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Publication Date

2021-08-01

DOI

10.1016/j.urology.2021.03.050

Video Visits are Practical for the Follow-up and Management of Established Male Infertility Patients

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OBJECTIVE To study the use of video visits for male infertility care prior to the COVID-19 pandemic

METHODS We reviewed video visits for male infertility patients completed at a tertiary academic center in southeast Michigan. These patients had follow-up after an initial in-person evaluation. We designed this retrospective case series to describe the diagnostic categories seen through telehealth, management steps completed during video visits, and to understand whether additional in-person care was required within 90 days of video visits. In addition, we estimated time and cost savings for patients attributed to video visits.

RESULTS Most men seen during video visits had an endocrinologic (29%) or anatomic (21%) cause for their infertility. 73% of video visits involved reviewing results; 30% included counseling regarding assistive reproductive technologies; and 25% of video visits resulted in prescribing hormonally active medications. The two patients (3%) who were seen in clinic after their video visit underwent a varicocelectomy in the interim. No patients required an unplanned in-person visit.

From a patient perspective, video visits were estimated to save a median of 97 minutes (IQR 64-250) of travel per visit. Median cost savings per patient— by avoiding travel and taking time off work for a clinic visit—were estimated to range from $149 (half day off) to $252 (full day off).

CONCLUSION Video visits for established male infertility patients were used to manage different causes of infertility while saving patients time and money. Telehealth for established patients did not trigger additional in-person evaluations. UROLOGY 154: 158–163, 2021. © 2021 Elsevier Inc.

Following the coronavirus disease 2019 (COVID-19) pandemic, experts estimated that there were approximately 1 billion telehealth visits in the United States in 2020.[1] Video visits—a form of telehealth using live, simultaneous audio and visual interactions to connect patients and providers—are not new. Historically, regulatory and reimbursement policies were cited as major barriers to wide-spread telehealth use.[2] However, the declaration of a public health emergency in March 2020 resulted in a rapid expansion of telehealth services by relaxing regulations at the state and national levels.[3-5] In particular, the Centers for Medicare & Medicaid temporarily changed regulatory requirements to allow more patients to engage in telehealth from their homes.[6,7] Complementing these national policies, many state-specific changes have permitted Medicaid and privately insured patients to receive care from home and allowed providers to practice across state lines.[8] The American Society of Reproductive Medicine (ASRM), Society for Male Reproduction and Urology, and the Society for the Study of Male Reproduction recommend clinicians use telehealth for reproductive consultations, to develop treatment plans, begin or continue evaluations, and educate patients.[9,10] The COVID-19 public health emergency and associated telehealth regulatory changes have been extended through April of 2021.[11]

Infertility is defined as the inability to conceive after one year of unprotected intercourse and affects approximately 15% of US couples.[12] Both the ASRM and National Institute for Healthcare Excellence (NICE) recommend male and female partners receive infertility evaluations.[12,13] However, there are numerous barriers for accessing infertility care, including the geographic distribution of providers.[14] Though video visits have been previously studied in general adult and pediatric urology populations,[5,15-19] to date no studies have specifically evaluated the use of telehealth in male infertility care. We hypothesized that video visits for established patients served as substitutes to follow-up, in-person care. It is

Funding Support: *1 K08 HS027632-01 grant support from the Agency for Healthcare Research and Quality.*

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Submitted: January 25, 2021, accepted (with revisions): March 31, 2021

https://doi.org/10.1016/j.urology.2021.03.050
0090-4295

plausible that video visits for male infertility may effectively facilitate follow-up care while reducing financial and geographic constraints for patients. Conversely, the sensitive nature of infertility care as well as the importance of the physical exam may result in telehealth being used in addition to in-person visits.

Since little is known about the role of telehealth in male infertility, we designed a retrospective case series to understand how video visits were used to provide male infertility care prior to the COVID-19 pandemic. Specifically, we sought to understand the etiologies for which established patients used telehealth for follow-up. We also reviewed how video visits were used in the evaluation and management of infertility. Finally, we estimated the financial benefits for patients using video visits by calculating travel costs and lost wages that would have been associated with in-person care.

