

## Research Letter

# Telemedicine Use and Satisfaction Among Radiation Oncologists During the COVID-19 Pandemic: Evaluation of Current Trends and Future Opportunities



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## Abstract

**Purpose:** During the COVID-19 pandemic, telemedicine became an attractive alternative to in-person appointments. The role of telemedicine in patients who undergo frequent on-site treatment, such as radiation therapy, is unclear. The purpose of this study was to examine telemedicine use, physician satisfaction, and barriers to continued use in radiation oncology.

**Methods and Materials:** An anonymous, electronic survey was distributed to radiation oncologists internationally between June and October 2020. Respondents described demographic and practice characteristics, and a 5-point Likert scale assessed provider satisfaction, ease of use, and overall utility of telemedicine. Analyses include descriptive statistics and subgroup comparisons using the  $\chi^2$  test and Fisher's exact test.

**Results:** The response rate was 4.3%. Two hundred thirty-two respondents completed the survey, 63.8% of whom were male, 52.6% aged 50 or younger, and 78.0% from the United States. Only 14.2% used telemedicine previously, which increased to 93.1% during COVID-19. Among all telemedicine users, usage rates were 77.9% for initial consultations, 97.2% for follow-up visits, and 35.9% for on-treatment visits. Of the respondents, 69.8% reported that <25% of patients requiring treatment experienced delays due to COVID-19. Most conducted appointments from the workplace, with 40.1% also doing so from home. Satisfaction was high at 73.8%, perceived usefulness was 76.9%, and 81.5% hope to continue using telemedicine after the pandemic. However, 82.4% had concerns with the inability to examine patients and 63.0% had concerns about poor patient access to the required technology. In addition, 49.5% had concerns regarding continued billing/reimbursement, less commonly at government centers (18.8%) compared with academic/satellite facilities (52.7%) and free-standing centers/community hospitals (50.7%,  $P = .039$  for both comparisons). These concerns were also significantly higher among US physicians (53.2% vs 34.9%,  $P = .048$ ).

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**Conclusions:** Widespread adoption of telemedicine by radiation oncologists occurred during COVID-19 with high rates of satisfaction and interest in continued use. Sustained reimbursement for telemedicine services is a significant concern, particularly in the United States and outside of government facilities.

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Telemedicine is the delivery of health care services by health care professionals to patients at a distant site, aided by information and communication technologies. Before the COVID-19 pandemic, the use of telemedicine in the United States was primarily limited by regulations set by the Centers for Medicare and Medicaid Services, which restricted reimbursement of telemedicine services to select patient populations and health care services.<sup>1</sup> Additionally, many virtual communication platforms that are widely available and allow for audio/video telecommunication were not previously Health Insurance Portability and Accountability Act (HIPAA) compliant. Outside of the United States, telemedicine in the field of oncology has been largely limited to patients who reside in rural areas or low/middle income countries that are resource poor.<sup>2</sup>

In response to the COVID-19 pandemic, regulations regarding telemedicine use and reimbursement were lifted by the Centers for Medicare and Medicaid Services in the United States to encourage remote patient encounters and consequently mitigate transmission of the novel coronavirus.<sup>3</sup> Additionally, restrictions imposed by HIPAA were loosened to allow use of platforms that were previously forbidden.<sup>4</sup> The option to participate in telemedicine became particularly attractive in oncology as reports began to surface that patients with cancer were at higher risk for COVID-19 infection and mortality.<sup>5</sup> While active oncologic treatment requires in-person visits, telemedicine has been shown to reduce the need for in-person visits for patients who are in follow-up or who could have treatment delayed.<sup>6</sup>

The goal of the current study was to assess patterns of telemedicine usage among radiation oncology physicians both before and after the COVID-19 pandemic. Physicians who used telemedicine were also asked about satisfaction and their perceived value of telemedicine. Finally, we aimed to describe barriers to telemedicine use as well as continued use. Given that COVID-19 had a significant global effect, but perhaps to varying degrees depending on region, it is important to attempt to capture the trends in telemedicine use in radiation oncology not only in the United States, but also in other countries throughout the world. To our knowledge, this is the largest survey study of telemedicine use in radiation oncology to date and the only international study.

