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Management of Cancer Patients in the COVID-19 Crisis Using Telemedicine: A Systematic Review

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Abstract. *Background:* Telemedicine can provide a solution for disease management during the COVID-19 pandemic. This literature review aims to explore the role of telemedicine during the COVID-19 pandemic for management of cancer patients. *Method:* A comprehensive systematic search was conducted in PubMed, Science Direct, EMBASE, and Web of Science databases for the papers published until April 2021. Studies were included in case they had practically used telemedicine in the management of cancer patients during the COVID-19 crisis. *Results:* After screening 2614 titles and abstracts and reviewing 305 full-texts, 16 studies were found to be eligible. The results indicated that most of the patients contacted by telemedicine services mostly used to intract with patients breast cancer (n=4, 25%). The most common use of telemedicine was the provision of virtual visit services (n=10, 62.25%). Besides, communication was most frequently provided by live video conferences (n=11, 68.75%). *Conclusion:* Telemedicine can provide continued access to necessary health services in oncology care and serve as an important role in pandemic planning and response.

Keywords. Telemedicine, Tele-oncology, COVID-19, Cancer

Introduction

Cancer has imposed a major burden on the whole world for a long time [1]. In the event of any crisis or epidemic outbreak, the treatment process for this group of patients is faced with many challenges, and the novel Coronavirus (COVID-19) pandemic has not been an exception. Studies have indicated that the incidence of COVID-19 was higher in patients with cancer and that these patients were at an increased risk of mortality [2] and developing severe life-threatening complications [3]. Increased transmission and poor outcomes among cancer patients infected with COVID-19 have called for social distancing and quarantine so as to minimize contact with infected individuals [4]. On the

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other hand, care delivery for cancer patients has been disrupted or delayed at least partially during the peaks of the pandemic due to the prioritization of resources, and physicians have become concerned about the recurrence of cancer prognosis. During such periods, health professionals take different measures to protect their patient groups. Telemedicine is one of the methods used by oncologists. Considering the fear from contagion during the COVID-19 pandemic, telemedicine has been regarded as a savior. In this context, telemedicine has been shown to be a reliable tool that distantly guarantees a proper surveillance [5, 6] and clearly outweighs the setbacks by minimizing the need for referring to healthcare facilities [7]. In fact, telemedicine has provided an opportunity to bring patients and physicians together digitally [8] without the need for physical contact and to prevent the further risk of infection [9, 10]. To the best of our knowledge, there are not comprehensive, study that investigating the application of telemedicine among oncology patients during the COVID-19 pandemic. Identifying these experiences is the first step of moving toward adopting and usage of telemedicine in pandemic planning and response, so this literature review aims to explore the role of telemedicine during the COVID-19 pandemic for management of cancer patients.

1. Methods

This systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [11].

1.1. Search Strategy

A search was performed in PubMed, Science Direct, Web of Science, and EMBASE databases for the relevant articles written in English between 2019 and April 2021. A combination of keywords and Medical Subject Headings (MeSH) were used as follows: COVID19, COVID-19, Coronavirus, 2019-nCoV, Tele*, Telemedicine, Tele-medicine, Tele oncology, Telecare, Virtual care, Remote care Cancer and Neoplasm. To combine the terms, use was made of the Boolean operators (AND, OR, and NOT). The applied search strategy is presented in Table 1.

Table 1. The search strategy of the study

Databases: PubMed, Science Direct, EMBASE, and Web of Science	
Limits: language: English, in title/abstract (keywords), full-text available, document type: article	
Publication date: 2019 up to April 2021	
#1	COVID19 OR COVID-19 OR Coronavirus OR 2019-nCoV
#2	Tele* OR Telemedicine OR Tele-medicine OR Teleoncology OR Telecare OR virtual care OR Remote care
#3	Cancer OR Neoplasm OR Malignant
Search strategy	#1 AND #2 AND #3

