

Scientific Article

Experience of Telemedicine Visits in Radiation Oncology During the COVID-19 Pandemic: A US National Survey and Lessons Learned for Incorporating Telemedicine Post-COVID-19



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Abstract

Purpose: We sought to survey the attitudes and perceptions of US radiation oncologists toward the adoption of telemedicine during the COVID-19 pandemic and offer suggestions for its integration in the postpandemic era.

Methods and Materials: A 25-question, anonymous online survey was distributed nationwide to radiation oncologists.

Results: One hundred and twenty-one respondents completed the survey, with 92% from academia. Overall, 79% worked at institutions that had implemented a work-from-home policy, with which 74% were satisfied. Despite nearly all visit types being conducted in-person before COVID-19, 25%, 41%, and 5% of the respondents used telemedicine for more than half of their new consultations, follow-up, and on-treatment visits, respectively, during the COVID-19 pandemic. Most (83%) reported being comfortable integrating telemedicine. Although telemedicine was appreciated as being more convenient for patients (97%) and reducing transmission of infectious agents (83%), the most commonly perceived disadvantages were difficulty in performing physical examinations (90%), patients' inability to use technology adequately (74%), and technical malfunctions (72%). Compared with in-person visits, telemedicine was felt to be inferior in establishing a personal connection during consultation (90%) and assessing for toxicity while on-treatment (88%) and during follow-up (70%). For follow-up visits, genitourinary and thoracic were perceived as most appropriate for telemedicine while gynecologic and head and neck were considered the least appropriate. Overall, 70% were in favor of more telemedicine, even after pandemic is over.

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Detailed data tables available upon request.

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Conclusions: Telemedicine will likely remain part of the radiation oncology workflow in most clinics after the pandemic. It should be used in conjunction with in-person visits, and may be best used for conducting follow-up visits in certain disease sites such as genitourinary and thoracic malignancies.

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Introduction

Long before the emergence of the COVID-19 pandemic, the effectiveness of telemedicine in oncology has been established, specifically in the setting of chemotherapy supervision, symptom management, palliative care, and more.¹ Its advantages, such as convenience, reduced travel time and costs, reduced appointment wait times, enhanced access to care, and overall ease of use were recognized.^{2,3} In the field of radiation oncology, pilot studies of telemedicine pre-pandemic have been well received.⁴⁻⁶ However, until the COVID-19 pandemic, its use was limited primarily to patients in rural and underserved areas, largely due to lack of technological infrastructure and reimbursement.^{1,7} The COVID-19 pandemic, however, catalyzed immediate new interest in and demand for telemedicine.

On March 30, 2020, 2 months after the index case in the United States, the US Centers for Medicare & Medicaid Services released an interim final rule loosening prior restrictions on the delivery of telemedicine, specifically lifting geographic restrictions, broadening eligibility, relaxing supervision requirements and importantly, preserving reimbursement.⁸ States and private payers soon followed suit, leading to a rapid temporary deregulation of telehealth services. In a survey conducted by the American Society for Radiation Oncology on May 20, 2020, most radiation oncology practices (89%) had begun to offer telemedicine options for patients, most commonly for routine follow-up and consultation visits.⁹ This magnitude of change was not unique to the United States, a rapid adoption of telemedicine was also seen globally.¹⁰⁻²⁰ In a survey sent by European Society Radiation Oncology in May 2020 with complete responses from 139 European radiation oncology centers, telemedicine was used in 78% of the departments.¹⁶ In an international survey of oncologists, telemedicine was implemented by 80% of respondents.²¹ Today, almost 2 years after the first known case in the United States, the COVID-19 pandemic appears to be far from being over, and telemedicine continues to play an important role in radiation oncology care today. To date, there are a paucity of studies gauging the perceptions and experiences of US radiation oncology providers in conducting telemedicine in different clinical visit types and disease sites.²² The purpose of this study was to survey the attitudes and perceptions of US radiation oncologists toward the adoption of telemedicine during

the COVID-19 pandemic and offer suggestions for its integration in the postpandemic era.

Methods and Materials

An anonymous, web-based survey (sample in Appendix E1) was developed to assess US radiation oncologists' experience, perception and attitude toward adoption of telemedicine in new patient consultations, on-treatment visits (OTVs) and follow-up visits. The survey was distributed via Qualtrics platform (Seattle, WA) as an open link. The link was distributed to all radiation oncology residency program directors and department chairs in the United States, as well as to additional private practice physicians. The e-mail recipients were encouraged to share the links with resident physician trainees at their institution as well as with other radiation oncologist colleagues. Participation was voluntary, and responses remained anonymized and confidential. As an incentive, at the end of the survey, respondents who completed the survey could opt to input their e-mail addresses to receive a \$10 gift card. The study was approved by the institutional review board (IRB#20-001389).

The survey contained 25 questions, with 24 multiple-choice questions (with write-in fields for certain questions if the respondents chose the "other" option) and one free text question at the end to solicit additional feedback. Questions pertaining to radiation oncologist perception of telemedicine appropriateness, comfort level and satisfaction, questions comparing in-person versus telemedicine and gauging the appropriateness of telemedicine follow-up in various scenarios were answered on a 5-point Likert scale to the statement at hand. The median time to complete the survey was 7.3 minutes. Only respondents who completed the survey in its entirety between October 12, 2020 and January 8, 2021 were included in the analysis. Descriptive statistics were used to analyze survey responses. In subgroup analysis, Fisher's exact test was used to determine whether there was a statistically significant difference between responses in different subgroups.

