ORIGINAL CLINICAL RESEARCH REPORT

Development, Implementation, and Evaluation of a Telemedicine Preoperative Evaluation Initiative at a Major Academic Medical Center

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BACKGROUND: With health care practice consolidation, the increasing geographic scope of health care systems, and the advancement of mobile telecommunications, there is increasing interest in telemedicine-based health care consultations. Anesthesiology has had experience with telemedicine consultation for preoperative evaluation since 2004, but the majority of studies have been conducted in rural settings. There is a paucity of literature of use in metropolitan areas. In this article, we describe the implementation of a telemedicine-based anesthesia preoperative evaluation and report the program's patient satisfaction, clinical case cancellation rate outcomes, and cost savings in a large metropolitan area (Los Angeles, CA).

METHODS: This is a descriptive study of a telemedicine-based preoperative anesthesia evaluation process in an academic medical center within a large metropolitan area. In a 2-year period, we evaluated 419 patients scheduled for surgery by telemedicine and 1785 patients who were evaluated in-person.

RESULTS: Day-of-surgery case cancellations were 2.95% and 3.23% in the telemedicine and the in-person cohort, respectively. Telemedicine patients avoided a median round trip driving distance of 63 miles (Q1 24; Q3 119) and a median time saved of 137 (Q1 95; Q3 195) and 130 (Q1 91; Q3 237) minutes during morning and afternoon traffic conditions, respectively. Patients experienced time-based savings, particularly from traveling across a metropolitan area, which amounted to $67 of direct and opportunity cost savings. From patient satisfaction surveys, 98% (129 patients out of 131 completed surveys) of patients who were consulted via telemedicine were satisfied with their experience.

CONCLUSIONS: This study demonstrates the implementation of a telemedicine-based preoperative anesthesia evaluation from an academic medical center in a metropolitan area with high patient satisfaction, cost savings, and without increase in day-of-procedure case cancellations. (Anesth Analg XXX;XXX:00–00)

KEY POINTS

- **Question:** Can telemedicine for preoperative consultations be accomplished in a metropolitan area?
- **Findings:** Preoperative telemedicine consultations can be accomplished in a metropolitan academic medical center with low case cancellation rate, high patient satisfaction, and patient cost savings.
- **Meaning:** Preoperative telemedicine consultations can be used successfully as an adjunct to in-person consultations before surgery.

GLOSSARY

ASA = American Society of Anesthesiologists; **COVID-19** = coronavirus disease 2019; **DRG** = diagnosis-related group; **EHR** = xxx; **EMR** = electronic medical record; **HIPAA** = Health Insurance Portability and Accountability Act; **IRB** = institutional review board; **PEPC** = preoperative evaluation and planning center; **RRMC** = Ronald Reagan Medical Center; **SD** = standard deviation; **SMH** = Santa Monica Hospital; **UCLA** = University of California, Los Angeles

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Accepted for publication August 14, 2020.

Funding: This study was supported by the NIH (1R01HL144692 and R01EB029751).

Conflicts of Interest: See Disclosures at the end of the article.

DOI: 10.1213/ANE.0000000000005208

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (www.anesthesia-analgesia.org).

Prior presentations: Huverserian A, Kamdar N. Telemedicine Preoperative Optimization Initiative at a Major Academic Medical Center. American Society for Anesthesiology Annual Conference. October 21, 2019 (selected for oral presentation and featured conference abstract); Thi WJ, Huverserian A, Maloney NJ, Kamdar NV. Savings Advantage of a Telemedicine-based Preoperative Evaluation in an Academic Anesthesia Program. American Society for Anesthesiology Annual Conference. October 21, 2019 (selected for oral presentation).

Telemedicine-based patient evaluation has reached an inflection point in modern medicine. The economic pressures on health care systems have influenced practice consolidation and, consequently, increased the geographic scope of patient care.[1,2] Major health systems now host patients spread across a large geographic scope, and, as a result, patients are accessing their health care systems from distant locations, particularly for highly specialized surgical care. Thus, preoperative anesthetic planning, assessment, and optimization must also be accomplished over greater distances. Health care systems recognize the importance of patient-centered care, the value of the patient experience, the importance of "on-demand" delivery of health care, and the fact that future patient demographics are accustomed to accessing goods and services (including health care) via mobile platforms.[3] While health care systems have incrementally incorporated telemedicine visits across specialties,[4] the coronavirus disease 2019 (COVID-19) pandemic forced the platform over the tipping point of acceptance for health systems, physicians, and even implementation skeptics.[5–7] At a time when state "shelter in place" policies made direct patient evaluation near impossible, telemedicine for perioperative care becomes even more relevant.

Despite preoperative evaluations reducing postoperative mortality,[8] anesthesiology had limited experience utilizing telemedicine for preoperative care,[9] and even more limited experience with this technology in large, urban health care systems. Therefore, the aims of this article are to (1) describe our telemedicine implementation experience, including descriptions of the technological platforms that we use; (2) highlight the patient experience best practices that we have learned and implemented during the maintenance of the program; (3) demonstrate patient-centered benefits from using telemedicine evaluations for preoperative anesthetic evaluations; and (4) elucidate implementation barriers and future questions.