## Methods and Materials

An anonymous, electronic survey composed of 15 questions was designed in REDCap to assess telemedicine

use, satisfaction, and barriers to use or continued use. Telemedicine was defined as the use of telecommunications technology, including audio and/or video, to evaluate, diagnose, and/or treat patients remotely. A copy of the survey is attached as Appendix EA. Only respondents who used telemedicine for patient encounters were asked questions regarding satisfaction and utility of telemedicine. Following approval from the institutional review board, survey invitations were distributed by email through REDCap to attending radiation oncologists in the United States and also internationally. Email addresses were obtained from personal and societal directories and institutional websites, namely the American Society for Radiation Oncology member directory. Survey invitations were distributed from June 2020 through October 2020. Two reminder emails were sent to potential respondents. Incentives were not offered to potential respondents. All physicians who completed the required survey questions were included in the study.

As part of the survey, respondents were asked to describe their demographic characteristics, disease specialization, and practice location. Respondents practicing within the United States were also asked to designate their regional location according to the US Census Bureau. Those who used telemedicine completed additional questions pertaining to the type of appointments telemedicine was used for, patients who were offered telemedicine appointments, medium used for telemedicine (audio, video, or both), provider location (eg, home, office), and whether other health care practitioners participated in telemedicine appointments. Multiple answer choices were allowed for this set of questions. A 5-point Likert scale was then used to assess provider satisfaction with telemedicine, ease of use for providers and patients, and overall utility of telemedicine within the field of radiation oncology.

Descriptive statistics summarizing the features of the survey data set were collected and are subsequently reported. Subgroup analyses were performed using version 3.6.2. R statistical software to determine the association of demographic features with telemedicine use, provider satisfaction, and barriers to continued use following the pandemic. For statistical comparison by age, respondents were grouped as aged 50 years or less and compared with those 51 or older. For comparisons by practice setting, respondents who practice primarily at a government center were compared with those working at a large academic center or satellite facility versus those working in a community hospital or free-standing center.

Due to the large number of countries of practice represented, those outside of the United States were combined into a single group for comparison. Groups were compared using the  $\chi^2$  test or Fisher's exact test, with a threshold  $P$  value of  $<.05$  indicating statistical significance.

## Results

Surveys were sent to 5343 radiation oncologists, and 232 respondents provided complete survey responses, making the response rate 4.3%. The 23 incomplete survey responses received were not analyzed or included in this report. Of the respondents, 63.8% (148) were male and 52.6% (122) were aged 50 years or younger. One hundred eighty-one respondents (78.0%) primarily practice within the United States, of whom 34.8% (63) practice in the Midwest, 26.0% (47) in the South, 21.5% (39) in the Northeast, and 17.7% (32) in the West. Demographics of the respondents are further detailed in Table 1.

Of the respondents 14.2% (33) reported using telemedicine in some capacity before the pandemic. This increased to 93.1% (216) during the COVID-19 pandemic. There was a single participant who reported using telemedicine before the pandemic but not during. There was no statistically significant association between respondent gender (Fig 1A), age group (Fig 1B), or practice setting (Fig 1C) with respect to telemedicine usage before or during the pandemic. Of those who practice primarily in the United States, 95.6% (173) reported using telemedicine during the pandemic compared with 84.3% (43) of those who did not practice in the United States (Fig 1D). This difference was statistically significant ( $P = .013$ ).

