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Pivoting to telemedicine in a single-day multidisciplinary liver tumor clinic during COVID-19: the Texas Liver Tumor Center experience※

Katherine S. Crow[1]^, Fred F. Poordad[1,2], Glenn A. Halff[1], Francisco G. Cigarroa[1], Eugenia Tsai[1,2], Irma V. Infante[1], Sukeshi Patel Arora[1,3]^

[1]Texas Liver Tumor Center, University Health Transplant Institute, University Health San Antonio, San Antonio, TX, USA; [2]Texas Liver Institute/UT Health San Antonio, San Antonio, TX, USA; [3]Division of Hematology/Oncology, Department of Medicine, Mays Cancer Center, University of Texas Health San Antonio, San Antonio, TX, USA

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Correspondence to: Katherine S. Crow, MS, PA-C. Texas Liver Tumor Center, University Health Transplant Institute, University Health San Antonio, 4502 Medical Drive, MS 18-1, San Antonio, TX 78229, USA. Email: crowks@uthscsca.edu.

Abstract: Cancer guidelines recommend that all patients with hepatocellular carcinoma (HCC) have an evaluation by a multidisciplinary team to assess liver health, stage the cancer, and discuss treatment and palliative care options. Coronavirus disease 2019 (COVID-19) had a catastrophic impact on patients with cancer resulting in increased disease burden due to late diagnosis and treatment delays. Late diagnosis has highlighted the need for the early intervention of palliative care for patients with HCC. Conversion to telemedicine has been essential to caring for patients with all stages of cancer without added delays. Texas Liver Tumor Center (TLTC) offers patients with liver cancer at any stage a single-day multidisciplinary evaluation with tumor board review facilitating the early integration of treatment and palliative care services. National Comprehensive Cancer Network (NCCN) guidelines support increasing and improving access to palliative care. TLTC allows for the early integration of palliative care within a 1-day clinic model with an incorporated tumor board. This unique model of patient care decreases the burden of separate patient visits, may expedite the time from diagnosis to first treatment, facilitates the early intervention of palliative care specialists, and allows for optimal screening for clinical trials. In this review, we will provide an overview of the current multidisciplinary models of care for HCC and describe the successful pivot of TLTC from a fully in-person single-day multidisciplinary clinic with a multidisciplinary tumor board (MDTB) to a fully virtual experience, thereby maintaining access to this unique clinical model of patient care during the COVID-19 pandemic. The ability to pivot from in-person clinical visits to completely virtual visits increases patient access to care and enables more physicians to participate. Areas for future study include the impact on patient experience, clinical outcomes, and cost-effectiveness of this high-resource model.

Keywords: Telemedicine; hepatocellular carcinoma (HCC); multidisciplinary care; coronavirus disease 2019 (COVID-19); palliative care

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^ ORCID: Katherine S. Crow, 0000-0003-4913-4352; Sukeshi Patel Arora, 0000-0002-1176-0713.

Introduction

Background

Cancer guidelines recommend that all patients with hepatocellular carcinoma (HCC) have an evaluation by a multidisciplinary team to assess liver health, stage the cancer, and discuss treatment or palliative options (1,2). National Comprehensive Cancer Network (NCCN) guidelines support increasing and improving access to palliative care (3). The team may include a hepatologist, medical oncologist, pathologist, diagnostic radiologist, interventional radiologist, surgical/transplant oncologist, radiation oncologist, anesthesiologist, gastroenterologist, palliative care specialist, oncology nurses, nutritionists/dieticians, psychologists/psychiatrists, and social workers (1,2). As many patients with liver cancer present with advanced disease, bringing a comprehensive team together is crucial in determining the optimal multimodality treatment approach, including palliative options (4). The multidisciplinary team determines the modality, sequencing, and intensity of therapies based on the number, size, and location of tumors, patient performance status, patient characteristics, liver function, and patient goals.

Rationale and knowledge gap

Many high-volume centers have established multidisciplinary HCC tumor boards to review imaging and treatment options and develop a plan of care. Tumor board recommendations are provided to the referring physician/team, who then make the recommended specialty referrals. The specialty service handles evaluation, scheduling, and coordination of treatment, which is usually far removed from the tumor board process. There is the potential for patients to be lost during the multiple referral and scheduling process and for miscommunication with the specialists regarding tumor board recommendations and the care plan. A 1-day clinic model with an incorporated tumor board decreases the burden of separate patient visits, may expedite the time from diagnosis to first treatment, facilitates the early intervention of palliative care specialists, and allows for optimal screening for clinical trials. Conversion to telemedicine has been essential to caring for patients with all stages of cancer without additional delays.

