



Research Article

Timesaving in Surgical Office Visits with Telemedicine: The Lasting Legacy of Covid-19 and the Need for Artificial Intelligence

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Abstract

Introduction: Since the onset of the Covid-19 pandemic, virtual office visits is becoming a part of the permanent landscape of medicine, highlighting the importance of studying their impact on medical and surgical practices. This study examines the impact of virtual appointments on time spent in the office of a surgical practice.

Materials & Methods: 201 patient appointments from a combined bariatric and general surgery practice were included in this retrospective cohort study from November 2020 through December 2020. There were 104 in-office visits and 97 virtual visits. Descriptive statistics and student t-test were used to analyse the data based on visit types (new vs. established vs. post-op appointment). Also was included the average length of time spent by the medical assistant per patient during the in-office visits.

Results: The average length of time spent on new, established, and post-op patient visits conducted in the office setting were significantly longer than those conducted virtually (60+/-20 vs. 12+/-5 min, $p<0.001$) (47+/-27 min vs. 6+/-3 min, $p<0.001$) (49+/-21 min vs. 5+/-2 min, $p<0.001$) respectively. This did not include the prep time of the virtual visits or the physician's time in reviewing the medical records or tests. Additionally, office staff members spent an average of 4.9+/-2.6 minutes per patient in triage during in-office visits, whereas they were not required to participate in virtual visits when conducted. The missing portion of these visits were the ability of obtaining vital signs, which could be solved by the addition of some type of artificial intelligence (AI).

Conclusion: The use of telemedicine technology to conduct virtual appointments within a surgical practice saves a significant amount of time for patients, physicians, and office staff when compared to in-office visits for specific cases. The missing portion of these visits could be solved by utilizing AI in the future.

Keywords: Virtual Appointment; Telemedicine; Artificial intelligence

Introduction

With the rapid development of new telecommunication technologies since the beginning of the 21st century, the use of telemedicine in healthcare emerged and has been growing at a relatively steady pace until the onset of the Covid-19 pandemic [1-3]. The threat of the virus and the subsequent need for physical

distance forced the healthcare industry to quickly expand its use of virtual patient appointments to nearly all fields of medicine, including surgical specialties [4,5]. However, as the spread of the virus has slowed, the use of video technology to conduct virtual appointments has declined but it is still being used at a higher rate than before the pandemic era. This slowdown is due, especially in the surgical practice, to the patients' preference in establishing a face-to-face relationship with their surgeon especially on their first consultation visit, rather than meeting the surgeon on the day

of the surgery [6]. As such virtual visits are becoming a part of the permanent landscape of medicine, highlighting the importance of studying their impact on both medical and surgical practices [7,8]. This study examines the impact of virtual appointments on time spent in the office of a surgical practice. What is missing from these visits is the ability to document the vital signs. However, Artificial Intelligence (AI) is evolving and there are many attempts to be involved in the medical field, which could solve this issue in the future in spite of many obstacles [9].

Materials & Methods

A retrospective cohort study was conducted using tracked time data from all patient appointments for a single surgeon's office with a combined bariatric and general surgery practice. The office visits were conducted twice a week; on Mondays from 1:00 pm to 5:00 pm and on Thursdays from 11:00 am to 5:00 pm using 4 exam rooms and one medical assistant (MA) to triage the patients. The study was conducted from November 2020 through December 2020. It included 201 patients where 104 were in-office visits and 97 were virtual visits. Appointments with incomplete or missing time data were excluded. Of the in-office visits, there were 34 (33%) new patient appointments, 41 (39%) established patient appointments, and 29 (28%) post-op appointments. Of the virtual patient appointments, 5 (5%) were new patient appointments, 46 (47%) were established patient appointments, and 46 (47%) were post-op appointments (Table 1). The total length of time for each appointment was reviewed.

The study used a commercially available telemedicine application with capability of video saving of the interview.

The typical office flow for a new patient visit starts by the patient signing in and filling the medical/surgical history and review of systems. The MA then enters the patient's data into the electronic medical record (EMR). During this period, the patient is waiting in the reception room. After the data is entered, the patient is then brought to the triage room for measurements and vitals then placed in the exam room while the data are being entered into the EMR system before the chart is given to the surgeon to see the patient. For the established and post-operative visits, all patients enter the triage room for vitals then they are placed in the exam room. Meanwhile the MA will enter the data in the EMR while the patient is sitting in the exam room waiting for the surgeon.