METHODS

This case series is a retrospective review of outpatient video visits in the department of urology at a single academic institution from August 21, 2017 through March 17, 2020. This study was deemed exempt by the Institutional Review Board (HUM00141665). We ended the study when COVID-19 was declared a public health emergency. After March 17th, 2020 there were wide-spread changes to telehealth policies that would have introduced confounders to our study objectives.[20,21] We included established patients seen for video visit follow-up of issues related to male infertility. All men had undergone a previous in-person examination with a urologist in the division of andrology. We excluded men younger than 18 years of age. Video visits were performed by a single urologist with andrology fellowship training. All video visits were performed using a HIPAA-compliant, video communication system integrated into the electronic health record (EHR). New patient video visits were not reimbursed or performed prior to March 17th, 2020 and were not included in this study. Chart review was conducted in the EHR to identify study variables, including age, gender, race and ethnicity, preferred language, referring provider, occupation, home zip code, and clinic location where an in-person visit would have taken place. Chart review was limited to data captured from Michigan Medicine and Mid-Michigan hospitals and affiliated outpatient clinics.

Diagnostic Categories and Patient Management

Our primary objective was to describe the landscape of male infertility diagnoses seen via video visits and what management was performed through telehealth. We first classified visits according to diagnostic category by evaluating the clinical history. Supplemental Figure 1 details all the individual diagnoses identified and how they were grouped into diagnostic categories. We then examined the management steps completed during the virtual encounters. Patient management categories included reviewing results, managing medications, referrals to other specialists, and counseling regarding sperm extraction, varicocelectomy, assistive reproductive technologies (ART), or cryopreservation. Visits often included multiple management steps, and these are broken down into more detail in supplemental figure 2. We extracted information about whether patients had clinic or emergency room visits for any urologic condition 90 days after their video visits within our health system, including Michigan Medicine and Mid-Michigan hospitals and affiliated outpatient clinics. Obtaining a semen analysis or DNA fragmentation index testing requires provided semen at infertility clinics but these interactions with the healthcare system were not categorized as in-person visits as they do not include interaction with a provider.

Patient Time and Cost Savings

Our secondary objective was to evaluate patient time saving and financial benefits from video visit utilization. Travel cost was estimated based on clinic visits with an andrologist and do not include travel for laboratory tests or semen analyses. We calculated round-trip driving distance and driving time using Google Maps©. We used each patients' home addresses documented in the EHR and address of the outpatient urology clinic they would have visited in person. To control for effects of traffic variation in our calculations, we used Wednesday at 10AM as our index time. Total time saved from avoiding round trip travel was converted to ordinal categories ranging from less than one hour to greater than 9 hours of travel to depict the travel burden in this patient cohort. We calculated transportation costs by multiplying travel distance with the American Automobile Association's (AAA) cost per mile driving estimate of $0.59 per mile for 2017-2019.[22] AAA's cost estimate includes the price of fuel, tires, maintenance, insurance, depreciation, license, and registration.

We also estimated potential lost wages had the patient needed to take time off from work to attend an in-person appointment. Patient occupations were identified from chart. The provider who initially saw these patients always documents patient occupation as part of his note template. Salary data estimates were obtained from Glassdoor.com based on occupation documented in the EHR. We used the salaries from Glassdoor to project the potential lost wages from missing half or full days of work to attend an in-person visit. To analyze the financial impact that video visits have on patients of varying occupations, we categorized patients as being "blue collar" versus "white collar" employees using the International Standard Classification of Occupations (ISCO-08) from the International Labour Organization.[23] Generally, "blue collar" workers engaged in outdoor, manual, agricultural, manufacturing, or service industries. "White collar" workers engaged in non-manual office work.

We estimated total cost avoidance by summing the calculated transportation costs with the estimated wages lost had the patient had taken time off from work to attend an in-person appointment. The median cost savings of "blue collar" and "white collar" workers were calculated independently. Total median cost savings of all patients were also calculated, with no respect to "blue collar" or "white collar" identification.

RESULTS

Between August 21, 2017 and March 17, 2020, 70 infertility video visits were completed by 56 men. The median age of patients using video visits was 36 (range 20 to 56 years of age). Seventy six percent of patients self-identified as white and 96% identified their preferred language as English. Most patients were referred by their primary care provider (47%) or by their partner's reproductive endocrinologist (33%).

There were a total of 49 unique occupations among the 56 men. 32% were blue collar workers and 68% were white collar

Table 1. Baseline characteristics of established male infertility patients.

