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# Deployment of an Interventional Radiology Telemedicine Program During the COVID-19 Pandemic: Initial Experience With 10,056 Visits

SA-CME

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## Abstract

**Objective:** To evaluate the clinical, operational, and financial effects of using telemedicine services in an academic interventional radiology setting during the coronavirus disease 2019 pandemic and to identify potential barriers to equitable telemedicine access for patients.

**Methods:** Evaluation and management (E&M) data over a 104-week period from September 2019 to August 2021 were reviewed. Data related to the visits were recorded including visit type, billing provider, patient demographic information, Current Procedural Terminology code charged, and reimbursement received. The ZIP code pertaining to the patient’s primary residence was matched with median household income from the US Census Bureau.

**Results:** In all, 14,754 E&M encounters were performed over the study period, of which 10,056 were conducted using telemedicine. Twenty-two percent of visits were performed with interactive video; the remainder were performed using audio only. Female patients were more likely than male patients to use interactive video visits for telemedicine encounters (23.7% versus 20.4%,  $P < .001$ ). Patients availing of video visits (mean age, 58.1 years, SD = 14.0) were also significantly younger than those patients who used audio-only (telephone) encounters (mean age, 62.5 years, SD = 13.3). Patients with private insurance and those living in neighborhoods with higher median household income were more likely to avail of interactive video visits ( $P < .001$ ). Professional E&M monthly revenue was between 23.3% and 53.2% of peak prepandemic levels (mean 37.7%).

**Conclusion:** Telemedicine services allowed for rapid restoration of E&M encounter volumes over the study period. Further work is required to determine the potential implementation barriers to increasing the use of video visits.

**Key Words:** Evaluation and management, interventional radiology, telemedicine

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## INTRODUCTION

The initial case of coronavirus disease 2019 (COVID-19) in the United States was detected in late January 2020 [1], and within approximately 2 months, the increasing impact of the disease on the general population required considerable changes to the delivery of health care. Patients with a diagnosis of cancer, for example, experienced several challenges, including access to diagnostics [2-4], chemotherapy [5], radiation therapy, surgery [5,6], clinical trials [7], interventional oncology [8], and other tenets of oncologic care. Patients with cancer have been shown to be at significantly increased risk for COVID-19 infection and its adverse outcomes after adjusting for COVID-19 risk factors [9]. Patients with cancer are also more likely to suffer infections in general due to immunosuppression. Interventional radiology (IR) is similar to other procedure-based specialties, and clinic visits are necessary to discuss the risks, benefits, and alternatives of image-guided therapy and to address postprocedural care.

Before the onset of the pandemic, our group saw approximately 6,500 to 7,500 patients in clinic annually, with no formal telemedicine program. A limited number of nonbillable telephone encounters were performed each month. At the beginning of the pandemic, a concerted effort was made by our institution to decrease the number of patients physically on our campuses when possible. Therefore, efforts were made to develop a robust IR telemedicine program. Herein, the immediate impact to the provision of IR clinic services at an academic medical center is reviewed, including the clinical, operational, and financial impacts of using telemedicine services, together with potential implementation barriers to ensuring equitable patient access.

## MATERIALS AND METHODS

### Data Source

This study does not qualify as human subject research and does not meet the requirement for institutional review board submission because only retrospective administrative and billing data were reviewed in aggregate, containing no individually identifying items. We retrospectively reviewed evaluation and management (E&M) data over a 104-week period, from September 2019 to August 2021. Revenue data were available for a 21-month period (September 2019 to May 2021). All IR clinic encounters were exported from the electronic medical record (Epic Systems Corporation, Verona, Wisconsin). The ZIP code of the patient's primary residence was cross-linked to the appropriate ZIP Code Tabulation Area, using data from the Uniform Data System (Health Resources and Services Administration). The median household income for that ZIP Code Tabulation Area

was retrieved from the US Census Bureau (2019 America Community Survey) [10].