Results

Respondent demographics

A total of 121 respondents completed the survey and were included in the analyses. Overall, 43% of the

respondents were resident physicians; 16%, 7%, 16%, and 8% had been practicing as attending physicians for 0 to 5, 6 to 10, 11 to 20, and ≥21 years, respectively. Females accounted for 39%, and males accounted for 61% of the total responses. The majority (92%) practiced in the academic setting, 5% in the community practice setting, and 3% in other. Similarly, the majority (94%) practiced in urban areas and 6% were in rural areas. Practice areas in order of descending frequency were Northeast (40%), Southwest (22%), Midcontinent (17%), Southeast (12%), Rocky Mountain (6%), and Northwest-Pacific Islands (3%). Compared with the national average, 40% reported significantly higher COVID-19 prevalence in the area of practice, 48% reported approximately equal prevalence, and 12% reported significantly lower prevalence. The respondents had a balanced representation of disease sites treated, including gastrointestinal (63%), breast (62%), genitourinary (62%), central nervous system (60%), thoracic (57%), gynecologic (54%), head and neck (49%), sarcoma (46%), lymphoma (42%), and melanoma (36%).

Work-from-home policy

Overall, 79% reported that their institution had implemented a work-from-home policy; 80% and 77% of attending and resident physicians reported an affirmative answer, respectively (Fig. 1A). Among these, 15%

reported personally working 0 d/wk from home, 35% reported 1 d/wk, 31% reported 2 d/wk, 12% reported 3 d/wk, and 2% reported 4 d/wk, with the remaining 5% reported a variable schedule. The breakdown between attending and resident physicians is shown in Fig. 1B. Most respondents were somewhat or extremely satisfied with the work-from-home flexibility (86%) and decreased commute to and from work (83%). Regarding the effect on workflow, 46% respondents were somewhat or extremely satisfied, and 18% were somewhat or extremely dissatisfied. The response to interaction with patients was more mixed, with 40% somewhat or extremely satisfied and 31% reporting somewhat or extremely dissatisfied. Nevertheless, overall, 74% were somewhat or extremely satisfied with the work-from-home policy with only 11% somewhat or extremely dissatisfied (Fig. 1C).

Adoption of telemedicine

Before COVID-19, virtually all clinic visits were conducted in-person: 93%, 97%, and 86% of the respondents reported that 100% of the new consultations, OTV and follow-up visits, respectively, were in-person. Even for respondents who had incorporated telemedicine in follow-up visits, most (85%) only used it for 25% or less of the time (Fig. 2A-C). After the start of the pandemic, however, only 10% and 2% of respondents reported

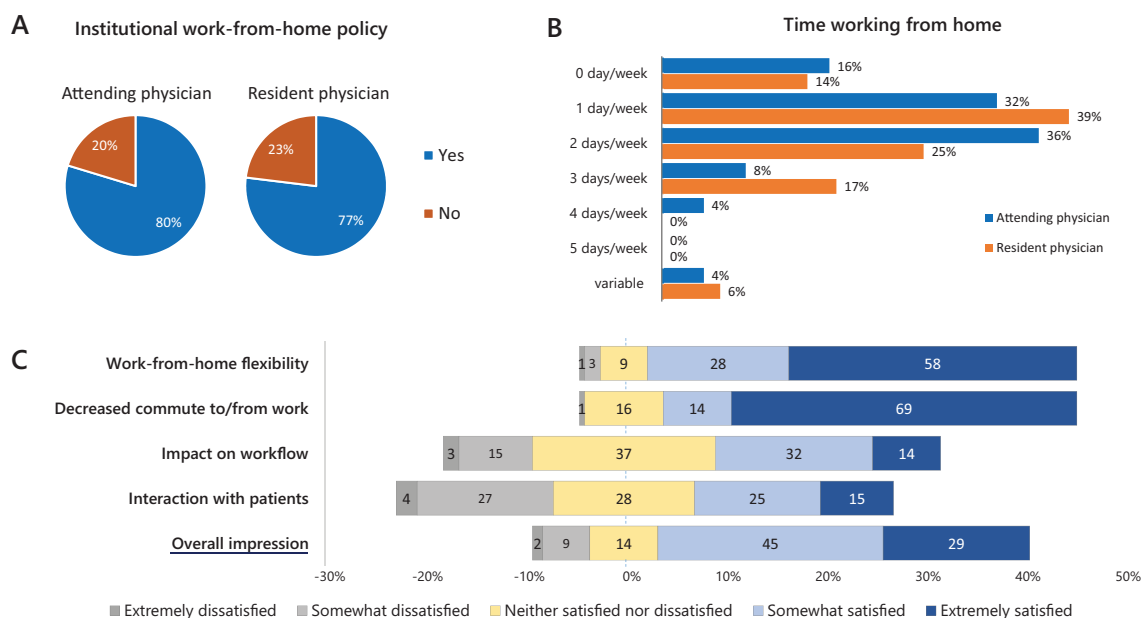


Figure 1 Work-from-home policy and physician’s satisfaction with working from home. (A) Respondents were asked the question “has your institution implemented a work-from-home policy?” (B) Respondents were asked the question “if you have implemented a work-from-home policy, how many days per week are you working from home?” (C) Respondents were asked the question, “if you have implemented a work-from-home policy, how satisfied are you with this modified workflow on each of the following dimensions?” A diverging stacked bar graph was plotted with a dashed line going through the middle of the “neither satisfied nor dissatisfied” answer.