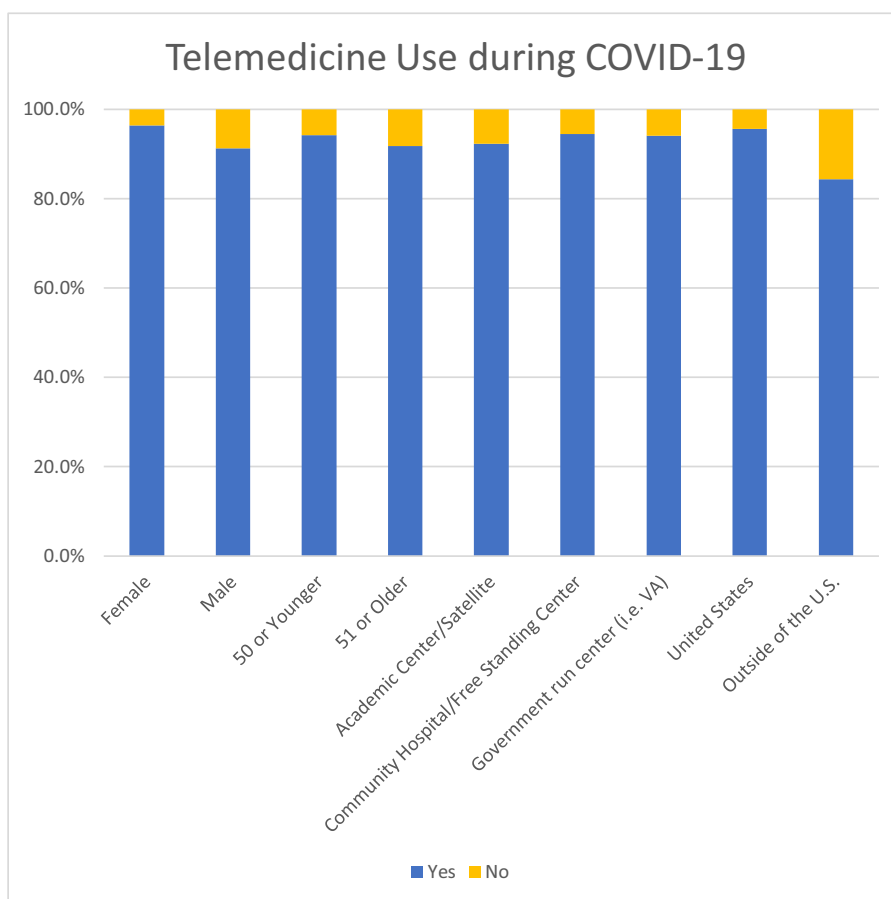
Of respondents who used telemedicine at any time point, 77.9% (168) did so for initial consultations, 97.2% (210) for follow-up visits, and 35.9% (78) for on-treatment visits. Among respondents 61.3% (142) conducted telemedicine visits using telephones with audio capabilities only, 20.7% (48) used other applications with audio only, and 80.2% (186) used software with audio and video capabilities. Most physicians participated in telemedicine visits from work, either in office space (89.4%, 207) or dedicated clinic space (28.1%, 65). However, 40.1% (93) stated they conducted telemedicine appointments from home.

Physician telemedicine appointments were often combined with ancillary staff visits such as nurses (54.4%), social workers (36.8%), dieticians (34.2%), and speech therapists (7.4%). Trainees included in telemedicine visits were resident/fellows (46.2%) and medical students (7.8%). Of the respondents, 12.4% (29) conducted telemedicine visits with other specialists, such as medical oncologists. Only 30.9% of respondents (72) stated that telemedicine visits were performed alone. Respondents were subsequently asked if they conducted telemedicine

**Table 1 Demographic and practice characteristics of participants**

Characteristic	No. (%)
<b>Gender</b>	
Male	148 (63.8%)
Female	84 (36.2%)
<b>Age group, y</b>	
<41	55 (23.7%)
41-50	67 (28.9%)
51-60	66 (28.4%)
61-70	39 (16.8%)
>70	5 (2.2%)
<b>Country of primary practice</b>	
United States	181 (78.0%)
Canada	10 (4.3%)
Mexico	7 (3.0%)
Australia	6 (2.6%)
Brazil	5 (2.2%)
Belgium	3 (1.3%)
India	3 (1.3%)
Saudi Arabia	2 (0.9%)
Spain	2 (0.9%)
Bahrain	1 (0.4%)
Chile	1 (0.4%)
Italy	1 (0.4%)
Japan	1 (0.4%)
New Zealand	1 (0.4%)
Taiwan	1 (0.4%)
The Netherlands	1 (0.4%)
United Kingdom	1 (0.4%)
Unknown	5 (2.2%)
<b>Practice setting</b>	
Academic center	100 (43.1%)
Academic center affiliate	42 (18.1%)
Community hospital	49 (21.1%)
Free-standing center	24 (10.3%)
Government center	17 (7.3%)
<b>Subspecialization</b>	
Genitourinary	47 (20.3%)
Breast	46 (19.8%)
Thoracic	37 (15.9%)
Central nervous system	36 (15.5%)
Gynecologic	26 (11.2%)
Head and neck	26 (11.2%)
Gastrointestinal	25 (10.8%)
Pediatrics	18 (7.8%)
Cutaneous	14 (6.0%)
Leukemia/lymphoma	14 (6.0%)
Sarcoma	14 (6.0%)
General practice	102 (44.0%)

consultations for patients who had a clear indication for radiation therapy based on chart review before the appointment. Of the respondents, 79.2% (171) offered telemedicine appointments regardless of the apparent need for radiation therapy, timing of when radiation therapy could take place, or likelihood of radiation therapy being delivered at an alternative institution. Only 6.5% (15) excluded patients from telemedicine appointments



**Fig. 1** Telemedicine use among radiation oncologists according to gender (A), age group (B), practice setting (C), and country of practice (D). *Abbreviations:* U.S. = United States; VA = Veterans Administration.

who had a clear indication for radiation therapy, and 14.3% (33) engaged in telemedicine consultations for only patients who would be recommended to undergo radiation therapy if they could have treatment delayed or were likely to be treated at another facility. Altogether, 69.8% of respondents (117) who used telemedicine for new patient visits indicated that 25% or less of their patients who required radiation therapy had treatment delayed due to COVID-19.