A recent narrative review summarizes the collective experience with preoperative telemedicine evaluations from earlier studies.[10] Much of the original research comprised pilot studies in rural locations that demonstrated technological feasibility[11,12] and showed high acceptability for using telemedicine. Applegate et al[13] performed a randomized controlled trial of 82 telemedicine visits in an academic medical center, compared results to in-person visits in their preanesthesia assessment center, and showed low case cancellations (1/82) and high patient satisfaction. Mullen-Fortino et al[14] used telemedicine consultations in series and in conjunction with in-person consultation to reduce the consultation time of patients who presented to their preanesthesia assessment center.

Due to the dearth of experience with telemedicine and overall low adoption of telemedicine in anesthesiology as a specialty,[15] anesthesiologists must share telemedicine implementation experiences, challenges, and strategies to aid future implementation. Our group at the University of California, Los Angeles Health (UCLA) initiated a telemedicine-enabled preoperative evaluation initiative in August 2017, and, in this article, we describe its implementation and early results.

METHODS

The UCLA Health telemedicine preoperative anesthesia evaluation was initiated on August 1, 2017, within our division's preoperative evaluation and planning center (PEPC). In this article, we report on the period from its implementation until October 31, 2019. Institutional review board (IRB) approval was obtained but given exempt status for the purposes of analyzing and retrospectively reporting our results to facilitate improvements in the patient experience at UCLA Health; hence, patient consent was waived (IRB # 19-000554).

Setting: UCLA Health Department of Anesthesiology and Perioperative Medicine

As of October 31, 2019, the Department of Anesthesiology and Perioperative Medicine at UCLA Health comprises 121 faculty, 100 residents, 21 fellows, and 44 certified nurse anesthetists. The department serves 2 main hospitals: Ronald Reagan Medical Center (RRMC), located in Westwood, and Santa Monica Hospital (SMH), located in Santa Monica; 3 affiliated hospitals (Olive View Medical Center, Martin Luther King Hospital, and Harbor UCLA); and a growing community practice, including outpatient surgery. These hospitals serve UCLA Health patients through a distributed network of 170 UCLA Health medical clinic locations throughout the Southern California region. On a daily basis, the department provides anesthesia services to more than 90 operating sites and performs over 60,000 procedures annually. As UCLA Health is expanding its community medical practice to increase its foothold in Southern California and to engage in population health management, the 2 main hospitals (RRMC and SMH) serve a growing surgical patient population and frequently patients must travel from outside of the Los Angeles metropolitan area. Therefore, in-person preoperative evaluations pose a challenge for many surgical patients, especially those who have multiple comorbidities and need specialist consultations.

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While the UCLA Health PEPC evaluates nearly 36,000 cases via telephone interview and chart review, we physically see ~1000 patients in clinic annually (2.78%). We established the PEPC telemedicine program on August 1, 2017, to improve our consultation access to surgical patients when geographic distance and time constraints limit patient access to the PEPC clinic. The video component improved patient experience with face-to-face, digital, interactions with an anesthesiologist.

Intake for a preanesthesia evaluation is represented graphically in Figure 1. Many low-risk patients are evaluated with a chart review and short phone interview with our preoperative nursing staff. When surgeons or proceduralists deem anesthesiologist consultation necessary or preferable, they triage the patient to the PEPC clinic for an in-person or telemedicine visit by an anesthesiologist. Our single nurse navigator at the clinic site monitors that each patient's unique preoperative requirements from the consult are met before the day of surgery, conducts follow-up interactions, and helps schedule subsequent telemedicine visits if the anesthesiologist or the patient requests an additional appointment.

The PEPC team is made up of physicians (1 faculty in clinic per day from a group of 7 faculty), 4 nurse practitioners, 20 registered nurses, and 3 support staff. The clinic has 7 examination rooms equipped with an examination bed and a computer for electronic medical record (EMR) access (Epic, Verona, WI). A separate, private, physician workroom accommodates an attending anesthesiologist, 1 anesthesia resident, and either a nurse practitioner or a perioperative fellow. Each computer workstation in the workroom is equipped with a computer that has a built-in camera for telemedicine encounters. All telemedicine visits are conducted from the PEPC clinic located at RRMC in Westwood, CA.

Planning, Execution, and Capital Expenditures

Implementation was facilitated by the UCLA Telehealth implementation team in the Department of Information Technology before the June 2017 launch in our PEPC. The implementation team consisted of a medical director, administrative director, and 2 implementation managers. Time spent for the initial, nonintegrated, workflow is estimated to 40 hours by the implementation team. Technical infrastructure to integrate the video visit platform into our electronic health record system required an estimate of 1338 hours for all departments. Implementation of the platform to go-live is estimated at 269 hours for the health system, which included the development of a training plan, tip sheets, eLearning, and training for long-term support staff. Administrative and clinical champions from each service line were asked to complete an 8-week program to define the project scope, build the charter, establish use cases and video visit–specific outcome measures, and determine hardware requirements which accounted for approximately 10 hours of administrative time dedicated to the anesthesia service line.

