

# Technology-based Health Solutions for Cancer Caregivers to Better Shoulder the Impact of COVID-19: A Systematic Review Protocol

Zhaohui Su (✉ [szh@utexas.edu](mailto:szh@utexas.edu))

University of Texas Health Science Center at San Antonio <https://orcid.org/0000-0003-2005-9504>

**Dean McDonnell**

Institute of Technology Carlow

**Bin Liang**

Chinese Academy of Medical Sciences and Peking Union Medical College

**Jennifer Kue**

Ohio State University

**Xiaoshan Li**

Beijing Normal University-Hong Kong Baptist University United International College

**Sabina Šegalo**

University of Sarajevo

**Shailesh Advani**

National Institute of Health

**Bertha E Flores**

University of Texas Health Science Center at San Antonio

**Jing Wang**

University of Texas Health Science Center at San Antonio

---

## Protocol

**Keywords:** COVID-19, coronavirus, technology-based interventions, cancer caregivers, cancer patients, systematic review protocol, telemedicine, digital health solutions

**Posted Date:** September 1st, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-66218/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

**Version of Record:** A version of this preprint was published on February 1st, 2021. See the published version at <https://doi.org/10.1186/s13643-021-01592-x>.

# Abstract

**Background** Cancer patients are particularly vulnerable to COVID-19, partially owing to their compromised immune systems and curbed or cut cancer healthcare services caused by the pandemic. As a result, cancer caregivers may have to shoulder triple crises: the COVID-19 pandemic, pronounced healthcare needs from the patient, and elevated need for care from within. While technology-based health interventions have the potential to address unique challenges cancer caregivers face amid COVID-19, limited insights are available. Thus, to bridge this gap, we aim to identify technology-based interventions designed for cancer caregivers and report the characteristics and effects of these interventions concerning the distinctive challenges cancer caregivers face amid COVID-19. Additionally, this paper will present practical insights into the diverse intervention approaches that can assist in the delivery of digital health solutions for cancer caregivers amid and beyond COVID-19.

**Methods** A systematic review of the literature will be conducted in PubMed, PsycINFO, CINAHL, and Scopus in September, 2020. Articles that center on technology-based interventions for cancer caregivers will be included in the review. The search strategy was developed in consultation with an academic librarian who is experienced in systematic review studies. Titles, abstracts, and full-text articles will be screened against eligibility criteria developed *a priori*. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses procedures will be followed for the reporting process.

**Results** NA—This is a protocol study.

**Conclusions** COVID-19 has uprooted cancer care as we know it. Due to barriers introduced by the COVID-19 pandemic, such as medical resources rationing, cancer caregivers often have to step up to address patients' healthcare needs and wants. This, in turn, will exert substantial stress on informal caregivers, above and beyond COVID-19-related burdens the general public shoulders on a daily basis. Findings of this study can shed light on evidence-based and practical solutions cancer caregivers can utilize to mitigate the unique challenges they face amid COVID-19. Furthermore, results of this study will also offer valuable insights for researchers who aim to develop interventions for cancer caregivers in the context of COVID-19. In addition, we also expect to be able to identify areas for improvement that need to be addressed in order for health experts to more adequately help cancer caregivers weather the storm of global health crises like COVID-19 and beyond.

**Study Protocol Registration:** PROSPERO CRD42020196301

## Background

A growing body of research is exploring the impact of COVID-19 on individuals with cancer. Already acknowledged as being infectious and deadly [1, 2], as of August 26<sup>th</sup>, 2020, there are approximately 23,736, 101 confirmed COVID-19 cases, among which, 815, 248 deaths have already occurred [3]. Through a retrospective analysis of 355 patients dying from the coronavirus, one in five of these patients had active cancer [4]. Individuals with cancer can experience underlying malignancy, treatment-induced

immunosuppression, and possible comorbidity [5-7], and it has been shown that they are more likely to develop severe symptoms from COVID-19 [5, 6, 8]. Research also indicates that, compared to COVID-19 patients without cancer, COVID-19 patients with cancer are more likely to have higher risks in all severe outcomes (e.g., higher mortality rates) [5, 6]. Additional factors may further increase cancer patients' vulnerability to COVID-19, such as limited access to medical resources and cancer care, during this pandemic [9-11].