According to Li *et al.*, coronavirus disease 2019 (COVID-19) had a catastrophic impact on patients with cancer resulting in increased disease burden due to late diagnosis and treatment delays (3). Johns Hopkins Hospital Multidisciplinary Liver Clinic (MDLC) noted an increase in patients presenting with incurable or untreatable cancers during the COVID-19 pandemic due to delays in cancer diagnosis and treatment (3). This highlights the need for the early integration of palliative care into the care plan of HCC patients. Texas Liver Tumor Center (TLTC) offers the opportunity to introduce palliative care early in the evaluation process.

Objective

In this review, we will provide an overview of current multidisciplinary models of care for HCC, and we describe the successful pivot of TLTC from a fully in-person single-day multidisciplinary clinic with a multidisciplinary tumor board (MDTB) to a fully virtual experience, thereby maintaining access to this unique clinical model of patient care during the COVID-19 pandemic.

Review of models of multidisciplinary clinics for HCC

In-person multidisciplinary models for liver cancer

Zhang *et al.* published the impact of a single-day multidisciplinary clinic on the management of liver tumor patients at Johns Hopkins Hospital MDLC (4). They concluded that MDLC evaluation significantly impacted management due to changes in diagnosis and treatment plan. Jia *et al.* reported the practice patterns and real-world clinical outcomes for patients presenting to the Johns Hopkins Hospital MDLC for HCC and biliary tract cancer (BTC) (5). The MDLC looked at changes in diagnosis, change in treatment, overall survival (OS), and disease-free survival. The authors concluded that coordinated expert multidisciplinary care is feasible for primary liver cancers with high adherence to recommendations and resulted in a change in treatment for second-opinion patients. It is unclear from the analysis if patients had imaging, laboratory testing, tumor board review, and multidisciplinary physician visits in a single day.

According to Soares *et al.*, there are broader benefits to the multidisciplinary clinic, including improved patient satisfaction, decreased time to initial treatment, and changes in management strategies (6). The ability to improve patient care decisions by incorporating the simultaneous collaboration of multiple specialists addresses the issue of patient care delays common for patients with HCC (6). In

Table 1 Summary of multidisciplinary clinic and tumor board publications

Author	Purpose	Conclusions
Li *et al.*	Compare liver resectability rates before and during COVID-19 pandemic	The percentage of patients presenting with curable liver cancers dropped during COVID-19 pandemic
Zhang *et al.*	Multidisciplinary cancer clinics may improve patient care	The multidisciplinary cancer clinic is an effective and convenient means of delivering expert opinion about the diagnosis and management of liver tumors
Jia *et al.*	Multidisciplinary care has been associated with improved survival in patients with primary liver cancers	Coordinated expert multidisciplinary care is feasible for primary liver cancers with high adherence to recommendations and a change in treatment for a sizeable minority of patients
Soares *et al.*	To evaluate differences in OS in patients with HCC after the establishment of a multidisciplinary clinic for HCC	The multidisciplinary clinic for the evaluation and treatment of patients with HCC is associated with improved OS
Yopp *et al.*	To evaluate differences in OS in patients with HCC after the establishment of a multidisciplinary clinic for HCC	A multidisciplinary clinic for evaluating and treating patients with HCC is associated with improved OS
Dharmarajan *et al.*	To assess the feasibility of designing and implementing virtual multidisciplinary clinic in a large academic network	Virtual multidisciplinary clinic is feasible to design and implement in a large academic medical network

COVID-19, coronavirus disease 2019; OS, overall survival; HCC, hepatocellular carcinoma.

their analysis of the multidisciplinary single-day HCC clinic at UT Southwestern, Yopp and colleagues found that the multidisciplinary approach is associated with an improved median survival of 13.2 months compared to 4.8 months observed in patients diagnosed before the multidisciplinary clinic formed (P=0.005) (7).