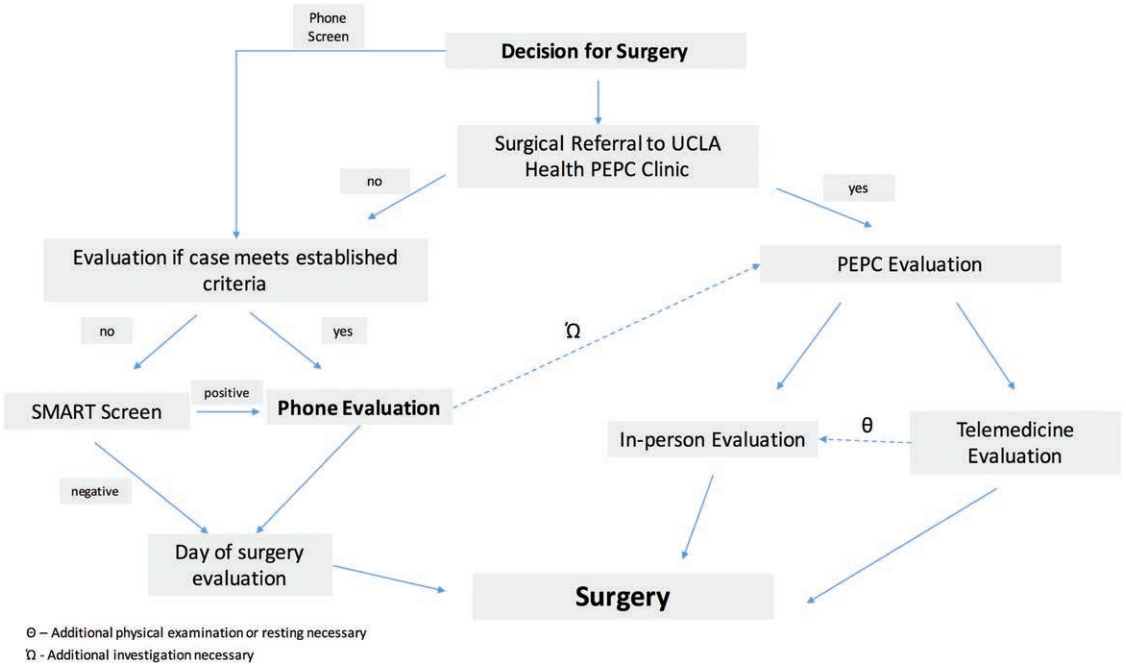

Figure 1. UCLA Health PEPC Screening Process for evaluation of preoperative patients suitable for a telemedicine visit. Dotted arrows indicate possible flow if clinical decision is made. PEPC indicates preoperative evaluation and planning center; UCLA, University of California, Los Angeles.

Telemedicine Visits

Once a patient or surgeon chooses a telemedicine consultation, PEPC staff assign an appointment date and time for their telemedicine preoperative consultation. As a care team, an attending anesthesiologist and anesthesia resident conduct the consultation via a video visit for 30 minutes. Consults include a verbal informed consent, a review of the goal of the visit, review of medications, and a full medical and anesthetic history with a brief examination of airway anatomy. The details of the anesthetic visit are seen in our document of best practices and workflow and given to each practitioner as a consult checklist before each telemedicine consultation (Supplemental Digital Content, Figure 1, http://links.lww.com/AA/D195).

Telemedicine Platform

During the period of this study, UCLA Health transitioned through 2 telemedicine platforms. From August 1, 2017 to June 8, 2018, PEPC telemedicine consultations were conducted via Zoom (Zoom Video Communications Inc, San Jose, CA). Zoom offers a Health Insurance Portability and Accountability Act (HIPAA) compliant platform with point-to-point encryption for video conferencing that was approved by our Office of Compliance Services for patient privacy through a Business Associate Agreement with the UC System. The PEPC scheduler confirms the appointment with the patient and then sends an individual meeting link directly to the patient via e-mail. Each link is unique to the individual meeting to ensure patient privacy. This platform was useful to start our initiative because it offered basic video conferencing tools and a stable login portal for both patients and clinicians. However, 1 difficulty with Zoom as a platform includes the inability to easily use photo capture to embed airway photos into the telemedicine assessment documentation. Additionally, appointments need to be made via patient e-mail rather than within the EMR. From June 8, 2018, UCLA Health transitioned to a video visit tool from Vidyo (Vidyo, Inc, Hackensack, NJ) that practices and health systems can license and integrate within Epic and use directly within the EMR system. At the time of this study, UCLA maintained a contract of 25 Vidyo licenses. Subsequent to transitioning to Vidyo, PEPC administrative staff scheduled patients directly within the Epic scheduling software; anesthesiologists logged into the video visit from the EMR-based clinic schedule. Patients logged into the myUCLA Health patient portal via the Epic MyChart application (Epic Systems Corporation, Verona, WI) on their smartphone or tablet. Their telemedicine appointment would be located within their appointments tab with a "Begin Visit" button allowing them to join directly in the app without any additional downloads. Due to the complexity of the website application for video visits, UCLA Health made an enterprise-wide operational decision to use a mobile-only option for patients as a way to optimize the user experience and avoid most technical problems. Within the video visit tool, an image capture tool was used to photograph the airway for the preanesthetic evaluation documentation for the day-of-surgery anesthesia care team. The interfaces for both patient and provider can be seen in Figure 2. Over the course of this study, these 2 different telemedicine platforms were implemented into our telemedicine program, and during the transition periods, there were a few technical failures.