Due to medical resource rationing, a majority of cancer care and treatment services were either cancelled or indefinitely postponed during the early part of the COVID-19 pandemic [12, 13]. No longer having access to the healthcare services they were accustomed to or depended upon [8, 13], informal cancer caregivers may now be shouldering considerably more caregiver burden due to COVID-19. While the effects of this deprivation of access to cancer care on cancer patients are well discussed [14, 15], caregiving responsibilities influencing cancer caregivers' health and well-being is less examined. Other than healthcare professionals in a caring role as a part of their work, an informal caregiver is one who is offered unpaid or ill-compensated care to a family member or a friend, due to disease-centered or ageing-related reasons. Pre-COVID-19 data show that caregivers shoulder approximately 70-89% of all care needed by patients in general [16]. Considering the interruptions COVID-19 exerts on cancer care and treatment, it is probable that cancer caregivers are shouldering even greater caregiving responsibilities for patients.

Cancer caregivers have been facing tremendous stressors during the COVID-19 pandemic. The range of issues resembles a triple crisis of (1) confronting the impact of the coronavirus outbreak, (2) shouldering pronounced care needs from the patient, and (3) coping with considerable needs for physical and psychological care from within. In other words, in addition to being forced to deal with a pandemic and patients' pronounced cancer care needs discussed above, caregivers may also experience substantial physical and psychological health issues that require timely medical attention. Mounting evidence indicates that cancer caregivers often face substantial caregiver burden that can have negative impacts on their physical and psychosocial health [17-19]. In a review study, findings on 21,149 caregivers show that the prevalence of depression and anxiety is 42.30% and 46.55% in these caregivers, respectively [20]. It is important to note that blanket measures, such as lockdowns, self-isolation, and social distancing, can exert further pressures on cancer caregivers. Research suggests that social support from community members can lower anxiety and depression experienced by cancer caregivers; these supports are significantly limited due to social distancing recommendations [21].

Technology-based interventions refer to "the use of technology to manage or support health promotion strategies aiming to produce accessible and affordable health solutions to the target audience" [22]. Studies have shown that technologies (e.g., telehealth) may be particularly useful to address issues cancer caregivers experienced during COVID-19; with some research identifying the potential improvement to health and well-being [23-25]. Technology-based interventions can offer greater accessibility to care for cancer caregivers that can be: (1) delivered remotely without physical contacts between interventionists and the caregivers [26, 27], (2) received cost-effectively without the need for

transportation [24], and accessed conveniently with self-paced learning [28, 29] of tailored content [30, 31]. In addressing the unique challenges cancer caregivers face amidst COVID-19, no research has identified technology-based health solutions for cancer patients that can address these needs, such as care needs, general healthcare needs, information and communication needs, and social support needs (see Table 1). Thus, to bridge this gap, this systematic review identifies the literature surrounding technology-based solutions for cancer caregivers that can mitigate challenges they face amid COVID-19.

**Table 1.** Cancer caregivers' unique needs associated with COVID-19

## Cancer Caregivers' Unique Needs Associated with COVID-19

---

Unique challenges due to COVID-19	Need Category
Due to cancer patients' canceled or delayed access to cancer care owing to heightened healthcare needs among COVID-19 patients, patients may need to rely more on caregivers for their care needs compared to their pre-COVID-19 normal.	Cancer care needs
As a result of negative impacts of COVID-19 and striking caregiver burden amid COVID-19, cancer caregivers may need healthcare services that can address issues associated with their physical and psychological health.	General healthcare needs
In addition to pronounced need for information on healthcare, due to the fear and uncertainty surround COVID-19, caregivers may need more information to help themselves as well as patients to cope with the impacts associated with COVID-19.	Information & communication needs
Protective measures against the spread of COVID-19 (e.g., lockdowns, self-isolation, and social distancing)	Social support needs

## Methods

### Study registration and Protocol

Two steps were taken to improve the research rigor [32, 33]: (1) *a priori* registration ([CRD42020196301](#)) with the International Prospective Register of Systematic Reviews or PROSPERO managed by the Centre for Reviews and Dissemination, University of York, U.K. and (2) compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) in our research procedures [34].

## Search Strategy

The following databases will be searched for potential articles: PubMed, PsycINFO CINAHL, and Scopus. The search will be limited to original articles published in English from the database inception to September, 2020. Searches incorporated medical subject heading (MeSH) and keyword terms in three categories: cancer, caregivers, and technology platforms. Our search strategy was developed in consultation with an academic librarian who are experienced in systematic review studies to ensure research rigor (see Table 2). Snowballing (manual searching reference lists) of included studies will be conducted to obtain additional eligible articles. Furthermore, reverse tracing potential eligible manuscripts that cited included papers will be administered via Google Scholar.