1.2. Selecting and Refining the Studies

All full-text articles that practically investigated the role of telemedicine in the management of cancer patients during the COVID-19 crisis were taken into

consideration. The papers in the formats of letters to editors, short communications and in other languages than English, and those with English abstracts published in languages other than English were excluded. During this step, it was attempted to inquire about the related gray literature or the studies that were not included in the search process by reviewing the reference lists of the selected studies or by contacting some experts or the authors of the articles. This complementary search was based on the titles of the related articles in the reference lists of the selected articles and was conducted in Google Scholar. After searching for studies in all databases and eliminating duplicates, the studies were independently reviewed and screened by two members of the research team (FS and ZE) in three phases (titles, abstracts and full texts). At each phase, the final decision for including the article was made based on the agreement between the two members. In case of disagreement, the opinion of the third member (LA) was asked. After selecting the final articles based on the desired inclusion and exclusion criteria, the data on the role of telemedicine in the management of cancer patients during the COVID-19 crisis were extracted and included in data extraction forms using Microsoft Excel 2016. The extracted data included the year of publication, study location, intervention type, study population, study objectives, methodology, and main findings. The articles meeting the inclusion criteria were critically reviewed using the summative analysis method.

2. Results

In total, 2614 articles were retrieved after searching the databases. After removing the duplicates, screening, and applying the inclusion and exclusion criteria, 305 studies were eligible for further full-text review. Thereafter, 16 articles were selected for the final analysis (Figure 1).

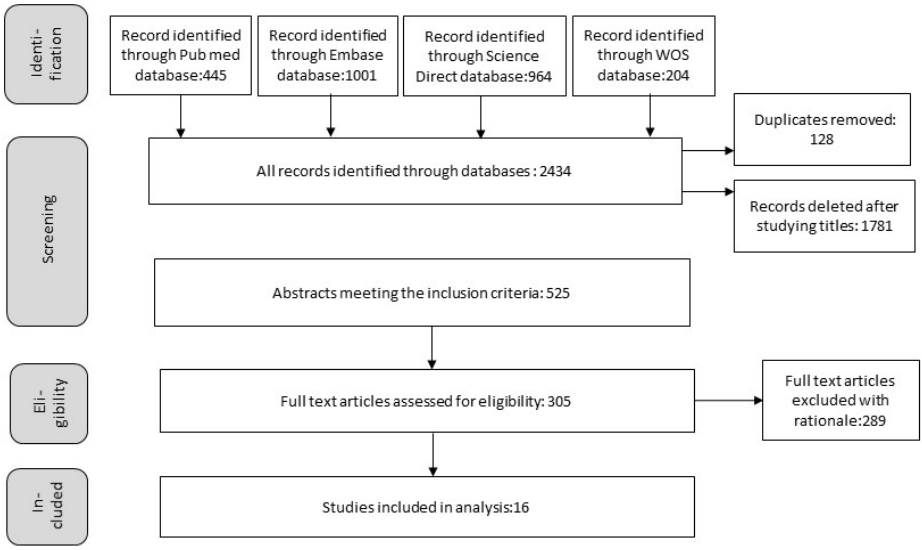

Figure 1. PRISMA Flow Diagram for the systematic review process

The summary of the characteristics of all included studies is shown in Table 2.

Table 2. Description of the included studies

Author &Ref	Publication date	Country	Study design	Participants in the intervention	Number of patients	Reasons telemedicine appointment
Rajasekaran [12]	2021	England	Cross sectional	Patient/provider/ other team personal	Not mentioned	Treatment and follow up
Nahm [13]	2021 Jan	USA	Case report	patient and provider	1	Treatment and follow up
Lonergan [14]	2020	USA	Cross sectional	Patient/provider/ other team personal	2281	Treatment and follow up
Christian [15]	2020 Feb	Canada	Multi Method	Patient/provider/ other team personal	12	Rehabilitation
Umar [16]	2020 Oct	USA	Cross sectional	Patient/provider/ other team personal	871	Screening
Sonagli [17]	2020 Nov	Brazil	Cohort study	Patient/provider/ other team personal	77	Screening
Berlin [18]	2021 Jan	Canada	Cohort study	Patient/provider/ other team personal	2207	Treatment and follow up
Olshinka [19]	2020 Oct	Canada	Cross sectional	Patient/provider/ other team personal	251	Triage and management
Lee [20]	2020 Apr	China	Cross sectional	Patient/provider/ other team personal	3800	Treatment and follow up
Klain [21]	2020 Sep	Italy	Cross sectional	Patient/provider/ other team personal	445	Treatment and follow up
Yildiz [22]	2020 Oct	Turkey	Cross sectional	patient and provider	421	Treatment and follow up
Daggubati [23]	2020 Jul	USA	Cross sectional	Patient/provider/ other team personal	Not mentioned	Treatment and follow up
Guerra [24]	2021 Mar	USA	Cross sectional	Patient/provider/ other team personal	45	Palliative care
Kang [25]	2020 Sep	USA	Cross sectional	Patient/provider/ other team personal	Not mentioned	Treatment and follow up
Kenney [26]	2021 Feb	USA	Cross sectional	Patient/provider/ other team personal	81	Treatment and follow up
Reddy [27]	2021 Feb	USA	Cross sectional	Patient/provider/ other team personal	1744	Treatment and follow up