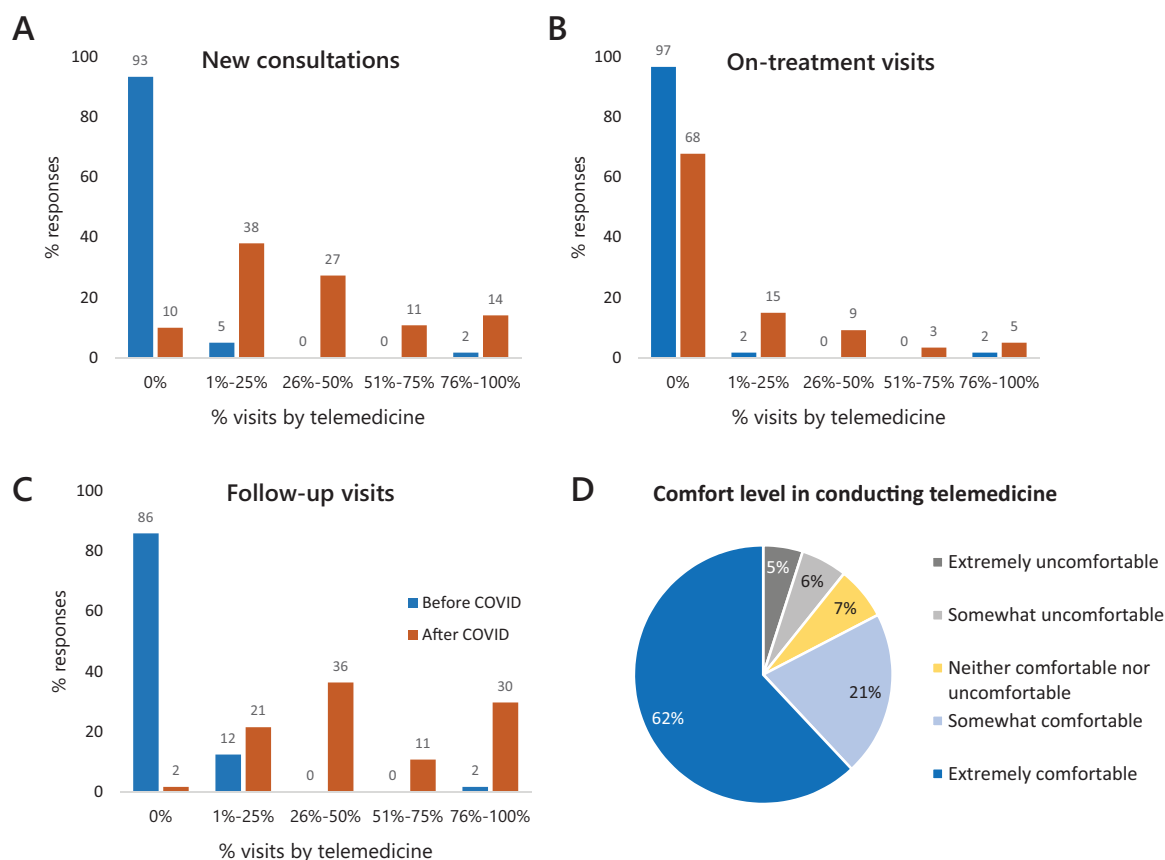


Figure 2 Utilization of telemedicine before and after the start of the COVID-19 pandemic for different visit types and physician's comfort in conducting telemedicine visits. (A) New consultation, (B) on-treatment visits, and (C) follow-up visits. Telemedicine visits included video and telephone only visits. (A-C) Respondents were asked the question, "on average, before and after COVID-19, what percent of your encounters occurred through telephone, telemedicine (video), or in-person?" Blue bars denote before COVID-19 and orange bars denote after COVID. (D) Respondents were asked the question, "what is your comfort level in conducting telemedicine video visits?"

conducting new consultations and follow-up visits face-to-face only, respectively. Notably, 30% conducted more than three-quarters of their follow-up visits by telemedicine. For OTVs, however, in-person visits remain the predominant modality, with 68% of respondents reporting conducting 100% of visits in-person.

Most respondents (62%) were extremely comfortable with conducting telemedicine, 21% somewhat comfortable and only 11% somewhat or extremely uncomfortable. No difference in level of comfort was found between resident physicians and attending physicians ($P = .707$). Most respondents found the need to supplement telemedicine visits with in-person visits to be uncommon: 55%, 76%, and 84% reported that they required in-person visits after new patient consults, OTVs, or follow-up visits by telemedicine, respectively, less than one-quarter of the time (Fig. 3A). Similarly, 70%, 93%, and 82% reported that they required additional testing after new patient consults, OTVs, or follow-up visits by telemedicine, respectively, less than one-quarter of the time (Fig. 3B).

Advantages and disadvantages of telemedicine

The top 2 cited advantages of telemedicine, compared with the traditional in-person approach, were increased convenience to patients (97%) and reduced transmission of infectious agents (83%). These were followed by increased convenience to physicians (47%), improved efficiency (40%), lower cost to the health system (36%) and positive effect on patient satisfaction (30%) (Fig. 4A). The most commonly reported disadvantages of telemedicine included not being able to perform in-person physical examinations (90%), patient's inability to use technology adequately (74%), and technical malfunctions (72%).