**Table 2:** Search strategy

Concept category	Search strings
Cancer Screening	"Early Detection of Cancer"[MeSH] OR "cancer screening"[TW] OR "early detection of cancer"[TW] OR "early diagnosis of cancer"[TW] OR "early cancer diagnosis"[TW] OR "HPV testing" OR "papanicolaou test"[MeSH Terms] OR "pap smear*" [TIAB] OR "pap-smear*" [TIAB] OR "visual inspection with acetic acid" [TIAB] OR "Colonoscopy" [MeSH] OR "colonoscop*" [TIAB] OR sigmoidoscop* [TIAB] OR "Mammography" [MeSH] OR "mammograph*" [TIAB] OR "colposcop*" [TIAB] OR "Papanicolaou" [TIAB] OR "Wart virus*" [TIAB] OR "prostate specific antigen*" [TIAB] OR "psa" [TIAB] OR "ldct" [TIAB] OR "low-dose-ct" [TIAB] OR "low-dose-comput*" [TIAB]
ePlatforms: Computers	"Computer"[MeSH] OR "computer" [TIAB] OR "computer assisted" [TIAB] OR "laptop" [TIAB] OR "laptops" [TIAB] OR "personal digital assistant" [MeSH]
ePlatforms: Tablets	"electronic device" [MeSH] OR "electronic devices" [TIAB] OR "mobile tablet*" [TIAB] OR "ipad*" [TIAB] OR "galaxy tab*" [TIAB] OR "surface pro*" [TIAB] OR "mobile device*" [TIAB] OR "mobile computer*" [TIAB] OR "handheld computer*" [MeSH]
ePlatforms: Smartphones	"smartphone" [MeSH] OR "smart-phone" [TIAB] OR "mobile-phone" [TIAB] OR "mobile phone" [TIAB] OR "cellphone" [TIAB] OR "iphone" [TIAB] OR "android" [TIAB] OR "Cell Phone" [MeSH] OR "Cell Phone Use" [MeSH] OR "cell phone" [TIAB]
ePlatforms: Wearables	"wearable sensor*" [MeSH] OR "wearable system*" [TIAB] OR "wearable device*" [TIAB] OR "wearable technolog*" [MeSH] OR "wearable electronic device*" [TIAB] OR "Smart Glasses" [MeSH] OR "smartwatch" [MeSH] OR "smart-watch*" [TIAB] OR "apple watch" [TIAB] OR "fitbit" [TIAB] OR "garmin watch*" [TIAB] OR "galaxy watch*" [TIAB] OR "samsung watch*" [TIAB]

## Inclusion and exclusion criteria

In the context of this study, caregivers are defined as patients' family or friends who may offer mostly long-term care to patients, often with little or no financial compensation of any form. This paper broadly defines interventions as stimuli or mechanisms that are aimed to produce changes in outcome variables (e.g., self-care abilities increased). Studies will be included if they were published in English, presented relevant information on technology-based interventions for cancer caregiving, with detailed inclusion criteria listed in Table 3. Ensuring data quality, comments, editorials, gray literature, and reviews will be excluded from the review. Overall, articles will be excluded if they: (1) did not include a cancer caregiver population, (2) did not provide information on intervention, and (3) did not describe how technology is integrated into the intervention strategy.

**Table 3.** Study inclusion criteria

<b>Data type</b>	<b>Inclusion criteria</b>
Participants	Cancer caregivers ( $\geq 18$ years old)
Language	English
Study type	Original journal article
Study design	Focus on technology-based intervention that aim to improve cancer caregivers' health and wellbeing
Intervention	Technology-based interventions for cancer caregivers
Outcome	Report empirical findings on intervention outcomes

### **Selection of studies and data extraction**

Search results will be managed using Rayyan [35], a free web application that allows sorting and storing articles was used to remove duplicate records and screen articles. Citations were examined by two primary reviewers (ZS and XL) independently. Discrepancies will be solved by consensus, and when needed, with input from the rest of the research team. Data were extracted based on the research aim and selection criteria adopted in this study. Specifically, for studies that met the inclusion criteria, the primary reviewers (ZS and XL) extracted the following information from final included studies: study and participant characteristics (e.g., study aim), intervention characteristics (e.g., the use of technology in interventions), and details on study outcomes (e.g., intervention outcomes).