Overall, 73.8% of physicians (171) agreed or strongly agreed that they were satisfied with their respective telemedicine system and 76.9% (178) agreed or strongly agreed that telemedicine is a useful tool in the field of radiation oncology. [Figure 2](#) further illustrates physician responses to questions assessing physician satisfaction and ease of use. There was no association between respondent gender, age group, practice setting, or country of residence with respect to overall satisfaction ([Fig 3](#)). Of the respondents, 47.5% (110) experienced no technological issues throughout their use of telemedicine. Of the 114 respondents who reported experiencing technological issues, 18.4% (21) agreed or strongly agreed that the system provided messages that instructed how to fix the issues, whereas 57.0% (65) disagreed or strongly disagreed

strongly with this statement, with the remainder being neutral. A total of 82 respondents (71.9%) disagreed or strongly disagreed with the statement that telemedicine visits are the same as in-person visits. Yet, 81.5% of respondents (176) who used telemedicine during the COVID-19 pandemic stated that they would like to continue using telemedicine once the pandemic resolves. There was no association between respondent gender, age group, practice setting, or country of residence with respect to desire to continue using telemedicine after COVID-19.

Despite the high rates of satisfaction with telemedicine and desire to continue using it after the COVID-19 pandemic, a mere 7.9% of respondents (17) had no concerns regarding telemedicine use. The reasons for concern are portrayed in [Figure 4](#). The most prevalent were the inability to perform physical examination and poor patient access to the technology required, which were selected by 82.4% and 63.0% of telemedicine users, respectively (178 vs 136). Only 6.0% of users (13) stated they had concerns regarding HIPAA and/or patient privacy; 49.5% (107) reported concerns regarding billing and/or reimbursement for telemedicine services after the COVID-19 pandemic. There was no association with respondent gender ([Fig 5A](#)) or age group ([Fig 5B](#)) with respect to