These were followed by uncertainty regarding reimbursement levels over the long term (36%), negative effect on patient satisfaction (33%), less familiar (covering) physicians forced to assess patients in acute settings (20%), cost of setting up telemedicine

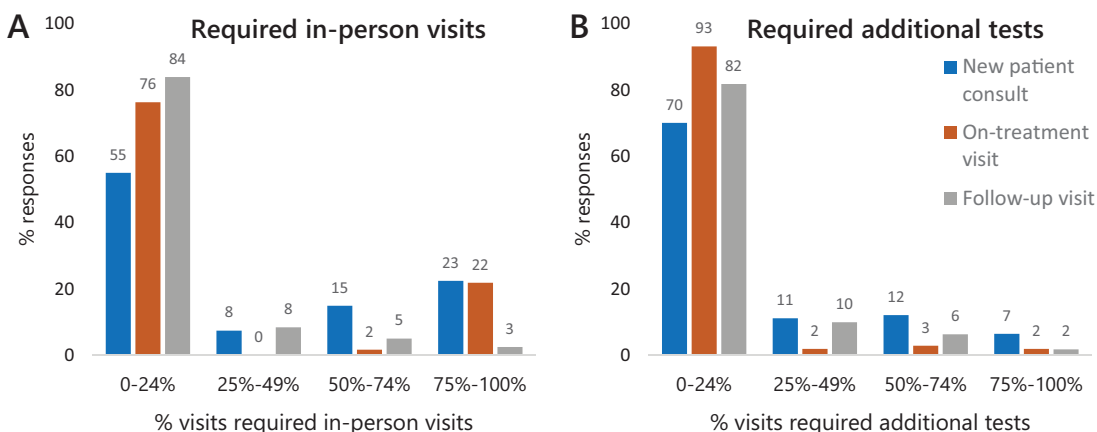


Figure 3 Self-sufficiency of telemedicine visits in requiring additional in-person visits (A) or tests (B). Participants were asked the question, “what percent of the time was your telemedicine visit not enough (ie, needing to be supplemented by an in-person visit or an additional test)?”

infrastructure (7%), and privacy risk of conducting visit through an Internet connection (7%; Fig. 4B). When comparing telemedicine and in-person visits in performing certain critical tasks, such as answering questions regarding radiation therapy, half (51%) of the

respondents expressed that they are approximately equal, and 43% believed that in-person visits are slightly or much better. In terms of obtaining adequate history and physical exam and collecting relevant information during consultation, and assessing for toxicity

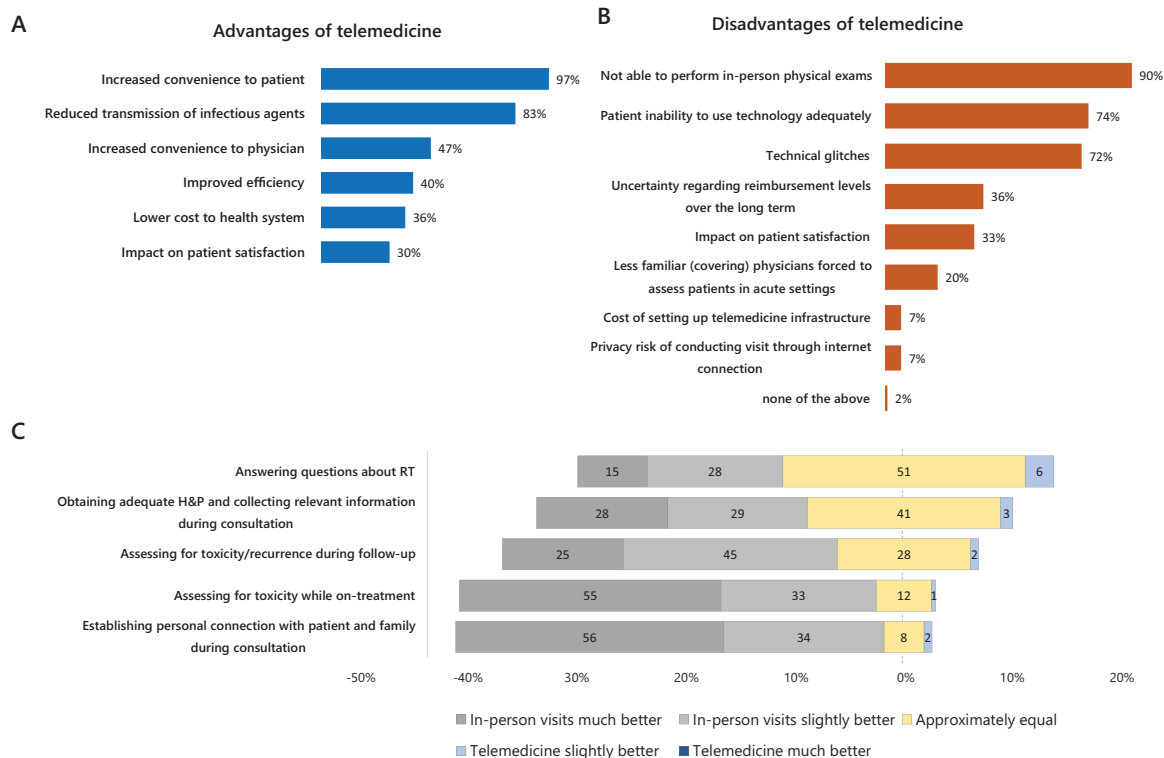


Figure 4 Perceived advantages and disadvantages of telemedicine versus in-person visits. (A) Respondents were asked the question, “which of the following do you consider to be considerable advantages to Telemedicine (check all that apply)?” (B) Respondents were asked the question, “which of the following do you consider to be considerable disadvantages to Telemedicine (check all that apply)?” (C) Respondents were asked the question, “how do telemedicine video visits compare to in-person visits on the following dimensions?” A diverging stacked bar graph was plotted with a dashed line going through the middle of the “approximately equal” answer.