### Study Population

All in-person and telemedicine encounters over the study period were analyzed. In response to the global pandemic, the final day of allowable in-person IR clinic visits at our institution was March 23, 2020. After this, there was an 11-week period in which telephone (audio only) encounters were used for ambulatory IR clinic encounters. After 76 days of development and testing, institutionally approved video consultation (Zoom Video Communications, Inc, San Jose, California) was made available through the existing electronic medical system and associated patient access portal. Six hundred six low-level visits (eg, site checks, suture removals) to the IR holding area were excluded, leaving 14,754 clinic encounters over the study period. There were 10,056 telemedicine encounters, representing 68.2% of all E&M visits. In-person visits were slowly reintroduced beginning in April 2021. Provider E&M data were examined, for both advanced practice providers and physicians over the study period. The visit date, billing provider, insurance coverage, visit type, patient's home address state and ZIP code, together with the Current Procedural Terminology codes for each visit, were recorded, together with any applicable modifiers, such as the -95 modifier used for synchronous interactive telemedicine service rendered using real-time audio and video systems. Guidelines and requirements related to the provision of telemedicine services, as outlined at institutional, state, and federal levels, were adhered to over the study period [11].

### Statistical Analysis

Summary statistics were used to describe the change in volume and nature of clinic visits over time. Categorical variables are presented as numbers with percentages, and continuous variables are presented as means with SDs. Data graphs were created using Microsoft Excel (Microsoft Corporation, Redmond, Washington) and Datawrapper (Datawrapper GmbH, Berlin, Germany). Univariate analysis of demographic variables was performed with the  $\chi^2$  or Fisher exact test. Means between groups were compared using the Student's *t* test. All statistical analyses were performed with Stata v14.2 (StataCorp LLC, College Station, TX). A cutoff value of  $P < .05$  was used for statistical significance.

## RESULTS

Telemedicine services were provided to residents of 46 states and the District of Columbia; however, provision of services, together with the type of service (telephone or video,

Relative Distribution of Telemedicine Encounters

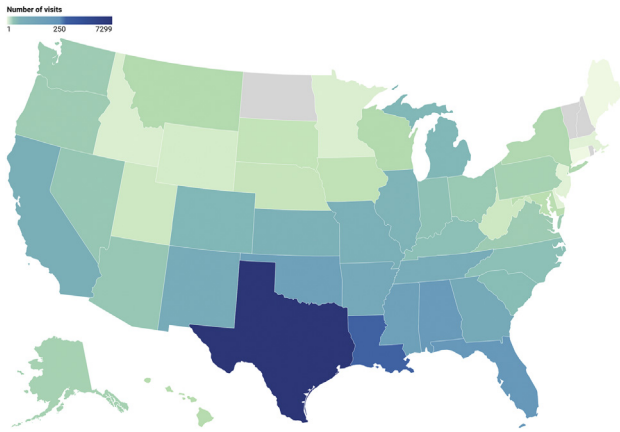


Fig. 1. Relative distribution of all telemedicine encounters based on patient’s home ZIP code (April 2020 to August 2021). A total of nine visits were performed for residents of US overseas territories (not shown).

for example), was contingent on both the patient and provider’s physical location at the time of the encounter, based on billing and licensing requirements. For the 10,010 telemedicine encounters in which a US state was listed in the address, 72.9% of patients had a home address in the same state as our institution (Fig. 1).

In the 6 months before pandemic conditions (September 2019 to February 2020), the average number of ambulatory E&M encounters for IR was 629 per month (range, 547-701). There was a precipitous decline in in-

person clinic visits, with 435 visits in March and just 2 in April 2020. Contact with the IR clinic was initially performed exclusively by telephone for patients who needed follow-up or as part of a preprocedural evaluation. Once the applicable licensing and regulatory requirements for telemedicine billing were established, it was possible to submit charges for these visits, when appropriate. The number of telephone encounters increased rapidly over the course of several weeks. Before the pandemic, telephone encounters represented the minority of monthly encounters, representing on average just 2.4% of all monthly clinic visits (range 0.4% to 3.7%). In total, 127 nonbilled telephone visits were completed during the prepandemic period.