As shown, the included studies were published in journals between January 2020 and April 2021. Most studies had cross-sectional designs (n=12, 75%) and half of them were conducted in the USA (n=8). Our findings show that the reasons for telemedicine appointments among cancer patients during the outbreak of COVID-19 were treatment and follow-up (n=11, 68.75%), screening (n=2, 12.5%), palliative care (n=1, 6.25%), rehabilitation (n=1, 6.25%) and triage and management (n=1, 6.25%) respectively (Figure 2). It should be noted that most number of studies that evaluated the telemedicine services based on cancer types of patients contacted by telemedicine suffered from breast cancer (n=4, 25%) (Figure 2). The results demonstrated that the most common usages of telemedicine during the COVID-19 pandemic were provision of virtual visit services (n=10, 62.25%), consultation (n=5, 31.25%), palliative care (n=2, 12.5%), and nurse visits (n=1, 6.25%) (Supplementary E). Based on the study findings, communication was most frequently provided by live video conference (n=11,68.75%), phone call (50%), and Email (n=7, 43.75%) (Table 3).

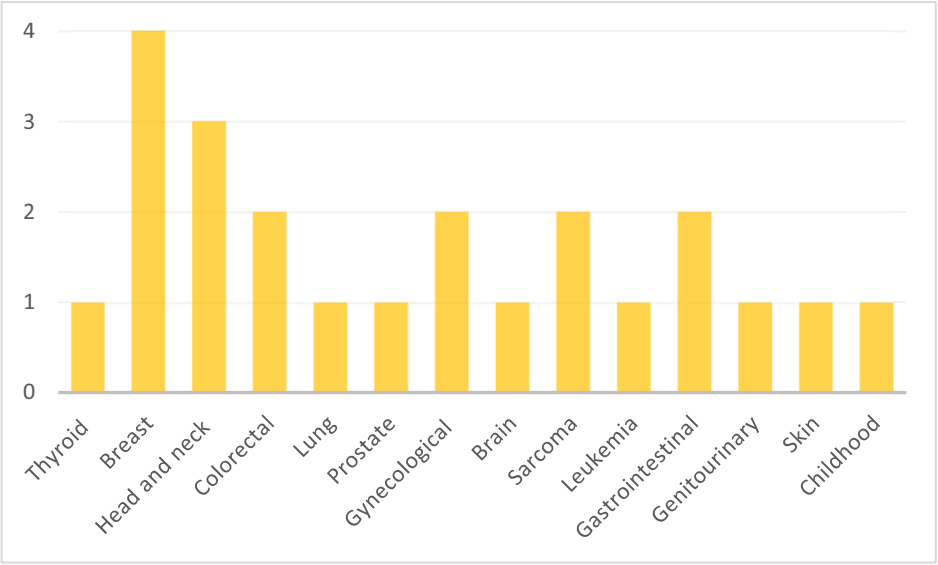

Figure 2. The number of studies that evaluated the telemedicine services based on cancer types of patients

Table 3. Types of telemedicine service

Type of telemedicine service	Frequency (%)	Reference
Clinical visit	10 (62.25%)	13, 14, 15, 16, 17, 18, 22, 23, 26, 27
Palliative care	2 (12.5%)	24, 26
Nurse visit	1 (6.25%)	26
Consultation	5 (31.25%)	12, 19, 20, 21, 25

3. Discussion

This study aimed to explore the role of telemedicine in management of cancer patients during the COVID-19 pandemic. In other words, this study explained the experiences of the used telemedicine services for improving the management of cancer patients during the COVID-19 pandemic.