Patient Satisfaction

To measure patient satisfaction, after completion of a telemedicine video visit, the UCLA Connected Health team issues each patient a patient experience survey via e-mail, as seen in Supplemental Digital Content, Figure 2, http://links.lww.com/AA/D195. Patients had the option to opt out of the experience survey. Eleven questions in 5-point Likert scale format are included in the survey, including a section for a free-text comment about the experience with the providers and the technological platform. Survey questions include items on interactions with the telemedicine team, technical ease of use, patient satisfaction, and future interest in telemedicine services. All responses are included in this analysis.

Case Cancellation Rate Analysis

We retrospectively compared the case cancellation rate of our telemedicine cohort to the current standard in-person clinic cohort. We extracted the total cases seen in the PEPC clinic using a digital extraction method from UCLA's DataMart[16] between January 1, 2017 and October 31, 2019. The total scheduled telemedicine and in-person visits were N = 419 and N = 1785, respectively. Case cancellations were tabulated if surgical cases were canceled on the day of surgery within 1 year of a presurgical anesthesia visit. Therefore, multiple surgical cases were possible for the same patient, thus accounting for 645 surgical cases among the telemedicine cohort and 3006 cases within the in-person cohort.

Calculation of Patient Cost Savings

We examined cost savings from the perspective of the surgical patient. In a metropolitan area, patients experience cost savings from both transportation to our clinic as well as time-based savings. The total direct cost to the patient included the total fuel cost, parking cost, and time-based savings (Supplemental Digital Content, Figure 3, http://links.lww.com/AA/D195). We used the median values for fuel costs and fuel economy among California vehicles ($3.36[17] and 24.90[18] mi/gal, respectively). Day parking at UCLA is $12. We

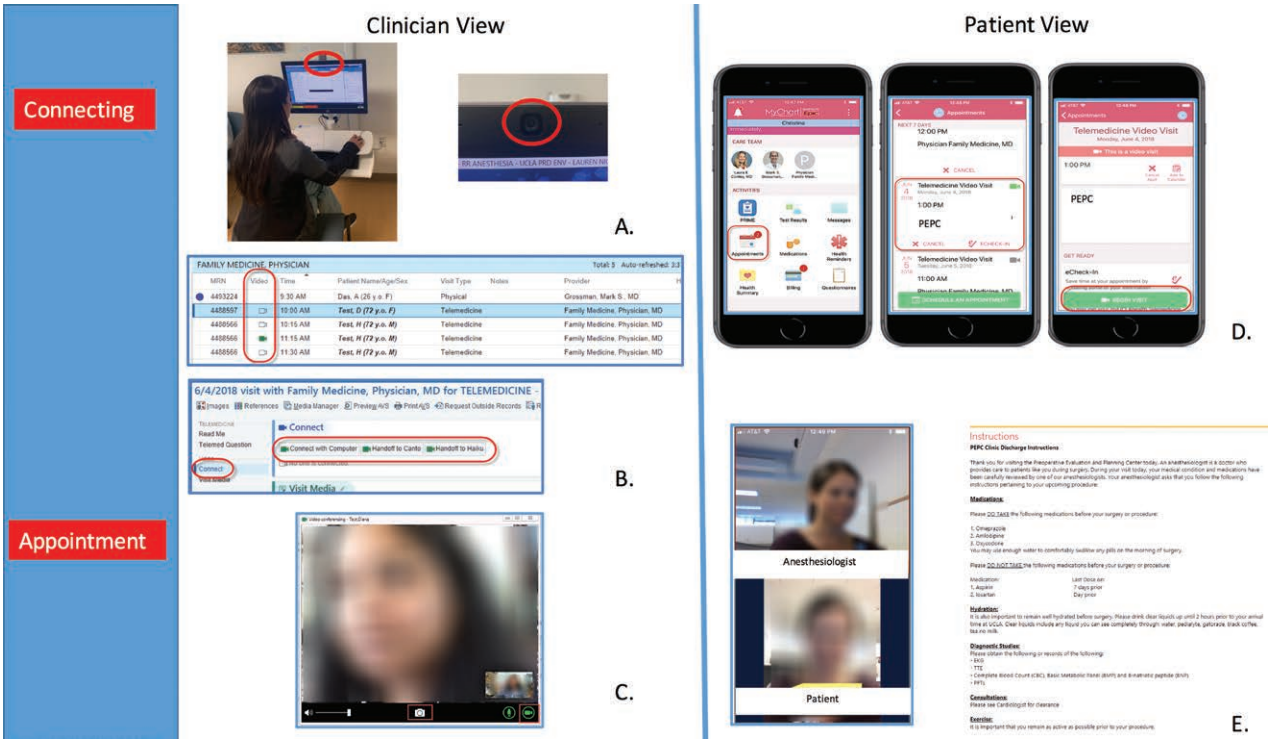

Figure 2. IT infrastructure. A, The computer console with the provider and video camera (left) on the upper panel of the computer monitor (right). B, Epic display that shows when the patient is active and ready for a telemedicine visit and is waiting for their provider to log into the encounter. The provider can connect either via the desktop computer monitor or from their mobile smartphone. C, The telemedicine encounter utilizes a window to display the patient with a smaller image to show the provider(s). D, The display from Epic smartphone mobile app so that patients can identify their video visit time and provider. E, The smartphone video encounter utilizes the phone's cameras to display both patient and provider on the single screen. The patient can obtain the after-visit recommendations within their phone directly from their anesthesia provider. ©Epic Systems Corporation. Used with permission.