With the availability of both telephone and video visits starting in June 2020, total clinic encounters in June (n = 595), July (n = 625), and August 2020 (n = 537) were at 94.6%, 99.4%, and 85.4% of average monthly prepandemic volume (n = 629), respectively. Patients were contacted by members of our operations team to determine their preference for video or telephone visit and to confirm suitability based on their physical location at the time of the planned telemedicine visit. Technical assistance was offered by members of the IR team when required, and in cases that could not be resolved, patients were directed to an institutional help desk. The volume of clinic encounters remained relatively stable over the coming months (Fig. 2); however, the overwhelming majority (77.2%) of such encounters continue to be performed with audio only. After the phased reintroduction of in-person visits beginning April

Distribution of Monthly Evaluation and Management (E&M) Encounters (September 2019 - August 2021)

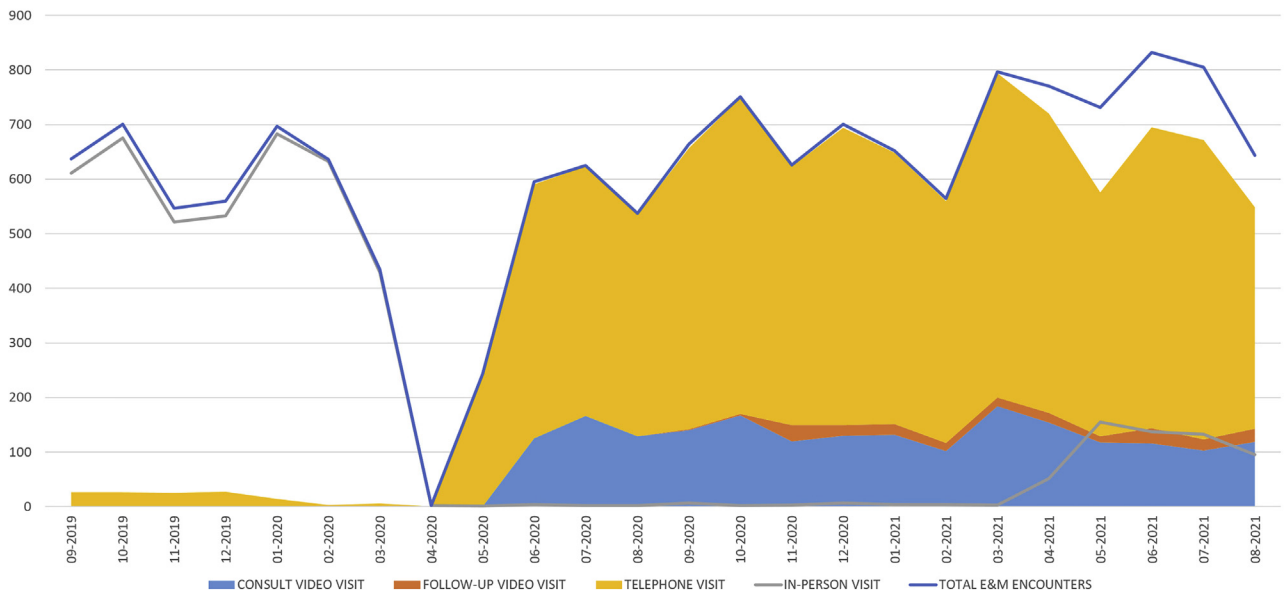
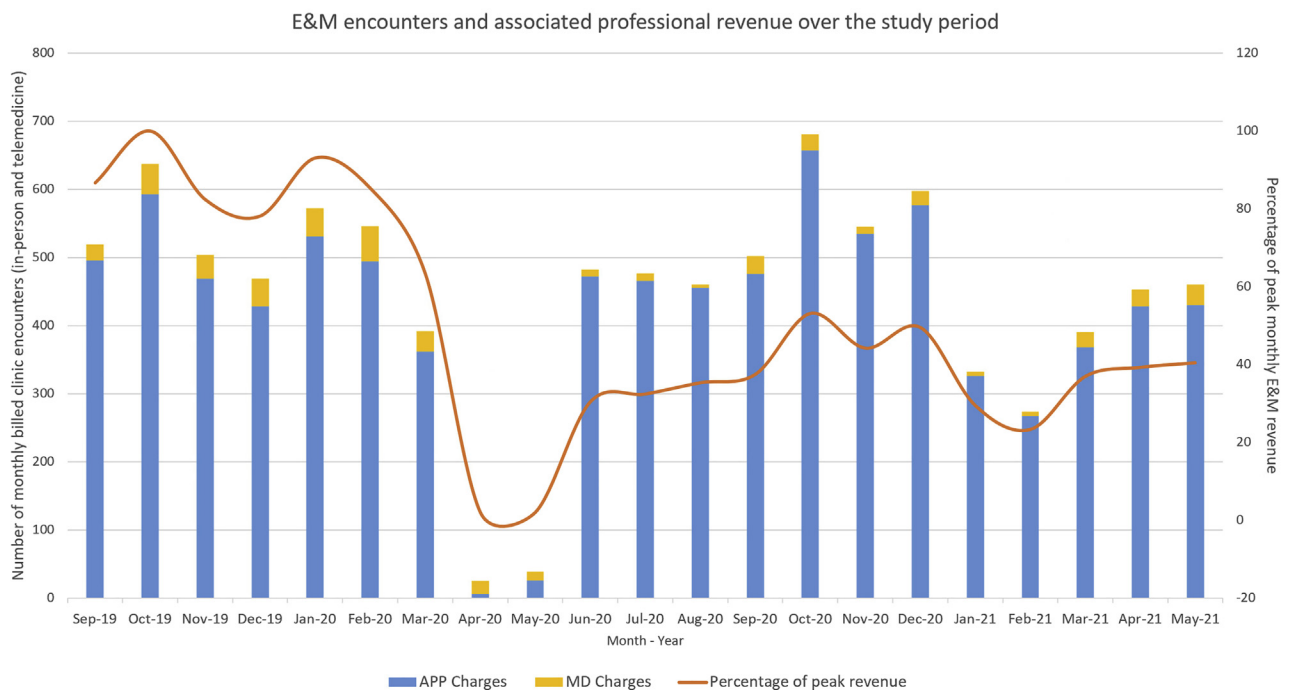