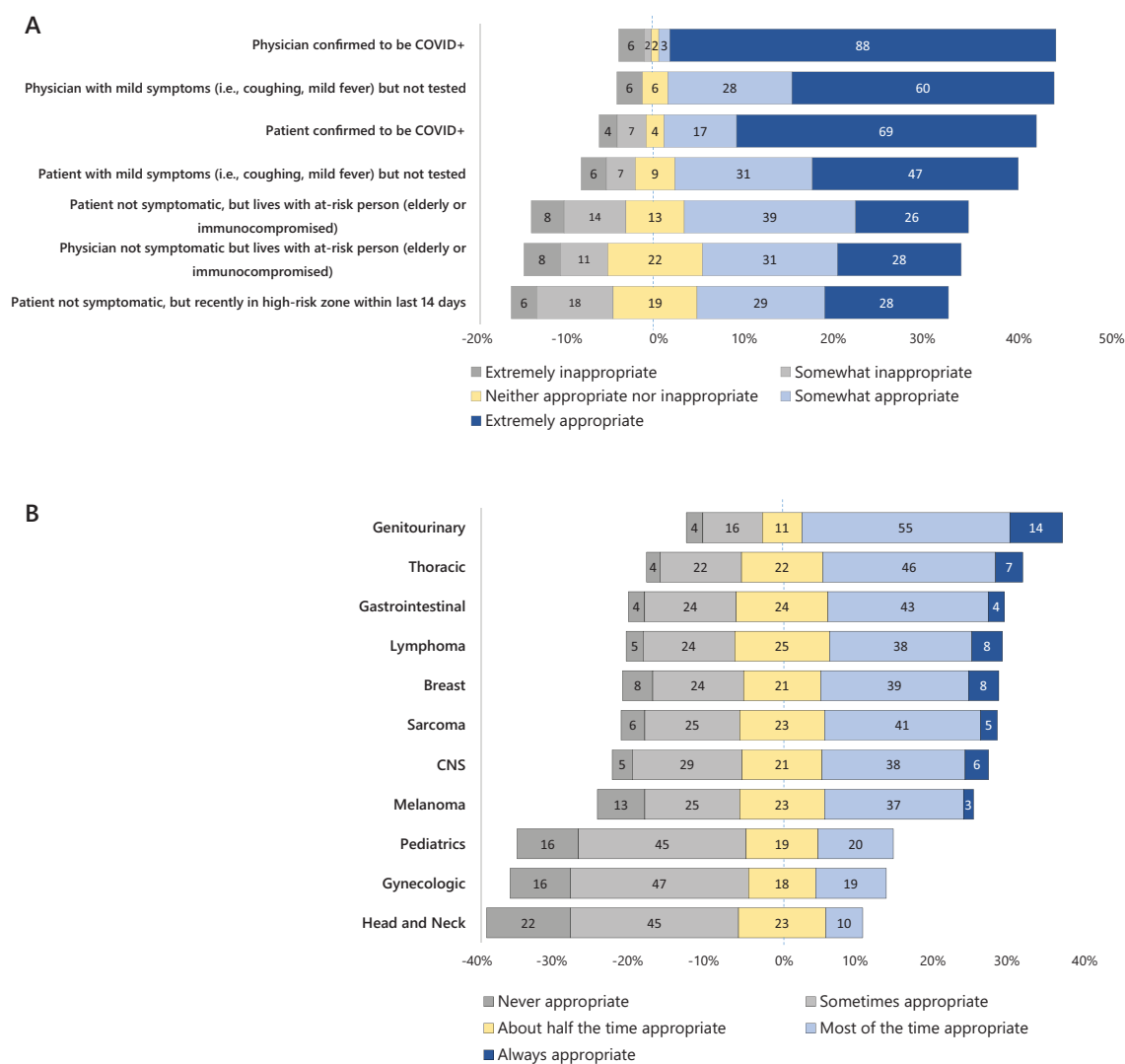


Figure 5 Appropriateness of telemedicine for different levels of corona virus disease 2019 infection risk (A) and for follow-up visits in various disease sites (B). (A) Respondents were asked the question, “for each of the following types of cancer patients treated definitively with radiation, how often do you anticipate a telemedicine follow-up being appropriate (assume if labs/imaging were ordered as part of routine visit, they did not reveal any definitive evidence of recurrence)?” (B) Respondents were asked the question, “for each of the following types of cancer patients treated definitively with radiation, how often do you anticipate a telemedicine follow-up being appropriate (assume if labs/imaging were ordered as part of routine visit, they did not reveal any definitive evidence of recurrence)?” Diverging stacked bar graph were presented dashed lines going through the middle of “neither appropriate nor inappropriate” and “about half the tie appropriate” answers. *Abbreviations:* CNS = central nervous system.

or recurrence during follow-up, 57% and 70% of the respondents believed that in-person visits were slightly or much better, respectively. The 2 tasks where telemedicine fared most poorly were establishing personal connection with patient and family during consultation (90% believed in-person visit to be slightly/much better) and assessing for toxicity while on-treatment (88% believed in-person visit to be slightly/much better; Fig. 4C).