conducted sensitivity analyses by varying the fuel cost ($3.15–4.00/gal), the median round trip distance (5–200 miles), and the fuel economy (15–60 MPG) to help characterize the range of total costs. The time-based savings were calculated by measuring the travel time from each subject's originating zip code to the UCLA PEPC clinic using Google Maps' Distance Matrix API (Google, Mountain View, CA). The methods were used and reported in previous literature involving telemedicine.[19] In our patient cohort, 14 zip codes were not entered into the EMR; hence, our time savings analysis was based on 405 subjects. We estimated the travel time with traffic by assuming morning telemedicine encounters occurring at 10 AM and afternoon encounters beginning at 1 PM. We used the median hourly wage in California ($20.40[20]) to calculate time-based savings for traveling to UCLA and conducted sensitivity analyses by varying originating distance and hourly wage to estimate the time-based savings of the subject cohort.

Statistical Analyses

Patient characteristics and study variables were summarized between the telemedicine and in-person cohorts using mean (standard deviation [SD]) or frequency (%) unless otherwise noted.

RESULTS

Demographics

In a 2-year period, we conducted N = 419 telemedicine preoperative consultations and N = 1785 in-person consults. On average, the population who used the UCLA PEPC telemedicine program was predominantly Caucasian and younger. Patient demographic characteristics are presented in Table 1.

Patient Satisfaction Data

Out of 419 patients evaluated by telemedicine, 131 (31%) of the patients completed the patient experience survey, 11 patients (3%) opted out from taking the survey, and 277 patients (66%) did not complete the survey. The majority of patients who responded to the survey (>90%) either agreed or strongly agreed with statements regarding what to expect from the video visit, confidence heading into it, clarity of video, meeting patient needs, overall satisfaction, and having more in the future (Table 2). Fewer patients (83% agree or strongly agree) found the technical process of joining to be easy, although still a clear majority. We present the results of the patient experience survey in Table 2.

Table 1. Demographic Characteristics of Patients Who Had a Telemedicine Encounter for a PEPC Video Visit Between August 2017 and October 2019 (Mean and 95% Confidence Intervals, Median, and Interquartile Range)

Variables	Telemedicine (N = 419)	In-Person (N = 1785)
Age		
Mean	56.1 (15.8)	61.1 (15.7)
Median	57 (45–68)	64 (51–73)
Sex		
Male	160 (38.2%)	699 (39.2%)
Female	259 (61.8%)	1086 (60.8%)
Race		
Native American	1 (0.2%)	9 (0.5%)
Asian	20 (4.8%)	153 (8.6%)
African American	28 (6.7%)	163 (9.1%)
Declined	4 (1.0%)	29 (1.6%)
LatinX	41 (9.8%)	301 (16.9%)
Other	48 (11.5%)	272 (15.2%)
Pacific Islander	0 (0.0%)	7 (0.4%)
Unknown	2 (0.5%)	9 (0.5%)
Caucasian	275 (65.6%)	842 (47.2%)
ASA physical status		
I	8 (1.9%)	21 (1.2%)
II	149 (35.6%)	484 (27.1%)
III	170 (40.6%)	885 (49.6%)
IV	16 (3.8%)	76 (4.3%)
Null	76 (18.1%)	319 (17.9%)

Abbreviations: ASA, American Society of Anesthesiologists; PEPC, preoperative evaluation and planning center.

Case Cancellation Rate Outcomes

Day-of-surgery case cancellations among evaluated patients occurred in 19 patients (2.96%) in the telemedicine cohort and 97 patients (3.23%) in the in-person cohort.

Travel Distance and Time Saved

The median round trip travel distance saved among telemedicine patients, as calculated from the patients' home zip codes to the UCLA PEPC Clinic, was estimated as 63 miles (Q1 24.7; Q3 119). When travel time and traffic conditions were factored, an estimated median of 137 minutes for a morning appointment (Q1 95; Q3 195) and 130 minutes for an afternoon appointment (Q1 91; Q3 237) based on traffic conditions were observed respectively. Figure 3 presents the geographical distribution of patients who participated in a telemedicine video visit with the PEPC clinic.

Patient Cost Savings With Telemedicine

The median round trip driving distance for patients in California who underwent a PEPC telemedicine visit was 63 miles. Direct savings per patient was estimated at $20 per visit (Q1 $15; Q3 $28). We conducted several sensitivity analyses and varied the round trip driving distance, fuel economy, and fuel prices per gallon. Savings for the patient ranged from $12 to $44 when round trip distances were 200 miles (Supplemental Digital Content, Figures 4–5, http://links.lww.com/AA/D195). The time-based savings based on initial assumptions was $46 (Q1 $32; Q3 $66). Sensitivity analyses were conducted to reflect the value of a telemedicine encounter based on wage (Supplemental Digital Content, Figure 6, http://links.lww.com/AA/D195). Therefore, the estimated median savings by using telemedicine for preoperative evaluation totaled $67 (Q1 $47; Q3 $94).

DISCUSSION

This retrospective study represents the largest published case series of telemedicine for preoperative evaluation in a metropolitan, urban, health system. Whereas we used telemedicine in place of in-person visits, in a comparable study, Mullen-Fortino et al[14] used telemedicine consultations in series and in conjunction with in-person consultation. Additionally, we discuss issues related to patient savings, satisfaction, and cancellation.