The results indicated that the virtual visit service was the most common telemedicine service used during the COVID-19 pandemic. Studies have demonstrated that virtual visits did not decline the quality of care and were as effective as in-person visits [28]. Evidence has also revealed that substantially more telemedicine visits were made during the COVID-19 pandemic [29]. A previous study estimated that 42% of individuals in the US had an avoided or delayed care during the COVID-19 pandemic [30]. Nonetheless, the role of virtual visits in improving outcomes in cancer has been vastly reported [31]. During the COVID-19 pandemic, for instance, telemedicine visits reduced disease exposure among staff, patients, and family members, eventually preserving the scarce supplies of personal protective equipment and reducing patients' demands for facilities

[29, 32]. Moreover, telemedicine could offer unparalleled flexibility; care partners could be either at the patient's side or physically distant and easily take part in voice or video conference visits [32]. Although telemedicine has been well-accepted by patients and oncologists [33, 12], in some cancer types, virtual visits might not be appropriate for some patients based on the level of accuracy or the necessity to conduct diagnostic tests or physical examinations. The current study findings indicated the following reasons for telemedicine appointments among cancer patients: treatment and follow-up during the COVID-19 pandemic, cancer screening, palliative care, and rehabilitation. Follow-up care has been recommended for all patients suffering from cancer in order to manage cancer-related health issues and provide training about the future health risks. These methods have also been reported to reduce morbidity and mortality during the pandemic [34]. Despite the great advantages of telemedicine, its implementation in resource-limited settings might be challenging. In this context, the most common barriers reported by studies were policy issues, concerns regarding malpractice-related issues, lack of formal organizational structures and reimbursement mechanisms, technological barriers including poor internet connection and low technology awareness, prescription issues, and social/cultural limitations [35-37]. The present study results showed that communication through telemedicine was most frequently provided by live video conferences. In order to control the spread of COVID-19, video consultations and telephone follow-ups have been possible in multiple settings for breast, lung, endometrial, colorectal, and prostate cancers [38]. Synchronous platforms allow patients and the neurosurgery team (physicians, advanced practice clinicians, nurses, residents, and/or fellows) to connect at the real time. Asynchronous forms of telemedicine, including Email and SMS have been also commonly used, but the rapid expansion of video conferencing capabilities and smartphones have paved the way for the synchronous forms of telemedicine [39]. Yet, there have been significant differences in demands for these two forms of telemedicine, which have to be considered in the development of any telemedicine system. To the best of our knowledge, this is one of the most comprehensive studies investigating the application of telemedicine among oncology patients during the COVID-19 pandemic. Like other studies, the present research had certain limitations. Firstly, it only included papers and reports published in English, and gray resources (unpublished reports and proceedings of conferences) were excluded. Secondly, the authors did not have access to some other databases, such as CINAHL and PsycINFO.

4. Conclusion

Telemedicine can provide continued access to necessary health services in oncology care and serve an important role in pandemic planning and response. Telemedicine is in fact an excellent method to maintain care continuity for cancer patients while limiting the risk of contagion for both patients and providers and maintaining social distancing. Yet, further studies are required to explore the factors that may enhance the quality of virtual care for both survivors and providers.

References

[1] Ma X, Yu H. Global burden of cancer. Yale J Biol Med. 2006;79(3-4):85-94.