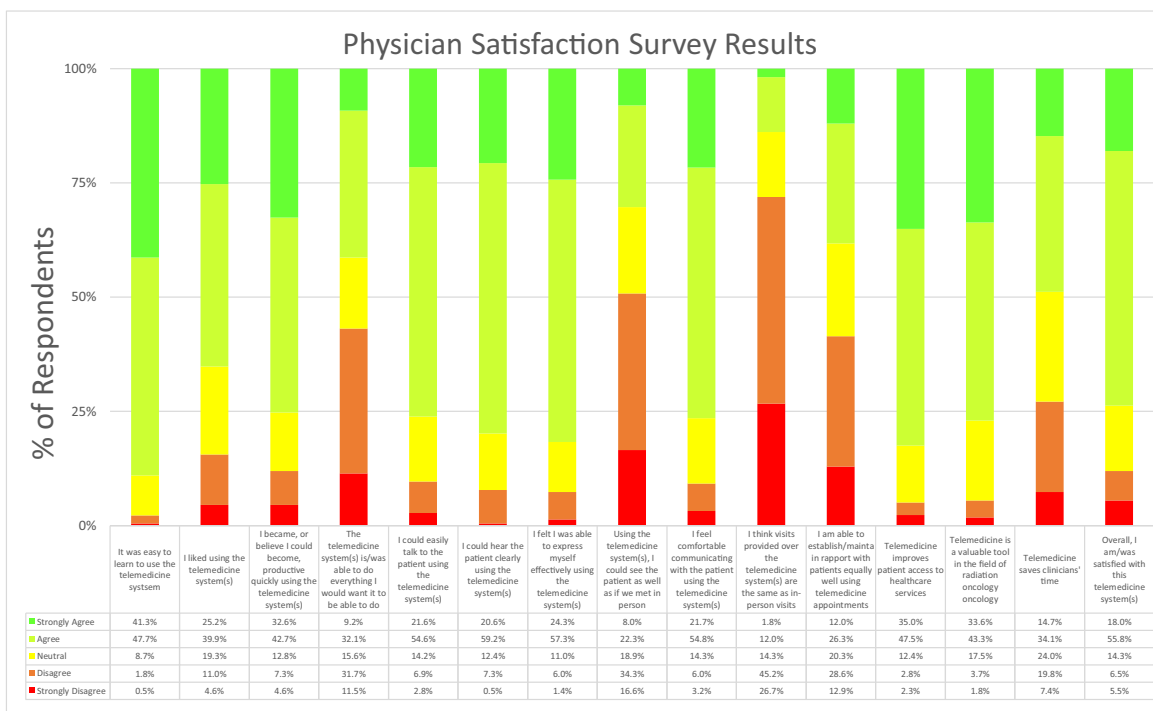


Fig. 2 Results of the telemedicine satisfaction questionnaire.