Appropriateness of telemedicine in various infection scenarios and disease sites

We next surveyed the participants regarding the appropriateness of telemedicine in scenarios with varying COVID-19 infection risks (Fig. 5A). An overwhelming majority of the respondents believed that telemedicine was somewhat or extremely appropriate in scenarios where the physician was confirmed to be COVID-19

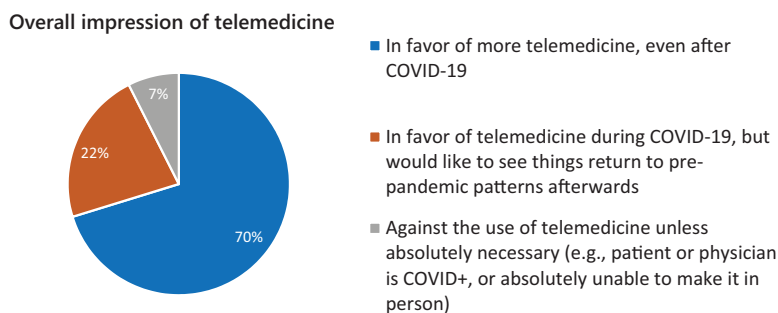


Figure 6 Physician's overall impression of telemedicine. Respondents were asked the question, "what is your overall impression of telemedicine in radiation oncology workflow?"

positive (91%), where the physician had mild symptoms but was not tested (88%) and where the patient was confirmed COVID-19 positive (86%). Dissent widened when asked about patients with mild symptoms but not tested, patients asymptomatic but living with at-risk person, physician asymptomatic but living with at-risk person or patient asymptomatic but recently in high-risk zones within the past 14 days. Nevertheless, for all the aforementioned scenarios, >50% of the respondents found it somewhat or extremely appropriate to use telemedicine.

We then assessed the appropriateness of telemedicine follow-ups in various disease sites (Fig. 5B). Disease sites with descending votes of most of the time appropriate or always appropriate for telemedicine follow-ups were genitourinary (69%), thoracic (53%), gastrointestinal (47%), breast (47%), lymphoma (46%), sarcoma (46%), central nervous system (44%), and melanoma (40%). Respondents who treated genitourinary cancers as part of their practice were not statistically significantly more likely to choose "most of the time appropriate" or "always appropriate" than the rest of the respondents when assessing the appropriateness of a genitourinary follow-up visit using telemedicine (74% vs 61%, $P = .204$). Similarly, respondents who treated thoracic malignancies were not statistically significantly more likely to favor thoracic telemedicine follow-up visits than those who did not (61% vs 42%, $P = .08$). Three sites thought to be least appropriate for telemedicine follow-ups were pediatric (20%), gynecologic (19%), and head and neck (10%).

Telemedicine in the postpandemic era

When asked about the overall impression of telemedicine, 70% were in favor of more telemedicine, even after the COVID-19 pandemic; 22% were in favor of telemedicine during COVID-19, but would like to see things return to prepandemic patterns afterward; and the remaining 7% were against the use of telemedicine unless absolutely necessary (eg, patient or physician is COVID-19 positive, or absolutely unable to make it in person; Fig. 6). Resident physicians were significantly less likely than junior attending physicians (in practice for 0-10

years) to be against the use of telemedicine unless absolutely necessary (1/52 vs 5/28, $P = .0183$). There was no significant difference between junior and senior attending physicians (in practice for >10 years; 5/28 vs 3/41, $P = .2551$) or between resident physicians and attending physicians overall (1/52 vs 8/69, $P = .0762$). In addition, there was not a statistically significant difference in the proportion of respondents who were in favor of more telemedicine after the pandemic, when stratified by practice setting (academic vs private practice, 69% vs 100%, $P = .32$), practice area (urban vs rural, 71% vs 57%, $P = .42$) or geographic location ($P = .11$).

In response to the optional free-text question at the end of the survey for additional comments, some respondents believed that physical examination was the only limiting factor for telemedicine going forward, and others were less amenable to the idea of continuing telemedicine as part of clinical practice post-COVID-19. One respondent suggested dedicated telemedicine clinics: "the best way to make it work is to have dedicated telemedicine clinics - it's impossible to do good virtual visits in the midst of a busy clinic of in-person visits. But with the need for a good examination in my practice (breast cancer) and patient's inability to use the technology, routine telemedicine visits are not reasonable after the pandemic." Another respondent advocated a hybrid model of telemedicine and in-person visits postpandemic: "the idea of post-COVID having maybe a day or 2 that you could do virtual or work from home is quite enticing, and in our field seems feasible. But I do think there is a lot of value of being in-person for both workplace benefits (creating a culture) and for patient benefit (better attention and interaction)."