Virtual tumor board only model

Many cancer centers have converted to a fully virtual tumor board format. Dharmarajan *et al.* from the University of Pittsburgh published their experience transitioning to a fully virtual MDTB during the COVID-19 pandemic (8). The data revealed that 57.9% of attending physicians and graduate medical trainees preferred the virtual MDTB to a traditional in-person format, and 78% preferred to continue virtually after COVID restrictions were lifted citing the ease of attendance and greater participation by outside physicians (8). Disadvantages focused on technical issues related to poor sound quality, poor connections, or inability to screen share (8).

Based on our literature review, summarized in *Table 1*, there are no recent publications regarding a fully virtual single-day multidisciplinary clinic for patients with HCC. This paper will describe the TLTC experience converting from an in-person clinical format to a fully virtual clinical format during the COVID-19 lockdown and the processes of both formats.

TLTC

TLTC offers a single-day, comprehensive, multidisciplinary clinic for patients with liver tumors, including HCC. TLTC is a University Health Transplant Institute San Antonio clinic in partnership with Texas Liver Institute, a private transplant hepatology practice, and University of Texas Health San Antonio (UTHSA). The Tumor Center is located at South Texas' only National Cancer Institute (NCI)-designated cancer center, Mays Cancer Center at UTHSA, serving a majority Latino population.

In-person TLTC

Between July 15, 2016, and March 23, 2020, TLTC and the MDTB were conducted in-person. Patients present to TLTC at 7:30 am for a blood draw for labs and are then transported with a TLTC staff member to the imaging center for updated magnetic resonance imaging (MRI) and/or computed tomography (CT) imaging. TLTC staff remains with the patient until the imaging is completed. Patients are transported back to TLTC to begin morning evaluations by transplant hepatology, transplant surgery

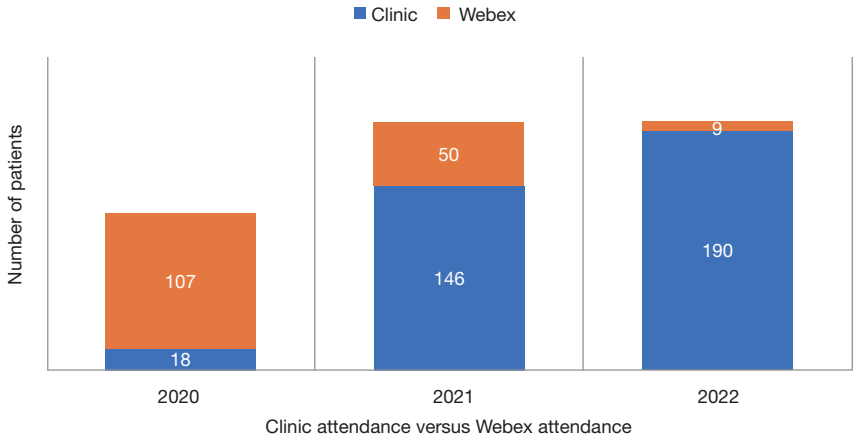

Figure 1 Virtual (i.e., Webex) versus in-person clinic visits by year at the TLTC. TLTC, Texas Liver Tumor Center.

physician assistant, dietician, and social worker. The rotation of the individual clinician visits is managed by the TLTC administrative assistant (AA).

The patient is discharged for a 1- to 2-hour lunch break, during which time the MDTB meets, and each patient is presented for comprehensive review and discussion. Board attendees include transplant hepatology, transplant surgery, surgical oncology, gastrointestinal oncology, radiation oncology, interventional radiology, body radiology, palliative care, and referring physicians. physicians are encouraged to participate. The MDTB engages in imaging and pathology review followed by a robust discussion of treatment options, including clinical trial candidacy. The board formulates treatment recommendations and a comprehensive plan of care for each patient.

Upon return to TLTC in the afternoon, the patient is roomed to await visits with the treating physicians, as recommended by the MDTB. The patient may see one to three physicians to discuss the plan of care. All procedures, imaging, lab work, and surgeries are scheduled at the time of the visit. At the end of the day, each patient meets again with the TLTC physician assistant or registered referring physicians to review the treatment recommendations and care plan and answer questions. A written care plan is provided, including all scheduling and instructions. This information is also available to the patient via the electronic health record (EHR).

Virtual TLTC

The COVID-19 quarantine and lockdown in March 2020 facilitated the need for a quick pivot to a completely virtual format for the full-day multidisciplinary visit and the tumor board. TLTC transitioned to a full-day telemedicine visit and continued full operations without cessation of services. Webex platform was used as it was already established within the health system.