No. visits	70
No. patients	56
No. of 1st time video visits	55
Age yrs, med (range)	36 (20-50)
Ethnicity	*no. (%)*
White	53 (75.7%)
Asian	9 (12.9%)
Other	3 (4.3%)
Black	2 (2.9%)
Declined	2 (2.9%)
Hispanic	1 (1.4%)
Language	no. (%)
English	67 (95.7%)
Albanian	2 (2.9%)
Spanish	1 (1.4%)
Referral	no. %
Primary care provider (PCP)	33 (47.1%)
Reproductive endocrinology & Infertility (REI)	23 (32.9%)
Urologist	8 (11.4%)
Self	4 (5.7%)
Obstetrician gynecologist	1 (1.4%)
Endocrinologist	1 (1.4%)
Occupation	no. (%)
Blue collar	18 (32%)
White collar	38 (68%)

workers. Blue collar workers had an estimated median annual income of $28,958 and white collar workers had a median estimated income of $61,240. Total median annual salary of our cohort was $51,331. See Table 1 for additional demographic data.

Diagnostic Categories and Patient Management

There was a broad array of male infertility diagnostic categories observed during video visits, including endocrinologic conditions (29%); anatomic causes of infertility (27%); idiopathic infertility (16%); concerns regarding medical treatments on fertility potential (9%); partners being evaluated by REI (9%); genetic abnormalities (7%); and low DNA integrity (3%).

Video visit patients received a variety of interventions, as described in Figure 1. The majority of men (73%) reviewed their test results with their provider during the video visits. Men also received counseling about ART (30%), changes in medications (25%), as well as counseling and indications for sperm extraction procedures (14%) and varicocelectomies (13%).

In the 90 days after video visits, there were only two in-person encounters (3%) within our health system, both of which were planned post-operative visits after varicocelectomy. Counseling regarding the impact of varicoceles on fertility as well as the risks, benefits and indications for surgery took place via a telehealth encounter once all infertility testing was completed. The remainder of the video visits did not result in additional in-person encounters. No patients required an unplanned office or emergency department visit in the three-month period after their telehealth follow-up.

Table 2. Driving time avoided through the use of video visits.

Round-trip Driving Times	N (% of all patients)
<1 hours	14 (21%)
1-3 hours	31 (44%)
3-5 hours	17 (24%)
5-7 hours	3 (4%)
7-9 hours	3 (4%)
9+	2 (3%)

Patient Time and Cost Savings

Video visits saved patients a median of 80 miles (interquartile range [IQR] 46-244) and 97 minutes (IQR 64-250) of round-trip travel time per visit. Patients travel time would have been between less than 1 hour for 21% of patients and greater than 9 hours for 3% of patients (Table 2). Median cost savings per patient from avoiding transportation to and from an in-person appointment was $47 (IQR $27-144).

When estimating lost wages, blue collar workers avoided a median loss of $58 (half day off) to $115 (full day off), and white collar workers avoided a median loss of $122 (half day off) to $244 (full day off), by not taking time off from work. Overall, patients across all occupations avoided a median loss of $102 (IQR $69 – 133) to $205 (IQR $137 – 266) in lost wages by not having to take a half or full day off from work, respectively (Table 3). In sum, we found that total potential cost avoidance per patient ranged from a median of $149 (IQR $96 – 277, half day off) to $252 (IQR $164-410, full day off).

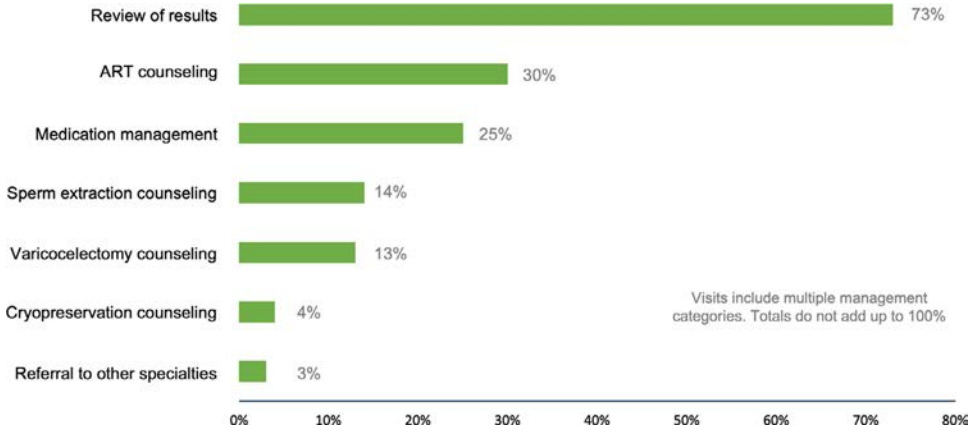

Figure 1. Patient management completed during video visits. (Color version available online.)