Fig. 2. Graph outlining distribution of telephone encounters, in-person consultations, and video consultations over the study period. E&M = evaluation and management.



**Fig. 3.** Comparison of evaluation and management (E&M) revenue with number of clinic encounters over a 21-month period, during which both clinical and revenue data were available (September 2019 to May 2021). APP = advanced practice providers.

2021, the monthly IR clinic volume for the final 6 months of the study (March 2021 to August 2021) was 763.3 visits (range 644-832), representing a 21.5% increase over pre-pandemic visits.

Professional E&M revenue (including advanced practice providers and MDs) from June 2020 to May 2021 was below peak prepandemic levels (mean, 37.7%, range, 23.3%-53.2%, Fig. 3). Physician-billed E&M monthly visits averaged 38.0 (range, 23-52) from September 2019 to March 2020. However, in the 14-month period from April 2020 to May 2021, inclusive, there was a 57% reduction in similar visits, with an average of 16.3 physician-billed visits per month (range, 5-30), a finding that was statistically significant ( $P < .001$ ). In the period before the deployment of the telemedicine program (September 2019 to March 2020), 86.4% of all clinic encounters had associated charges that were submitted for reimbursement. However, in the following 13 months for which revenue information is available, the number of encounters associated with charges decreased to 69.2%.

When it came to access to telemedicine, female patients were more likely than male patients to use interactive video visits for telemedicine encounters (23.7% versus 20.4%,  $P < .001$ ). Patients availing of video visits (mean age, 58.1 years, SD = 14.0) were also significantly younger than those patients who use audio only (telephone) encounters (mean

age, 62.5 years, SD = 13.3). Ethnicity was not a significant predictor for the use of interactive video over audio-only visits ( $P = .11$ ). Patients with private insurance (Table 1) were significantly more likely to use interactive video visits over those without private insurance ( $P < .001$ ). Finally, patients living in areas with higher median household income (Fig. 4) were also more likely to use video visits ( $P < .001$ ).

With the return of in-person visits in the final 3 months of the study (June to August 2021), monthly E&M visits completed in-person ranged from 14.8% to 16.5% of all visits (average 15.9%).

## DISCUSSION

Deployment of a comprehensive telemedicine program allowed for rapid restoration of IR clinic volumes. Younger patients, female patients, patients with private insurance, and patients with a primary ZIP-code associated with higher median household income based on US Census data were more likely to complete their visit using interactive video. Despite availability of interactive video visits, the majority of telemedicine encounters were performed using audio only.

