



# Rethink Thoracic Surgery as a Whole after the Pandemic: How to Optimize Resources and Deliver Excellent Patient Care

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## Abstract

Telemedicine has recently emerged as a powerful tool in healthcare delivery in various surgical specialties. The COVID-19 pandemic restrictions have challenged care of surgical patients, both preoperatively and postoperatively. Previously predominant in-person clinic visits of postoperative patients have been shifted to a virtual platform for patients' evaluation and follow-ups. Current literature indicates that there is no difference in postoperative emergency department visits and 30-day readmission rates between virtual and in-person clinic visits. In addition, virtual platforms offer several advantages, such as good clinical outcomes, enhanced patient satisfaction, increased accessibility to timely care, reduced cost, travel and waiting times. Thoracic surgeons should recognize the value of telemedicine and continue adopting and developing the practice as the new norm. We suggest that if given an appropriate virtual system, most elective thoracic oncology resections could be followed virtually post hospital discharge.

**Keywords:** COVID-19; Thoracic surgery; Postoperative care; Virtual clinic; Telemedicine; Telehealth

## Introduction

The worldwide emergence of Coronavirus Disease-2019 (COVID-19) in early 2020 has dramatically changed how medicine is practiced. The pandemic has created a massive public health crisis, leading to increased risk of exposure for both healthcare providers and patients. Due to travel and contact restrictions, previously predominant in-person clinical visits, both pre- and post-operatively were shifted to a virtual platform for patient evaluation and care in many surgical specialties, such as in thoracic surgery. The COVID-19 pandemic has certainly changed the way surgeons assess patients preoperatively and postoperatively, as well as the ways they follow patients for oncologic surveillance. Mostly, patients' fear of coming to the hospital postoperatively or to the emergency department has negatively influenced outcomes and have forced surgeons to change their practice accordingly. Overall, telemedicine has emerged as an increasingly used tool around the world in the current pandemic era, now allowing providers to communicate with patients remotely in a safe fashion, yet its use for surgery in the future remains to be assessed.

In this paper, we will review the impact of COVID-19 pandemic on surgical postoperative care, especially with thoracic postoperative patients. We will then review patient experiences of virtual care in the current literature and the remaining challenges of telemedicine.

## COVID-19 Pandemic and Thoracic Surgical Postoperative Care

The definition of telemedicine or telehealth includes any form of electronic communication in medicine, whether between clinicians, clinician to patient, or patient interaction with mobile health technology [1]. This platform allows to minimize preoperative in-person office time effectively, reduces need for total number of postoperative clinic visits and emergency department visits [1].

Many institutions in China and the United States have significantly increased the use of telemedicine in response to the COVID-19 pandemic [2]. In the US, the Centers for Medicare and Medicaid Services have essentially waived co-pays for telemedicine visits to encourage its utilization during the pandemic. In addition, Jefferson Health 2020 publication describes the complete transition to telemedicine for both preoperative and postoperative evaluations for thoracic surgery patients [3]. Similar restructuring has been reported in other centers in the US, Canada and in

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Europe, highlighting the need of telemedicine in thoracic surgery practice for the anticipated future to ensure safety of patients, healthcare providers and supportive staff [4,5].

In the field of general surgery, a prospective study of 219 patients undergoing either elective or emergency abdominal surgery was conducted in which patients were given the option to have either a telemedicine or an in-person postoperative follow-up during the pandemic [6]. Minor and major complication rates showed no differences between telemedicine and in-person follow-up groups [6]. Their findings indicated that telemedicine postoperative follow-up could be effectively and safely performed in selected groups of surgical patients in the context of the current pandemic [6]. Moreover, a randomized non-inferiority controlled trial was recently conducted to evaluate the outcomes of patients who have a post discharge video-based virtual visit follow-up compared with in-person follow-up following emergency laparoscopic appendectomy or cholecystectomy [7]. This trial included 432 adult patients and demonstrated that the post discharge hospital encounter (readmissions or ER visits) was not significantly different (12.8% for virtual vs. 13.3% in-person). It also showed that virtual follow-up was not associated with increased need for care and provided shorter overall time commitment for visits [7].