[2] Novara G., Checcucci E., Crestani A. Telehealth in Urology: a systematic review of the literature. How much can telemedicine be useful during and after the COVID-19 pandemic? European Urology. 2020; 78(6):786-811.
[3] Grewal US, Terauchi S, Beg MS. Telehealth and Palliative Care for Patients With Cancer: Implications of the COVID-19 Pandemic. JMIR Cancer. 2020;6(2):e20288. Published 2020 Nov 24. doi:10.2196/20288
[4] Liang W, Guan W, Chen R, Wang W, Li J, Xu K, et al. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. Lancet Oncol 2020 Mar;21(3):335-337.
[5] Moazzami B, Razavi-Khorasani N, Dooghaie Moghadam A, Farokhi E, Rezaei N. COVID-19 and telemedicine: Immediate action required for maintaining healthcare providers well-being. J Clin Virol. 2020;126:104345. doi:10.1016/j.jcv.2020.104345
[6] Ward E, Crombie J, Trickey M, Hill A, Theodoros D, Russell T. Assessment of communication and swallowing post-laryngectomy: a telerehabilitation trial. J Telemed Telecare. 2009;15(5):232-237.
[7] Biswas S, Adhikari SD, Gupta N, Garg R, Bharti SJ, Kumar V, Mishra S, Bhatnagar S. Smartphone-Based Telemedicine Service at Palliative Care Unit during Nationwide Lockdown: Our Initial Experience at a Tertiary Care Cancer Hospital. Indian J Palliat Care. 2020 Jun;26(Suppl 1):S31-S35.
[8] Bokolo AJ. Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic. Ir J Med Sci (1971-). 2020:1-10. 10.1007/s11845-020-02299-z
[9] Kapoor A, Guha S, Das MK, Goswami KC, Yadav R. Digital healthcare: The only solution for better healthcare during COVID-19 pandemic?. Indian Heart J. 2020. [PMC free article] [PubMed]
[10] Torous J, Myrick KJ, Rauseo-Ricupero N, Firth J. Digital Mental Health and COVID-19: Using Technology Today to Accelerate the Curve on Access and Quality Tomorrow. JMIR mental health. 2020;7(3):e18848. doi: 10.2196/18848
[11] Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7);1-6.
[12] Rajasekaran RB, Whitwell D, Cosker TDA, Gibbons CLMH, Carr A. Will virtual multidisciplinary team meetings become the norm for musculoskeletal oncology care following the COVID-19 pandemic? - experience from a tertiary sarcoma centre. BMC Musculoskelet Disord. 2021 Jan 5;22(1):18.
[13] Nahm WJ, Gwillim EC, Badiavas EV, Nichols AJ, Kirsner RS, Boggeln LH, Shen JT. Treating Melanoma in Situ During a Pandemic with Telemedicine and a Combination of Imiquimod, 5-Fluorouracil, and Tretinoin. Dermatol Ther (Heidelb). 2021 Feb;11(1):307-314.
[14] Lonergan, Peter E et al. "Rapid Utilization of Telehealth in a Comprehensive Cancer Center as a Response to COVID-19: Cross-Sectional Analysis." Journal of medical Internet research vol. 22,7 e19322. 6 Jul. 2020, doi:10.2196/19322
[15] Christian J, Lopez CJ, Edwards B, Langelier DM, Chang EK, Chafranskaia A, Jones JM, Delivering virtual cancer rehabilitation programming during the first 90 days of the COVID-19 pandemic: A multimethod study, ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION (2021).
[16] Umar S, Shifa MD1; Cole, Rita MBA, BS1; Seoud, Talal MD1; Frankowski, Sarah BSN, RN1; Aoun, Elie MD, MS1; Farah, Katie MD1 S0289 Utilization of Telemedicine for Colorectal Cancer Outreach During the COVID-19 Pandemic: COLOVID-19, The American Journal of Gastroenterology: October 2020 - Volume 115 - Issue - p S142 doi: 10.14309/01.ajg.0000703204.68827.1d
[17] Sonagli M, Cagnacci Neto R, Leite FPM, Makdissi FBA. The use of telemedicine to maintain breast cancer follow-up and surveillance during the COVID-19 pandemic. J Surg Oncol. 2021 Feb;123(2):371-374.
[18] Berlin A, Lovas M, Truong T, et al. Implementation and Outcomes of Virtual Care Across a Tertiary Cancer Center During COVID-19. JAMA Oncol. 2021;7(4):597–602. doi:10.1001/jamaoncol.2020.6982
[19] Olshinka N, Mottard S. Musculoskeletal Oncology: Patient Triage and Management during the COVID-19 Pandemic. Curr Oncol. 2020 Oct 1;27(5):512-515. doi: 10.3747/co.27.6907. PMID: 33704139.
[20] Lee AKF, Cho RHW, Lau EHL, et al. Mitigation of head and neck cancer service disruption during COVID-19 in Hong Kong through telehealth and multi-institutional collaboration. Head & Neck. 2020;1–6.
[21] Klain M, Nappi C, Maurea S, et al. Management of differentiated thyroid cancer through nuclear medicine facilities during Covid-19 emergency: the telemedicine challenge. Eur J Nucl Med Mol Imaging. 2021;48(3):831-836. doi:10.1007/s00259-020-05041-0
[22] Yildiz F, Oksuzoglu B. Teleoncology or telemedicine for oncology patients during the COVID-19 pandemic: the new normal for breast cancer survivors? Future Oncol. 2020 Oct;16(28):2191-2195.
[23] Daggubati LC, Eichberg DG, Ivan ME, et al. Telemedicine for Outpatient Neurosurgical Oncology Care: Lessons Learned for the Future During the COVID-19. World Neurosurg. 2020;139:e859-e863.
[24] Chávarri-Guerra Y, Ramos-López WA, Covarrubias-Gómez A, Sánchez-Román S, Quiroz-Friedman P, et al. Providing Supportive and Palliative Care Using Telemedicine for Patients with Advanced Cancer During the COVID-19 Pandemic in Mexico. Oncologist. 2021 Mar;26(3):e512-e515.