Discussion

In the prepandemic era, telemedicine was primarily used for patients in rural and underserved areas, largely due to lack of technological infrastructure and reimbursement.^{1,7} Nevertheless, these initial experiences were encouraging. Hamilton et al reported their experience of providing telemedicine services to the regional

and rural population at the Townsville Cancer Center in northern Queensland in Australia. Patient satisfaction was high, with 55% preferring telemedicine for future consultations, 35% preferring a mixture of telemedicine and in-person consultations and only 1 patient (0.9%) indicating a preference for in-person only.⁴ Thomas Jefferson University reported their pilot trial using telemedicine for the first postirradiation visit during 2016 to 2018 and similarly found very high level of patient and provider satisfaction.⁵ Canada's Ontario Telemedicine Network is one of the largest telemedicine service providers, and saw an average annual utilization growth of 51% between 2008 and 2013.^{20,23} By 2016 to 2018, 20% of Ontario's medical and radiation oncologists had used telemedicine, although these visits were mostly ad hoc.²⁰ After the pandemic, radiation oncology practices adapted quickly by employing telemedicine to facilitate treatment continuity together with other measures to continue to provide optimal care to oncology patients despite lack of prior experience.^{9,24,25} However, given that these drastic changes were made in the wake of a major public health emergency, the long-term effect of the pandemic on radiation oncology practice remains uncertain. The existing telehealth waivers will expire once the COVID-19 public health emergency is declared over. Coverage for telemedicine visits and limitations on out-of-state practice and licensing vary by state and payer, and the degree that telemedicine is incorporated into clinical practice will be heavily influenced by the regulatory environment moving forward. Nevertheless, barring a drastic reduction in reimbursement and policies restricting its use at a state or federal level, it is safe to infer that telemedicine will likely continue to be an integral part of care delivery, albeit to a lesser extent. This is supported by the strong motivation and high demand from providers and patients alike in multiple surveys to retain telemedicine as a delivery modality,^{22,25-27} with some even reporting preference of telemedicine over face-to-face visits for future encounters.^{4,26}

In the present study, a drastic increase in the portion of new consultations and follow-up visits conducted through telemedicine was seen and the majority (82%) felt comfortable conducting telemedicine. Most respondents appreciated telemedicine for its increased convenience to patient and physicians and reduced transmission of infectious agents. Our study also revealed high provider satisfaction, with 70% in favor of more telemedicine, even after the pandemic. This is in agreement with other available studies showing high satisfaction from both physicians as well as patients with telemedicine visits,^{22,25-30} with some showing no significant difference in the satisfaction scores of patients between office and telemedicine consultations.²⁷ In a study conducted by the Memorial Sloan Kettering Cancer Center (MSKCC),²⁷ more patients (45%) preferred telemedicine than those preferring office visits (34%), a testimony to the high effectiveness of telemedicine visits.

At the same time, a pattern of drawbacks of telemedicine compared with traditional in-person visits started to emerge. The top 3 from our study were an inability to perform physical examinations adequately, difficulty in assessing for toxicity, and recurrence during follow-up, challenges in establishing personal connection with patient or family during consultation, and issues related to a patient's lack of digital health literacy and technical malfunctions. It is imperative that we address and mitigate these concerns. There appears to be a divide in physicians' experience regarding the ability to connect with patients through telemedicine. In a survey to U attending radiation oncologists,²² 48% of respondents strongly agreed or agreed with the statement that a telemedicine consultation felt impersonal, 16% were neutral while a considerable proportion (36%) disagreed or strongly disagreed. In contrast, studies from the perspective of patients are generally more favorable.^{27,31} One potential explanation for the more favorable responses from patients is the change in location. With telemedicine, patients are in their own comfortable environments, often at home, and with family, friends and caregivers, rather than in an unfamiliar outpatient clinic. Nevertheless, for us as clinicians, we should be cognizant of the limitation of telemedicine in conveying subtle signs of empathy and compassion and adjust our communication styles accordingly. A helpful guide is written by Banerjee et al from MSKCC³² regarding strategies to effectively respond to patients' medical needs and concerns, alleviate distress, and provide support via videoconferencing.

Admittedly, certain physical examination maneuvers are difficult to perform, if not downright impossible, through telemedicine visit. However, whether a lack of examination by radiation oncologists negatively effects the design of the radiation plan, monitoring of side effects and continued surveillance after radiation therapy still needs to be further studied and understood. There indeed appears to be a divide in the perception of the physicians.²² In a survey of radiation oncologists from a large academic center,²⁵ only 14% of the respondents expressed that physical examination by a radiation oncologist is preferred, 14% expressed that examination by other providers can be used, 37% expressed that visually inspecting patients through video suffices, 12% reported that examination can be deferred until day of treatment, and the remaining 23% deemed physical examination not necessary (mostly reliant on imaging).

In the new consultation setting, in certain disease sites, such as thoracic and upper gastrointestinal, imaging and endoscopic findings may be of greater importance than the physical examination in formulating an appropriate radiation plan. In one large academic center,³³ the radiation oncology department has stopped all endoscopic procedures for head and neck cancer and used multiple forms of cross-sectional imaging such as positron emission tomography/computed tomography and magnetic

resonance imaging for radiation planning. In the follow-up setting, physical examinations are recommended for many cancer sites, although evidence is generally limited.³⁴⁻³⁷ However, in a few disease sites, follow-up physical examinations play a more critical role, such as laryngoscopy for head and neck cancers, lymph node palpation for lymphomas and pelvic examinations for gynecologic cancers.²⁵ For these scenarios, telemedicine may be less appropriate. Notably, during the COVID-19 pandemic, multiple physical examinations tailored specifically for telemedicine visits have been developed, including neurologic examination of the spine, musculoskeletal examination and dermatologic examination.³⁸⁻⁴¹ Additionally, substitution with examinations from other disciplines, cross-sectioning imaging, or even omission if clinically appropriate can be considered for many disease sites.