## **Results**

NA: This is a protocol study

## Discussion

COVID-19 has uprooted cancer care as we know it [36–40], approximately six months after the World Health Organization declared COVID-19 a global pandemic [41], COVID-19 remains a growing public health emergency that is particularly deadly to vulnerable populations, such as cancer patients [5–7]. Furthermore, COVID-19 prevention mechanisms, such as lockdowns, self-isolation, and social distancing measures, as well as COVID-19-induced medical resources rationing, have curbed or cut cancer patients' access to traditional healthcare services [42–45]. As a result, cancer caregivers often have to step up to address patients' healthcare needs and wants [37, 46–49], which, in turn, could exert substantial mental and physical stress on informal caregivers, above and beyond COVID-19-related burdens the general public shoulders on a daily basis [17–19]. Technology-based health solutions can bypass spatial distancing constraints caused by COVID-19 and have the abilities to address unique challenges cancer patients and their caregivers face amid COVID-19 [50–53].

In China, as the frontline physician among us observed, the most challenging part about cancer care amid COVID-19 is how to resume cancer treatment for patients. Because the pandemic occurred during the Chinese traditional spring festival, many patients, even in severe conditions, have suspended the treatment and travelled home with their caregivers for their extended-family reunion. However, due to the COVID-19 outbreak [54], after the spring festival, most of them are locked down at their hometown or somewhere in between their hometown and the hospital. Even among patients and caregivers who managed to rush back to the hospital for care and treatment, they had to be self-quarantined for 14 days and then undergo a series of tests. Technologies such as the “Health Code”, which is a digital color-coded health system that allows the governments and health agencies to track cell phone location to better determine individuals' whereabouts (i.e., whether they have recently travelled to places witnessed severe COVID-19 outbreaks) [55], undoubtedly have helped expedite the information processing speed, and saved valuable time these patients and caregivers are desperately need.

However, while useful insights are available in the literature, there is a dearth of research that can shed light on evidence-based and practical health solutions cancer caregivers can use to address and alleviate unique challenges they face during COVID-19 or any future disease pandemics. Therefore, to bridge this gap, we aim to identify technology-based interventions designed for cancer caregivers and report the characteristics and effects of these interventions concerning the distinctive challenges cancer caregivers face amid COVID-19. Additionally, this paper will present practical insights into the diverse intervention approaches that can assist in the delivery of digital health solutions for cancer caregivers amid and beyond COVID-19. Furthermore, the results of this study can also offer valuable insights for researchers who aim to develop interventions for cancer caregivers in the context of COVID-19. In addition, we also expect to identify areas for improvement that need to be addressed in order for health experts to more adequately help cancer caregivers weather the storm of global health crises like COVID-19 and beyond.

## Conclusions

NA: This is a protocol study

## List Of Acronyms

COVID-19: coronavirus disease 2019

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PROSPERO: International Prospective Register of Systematic Reviews

## Declarations

- Ethics approval and consent to participate

- Not applicable.

- Consent for publication

- Not applicable.

- Availability of data and materials

- No.

- Competing interests

- None.

- Funding

- None.

- Authors' contributions

- ZS developed the research idea and drafted the manuscript, DMD, BL, JK, XL, SS, SA, BEF, and JW reviewed and revised the manuscript.

- Acknowledgements

- The authors wish to express their gratitude to Emme Lopez, the academic librarian who helped with finalizing the search strategy. Gratitude also goes to the editors and reviewers for their constructive input.

## References

1. Jordan RE, Adab P, Cheng KK. Covid-19: Risk factors for severe disease and death. *BMJ*. 2020;368:m1198.
2. Wu Z, McGoogan JM, *Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention*. *JAMA*, 2020. **323**(13): p. 1239–1242.
3. John Hopkins University. *The COVID-19 global map*. 2020 [cited 2020 August 26th]; Available from: <https://coronavirus.jhu.edu/map.html>.