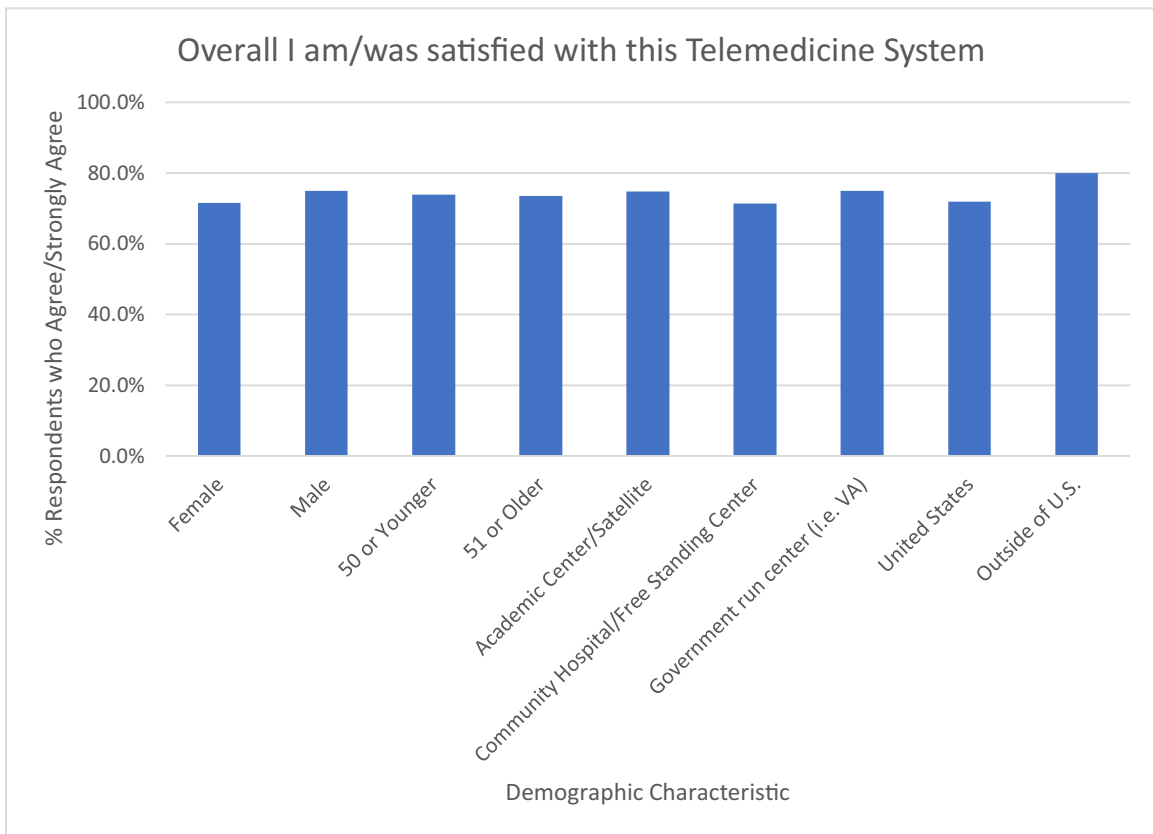
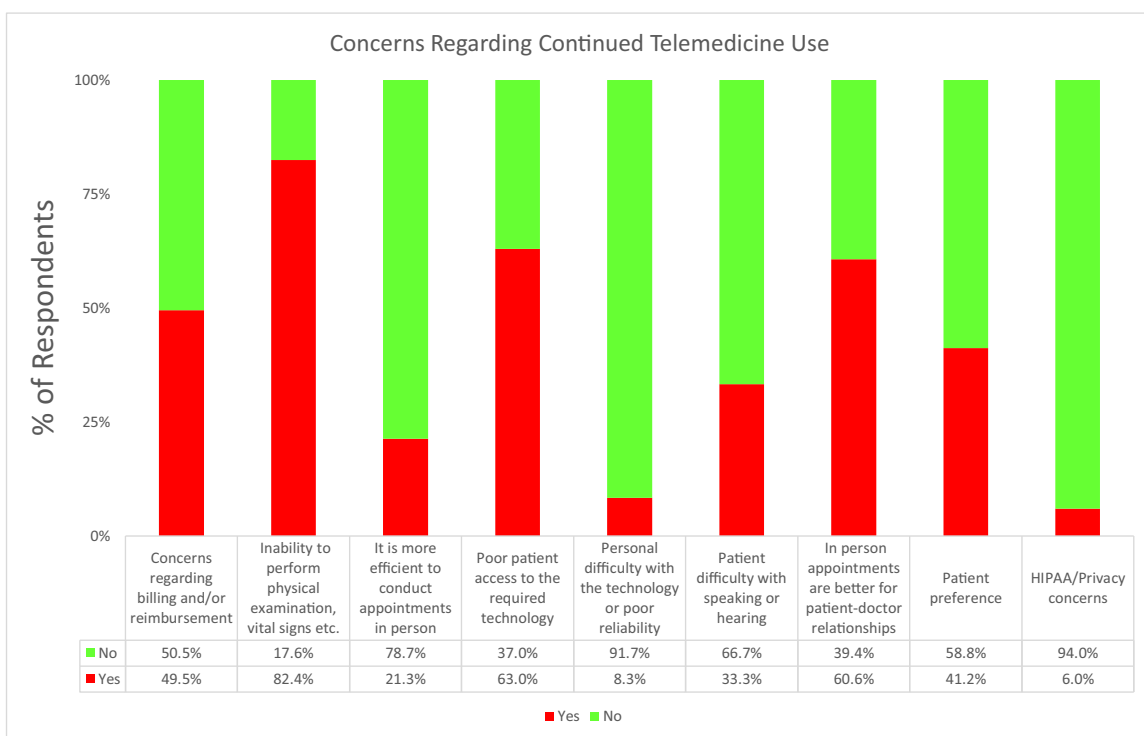
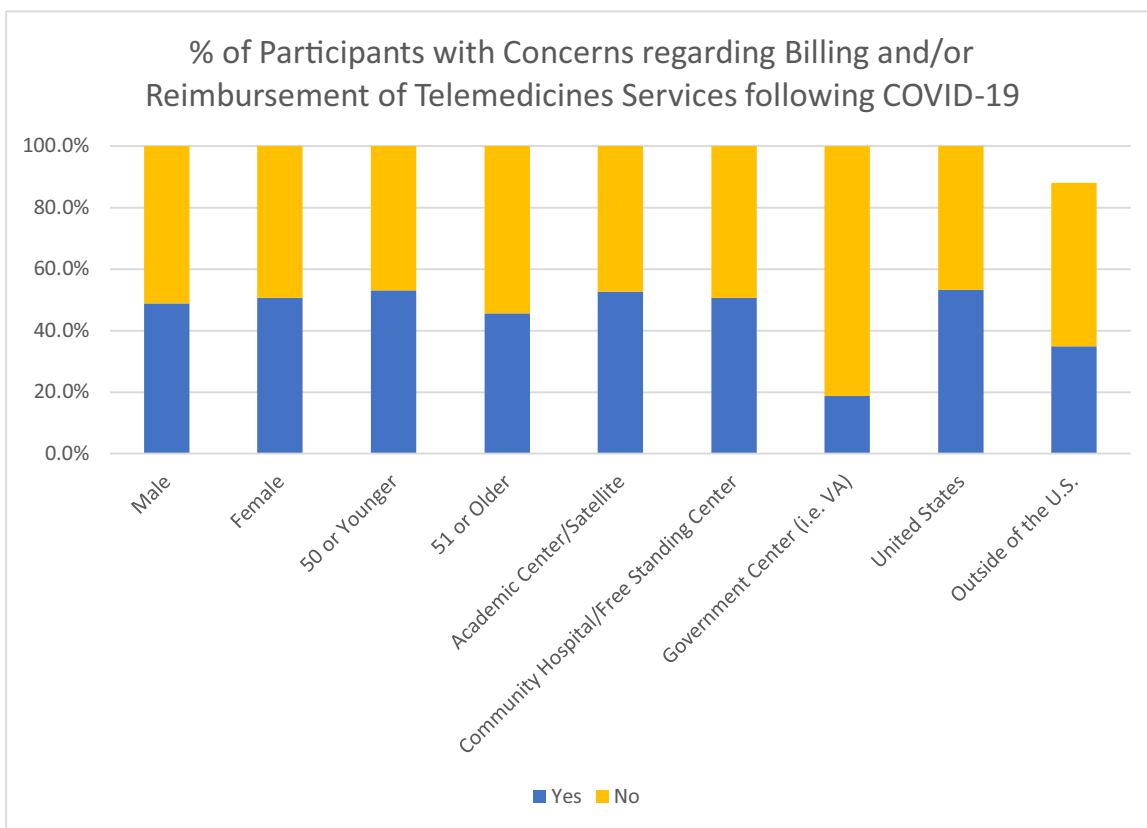


