in Canada: Snapshots of Innovative Virtual Care	Digital Health Canada, 2019 [67]	No	No	No	No	Case studies of 6 successful programs/services in Canada
Virtual care best practices guide	University of Ottawa; Evans, 2020 [68]	Yes	No	No	No	Best practices for family physician – patient interaction
ASCO special report: A guide to cancer care delivery during the COVID-19 pandemic, May 19, 2020	American Society of Clinical Oncology (ASCO), 2020 [69]	(Yes)	No	No	(Yes)	General report on cancer care during COVID-19, one page on telemedicine
ASCO interim position statement telemedicine in cancer care approved by the board of directors July 23, 2020	American Society of Clinical Oncology (ASCO), 2020 [70]	No	Yes	No	Yes	Focus on legislative or regulatory changes or challenges, equity

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
Taskforce on telehealth policy (TTP) findings and recommendations. Latest evidence: September 2020	Alliance for Connected Care, The National Committee for Quality Assurance (NCQA), American Telemedicine Association (ATA); Antall, 2020 [71]	(Yes)	Yes	No	Yes	Subgroups on patient safety and program integrity; data flow, care coordination and quality measures; and on impact on total costs
Clinical practice guidelines for teleoncology	Clinical Oncology Society of Australia, 2015 [72]	Yes	(Yes)	(Yes)	(Yes)	Describes some types of cancer care for which virtual care is suitable
Guidelines. A list of useful guidelines for developing telehealth services	Australasian Telehealth Society, 2020 [73]	No	No	No	No	List of guidelines
Reviews on Technical or System Issues for Virtual Care						
Ontario						
Evidence synthesis briefing note: Provider-led virtual care in ambulatory care, 2020 Aug 28	COVID-19 Evidence Synthesis Network, Ontario Ministry of Health, 2020 [74]	Yes	(Yes)	No	No	Describes health systems that use virtual care in Ontario, other provinces, USA, and Australia, their experience, and lessons learned. Also summarizes some trials and reviews General; not cancer focus
COVID-19 Rapid Evidence Profile #14 (26 June 2020)	Rapid-Improvement Support and Exchange (RISE), McMaster University Health Forum, 2020 [75]	?	?	?	?	Experiences of shifting to virtual care, Canadian and international List of most relevant studies but no overall analysis or summary; not focussed on cancer
COVID-19 Rapid Evidence Profile #16 (31 July 2020)	Rapid-Improvement Support and Exchange (RISE), McMaster University Health Forum, 2020 [76]	?	?	?	?	Technology used, conditions, implementation considerations, patient experience and outcomes, cost Experience at major US and Canadian centres List of relevant studies but no overall analysis or summary; not focussed on cancer

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
Rapid response on provider-led virtual care in ambulatory care. Evidence Synthesis Unit #852	Research, Analysis & Evaluation Branch (RAEB), Ontario Ministry of Health; Surajbali, 2020 [77]	No	(Yes)	No	No	Summary of virtual care technologies in Canada and Australia; systematic reviews Type of service; patient and provider experience, effectiveness
Discussing serious news remotely: Navigating difficult conversations during a pandemic	Holstead, 2020 [78]	Yes	No	No	No	SPIKES (Setting, Perception, Invitation, Knowledge, Empathy/Emotion, and Strategy/Summarize) protocol as a framework to discussion
Translating the restoring body image after cancer (ReBIC) group therapy intervention into an online version: A successful case study and recommendations	Trachtenberg, 2020 [79]	Yes	(Yes)	No	No	Case study on converting in-person group therapy to online program for women with breast cancer
United States						
Implementing telemedicine in response to the COVID-19 pandemic	Gadzinski, 2020 [80]	Yes	No	No	Yes	Increased reimbursement by Medicare; focus on urology; HIPAA-compliance; legislation
Telemedicine use in oncology practices	Baum, 2020 [81]	(Yes)	No	No	(Yes)	Financial parity since March 2020 Examples of oncology scenarios where telemedicine may be appropriate
Telemedicine in Cancer Care	American Society of Clinical Oncology Educational Book; Sirintrapun, 2018 [82]	(Yes)	No	(Yes)	Yes	Telepathology, genetics, cancer care; policy and implementation; education; barriers
Surgical oncologists and the COVID-19 pandemic: Guiding cancer patients effectively through turbulence and change	Hwang, 2020 [83]	(Yes)	No	(Yes)	Yes	Implications of the pandemic on providing care to surgical oncology patient; telemedicine is subset of document Coverage by Medicare and Medicaid, licensure requirements