4. Onder G, Rezza G, Brusaferro S. Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *JAMA*. 2020;323(18):1775–6.
5. Mehta V, et al., *Case fatality rate of cancer patients with COVID-19 in a New York hospital system*. *Cancer Discovery*, 2020: p. CD-20-0516.
6. Dai M, et al. Patients with cancer appear more vulnerable to SARS-CoV-2: A multicenter study during the COVID-19 outbreak. *Cancer Discov*. 2020;10(6):783.
7. Zhang L, et al., *Clinical characteristics of COVID-19-infected cancer patients: A retrospective case study in three hospitals within Wuhan, China*. *Annals of Oncology*, 2020.
8. Sidaway P. COVID-19 and cancer: What we know so far. *Nat Rev Clin Oncol*. 2020;17(6):336.
9. Gray DM, et al., *COVID-19 and the other pandemic: Populations made vulnerable by systemic inequity*. *Nature Reviews*, 2020.
10. Saini KS, et al. Effect of the COVID-19 pandemic on cancer treatment and research. *The Lancet Haematology*. 2020;7(6):e432–5.
11. Segelov E, et al., *Practical considerations for treating patients with cancer in the COVID-19 pandemic*. *JCO Oncology Practice*, 2020: p. OP.20.00229.
12. Kutikov A, et al. A war on two fronts: Cancer care in the time of COVID-19. *Ann Intern Med*. 2020;172(11):756–8.
13. CovidSurg Collaborative D, Nepogodiev, Bhangu A, *Elective surgery cancellations due to the COVID-19 pandemic: Global predictive modelling to inform surgical recovery plans*. *BJS (British Journal of Surgery)*, 2020. [n/an/a](#).
14. Xia Y, et al. Risk of COVID-19 for patients with cancer. *The Lancet Oncology*. 2020;21(4):e180.
15. Romeo A, Castelli L, Franco P, *The impact of COVID-19 on radiation oncology professionals and cancer patients: From trauma to psychological growth*. *Advances in Radiation Oncology*, 2020.
16. Hsu T, et al. Understanding caregiver quality of life in caregivers of hospitalized older adults with cancer. *J Am Geriatr Soc*. 2019;67(5):978–86.
17. Bevans M, Sternberg EM. Caregiving burden, stress, and health effects among family caregivers of adult cancer patients. *JAMA*. 2012;307(4):398–403.
18. Charalambous A, et al. Cancer-related fatigue and sleep deficiency in cancer care continuum: concepts, assessment, clusters, and management. *Support Care Cancer*. 2019;27(7):2747–53.
19. He Y, et al., *Sleep quality, anxiety and depression in advanced lung cancer: Patients and caregivers*. *BMJ Supportive & Palliative Care*, 2020.
20. Geng H-M, et al. Prevalence and determinants of depression in caregivers of cancer patients: A systematic review and meta-analysis. *Medicine*. 2018;97(39):e11863–3.
21. García-Torres F, et al. Social support as predictor of anxiety and depression in cancer caregivers six months after cancer diagnosis: A longitudinal study. *J Clin Nurs*. 2020;29(5–6):996–1002.
22. Su Z, et al., *Understanding technology-based interventions for caregivers of cancer patients: A systematic review-based concept analysis*. *Journal of Medical Internet Research*, 2020.

23. Carrion-Plaza A, Jaen J, Montoya-Castilla I. *HabitApp: Newplay technologies in pediatric cancer to improve the psychosocial state of patients and caregivers*. *Frontiers in Psychology*, 2020. 11(157).
24. Wang J, et al., *Mhealth supportive care intervention for parents of children with acute lymphoblastic leukemia: Quasi-experimental pre- and postdesign study*. *JMIR mHealth and uHealth*, 2018.
25. Duggleby W, et al., *Feasibility study of an online intervention to support male spouses of women with breast cancer*. *Oncology Nursing Forum*, 2017.
26. Kubo A, et al., *A randomized controlled trial of mHealth mindfulness intervention for cancer patients and informal cancer caregivers: A feasibility study within an integrated health care delivery system*. *Integrative Cancer Therapies*, 2019.
27. Kubo A, et al., *A pilot mobile-based mindfulness intervention for cancer patients and their informal caregivers*. *Mindfulness*, 2018.
28. Mosher CE, et al., *Randomized pilot trial of a telephone symptom management intervention for symptomatic lung cancer patients and their family caregivers*. *Journal of Pain and Symptom Management*, 2016.
29. Dionne-Odom JN, et al. Family caregiver depressive symptom and grief outcomes from the ENABLE III randomized controlled trial. *J Pain Symptom Manage*. 2016;52:378–85.
30. DuBenske LL, et al. CHES improves cancer caregivers' burden and mood: Results of an eHealth RCT. *Health Psychol*. 2014;33(10):1261–72.
31. Santin O, et al. Using a six-step co-design model to develop and test a peer-led web-based resource (PLWR) to support informal carers of cancer patients. *Psycho-Oncology*. 2019;28(3):518–24.
32. dos Santos MBF, et al. Protocol registration improves reporting quality of systematic reviews in dentistry. *BMC Med Res Methodol*. 2020;20(1):57.
33. Xu C, et al. Protocol registration or development may benefit the design, conduct and reporting of dose-response meta-analysis: Empirical evidence from a literature survey. *BMC Med Res Methodol*. 2019;19(1):78.
34. Moher D, et al. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA statement. *PLoS Medicine*. 2009;6(7):e1000097.
35. Ouzzani M, et al., *Rayyan – a web and mobile app for systematic reviews*. *Systematic Reviews*, 2016. 5(210).
36. Zhen H, et al. COVID-19 outbreak and cancer patient management: Viewpoint from radio-oncologists. *Radiother Oncol*. 2020;p. S0167-8140(20):30206–1.
37. Baddour K, et al. Potential impact of the COVID-19 pandemic on financial toxicity in cancer survivors. *Head Neck*. 2020;42(6):1332–8.
38. Brunetti O, et al. COVID-19 infection in cancer patients: How can oncologists deal with these patients? *Front Oncol*. 2020;10:734–4.
39. De Vincentiis L, et al., *Cancer diagnostic rates during the 2020 'lockdown', due to COVID-19 pandemic, compared with the 2018–2019: An audit study from cellular pathology*. *Journal of Clinical*