Patient Satisfaction

Similarly to other studies,[9,12,13] patients rated telemedicine consultations favorably. Mullen-Fortino et al[14] showed that 97.5% of patients preferred telemedicine-based applications for anesthesia presurgical evaluation. Of the 131 respondents, 129 of 131 participants (98%) "agreed" or "strongly agreed" that they were satisfied with a video preoperative consultation, with 120 of 131 patients (92%) reporting that they "agreed" or "strongly agreed" that they preferred these visits in the future. That said, 12 of 131 patients (9%) either "disagreed" or "strongly disagreed" that the technological link process was easy. Compared to other health centers with EMR-based video visits,[14] our group did not have a telemedicine coordinator review the download, login, or connection quality. Lack of an organized orientation program for patients may explain some patient dissatisfaction, particularly among our older demographic.

Case Cancellation Rate

Without a full physical examination, case cancellations or case delays are of concern in telemedicine consultations. We found the case cancellation rate among evaluated patients was similar between our telemedicine cohort (n = 19 patients, 2.96% case cancellation rate) and in-person cohort (n = 97 patients, 3.25% cancellation rate). Although our in-person cohort had a slightly higher American Society of Anesthesiologists (ASA) physical status, the results of our data demonstrate that, despite a limited physical examination, we can successfully use telemedicine on ASA physical status of I–IV patients without increasing case cancellation, as similarly reported at other institutions.[9,12,13]

Table 2. UCLA Health Telemedicine Patient Satisfaction Survey Results (n = 131/419 [31%] Patients)

Survey Question	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
The care team adequately explained what to expect during my video visit session	55	37	7	2	1
I felt confident in meeting with my provider via video visit	63	31	5	1	1
The technical process of joining the video visit was easy	50	33	8	5	5
I could clearly see and hear my provider during the video visit session	63	29	6	2	1
The video visit met my expectation for the needs of my appointment	67	30	2	1	1
Overall, I was satisfied with my video visit	70	28	1	1	1
Given the option, I would choose to have other appointments via video visit in the future	63	28	7	2	0

Abbreviation: UCLA, University of California, Los Angeles.

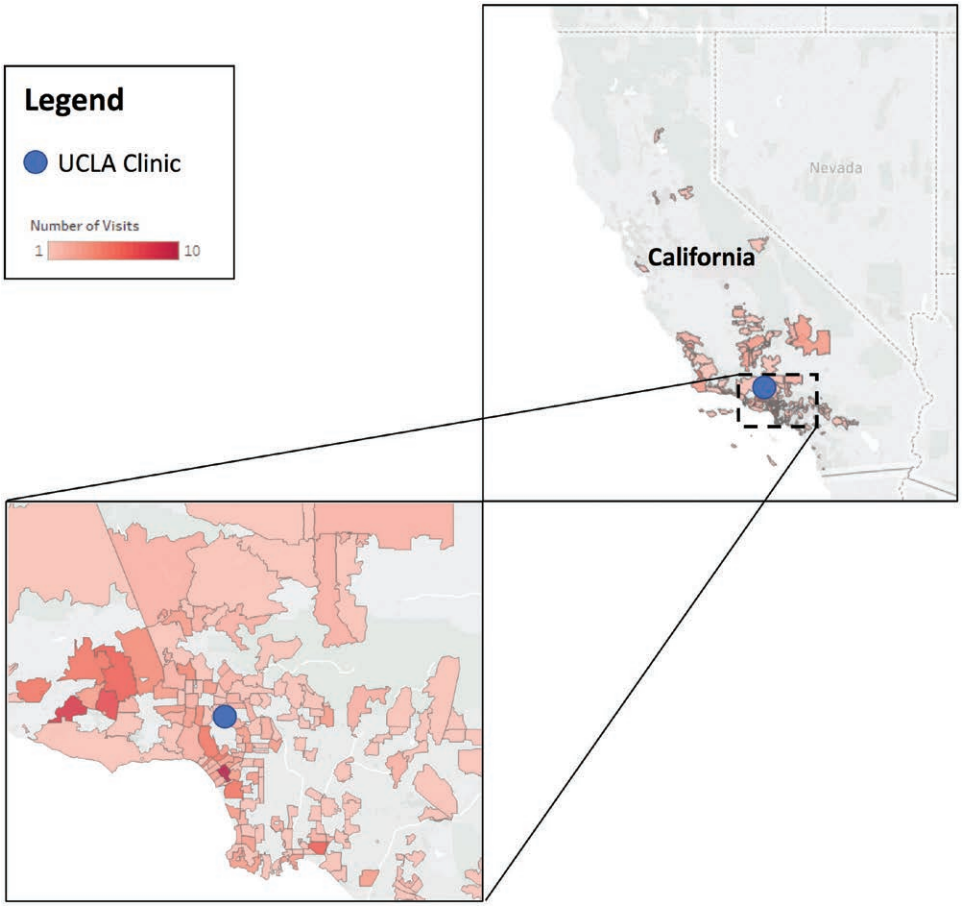

Figure 3. Geographical distribution of patients who had a UCLA Health PEPC telemedicine encounter. PEPC indicates preoperative evaluation and planning center; UCLA, University of California, Los Angeles.