The study start time for the in-office visits began when the patient signed into the office and ended when the patient exited the exam room following the completed visit (Table 2). On the other hand, for the virtual visits of a new patient, the MA interviewed the patient on the phone. The data of the history and review of systems were entered on the EMR and the patient was then asked to download the telemedicine application from the App store onto the smart phone and was instructed on how to take an appointment.

On the other hand, for the established patient, if the application was not download previously, he/she was asked to followed the same steps as a new patient. Otherwise, the patient was asked to schedule the appointment on the application. These data entries occurred typically before the visit when the MA had free time during the week. However, for the post-operative visits, if the patient did not download the application previously, he/she was sent an invitation to his/her smart phone either when the patient was in the pre-op hold area, for outpatients, or on the day of discharge, for the in-patient. The patient was guided on how to take a post-op appointment.

Start time for the virtual appointments began when the virtual call was connected on the day of the visit and ended when it was disconnected (Table 3). The application has the capability of video recording and saving the interview on the smart phone of both the patient and the surgeon. These data did not include the surgeon's time in reviewing the medical records or tests that the patients brought in with them or the time of search and reviewing them on the EMR prior to the visit. In addition, it did not include the time of the surgeon which was spent in entering the data and completing the EMR for completion of the visit and billing.

Descriptive statistics and student t-test were used to make a comparison between the in-office and the virtual appointment lengths, based on visit type (new patient vs established patient vs post-op appointment). Average length of time spent by medical assistant staff per patient during in-office visits was also reviewed and included.

Results

The average length of a new patient visit conducted in the office was significantly longer than for virtual appointment (60+/-20 vs. 12+/-5 min, $p<0.001$). Likewise, the average length of an established patient visit conducted in the office was significantly longer than for a virtual visit (47+/-27 min vs. 6+/-3 min, $p<0.001$), and the average length of an in-office post-op patient visit was significantly longer when compared with a virtual post-op patient visit (49+/-21 min vs. 5+/-2 min, $p<0.001$).

When looking at the breakdown of the time of these visits we see that the majority of the time was spent in patients waiting to fill their information and triage, as well as, waiting to see the surgeon (Table 1). Unfortunately, the face-to-face time of the surgeon was not documented to be able to compare it directly with the virtual time, which is technically all face-to-face. All virtual visits were scheduled toward the end of the office day from 3:00 pm to 5:00 pm where the MA was not required to stay or participate in these visits. This allowed the staff to finish their work on time and leave by 5:00 pm. The time spent on entering the data into the EMR for these virtual visits was not calculated since it occurred whenever the MA had free time during the week to call the patient and

prepare for the visit. Whereas in the in-office appointments this required the medical assistants to spend an average of 4.9+/-2.6 minutes per patient collecting vitals and entering preliminary history into the EMR prior to the physician entering the exam room. As a historical flash back before using the virtual calls we rarely finished the office on time and often the hours were extended to 6:00 or 7:00 pm before all patients were seen resulting in extra overhead cost for overtime and longer office hours for the surgeon which was spent in waiting for the patients to be ready to be seen.

When evaluating the types of visits, we found almost equal split between all three types for the in office visits, while there was a shift toward established and post-op patients than new patients for the virtual visits (Table 3). In further evaluation of the disease, process we notice that established patients (majority bariatric follow-ups) did not mind to have either in office or virtual appointments. While new patients opted more for the in-office visits. On the other hand, the post-operative patients preferred the virtual visit especially for those who were given results of diagnostic testing or endoscopy and those with post-operative uncomplicated well-healed incisions who had no drains or sutures/staples to be removed.

Type	In-office	Virtual
New	34 (33%)	5 (5%)
Established	41 (39%)	46 (47%)
Post-op	29 (28%)	46 (47%)
Total	104	97

Table 1: Types of visits.

Type	Number	Check in to triage	Triage to Room	Room to check out	Total time
New	34	19	6	35	60
Established	41	13	5	29	47
Post-op	29	12	4	23	39
Total	104	15	5	29	49

Table 2: In-office visits times.