Because of state-specific heterogeneity in the requirements to provide telemedicine services to patients, a web-based tool was developed and updated by the

**Table 1.** Characteristics of patients accessing in-person and telemedicine services over the study period

Characteristic	In-Person Visit	Telemedicine	
		Video	Audio Only (Telephone)
Gender, n (%)			
Male	2,537 (54.0)	1,079 (48.8)	4,206 (53.6)
Female	2,161 (46.0)	1,130 (51.2)	3,641 (46.4)
Mean age, years $\pm$ SD	62 $\pm$ 13.3	58.1 $\pm$ 14.0	62.5 $\pm$ 13.3
Race, n (%)			
American Indian or Alaska Native	23 (0.5)	5 (0.3)	41 (0.5)
Asian	268 (5.7)	114 (5.2)	415 (5.3)
Black or African American	397 (8.5)	194 (8.8)	732 (9.3)
Declined to answer	23 (0.5)	16 (0.7)	60 (0.8)
Native Hawaiian or other Pacific Islander	10 (0.2)	1 (0.0)	8 (0.1)
Other or unknown	312 (6.6)	115 (5.2)	512 (6.5)
White or Caucasian	3,665 (78.0)	1,764 (79.9)	6,079 (77.5)
Insurance, n (%)			
Commercial	2,252 (47.9)	1,329 (60.2)	3,664 (46.7)
Medicare or Medicaid	2,205 (46.9)	819 (37.1)	3,916 (49.9)
Government or other	138 (2.9)	36 (1.6)	162 (2.1)
Not listed	103 (2.2)	25 (1.1)	105 (1.3)
Total, n	4,698	2,209	7,847

institution to guide providers on the types of permitted visits. Written instructions on best practices for video and telephone appointments, including environment setup, background noise, and establishing rapport, were made available to providers. In addition, temporary telemedicine licenses were requested for both IR physicians and advanced practice providers in some neighboring states. Some states do not permit telemedicine services with an out-of-state provider, although telephone calls (nonbillable) or portal-based conversations with an existing patient regarding a prior in-person encounter are generally appropriate across all states.

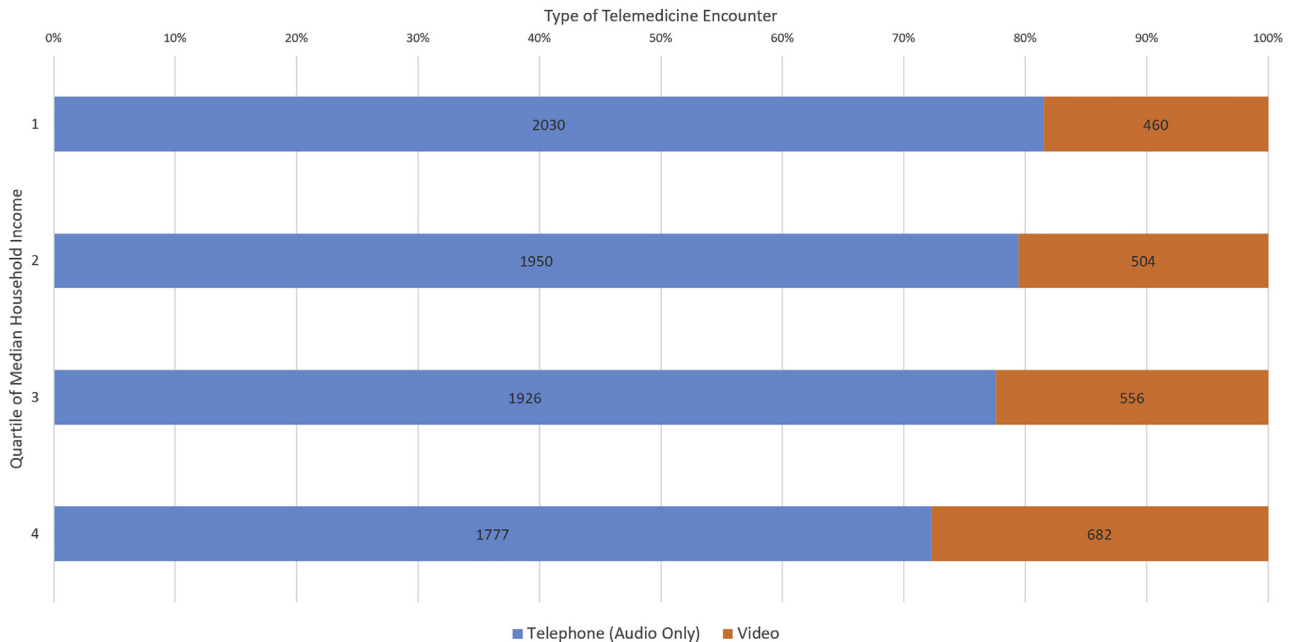
We identified a negative impact on E&M reimbursement during pandemic conditions, despite availability of telemedicine visits. This was related to a 17% increase in nonbilled encounters and the predominance of telephone encounters over video visits. New and established outpatient video visits allow for use of “conventional” E&M Current Procedural Terminology codes, with providers billing based on medical decision making or all time spent on the encounter that day. However, audio-only or telephone encounters require use of different codes (99441-99443), for which billing is based only on the amount of time spent in medical discussion with the patient. There was also a decrease in the number of physician-billed clinic encounters with the availability of telemedicine, which may be related to challenges incorporating such visits into physician daily