[25] Kang JJ, Wong RJ, Sherman EJ, Rybkin A, McBride SM, et al. The 3 Bs of cancer care amid the COVID-19 pandemic crisis: "Be safe, be smart, be kind"-A multidisciplinary approach increasing the use of radiation and embracing telemedicine for head and neck cancer. Cancer. 2020 Sep 15;126(18):4092-4104.
[26] Kenney LB, Vrooman LM, Lind ED, Brace-O'Neill J, Mulder JE, Nekhlyudov L, Recklitis CJ. Virtual visits as long-term follow-up care for childhood cancer survivors: Patient and provider satisfaction during the COVID-19 pandemic. Pediatr Blood Cancer. 2021 Jun;68(6):e28927.
[27] Reddy A, Arthur J, Dalal S, Hui D, Subbiah I, et al. Rapid Transition to Virtual Care during the COVID-19 Epidemic: Experience of a Supportive Care Clinic at a Tertiary Care Cancer Center. J Palliat Med. 2021 Feb 2.
[28] Read Paul L, Salmon C, Sinnarajah A, Spice R. Web-based videoconferencing for rural palliative care consultation with elderly patients at home. Support Care Cancer 2019 Sep;27(9):3321-3330
[29] Koonin LM, Hoots B, Tsang CA, et al. Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic, United States, Jan–March 2020. MMWR Morb Mortal Wkly Rep 2020;69:1595–1599.
[30] Czeisler MÉ, Marynak K, Clarke KEN, et al. Delay or avoidance of medical care because of COVID-19–related concerns—United States, June 2020. MMWR Morb Mortal Wkly Rep 2020;69:1250–7
[31] Taylor C, Munro AJ, Glynne-Jones R, et al. Multidisciplinary team working in cancer: what is the evidence? BMJ. 2010;340:c951. Published 2010 Mar 23. https://doi.org/10.1136/bmj.c951.
[32] Daggubati LC, Eichberg DG, Ivan ME, et al. Telemedicine for Outpatient Neurosurgical Oncology Care: Lessons Learned for the Future During the COVID-19 Pandemic. World Neurosurg. 2020;139:e859-e863.
[33] Leon, A.; Kaltman, R.; Arem, H.; Amdur, R.; Gesteira, A.; Duffy, S.; Miller, C.; Burgess, B.; Morecock, C. Telemedicine usability for cancer care during the COVID-19 pandemic. Cancer Research ; 81(4):1, 2021.
[34] Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. BMC Public Health. 2020;20:1193.
[35] Calton B, Abedini N, Fratkin M. Telemedicine in the Time of Coronavirus. J Pain Symptom Manage 2020;60:e12–e14
[36] Bali S. Barriers to Development of Telemedicine in Developing Countries. Available at https:// www.intechopen.com/books/telehealth/barriersto-development-of-telemedicine-in-developingcountries.
[37] Chávarri-Guerra Y, Ramos-López WA, Covarrubias-Gómez A, Sánchez-Román S, Quiroz-Friedman P, Alcocer-Castillejos N, et al. Providing Supportive and Palliative Care Using Telemedicine for Patients with Advanced Cancer During the COVID-19 Pandemic in Mexico. Oncologist. 2021 Mar;26(3):e512-e515.
[38] Simcock R, Thomas TV, Mercy CE, Filippi AR, Katz MA, Pereira IJ, et al. COVID-19: global radiation Oncology's targeted response for pandemic preparedness. Clin Transl Radiat Oncol 2020.
[39] Mechanic OJ, Persaud Y, Kimball AB. Telehealth Systems. [Updated 2020 Sep 18]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021.