The first fully virtual TLTC was held on March 30, 2020. As institutional mandates regarding virtual care eased in October 2020, allowing for in-person meetings, the TLTC adopted a hybrid visit format allowing some in-person visits to decompress the clinic as mandated by the health systems. In-person visits were allowed with restrictions regarding the number of people in the clinic. Only one support person was allowed per patient and additional staff, dietician, and social worker, remained remotely located. Physicians could conduct in-person visits. TLTC would pivot several times from hybrid to fully virtual as required by hospital policy. *Figure 1* illustrates the percentage of patients seen in-person and from March of 2020 through 2022.

Methods

TLTC administrative staff contact each patient to discuss the virtual visit format and establish EHR patient portal access. A secure virtual Webex invitation for the date and time of the visit is emailed to the patient. Laboratory testing and pre-clinical imaging are scheduled for the patient by the TLTC team before the visit. The AA calls each patient, reviews Webex installation, and performs a Webex test 3–7 days prior to the visit. The patient is instructed to log into the visit with camera and microphone on at the appointed date and time and remain in the visit until evaluated individually by the transplant hepatologist,

transplant surgery physician assistant, social worker, and dietician. Clinicians rotate in and out of the virtual clinic room as directed by the AA. The AA remains in the visit throughout the morning to keep the Webex visit open. After the morning session is completed, the patient is logged out of the visit with instructions to log back in at a specific time for the afternoon session.

The tumor board meets via Webex to review imaging, and pathology, discuss recommendations and formulate a plan of care for each patient. Interventional radiology leads the meeting with an imaging review followed by pathology review and discussion. TLTC staff schedule treatment dates and times during the tumor board to ensure that each patient leaves with a schedule of appointments for all recommended procedures or imaging.

Patients log back into the Webex meeting in the afternoon to meet the treating physicians and review board recommendations and the care plan. The physicians again rotate in the virtual room as directed by the AA. If surgery is recommended, the surgical nurse coordinator will meet with the patient and sign virtual consent for surgery. Patients who are candidates for liver transplant evaluation virtually consults with the transplant surgeon to facilitate liver transplant evaluation. Before discharge, the TLTC nurse coordinator meets with the patient to review scheduled procedures and imaging, answer questions, and provide the recommendations and treatment plan in writing. The recommendations and treatment plan are also available to the patient via the EHR. All recommendations, imaging reports, lab results, and clinical visit notes are provided to the referring physician and primary care provider. *Table 2* provides a summary of the TLTC in-person and virtual day.

Findings

While multidisciplinary evaluation to determine the therapy plan for HCC is considered the standard of care for HCC, many patients do not have access to advanced evaluation and treatment options in their local community. The Association of Community Cancer Centers (ACCC) conducted a survey to identify factors associated with the delivery and coordination of care for HCC patients (9). Of the 31 providers, 69% were from non-teaching community hospitals, freestanding cancer centers, private practice, or others, and 61% of their cancer programs did not have a specialized hepatobiliary multidisciplinary team.

Offering a virtual visit for new patients who have transportation barriers, are geographically distant, or are unable to physically attend an in-person clinical visit increases access to care.

Patients who do not have access to liver transplant evaluation and advanced treatment options for HCC in their communities can virtually access the single-day model decreasing emotional, financial, and physical stress. According to Worster and Swartz, European studies have shown that integrating palliative care using telemedicine improves symptom management (10). The single-day model encourages the introduction of palliative care to HCC patients at the initial evaluation to provide support at any stage of the disease process. Clinicians collaborate in real-time during and after the tumor board increasing quality and continuity of care. Potential benefits for hospital-based systems include increased referral volumes and recovery of overhead costs through imaging, surgeries, procedures, and infusions.

While a single-day multidisciplinary model is a gold standard for expediting care for patients with HCC, there are limitations. The long visit time as well as the breadth of information given can be overwhelming to the patient and family. Insurance barriers include obtaining financial clearance for several specialties and insurance company restrictions on virtual new patient visits post-COVID-19. In late 2022 most insurance carriers warned that new patient telemedicine visits would no longer be covered while follow-up telemedicine visits would be covered. Insurance coverage was another principal factor in the conversion of the fully virtual and hybrid TLTC model back to an in-person model. Also, scheduling staff noted that when offered the option of a Webex visit or an in-person visit, patients chose to attend the clinic in person.