workflow. All visits were completed using the existing complement of IR physicians and advanced practice providers. The initial setup costs, including platform updates to the electronic medical record system, hardware purchases (including web cameras, for example), and applications for out-of-state telemedicine licenses when necessary, were funded by the institution.

Before the pandemic, “virtual visits” and other telemedicine encounters represented the minority of health care interactions [12]. Although patients have increasingly had access to their providers in the form of electronic mail and secure messaging platforms, the widespread availability of interactive video consultation has been hampered by various factors. These include privacy concerns [13], required spending on information technology infrastructure [14], medicolegal issues [12,13,15], regulatory restrictions, and actual or perceived potential for negative financial impacts [16].

Our study demonstrates that even with the availability of video visits, telephone encounters remained an important component of maintaining IR clinic access, a finding that others have also described [17]. Providers should be familiar with the Current Procedural Terminology codes and associated reimbursement for telemedicine encounters. As pandemic conditions evolve, a return to in-person clinic visits may be preferable based on patient experience, operational workflow, and provider preference, and staffing models

## Distribution of Telemedicine Encounters relative to Median Household Income quartile



**Fig. 4.** The mean and median annual household income (as estimated using US Census Bureau Data) for all telemedicine encounters were \$73,883 and \$67,470, respectively. Encounters in which estimated median annual household income was available were divided into quartiles: quartile 1 = \$51,309, quartile 2 = \$67,470, and quartile 3 = \$92,327.

may need to be adjusted to reflect this change. Some groups may elect to offer video visits or in-person visits, for example, with the intention of decreasing the use of audio-only encounters. With the return of in-person visits at our institution, approximately 16% of E&M encounters are now completed in person. Selection of in-person visits depends on patient preference, provider availability, and compliance with social distancing guidelines in the waiting areas, for example. It is expected that this number will increase over time but that telemedicine will remain part of our practice in the future.

Although telemedicine was initially envisioned as a way of providing access to medical care for remote communities [13], use of the technology during the pandemic has demonstrated the potential benefits to many patients, regardless of geographic location or medical condition. CMS increased access to telehealth services during the COVID-19 public health emergency [18], adding 85 telehealth services that are reimbursed at the same rate as in-person visits [19]. Coverage among private insurers varies among various factors, including the state. However, it remains to be seen whether this option will remain available beyond the pandemic, and there may be financial disincentives for providers and health care organizations to continue widespread adoption of telemedicine when pandemic conditions abate.

Nonetheless, availability of telemedicine had slowly been increasing in the years leading up to the pandemic. In one

study in which patients were asked why they would choose a telemedicine visit over a clinic visit, the factors outlined included avoiding the risk of COVID-19 transmission, less waiting time, and the potential to save money on travel [20]. In the same study, the majority (80.8%) of surveyed providers desired the option to use telemedicine in the future.

The rollout of telemedicine services since the start of the pandemic has been well described. One large academic medical center in New York reported an increase in virtual urgent care visits from 82 to 1,336 in 15 days [21], with the addition of approximately 250 “surge providers” from other medical specialties to assist existing emergency medicine providers. For nonurgent visits, video encounters increased from less than 50 per day to more than 7,000 per day, within a 10-day period.