Type	Number	Virtual time
New	5	12
Established	46	6
Post-op	46	5
Total	97	5

Table 3: Virtual visits times.

Discussion

The results of this study demonstrate a very important fact; a surgical practice that incorporates virtual appointments can save a significant amount of time in the office for the surgeon, the patient, and the office staff. The surgeon does not have to wait for the patient to be brought back to the room while having the vitals checked, or wait for the room to be cleaned and turned over for the next patient, if only one exam room is available. Also, there is no need to share rooms and waiting for them to be turned over when multiple physicians are seeing patients at the same time utilizing the other exam rooms. In addition, the patients do not have to drive to the surgeon's office and spend the majority of their time in waiting just to be seen for a few minutes for post-op evaluation of

an uncomplicated recovery or having a blood test results or discuss endoscopy findings.

Although some amount of patient's waiting time is common and often unavoidable in a medical office setting, it surely has value to the patient and affects his or her impression of the entire patient-doctor experience. It is possible that the short length of the virtual appointments will result in more follow-up phone calls, as the patient might not have had enough time to think of all the questions at the time of the call. However, the application that was used in our study has a feature of saving the virtual appointment for the patient with the ability to review the encounter at a later time or share it with relatives. This feature may prove to be very beneficial and cut down on time for future calls to recall what the

physician discussed with the patient. This is especially valuable if it involves directions or different management protocols of malignant problems.

Perhaps the most important aspect of virtual appointments of this study is the confirmation of the finding of the survey that was conducted by Sorensen et al. [7] proving that new patients prefer to have a face to face relationship with their surgeon on their first visit. The potential clinical consequence of not conducting a hands-on physical exam may be overcome by the future development of new technologies through AI allowing the physician to streamline which surgical diseases can lend itself to be conducted using virtual vs. hands on type of evaluation. Missing incidental finding on physical exam is a drawback to telemedicine. Physicians may find unrelated pathology to the reason why the patient is seeing them for which could be lifesaving. As such, studying the clinical consequences of virtual appointments will be important in understanding the impact of virtual appointments on patients' health moving forward, as well as, identifying cases that might be inappropriate for virtual visits.

There have been many attempts at incorporating AI into the medical practices. However, many obstacles need to be overcome before AI can be ready to be utilized in clinical application [9]. Adding the vital signs to the virtual visits may overcome one of the negative aspects of these encounters. In our practice, we have found that virtual appointment technology is particularly useful for follow-up appointments to share test results with established patients or for bariatric patients to follow up on their weight loss and keep them on track. On the other hand, new patients and unfavourable test results are often better delivered in person. Putting a hand on a patient shoulder or providing him or her with a Kleenex, for example, are an essential part of the art of medicine and the act of humanism, which is impossible to replicate via telecommunication.

The challenges that exist in preventing the wide spread use of telemedicine due to the unfamiliarity of a segment of older patients with these technologies, along with the limitation of the availability of smart phones or access to the internet in some areas, may not be present in the future. The younger generations are well versed in these technologies. In addition, the expansion and the increase speed of the internet and the utilization of AI is going to be a big factor in the wider use of telemedicine and gaining larger presence in the armamentarium of future medical practices.

Conclusion

The use of telemedicine technology to conduct virtual appointments within a surgical practice saves a significant amount of time for the patient, the physician, and the office staff when compared with in-office visits. However, more research is needed to look at patients' satisfaction, as well as, the potential

clinical consequences of a surgeon foregoing a hands-on physical assessment of new, established, and post-operative patients. The capability of saving the recording of the virtual interview may prove to be beneficial for both the physicians and patients, which requires further evaluation. This is in addition to the utilization of the AI in providing additional value to these visits such as vital signs and cardiac strips. We are currently scratching the surface of telemedicine. The future advances in technology and AI are going to be the drive behind a wider spread in the incorporation of this methodology in the future medical practices.

Highlights

- Average length of time of new, established and post-op patient appointments in the office setting versus virtual setting in a surgical practice.
- Average amount of time spent by office staff per patient during in-office appointments in a surgical practice and utilization of resources.
- Types of surgical visits that can be best handled by virtual appointments.
- The need for incorporating Artificial Intelligence into Virtual Calls.

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