Fig. 3 Overall satisfaction among radiation oncologists who used telemedicine during COVID-19 pandemic according to gender (A), age group (B), practice setting (C), and country of practice (D). Abbreviations: U.S. = United States; VA = Veterans Administration.



**Fig. 4** Telemedicine concerns among radiation oncologists who used telemedicine during COVID-19 pandemic. *Abbreviation:* HIPAA = Health Insurance Portability and Accountability Act of 1996.



**Fig. 5** Relative proportion of participants with concerns regarding billing and/or reimbursement for telemedicine services following COVID-19 pandemic according to gender (A), age group (B), practice setting (C), and country of practice (D). *Abbreviations:* U. S. = United States; VA = Veterans Administration.

concerns regarding billing/reimbursement. As shown in Figure 5C, respondents primarily practicing at government centers were less likely to have concerns regarding billing and reimbursement (18.8%) compared with those who practiced at a large academic center/satellite (52.7%) or a free-standing center/community hospital (50.7%). This difference was statistically significant ( $P = .039$  for both comparisons). With respect to country of practice, 53.2% of respondents (96) primarily practicing within the United States had concerns regarding billing and reimbursement compared with 34.9% (18) practicing outside of the United States (Fig 5D), which was also statistically significant ( $P = .048$ ).

## Discussion

The results of this international survey study of radiation oncologists during the COVID-19 pandemic demonstrated high rates of telemedicine use, mostly among physicians who did not use telemedicine before the pandemic. The high rate of telemedicine use during the pandemic among respondents is consistent with recent reports.<sup>7,8</sup> Additionally, compared with our respondents, a similar proportion of physicians reported positive experiences with telemedicine in prior single-institution studies.<sup>9</sup> The high rates of satisfaction are encouraging for the future of telemedicine in radiation oncology as prior studies have indicated that provider preference ultimately drives telemedicine use.<sup>10</sup>

There is increasing awareness of nonmedical costs associated with oncologic care that can be burdensome for patients and their family members, such as time off from work as well as travel and/or parking.<sup>11</sup> Telemedicine has the potential to mitigate some of these costs. The current study of providers is unable to ascertain whether or not telemedicine provides health care savings, but other studies have suggested that telemedicine is a cost-effective way to deliver oncology care.<sup>12</sup> In a study of patients treated in the radiation oncology department at Memorial Sloan Kettering Cancer Center, approximately two-thirds of those surveyed reported reduced costs with telemedicine appointments.<sup>13</sup> These savings may be particularly apparent for patients who live in remote areas or at far distances from the treatment facility.<sup>14</sup> It should be noted that there is an inherent cost to providing telemedicine for patients because this service often requires computers, Internet, and/or phone service.<sup>15</sup> Not all patients have access to these technologies, which was noted by many respondents in our study. Given the costs associated with the technology required for telemedicine visits, it is possible that widespread adoption could increase health care disparities among low income populations<sup>16</sup> or the elderly.<sup>17</sup> This may be particularly true for telemedicine visits requiring a video platform<sup>18</sup> as a prior study found that certain demographic characteristics, such as age,

race, and income, were associated with telemedicine use and ability to interface by video.<sup>19</sup> Efforts to overcome these barriers include the distribution of tablets by the Veterans Administration to high-need veterans.<sup>20</sup> Initial studies suggest that this strategy appears successful, but patients are still required to have cell phone service or Internet access.