In thoracic surgery, after the 2018 study from the US Veterans Affairs (VA) system, a virtual consultation system was originally developed for veterans with pulmonary nodules who were having difficulty accessing specialty thoracic care [1]. This survey demonstrated that veterans who completed a virtual consultation had reduced mean time to consultation, decreased hospital costs and travel costs [1]. Similar study in Canada published in 2003 and 2015 showed decreased travel distance and costs for patients living in remote areas in the province of British Columbia to access thoracic surgeons *via* "virtual thoracic surgery clinics" [8]. Ferrari-Light demonstrated that telemedicine visits for patients undergoing major thoracic surgery had excellent outcomes and high satisfaction for both preoperative and postoperative telehealth visits. Preoperative telehealth visits also allowed the opportunity to evaluate the patient and patient-environment to assess functional limitations, home support and infra-structure of the patient [1]. Any potential challenges to safe recovery at home were readily recognized and addressed prior to surgery.

One of the most gratifying aspects of telemedicine in thoracic surgery is the ability to provide support and promote safe recovery in postoperative phase after lung resections. A recent retrospective review of elective thoracic surgery patients from 2017 till 2019 by Tham et al. [9] showed that postoperative telehealth visits were able to reduce emergency department visits (2.4% vs. 15.2%,  $p < 0.0001$ ) and 30-day readmissions (3.4% vs. 17.4%,  $p = 0.0006$ ). Cleeland et al. [10] also showed that post thoracotomy patients who had frequent symptom telemonitoring had a greater reduction and decline in events related to moderate to severe symptoms. Both patients and clinicians were satisfied with the automated telemedicine survey system and postoperative symptom control [10]. Overall, telehealth services providing web-based and Smartphone apps accessible on-demand have also been successful in promoting recovery through motivation and positive reinforcement [1]. A study in Netherlands previously showed that post lung resection patients found that telehealth programs were beneficial in their recovery phase [11]. Furthermore, postoperative chest tube management using digital chest tube drainage systems at home can be followed by telemedicine

and telemonitoring systems. Digital drainage systems help reduce risk of postoperative air leak, decrease treatment time and hospital stay by monitoring parameters virtually [1]. In addition, patients discharged home with chest tubes and connected to a digital drainage system can have their tubes removed accurately when the air leak stops, as the system provides an objective measurement. Patients can submit daily data *via* telemedicine and present to clinic to have their chest tube removed on the day of air leak resolution instead of having the surgeon schedule an in-person clinic appointment to subjectively evaluate the tube and air leak for possible removal [1].

An outpatient community care access program called Integrated Comprehensive Care (ICC) program was implemented by our Division of Thoracic Surgery at McMaster University, following all thoracic surgery patients post discharge after lung resection within a specific geographic area. This program has been shown to be associated with cost-effectiveness, shorter length of stay, fewer emergency department visits and less readmissions after discharge [12,13]. With the advent of the COVID-19 pandemic, our center also moved to "all virtual" post discharge follow-up visits for all patients undergoing lung resection for malignancies using telehealth video or telephone platforms. The combination of our ICC program and virtual clinic follow-up visits have so far been successful in providing postoperative patient-centered care with no need for in-person visits to hospital for the majority (>80%) of patients post elective lung resections and no additional post discharge complication, while patients are being followed at home on an "as-needed" basis by the ICC team (unpublished data 6.2021).

## Patient Experiences of Virtual Visits

A recent survey was conducted by a multidisciplinary musculoskeletal team in British Columbia from mid-March to May 2020 to assess patient experiences on the delivery of medicine switch to a virtual platform during the pandemic [14]. Patients did favor the virtual platform for several reasons, including decreased time of travel, decreased requirement for caregiver assistance, shorter travel distances, decreased time at doctor's office, ease of platform use, and the fact that use of virtual platform is less costly [14]. Travel to in-person clinic appointments is associated with cost of fuel and resulting greenhouse gas emissions [14]. On the other hand, negative effect on patient experiences were tardiness in contact of 10 min or more and technical difficulties in establishing working video link [14]. Given these issues, surgeons should schedule virtual patient contacts to minimize delays and invest in a practice call to confirm that the video link works well before actual clinical contact [14]. Interestingly, in this survey, only 20% of patients requested that future clinical visits are conducted in-person.