Patient Savings

Telemedicine patients experienced direct savings in fuel and parking at the university campus. We conducted sensitivity analyses by varying fuel costs, distance, and fuel economy. Our results show that patients directly saved a median of $20. This savings becomes greater as driving distance increases. The time-based savings adds significant value to patients distant from the main consultation area, those on high-traffic routes, and those who experience opportunity costs from missed work. We provide a hypothetical clinical vignette demonstrating the cost savings for an individual patient (Figure 4). Reflecting a median wage of $20, the time-based opportunity savings is $46, bringing the total savings to greater than $65 per patient—greater than $43 previously published.[22] While studies from management consulting firms show time savings value scales particularly when the patient's socioeconomic status is high,[23] we found some savings across all socioeconomic statuses. Within the free-text feedback in the patient experience survey, participants rated eliminating transport highly. However, our analysis was limited, neglecting the unemployed, full-time students, retired, etc, who may reflect a $0/h opportunity cost. Future studies should investigate the consumer value and willingness to pay for telemedicine.

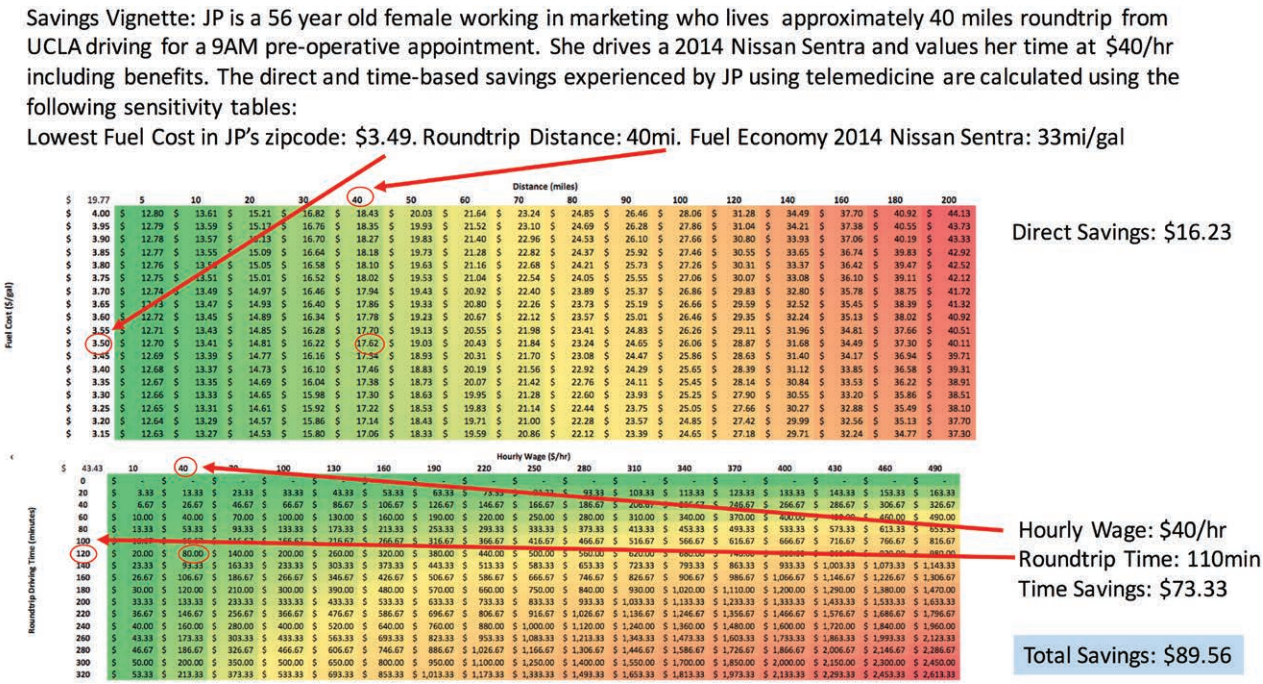

Figure 4. Savings vignette from a hypothetical patient to show readers how to navigate the sensitivity analyses presented in Table 3. UCLA indicates University of California, Los Angeles.

Geography

As a referral center in Southern California, UCLA Health treats patients inside and outside the metropolitan area; for residents of Los Angeles County, traveling short distances can take significant time due to traffic. Figure 3 shows the geographical reach of patients who received a telemedicine preoperative consultation. While some patients were in Northern California and the Central Valley, a vast majority of patients within neighboring counties to UCLA opted for a telemedicine visit. Because Los Angeles has high traffic congestion,[24] patients significantly value time saved with video visits from home or work. Compared to other studies conducting telemedicine consultations with patients in rural areas, our data show that there is high demand for telemedicine preoperative consultations even within metropolitan areas over shorter distances.

Organizational Learning and Telemedicine Best Practices

Our case series of 419 telemedicine preoperative consultations gave our group insight into telemedicine best practices. Our PEPC Clinic keeps a best practices checklist within each room where telemedicine consults occur (Supplemental Digital Content, Figure 1, http://links.lww.com/AA/D195), outlining necessary communication points about telemedicine consent, limited physical examination, and necessity to capture still airway images for EHR documentation. The largest participants in telemedicine emerge from a younger demographic accustomed to "on-demand" services. Therefore, we aimed for punctual telemedicine consults. To facilitate patient satisfaction and workflow of our in-person anesthesiology clinic, telemedicine encounters were kept to 30 minutes.