Another potential barrier to telemedicine is the heterogeneity of digital health literacy and potentially technical challenges. More than 30% of US households are headed by a person aged 65 or older lacking a desktop or laptop computer and more than half lack smartphones.⁴² Uninsured patients, patients with Medicaid, and patients with lower median household incomes have also been shown to have lower rates of completing a virtual care visit.⁴³ Therefore not all may benefit equally due to “digital divide,”⁴⁴ in part due to poor digital health literacy and in part due to lack of infrastructure such as access to high-speed Internet. Improving digital health literacy is an important component in expanding the world of telemedicine care delivery. It is crucial that we approach these new processes with a health equity lens with efforts to screen for patients with access difficulties so as to minimize health disparities.⁴⁵

The effectiveness and appropriateness of telemedicine visits varies considerably with visit types. We believe that in general, telemedicine visits are most appropriate for follow-up visits, followed by new consultations and least appropriate for OTVs; this agrees with the telemedicine utilization pattern reported by our respondents (Fig. 2A-C). In a survey to staff physicians at Mayo Clinic Florida,²⁶ overall, 68% were open to using telemedicine routinely in the future for consultations, and 88% were open for follow-ups. For routine follow-up and surveillance visits, the need for emotional support or rapport building is generally not as great, and in many disease sites, laboratory and imaging surveillance are sufficient, reducing the need for an in-person examination. For new patient consultations, our field uniquely requires in-office patient presence for radiation simulation, thus allowing a virtual consultation as an introduction and the presimulation office visit as a built-in opportunity to modify the treatment plan, answer questions, and further review the care plan.²⁵ For OTVs, on the other hand, telemedicine generally lends itself poorly after the pandemic for multiple reasons: (1) the need for close examination to manage acute

side effects. In our study, 88% of the respondents agreed that telemedicine is inferior to in-person visits in that regard. (2) The need to continue relationship-building when patients feel most vulnerable, and (3) technical difficulties easily bypassed by visiting the patient and there is not much to be gained in terms of commute time for patients; the patients are already visiting the treatment facility for radiation therapy. Our tiered recommendation regarding visit types is also in agreement with patients' satisfaction level in the literature, as 100%, 94%, and 73% patients were satisfied with virtual follow-ups, consultations and OTVs, respectively, according to one study.²⁸

Additionally, our international colleagues have offered insights into the adoption of telemedicine into routine clinical care in a postpandemic world. The group from Princess Margaret Hospital described a system of distributed leadership and decision-making, and the use of a Service Design process to map the ambulatory encounter onto a digital workflow, which the authors believed were crucial for a large-scale virtual transition.²⁰ Abdel-Wahab et al from Austria also discussed best areas of telemedicine integration as well as the International Atomic Energy Agency's initiatives in broadening the application of telemedicine in radiation therapy delivery and education.¹⁸

The present study has several limitations. First, we were unable to calculate the response rate of the survey. The survey link was distributed to all radiation oncology residency program directors and department chairs in the United States, as well as additional private practice physicians. The email recipients were encouraged to share the links with resident physician trainees at their institution as well as other radiation oncologist colleagues. Therefore, the denominator of the response is unknown. Second, the majority of the respondents were from urban academic centers, so this study may not reflect the practice pattern and experience of community radiation oncologists. The community radiation oncologists that we emailed the survey link to were personal contacts of senior authors (MLS and ACR) and were likely biased toward practices in urban areas. Forty-three percent of the respondents were resident physicians at various stage of training and the survey results may be different from an all-attending physician cohort. Third, we did not track the affiliations of the respondents and it is possible that certain large institutions might have represented the majority of respondents from a given geographic area. Fourth, due to length limitations, our survey focused on radiation therapy with curative intent. However, telemedicine can be especially valuable for selected patients being considered for palliative radiation therapy (eg, patients with known central nervous system metastasis) who may have poorer performance status, are already seeing many physicians, and for whom physical examinations have minimal benefit.

Fifth, similar to all survey-based studies, participation bias may be a confounding factor as physicians particularly satisfied or dissatisfied with telemedicine may have been more likely to respond to the survey. Lastly, the relatively small sample size of certain subgroups may preclude accurate detection of significant differences due to a lack of statistical power, although this is not a primary objective of the study.

Conclusions

The COVID-19 pandemic has caused a seismic shift in the workflow of radiation oncology, with rapid adoption of telemedicine as a hallmark of change. The studies by us and others have consistently demonstrated an overall high level of satisfaction with telemedicine among physicians and patients,^{22,25-27} as well as the overwhelming demand to continue telemedicine as part of care delivery after the pandemic.^{22,25-30} However, heterogeneity in the appropriateness and effectiveness of telemedicine across disease sites and visit types exists. We believe telemedicine is best used for routine follow-up visits, followed by new patient consultations, although OTVs are more poorly suited in most situations. Disease sites such as thoracic and genitourinary, where physical examinations play a less crucial role, are best suited for telemedicine, and sites such as head and neck and gynecologic malignancies may benefit from a higher-than-average level of face-to-face encounters. We should remain cognizant of the heterogeneity of patients' digital health literacy and access to technology and communication barriers (eg, laryngectomy, cognitive impairment, hearing loss, neurologic conditions, and limited English proficiency) when triaging patients for telemedicine visits. It is crucial that we continue to keep our patients at the center as we make changes to the radiation oncology workflow.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.adro.2022.100924](https://doi.org/10.1016/j.adro.2022.100924).

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