- Pathology, 2020: p. jclinpath-2020-206833.
40. Calabrò L, et al. Challenges in lung cancer therapy during the COVID-19 pandemic. *The Lancet Respiratory medicine*. 2020;8(6):542–4.
  41. World Health Organization. *Timeline: WHO's COVID-19 response*. Coronavirus disease (COVID-19) 2020 [cited 2020 August 15th]; Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline>.
  42. Farrell TW, et al. Rationing limited healthcare resources in the COVID-19 era and beyond: Ethical considerations regarding older adults. *J Am Geriatr Soc*. 2020;68(6):1143–9.
  43. Smrke A, et al. Telemedicine during the COVID-19 pandemic: Impact on care for rare cancers. *JCO Glob Oncol*. 2020;6:1046–51.
  44. Kuderer NM, et al., *Clinical impact of COVID-19 on patients with cancer (CCC19): A cohort study*. *Lancet*, 2020.
  45. van de Haar J, et al., *Caring for patients with cancer in the COVID-19 era*. *Nature Medicine*, 2020.
  46. Guo Q, et al., *Immediate psychological distress in quarantined patients with COVID-19 and its association with peripheral inflammation: A mixed-method study*. *Brain, behavior, and immunity*, 2020: p. S0889-1591(20)30618-8.
  47. Sher L. The impact of the COVID-19 pandemic on suicide rates. *QJM: An International Journal of Medicine*; 2020.
  48. Young AM, et al. Uncertainty upon uncertainty: Supportive care for cancer and COVID-19. *Support Care Cancer*. 2020;28(9):4001–4.
  49. Laughlin AI, et al., *Accelerating the delivery of cancer care at home during the Covid-19 pandemic*. *NEJM Catalyst Innovations in Care Delivery*, 2020. 1(4).
  50. Keshvaridoost S, Bahaadinbeigy K, Fatehi F, *Role of telehealth in the management of COVID-19: Lessons learned from previous SARS, MERS, and Ebola outbreaks*. *Telemedicine and e-Health*, 2020.
  51. Al-Shamsi HO, et al. A practical approach to the management of cancer patients during the novel coronavirus disease 2019 (COVID-19) Pandemic: An international collaborative group. *Oncologist*. 2020;25(6):e936–45.
  52. Nguyen NP, et al., *Older cancer patients during the COVID-19 epidemic: Practice proposal of the International Geriatric Radiotherapy Group*. *Cancers*, 2020. 12(5).
  53. Lonergan PE, et al. Rapid utilization of telehealth in a comprehensive cancer center as a response to COVID-19: Cross-sectional analysis. *J Med Internet Res*. 2020;22(7):e19322.
  54. Chen S, et al. COVID-19 control in China during mass population movements at New Year. *The Lancet*. 2020;395(10226):764–6.
  55. Pan X-B. *Application of personal-oriented digital technology in preventing transmission of COVID-19, China*. *Irish Journal of Medical Science (1971 -)*, 2020.