Future Challenges

Telemedicine among anesthesiologists is nascent; thus, many questions remain unanswered and many challenges remain. From a financial perspective, telemedicine reimbursement remains regulated on a state-by-state basis; individual state health plans have individual stipulations for reimbursement, and these regulations need to be understood by anesthesiology departments in their respective state of practice. While, typically, Medicare does not reimburse for telemedicine visits, Congress lifted those provisions for the COVID-19 pandemic. We hope the telemedicine parity laws within 30 states, mandating commercial insurance companies to reimburse services for telemedicine visits, will expand nationwide. These policies are evolving, and we expect more US states and commercial insurers will provide reimbursement for telemedicine services, broadening the use of telemedicine for outpatient encounters. At UCLA, PEPC telemedicine visits were bundled within the surgical diagnosis-related group (DRG) both to aid both adoption of telemedicine visits before the day of surgery and as a value-add to preoperative optimization.

Limitations

This study has several limitations. First, this is a retrospective, nonrandomized implementation

study for telemedicine preoperative consultation. Although we present cancellation results in telemedicine and in-person consultation workflow, we did not randomize the patient population to test if telemedicine consultations were noninferior to in-person consultation and do not make direct statistical comparison. Rather, this study demonstrated feasibility of telemedicine implementation in opposition to a brick and mortar preanesthesia evaluation center. Second, we did not make statistical comparisons between the in-person and telemedicine cohorts to compare demographic and case cancellation data, which would require controls for confounding bias. Finally, our patient satisfaction scores were measured only in the telemedicine group and our technological platform changed from Zoom to an Epic-bundled product midway during our retrospective analysis. Therefore, change in satisfaction could have resulted from the change in platform itself. However, we did not see a significant change in satisfaction scores before and after a change to our platform.

CONCLUSIONS

This study examines a 419 patient case series of telemedicine for preoperative consultation in patients across surgical service lines in a large, tertiary, metropolitan health center. We describe telemedicine implementation among ASA physical status of I–IV patients as the cornerstone of our preoperative evaluation enterprise at our academic medical center, low levels of case cancellations or delays, and high patient satisfaction with the technology and platform. We show direct patient savings from transportation costs and illustrate that larger savings could be realized due to opportunity cost savings. Our article illustrates that anesthesiologists can use telemedicine safely, efficiently, and with high patient satisfaction with savings benefits within metropolitan areas where patients may be geographically near but temporally far from health care institutions. We conclude that the UCLA PEPC telemedicine program may be an effective and appropriate substitute for face-to-face PEPC visits in an urban metropolitan area, and our experience illustrates that anesthesiologists can use telemedicine as a capstone technology and platform with which to interact and consult with patients in the perioperative environment. Implementation of telemedicine in anesthesia practices across the United States should be further explored, and the impact on departmental revenue should be quantified.

ACKNOWLEDGMENTS

The authors acknowledge the Division of Informatics, Dr Eilon Gabel and Ira Hofer, in particular, for assisting the authors to obtain data for the retrospective review of the cohorts in this article. The authors also acknowledge the UCLA Telehealth Administrative team, particularly Erin Thomas and Heather Hitson, for their implementation support and data acquisition.

DISCLOSURES

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Contribution: This author created the study and helped author the primary manuscript.
Conflicts of Interest: Dr Kamdar is a seed preferred shareholder and medical advisor to HAI Solutions LLC and a medical advisor to Heartcloud Inc.
Name: Ari Huverserian, MD.
Contribution: This author collected the data, conducted data analyses, and helped author the primary manuscript.
Conflicts of Interest: None.
Name: Laleh Jalilian, MD.
Contribution: This author helped write and review the final manuscript.
Conflicts of Interest: None.
Name: William Thi, BS.
Contribution: This author helped collect and analyze data for the manuscript.
Conflicts of Interest: None.
Name: Victor Duval, MD.
Contribution: This author designed the infrastructure to conduct the study and helped write sections of the final manuscript.
Conflicts of Interest: None.
Name: Lauren Beck, MD.
Contribution: This author helped collect the data for the manuscript.
Conflicts of Interest: None.
Name: Lindsay Brooker, MPP.
Contribution: This author helped maintain the technical infrastructure of the program and write and edit the final manuscript.
Conflicts of Interest: None.
Name: Tristan Grogan, MS.
Contribution: This author helped conduct all the statistical analyses and write the methodological sections of the manuscript.
Conflicts of Interest: None.
Name: Anne Lin, MD.
Contribution: This author implemented the infrastructure for the study and reviewed the final manuscript.
Conflicts of Interest: None.
Name: Maxime Cannesson, MD, PhD.
Contribution: This author helped write and review the final manuscript.
Conflicts of Interest: Dr Cannesson is a consultant for Edwards Lifesciences and Masimo Corp, and has funded research from Edwards Lifesciences and Masimo Corp. He is also the founder of Sironis, owns patents, and receives royalties for closed-loop hemodynamic management that have been licensed to Edwards Lifesciences.
This manuscript was handled by: Thomas M. Hemmerling, MSc, MD, DEAA.

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