There are several limitations of this study. Because the survey was electronic, there may be an inherent selection bias for physicians who are more likely to use telemedicine and be comfortable with telecommunications technology. Like many survey studies of physicians in the digital era,<sup>21</sup> the overall response rate to our questionnaire was low. Furthermore, the majority of respondents practiced in the United States. This could be due to the inability to contact a large number of international radiation oncologists as well as language limitations because the survey was written in the English language only.

Additionally, usage of telemedicine was quite high among respondents during the COVID-19 pandemic as recommended by various sources.<sup>22,23</sup> Due to the widespread use of telemedicine in efforts to reduce exposure to the COVID-19 virus, it is unlikely that a difference would be noted in use by gender, country of practice, practice setting, or age group. Lastly, the survey was distributed to physicians only. Because patients were not included, we cannot make any conclusions regarding patient attitudes or experience. However, in the aforementioned published survey study of 1077 patients at Memorial Sloan Kettering Cancer Center, 45% actually preferred telemedicine appointments compared with in-person office visits.<sup>13</sup> Another study of patient satisfaction with telemedicine in radiation oncology found high rates of patient satisfaction, particularly for new patient visits and follow-up appointments.<sup>24</sup> Lower satisfaction rates were reported for other types of patient visits, such as on-treatment visits (OTVs). A potential explanation for this discrepancy is that telemedicine appointments for OTVs do not obviate the need for patients to be on site. Nevertheless, in the setting of a pandemic, telemedicine may be beneficial for OTVs to minimize the use of personal protective equipment.<sup>25</sup>

An inherent limitation of telemedicine is the inability to perform comprehensive physical examination, as reflected by the concerns of our respondents. This is a well-known drawback of telemedicine in a variety of specialties that has been shown to affect provider satisfaction.<sup>26</sup> Despite this concern, many respondents in our study report high satisfaction rates with telemedicine and were able to conduct initial consultations by telemedicine for patients who would eventually require radiation therapy. It is therefore possible that providers were content with the inability to perform physical examination at the time of the telemedicine appointment because they knew the patient would eventually be physically present for

treatment-related appointments and the examination could take place at that time.

Some may argue that telemedicine was only a necessity during the pandemic because it allowed physicians the opportunity to keep patients who were in follow-up or could have radiation therapy delayed or omitted out of the clinic. While this is certainly a key benefit to telemedicine for select patients, many of the respondents in this study used telemedicine for appointments other than routine follow-up. Furthermore, few respondents preselected patients for telemedicine visits who could forgo RT entirely, be treated at a facility closer to home, or have RT delayed until after the pandemic. Rather, the majority of respondents who used telemedicine for new patient visits indicated that these patients would be treated immediately. While telemedicine may reduce the overall number of in-person visits required, most respondents indicated that telemedicine did not preclude clinic visits for the majority of patients evaluated.

Despite the high rates of satisfaction with telemedicine and desire to continue using this service, roughly half of respondents expressed concern regarding billing and reimbursement in the future for telemedicine services. These concerns were noted before the pandemic and likely stifled the use of telemedicine.<sup>11</sup> Similar concerns regarding insurance coverage were noted in a prior study that took place before the COVID-19 pandemic in medical oncologists.<sup>27</sup> These findings provide further support for the statement by Maroongroge et al that the retention of telemedicine services will likely be influenced by health care policy going forward.<sup>28</sup> While it is unlikely that telemedicine will entirely replace in-person visits, it does offer a flexible option for both patients and providers. Additionally, telemedicine has the potential to offer unique clinical solutions for patients in rural communities or those who desire second opinions from out-of-state health care institutions. Further advances in digital health and data sharing coupled with continued improvement in telecommunication media can solidify telemedicine's future utility in the field of radiation oncology. We remain hopeful that telemedicine services will be covered by government and commercial health plans in the United States following the COVID-19 pandemic given the high rates of provider satisfaction and perceived benefits.

## Conclusions

Widespread use of telemedicine in radiation oncology began during the COVID-19 pandemic. Most radiation oncologists surveyed were satisfied with their respective telemedicine systems and would like to continue using telemedicine following the pandemic despite the inherent limitations of virtual patient appointments. Threats to continued use of telemedicine include uncertainty regarding reimbursement. This concern is more prevalent in

radiation oncologists who practice in the United States, as well as those who practice outside of a government health care facility.

## Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.adro.2021.100835](https://doi.org/10.1016/j.adro.2021.100835).

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