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
Telemedicine in the era of coronavirus disease 2019 (COVID-19): A neurosurgical perspective	Blue, 2020 [84]	Yes	Yes	No	Yes	Reimbursement, licensure, liability, technical challenges. Virtual neuroexamination
Telemedicine for outpatient neurosurgical oncology care: Lessons learned for the future during the COVID-19 pandemic	Daggubati, 2020 [85]	Yes	No	No	Yes	Outpatient care of neurosurgical oncology patients due to COVID-19. Can do neurologic exam by video conferencing
State of eHealth in cancer care: Review of the benefits and limitations of eHealth tools	Doyle-Lindrud, 2020 [86]	No	(Yes)	No	Yes	Broader field of eHealth, not just virtual care
Access to care: Using eHealth to limit location-based barriers for patients with cancer	Baldwin-Medsker, 2020 [87]	Yes	Yes	(Yes)	No	Access to care, implementation, 2 case studies. Focus on nursing care
Telemedicine and gynecologic cancer care	Shalowitz, 2020 [88]	(Yes)	Yes	Yes	(Yes)	Prediagnosis, pretreatment, treatment, and posttreatment/ survivorship phases Telemedicine can reduce inequalities
Telehealth triage and oncology nursing practice	Steingass, 2020 [89]	Yes	No	No	No	Roles of the registered oncology nurse in telehealth setting; there are standards by the American Academy of Ambulatory Care Nursing and by the American Nurses Association regarding telehealth nursing Establishing telehealth centre
Other						
Using telepractice to support the management of head and neck cancer: Key considerations for speech-language pathology service planning, establishment, and evaluation	Burns, 2017 [90]	Yes	No	No	No	Australia Discussion of requirements to establish speech-language pathology telepractice service: licensure, technology, data security, reimbursement, physical resources (equipment),

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
						training, patient factors, communication, documentation, evaluation
Implications of telemedicine in oncology during the COVID-19 pandemic	Shirke, 2020 [91]	Yes	(Yes)	No	No	United Kingdom Tele-oncology to reduce COVID-19 risk to patients Advantages and disadvantages of telehealth modalities
Upheaval in cancer care during the COVID-19 outbreak	Salako, 2020 [92]	No	No	No	No	A global directory of telehealth platforms is being compiled to support care delivery during the COVID-19 outbreak https://docs.google.com/spreadsheets/d/1XMsJJIduO6yI_GEo1Vy_b_SXoz9YwbgtEL63-siNS_Q/edit#gid=0" -Some digital platforms such as http://www.oncopadi.com were designed for low-resource settings
Systematic Reviews						
Telehealth services in rural and remote Australia: a systematic review of models of care and factors influencing success and sustainability	Bradford, 2016 [93]	Yes	Yes	No	Yes	Systematic review of telehealth services in people living in rural and remote areas of Australia Found 72 discrete telehealth services (5 in oncology) of which 68% of services operated from tertiary public hospitals into regional hospital facilities, 26% were urban-based specialists
Acceptability of telephone support as perceived by patients with cancer: A systematic review	Liptrott, 2018 [94]	(Yes)	No	No	No	This review summarizes earlier publications (up to September 2014). At that time video was less common and therefore the review focussed to telephone support during cancer treatment or post-therapy, with outcomes

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
						of patient satisfaction and acceptability.
Framework to advance oncology-related telehealth	Rising, 2018 [95]	No	(Yes)	No	(Yes)	This is a review of systematic reviews informing the National Quality Forum (NQF) Telehealth Framework (on behalf of the US Department of Health and Human Services) that includes access to care, financial impact or cost, experience, and effectiveness for telehealth within oncology. The field of oncology did not have significant evidence/
Telemedicine in dermatology: findings and experiences worldwide – a systematic literature review	Trettel, 2018 [96]	No	No	No	No	While teledermatology was outside the scope of the current evidence summary, this review summarizes the topic and indicates “teledermatology is already accepted as a valid tool”.
Rapid review: Virtual vs in-person care	COVID-19 Scientific Advisory Group, Alberta Health Services, 2020 [97]	No	(Yes)	No	No	The review focuses on virtual care by physicians that is accessible from a patient’s home (smartphone, telephone, computer) and not requiring attendance at a different site. Data was limited and not restricted to cancer; one trial involving patients with cancer compared phone to WeChat and not to in-person care.
The impact of the COVID-19 pandemic on genitourinary cancer care: Re-envisioning the future	Wallis, 2020 [98]	No	(Yes)	No	(Yes)	This narrative review explores some issues of virtual care for genitourinary cancer during the pandemic and how this may change care afterwards. Considerations for genitourinary cancer treatment during COVID-19 pandemic