The impetus to provide ongoing synchronous and asynchronous telemedicine access may be limited by changes in reimbursement models after the public health emergency. However, any decrease in reimbursement may be offset by other advantages, including patient satisfaction, operational efficiencies, and decreased provider burnout [20]. In the United States, there is considerable heterogeneity between states when it comes to coverage for telemedicine services. In 2019, 42 states and the District of Columbia had laws that addressed telemedicine coverage by commercial payers. Of these, 16 states had laws that specifically

addressed the reimbursement of telehealth services, 10 of which provided for “payment parity” compared with in-person visits [22]. Although few states had telehealth parity laws before the pandemic [19], several have now passed temporary telehealth parity laws [23].

Some groups have advocated for the concept of payment *equity*, rather than payment *parity* [23]. Although payment parity may have been introduced as a stopgap measure, that model may not be sustainable in the long term, because telemedicine visits tend to be shorter than in-person visits. Widespread use of telemedicine by providers may allow for more patient encounters per unit of time, raising the possibility that such visits such be reimbursed at close to, but less than, in-person visits. In the future, it may be useful for individual practices to evaluate their overall efficiency with E&M encounters, in terms of staffing models, resource utilization, and inpatient versus ambulatory visits.

Maintaining or increasing access to telemedicine for IR patients in the postpandemic period offers the possibility of allowing patients to discuss treatments without traveling to the hospital or clinic, including potentially inviting family members in remote locations to join the virtual consult. For postprocedural patients, telemedicine may allow for the remote evaluation of wounds (after implanted port placement, for example) [24]. Access to such services may reduce the frequency of hospital visits. This is particularly important to patients with cancer, who have higher risk of developing severe effects related to COVID-19 [25].

Shah et al recently reported that telemedicine reduced time from initial referral to biopsy from 17 to 12 days for IR patients [26]. For the 172 telemedicine visits in that cohort, the authors reported that telemedicine saved patients a total of 367 hours of travel time and 11,222 miles in travel distance. There are also potential economic benefits to patients, related to less time away from work and travel expenses associated with attending appointments.

Conversely, there are some who believe telemedicine should be a temporary solution for the duration of the public health emergency, citing issue surround quality and fragmentation of medical care [27]. However, based on provider and patient experiences to date, it is clear that telemedicine will almost certainly play an increasing role in health care delivery during the pandemic and beyond. Many long-term challenges remain in the form of regulations, licensing, and reimbursement. Some have proposed federal licensing for telemedicine services [23] as a potential method of addressing geographical hurdles. Others have suggested that reciprocity of medical licenses between states may provide a viable option, similar to the rules applying to physicians practicing in the Veterans Affairs system [28]. Finally, the Interstate Medical Licensure

Compact may streamline physician licensing across state lines [29], facilitating the ongoing provision of telemedicine services beyond the COVID-19 pandemic.

There are limitations to this study. Ad hoc patient-initiated or provider-initiated telephone encounters may not have been counted if they were not associated with the creation of a “telephone encounter” within the electronic medical record. Some brief telephone interactions may not be captured on either financial or clinical operational data sets. The study was retrospective in nature and involved visits at a single institution. The results may not be generally applicable to other practices, particularly given the focus on cancer treatment at our facility.

Our findings demonstrate that telemedicine services can be delivered effectively for IR patients, but challenges remain with the widespread implementation of synchronous video visits. Further work is required to determine the potential implementation barriers to increasing the proportion of telemedicine encounters using video technology and to monitor changes in federal and state requirements for the provision of telemedicine services.

## TAKE-HOME POINTS

- This study reveals that telemedicine can be used to effectively maintain IR clinic access to patients during pandemic conditions. Even with the availability of video visits, the majority of patient encounters were conducted by telephone.
- Those who were more likely to complete their visit using interactive video were younger patients, female patients, patients with private insurance, and patients with a primary home ZIP code associated with higher median household income based on US Census data.
- Beyond the public health emergency, the ongoing provision of telemedicine services for IR will be contingent on updated licensing, regulatory, and reimbursement guidelines.

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