Table 3. Cost saving estimates from using video visits for follow-up.

	Blue Collar	White Collar	All Patients
Driving Cost (miles x $0.59)			
Median (IQR)			
Miles Driven	162 (94-280)	82 (60-250)	80 (46-244)
Cost/Mile ($)	0.59	0.59	0.59
Total ($)	96 (55-165)	48 (35-148)	47 (27-144)
Wages Saved ($)			
Median (IQR)			
Half Day	58 (56-77)	122 (94-145)	102 (69-133)
Full Day	115(112-154)	244 (187-290)	205 (137-266)
Total Savings ($)			
Median (IQR)			
Half Day	154 (111- 242)	168 (129-293)	149 (96-277)
Full Day	211 (167-319)	292 (222-438)	252 (164-410)

IQR, interquartile range.

DISCUSSION

In this pre-COVID case series, video visits were used to provide care for patients who had an initial in-person evaluation and were found to have a variety of different conditions impacting male infertility. From these visits, patients were able to review results, undergo medication changes and be counseled on a number of interventions for managing male infertility. We found that there were no unplanned clinic or emergency department visits 90 days after a video visit. Furthermore, these virtual encounters eliminated driving time and travel-related costs as well potentially preventing lost wages by reducing time off work. Collectively, these findings highlight that infertility video visits can serve as practical substitutes for in-person care for established patients.

This is the first study to explore the application of telehealth for delivering male infertility care. Berg *et al.* described their institutional experience with telehealth use for male and female infertility care during the COVID-19 pandemic.[24] Our findings corroborate their real-world experience and suggest that male patients with a variety of diagnoses can be provided telehealth follow-up care for male infertility. Importantly, we found that video visits seem to be used as substitutes for in-person care rather than as additive visits. The two patients who saw their urologist in the 90 days after a virtual encounter had surgery in the interim and opted for an in-person, post-operative visit. No patients required an unexpected or unplanned evaluation within 90 days after a video visit. The largest case-control study of telehealth use in urology compared 600 virtual visits to 600 clinic visits and found that less than 1% of patients required an unplanned, in-person evaluation in the 30 days after either an in-person or virtual appointment.[25] Our study extends these results to the male infertility patient population over a longer period of follow-up when a physical exam was performed at the initial evaluation for infertility.

In our study, patients seeking male infertility care avoided a median of 80 miles and 97 minutes of round-trip travel. Our results are consistent with previous publications regarding general adult and pediatric urology patients that estimated that video visits saved 82-95 miles of round-trip travel and 95-113 minutes of travel time.[15,16,25] The potential to eliminate travel time is especially pertinent to the field of male infertility where significant geographic barriers to healthcare access exist. Twenty-nine states have five or fewer assisted reproductive technology (ART) centers, and 13 states do not have a single male reproductive urologist.[14] However, traveling for care does not only burden patients who live far from infertility specialists. Urology patients in metropolitan cities report reduced travel burdens with the use of telehealth visits.[26] Future work should evaluate whether the use of telehealth is leading to increased coordination with local providers and infertility clinics to minimize the burden of testing and whether at-home semen analysis kits[27] are a reliable option for patients who opt to use video visits.

Within the urologic literature, telehealth studies have estimated cost savings for patients from $48 to $150 by avoiding traveling for an appointment.[10,12] Viers et al. found in their randomized study of post-operative prostatectomy visits that patients who had in-person follow-up reported having to miss a day of work, compared to no days missed by patients seen via video visit.[15] Our study builds upon this previous work by estimating the scope of lost wages and is the first to estimate lost wages using patients' occupations. After accounting for driving costs and lost wages, our patient cohort potentially avoided a median of $149 (half day off) to $252 (full day off) in costs by connecting with their provider through a video visit. Our calculated cost savings may underestimate financial benefits for patients since we could not calculate costs of parking, meals, childcare, lodging or other expenses incurred by travelling for an in-person visit. On the other hand, our calculated savings could overestimate the benefits seen during the COVID-19 pandemic. As more people are working from home, it may be easier for patients to attend doctors' appointments without formally having to request time off work. Regardless, infertility care is already expensive[28] so minimizing the financial impact of these appointments will be meaningful for patients. Future studies should examine real-world, patient reported cost savings to further understand the financial impact of telehealth.