Another retrospective single-site cohort study was carried out in which an anonymous voluntary survey was performed to assess patient satisfaction on use of telemedicine in surgical specialties, such as general surgery, otolaryngology, plastic surgery, urology and vascular surgery [2]. Telemedicine was demonstrated to be an acceptable form of keeping communication between patients and healthcare providers during the COVID-19 pandemic. Many patients expressed that they would prefer a clinic visit in the immediate postoperative period, although they could have their surgical needs mostly met with virtual medicine [2]. For preoperative assessment, a previous survey study of veterans affairs patients using virtual platform found that 85% felt telemedicine was as good as in-person visits [2]. Ferrari-Light et al. [1] conducted a preoperative evaluation

with thoracic surgery patients and patients reported high marks for surgeon communication in the postoperative satisfaction surveys. In the future, telemedicine may be used more widely for preoperative and long-term follow-up of surgical patients.

## Challenges Ahead

Mehrotra et al. analyzed 50 million outpatient visits from February to October 2020 in the United States and reported that there is a resurgence of in-person outpatient visits to pre-COVID-19 levels with concomitant decline in telemedicine visits [15]. This phenomenon may indicate that both clinicians and patients may view the use of telemedicine as a temporary substitute for in-person visits during the COVID-19 pandemic.

The most common concern for virtual visits is the less than perfect ability to perform an adequate clinical assessment and physical examination of patients [2]. In response to this concern, several specialties like orthopedic surgery, ENT, urology and plastic surgery, have described protocols to optimize positioning methods to visualize surgical sites in telemedicine visits to maximize efficiency [2]. Gunter et al. also described an image-based application for vascular surgery patients to monitor wounds and surveillance of surgical site infections [16] during postoperative visits.

In addition, developing interpersonal relationships with patients is a fundamental attribute of high-quality surgical care [17]. In order to achieve this high standard, a more targeted application may be required, such as adjustment of expectations of telehealth and its tools to establish confidence between patients and clinicians [18]. Additional efforts for privacy data protection are still needed [18]. Technological innovations are also required to enhance surgical diagnostic capacity of telehealth [18], such as use of wearable portable devices that transmit patient data continuously, which may provide the surgeon in making more informed decisions when examining patients during a virtual postoperative visit [18]. Lastly, telemedicine services need to be widely accepted for continued coverage and funding from different payment models and healthcare systems. To maintain this model of healthcare delivery, further refinement of the existing policies needs to be made, especially in healthcare systems with direct relationship with insurance companies [18]. Additionally, more rigorous prospective trials are needed to confirm the non-inferiority of virtual care.

## Conclusion

Overall, telemedicine has emerged as a strong and necessary tool in the delivery of safe healthcare to surgical patients. Several pre-COVID studies have shown its effectiveness in the preoperative and postoperative care phases of surgical patients. During the COVID-19 pandemic, the rapid implementation of telehealth has certainly alleviated challenges associated with contact precautions and therefore, it has solidified its potential as an important tool in future healthcare delivery. Notably, telemedicine has been widely used in thoracic surgery during the pandemic. Thoracic surgeons should recognize the value of virtual medicine and continue adopting the practice as the new norm rather than as a temporary measure during the pandemic. We suggest that if given an appropriate virtual system, most elective thoracic oncology resections could be followed virtually, preferably with an adequate out-patients support systems, enabling prompt identification of post-discharge complications and patients who are at need to be seen in person prior to clinical deterioration. We are currently evaluating our own institutional experience over

the last 18 months and, should this analysis show no compromise in patient care and outcomes, we will be implementing a fully virtual postoperative care for our patients. While struggling how to practice best-practice medicine in such a challenging era, some changes, originally forced upon us by this on-going massive scale epidemic, might in fact pave the way to a more efficient, 21<sup>st</sup> century practice!

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