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
An overview of reviews of digital health interventions for the prevention, detection and management of mental health problems in people with chronic diseases: Preliminary results	Canadian Institutes of Health Research ; Gagnon, 2020 [99]	No	No	No	No	This is a rapid review (overview of other reviews) found positive effect of digital health interventions on depression, anxiety, distress, and psychosocial outcomes. Teleconsultation and web-based interventions were most effective for people affected by or survivors of cancer.
Psychological intervention targeting distress for cancer patients: A meta-analytic study investigating uptake and adherence	Brebach, 2016 [100]	No	No	No	No	This is a systematic review/meta-analysis of older data (1993-2014). Higher uptake of therapy when offered by phone vs. face-to-face (71.2% vs. 53.8%, p=0.027) and when conducted by a nurse. Evidence of greater efficacy is lacking.
Cancer guidelines that Include aspects of virtual care, developed during the COVID-19 pandemic						
ESMO management and treatment adapted recommendations in the COVID-19 era: Breast cancer	ESMO; de Azambuja, 2020 [101]	No	No	(Yes)	No	Shift non-priority outpatient visits to telemedicine: non-urgent situations for established patients without new complaints, survivorship and follow-up care, referrals to high-risk (genetic) clinics
ESMO management and treatment adapted recommendations in the COVID-19 era: colorectal cancer	ESMO; Vecchione, 2020 [102]	No	No	(Yes)	No	Shift outpatient visits to web technology contact for those on oral treatment. Telemedicine is an option for second opinion visits; follow-up; psychological support; discussion of secondary prevention examinations, blood test controls, metastatic staging when no curative surgery is planned
ESMO management and treatment adapted recommendations in the COVID-19 era: Pancreatic cancer	ESMO; Catanese, 2020 [103]	No	No	(Yes)	No	Consider telemedicine for established patients to evaluate new symptoms; consultations of

Title	Organization and citation	Topics Covered[5]				Other
		Technical considerations	Equity	Inter-professional care	Compensation	
						laboratory or imaging results; details of admittance for consultation, diagnostics, or medical treatment; survival follow-up
Anti-cancer therapy and clinical trial considerations for gynecologic oncology patients during the COVID-19 pandemic crisis	Pothuri, 2020 [104]	No	No	No	No	Use telemedicine to limit contacts with health care facilities; goals of care discussions prioritized even if by telephone or telemedicine; postpone or convert to telemedicine routine surveillance if no symptoms; in clinical trials assess toxicity, symptoms, concomitant medication using telemedicine and delivery oral drugs directly to patients

Appendix 7: Established Virtual Care /Telemedicine Programs Prior to COVID-19

This list includes programs noted in the literature review. Literature searches are as indicated in the Methods section, but no specific search was run for this topic. The COVID-19 Evidence Synthesis Network report [74] also lists some major health systems, although some of the programs listed may have been implemented since the COVID-19 pandemic.

Canada

University Health Network [105,106]

Ontario Telemedicine Network [107]

The Women's College Hospital Institute for Health System Solutions and Virtual Care (WIHV, Toronto

Alberta Health Services (AHS) Virtual Hospitals (Edmonton and Calgary)

Interior Health Thoracic Surgical Group, British Columbia [108]

Office of Virtual Health, Provincial Health Services Authority, B.C.

United States

Kaiser Permanente [109] [110]
Covers 12 million health plan members. In 2016 almost half of patient contacts were virtual (6.2 million telephone appointments, almost 100,000 video visits, 30 million secure messages)

Cleveland Clinic Distance Health [111]

University of California, San Francisco Comprehensive Cancer Center [112]

Sevier Valley Hospital (rural Utah) [113]
Now part of Intermountain Health which has 15 Tele-Health locations for cancer throughout Utah

MD Anderson Cancer Center, University of Texas [114]
https://www.mdanderson.org/publications/promise/telemedicine-att.h34-1587468.html

Department of Radiation Oncology, University of Texas Medical Branch (UTMB), Galveston, Texas [115].
-300 sites and 60,000 patient encounters per year in rural communities and the Texas Department of Criminal Justice state prison system
-article focuses on radiation oncology follow-up, mostly for prostate cancer, approximately 250 patient encounters per year

University of Kansas Center for Telemedicine & Telehealth (KUCTT) [116]
-More than 100 sites throughout Kansas

Mercy Hospital (44 hospitals Oklahoma, Arkansas, Kansas, Missouri plus clinics elsewhere)
-Virtual Care Center opened in 2015 and in 2017 had more than 700 physicians, nurses and support staff serving 750,000-plus patients [117]

Providence (Providence St. Joseph Health), based in Washington state, owns 51 hospitals and 1085 clinics. Telehealth (virtual clinics) serves 8 states at over 150 sites, over ½ million virtual visits in 2020, and 16 years of experience

Other

New South Wales, Australia [118,119]

Townsville TeleOncology Network, Tropical Centre of Telehealth Practice and Research, Townsville University Hospital, Queensland, Australia [120,121]

University Hospital of North Norway [122]

Supportive care and eHealth: A narrative review of technologies, interventions, and opportunities for optimizing care in patients with cancer [123]