Our study has several limitations. First, this was a single institution study in an outpatient setting in the state of Michigan. These results are not generalizable to inpatient or emergency urological care, or to outpatient urology clinics in other states or countries where reimbursement policies may differ. Second, we evaluated established patients who were offered follow-up with video visits. We did not determine how many patients opted for an initial in-person visit over a telehealth encounter. Third, we did not measure patient satisfaction associated with our video visits. However, previous studies within the field of urology have shown that video visits have higher or equivalent levels of patient satisfaction rates as compared to in-person visits.[15-19,29] Finally, this was a retrospective case series without a comparison group. This study was intended to be an initial descriptive analysis of how telehealth is being used to provide established infertility patients with follow-up care.

These limitations notwithstanding, our finding have important implications for providers, patients, payors, and policymakers. Providers should be reassured that a broad spectrum of male infertility diagnostic categories can be followed-up using video visits without additional in-person evaluations. Our current study is possible because patients underwent an initial visit with an andrologist where a genitourinary exam was performed. The importance of the scrotal exam in male infertility remains paramount and how this can be integrated into virtual care models remains to be seen. For patients, this work highlights that video visits can reduce time spent driving to a clinic and can help avoid additional cost in seeking infertility care. For payors, telehealth for male infertility patients does not result in excess or inappropriate care as evidenced by the lack of unplanned clinic or emergency department visits in our health system within 90 days after video visits. Finally, for policymakers, this work can support advocacy efforts to ensure continued coverage and reimbursement of video visits. Given the changes in telehealth policy that have taken place due to the COVID-19 public health emergency, future research should help clarify how new patient video visit evaluations could impact access to male infertility specialists. Additionally, other forms of telehealth must be evaluated and reimbursed to ensure that patients have choices in how they receive infertility care. Early studies evaluating telemedicine use during the COVID-19 pandemic have found that age, race, ethnicity, and socioeconomic status impact whether patients use video or telephone visits to receive care.[30] Relying on video visits, which require broadband internet and expensive hardware, as the only reimbursed form of telehealth could exacerbate health disparities.

CONCLUSION

Video visits for established male infertility patients were used to manage different causes of infertility while saving patients time and money. Telehealth for established patients did not trigger additional clinic or emergency evaluations and served as substitutes for in-person care.

SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.urology.2021.03.050.

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EDITORIAL COMMENT

A silver lining of the pandemic has been the rapid uptake of telehealth, facilitated by readiness of the technologies across which telemedicine is provided. Additionally, changes in reimbursement by Medicare, Medicaid and private insurers have made this service economically feasible.[1]

The virtual platform has been vital to our practice during the pandemic and prior, as we have utilized telehealth in various phases when delivering care to infertility patients. Similar to the authors, we most commonly leverage telehealth to discuss a plan of care after the initial in-office assessment and testing has been completed. However, occasionally we will alter this sequence, conducting the initial consult virtually, then completing the physical exam at a subsequent visit. This is driven by the patient's selection of the virtual platform for their initial consult. The virtual platform additionally allows the female partner to participate directly in the visit even if she and her partner are not physically together. Our experience with telehealth to facilitate care for infertility patients matches that of the authors of this study. This study clearly quantifies a few of the greatest benefits imparted by telehealth - the conservation of the limited resources of time and money. Their efforts to estimate travel time and income saved with telehealth care should be applauded. Additionally, as pointed out by the authors, many patients have inadequate access to fellowship-trained fertility specialists. This medium minimizes the time and money spent by patients that travel great distances to receive expert care. As andrology subspecialists, we must continue to emphasize the importance of the male evaluation for infertile couples and telehealth may assist in providing access to this finite resource. For the aforementioned reasons, a male infertility practice has always been well suited for the virtual platform.

The authors rightly comment on the potential for exacerbating existing healthcare disparities. Socioeconomically disadvantaged populations may be particularly vulnerable with the widespread adoption of telehealth due to the requirement of high-speed internet connectivity and a computer or smartphone. However, this technology has become ubiquitous, and given the challenge of transportation in this cohort, potential benefits may also exist. While older patients may have usability issues — in our particular patient population this is rarely an issue.

Survey data from the pandemic has found that patients and providers alike value the virtual platform and support its further use as pandemic restrictions lessen.[2] We hope that this study will serve as evidence to policymakers and other key decision makers that telehealth can play an important role in delivery of care. It will be paramount that payors continue to reimburse these visits at an equal or near equal rate to ensure providers will continue to make use of this platform to benefit our patients.

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