Additionally, it is a challenge to coordinate physician schedules due to competing clinical responsibilities. Some patients lack access to technology or are unfamiliar with technology. In many cases, the latter is overcome by utilizing family members who do have access to and understand technology. The single-day multidisciplinary model requires a high level of coordination and staffing to manage preclinical testing and imaging, virtual access, and the comfort of patients and their families for the day (snacks, water, box lunches). As referenced previously, the data indicated that when given the choice between an in-person initial evaluation or a telemedicine initial evaluation, patients prefer to be seen in the clinical setting. *Table 3* summarizes the benefits and limitations of the single-day multidisciplinary model for patients with liver tumors.

Table 2 Summary of the schedule for in-person versus virtual TLTC visit

Schedule	In-person	Virtual
7:30 AM arrival	Labs drawn in clinic	Labs completed prior to visit
Imaging	Imaging completed prior to visit or same day (based on patient convenience)	Imaging completed prior to visit or same day (based on patient convenience)
	Patient transported by clinic staff for same day imaging	Patient self-transports to imaging center
AM clinic	Patient arrives at the clinic	Patients and family log into Webex virtual visit
	Triage and rooming	Virtual triage
	In-person evaluation by:	Virtual evaluation by:
	• Transplant hepatology	• Transplant hepatology
	• Transplant surgery PA	• Transplant surgery PA
	• Dietician social worker	• Dietician social worker
Noon/lunch (1 hour) (patient and family are dismissed for lunch break)	In-person MDTB attendees:	Virtual MDTB attendees:
	• Transplant hepatology	• Transplant hepatology
	• Transplant surgery	• Transplant surgery
	• Surgical oncology	• Surgical oncology
	• Gastrointestinal oncology	• Gastrointestinal oncology
	• Radiation oncology	• Radiation oncology
	• Interventional radiology	• Interventional radiology
	• Body radiology	• Body radiology
	• Palliative care	• Palliative care
	• Referring physicians	• Referring physicians
	• Transplant surgery PA	• Transplant surgery PA
	• Nurse navigator/coordinators	• Nurse navigator/coordinators
PM clinic (patient leaves clinic by 2–3 pm)	Patient and family return and are roomed	Patient and family log into the visit via Webex
	Consultation with 1–3 specialty physicians to discuss the plan of care based on MDTB recommendations	Virtual consultation with 1–3 specialty physicians to discuss the plan of care based on MDTB recommendations
	All procedures and follow-up appointments scheduled and documented in patient plan of care	All procedures and follow-up appointments scheduled and documented in patient plan of care
	TLTC RN coordinator reviews recommendations and plan of care with patients and family including scheduling	TLTC RN coordinator reviews recommendations and plan of care with patients and family including scheduling
	Discharged from clinic	Discharged from virtual clinic
	Recommendations and plan of care are posted to EHR for patient access	Recommendations and plan of care are posted to EHR for patient access
	Plan/notes sent to referring providers	Plan/notes sent to referring providers

TLTC, Texas Liver Tumor Center; AM, morning; PA, physician assistant; MDTB, multidisciplinary tumor board; PM, evening; RN, registered nurse; EHR, electronic health record (i.e., Epic).

Table 3 Summary of benefits and limitations of the virtual single-day multidisciplinary clinic

Benefits	Limitations
One-day clinic model improved access to cancer care and patient navigation	Coordination of clinicians for a 1-day clinic can be challenging given scheduling conflicts and limitations
One-day clinic model increases access to timely liver transplant evaluation	In the virtual format, can limit patient access due to lack of access to technology or unfamiliarity with technology
One-day visits with all liver cancer specialists results in patient convenience and expedited care plan	A 1-day visit results in a longer visit day for the patient and the volume of information from all the specialists may be overwhelming
One-day clinic fosters real-time clinician collaboration	The multi-disciplinary clinic requires a high-level of staffing due to the coordination required, and thus, is limited to a high resource setting
Expediting assessments by all specialties leads to downstream revenue generation (i.e., increased procedures, surgeries)	Insurance may be a barrier to access as some insurance companies do not approval multi-specialty visits in 1 day or require multiple referrals, which delays the visit

Conclusions

TLTC offers patients with liver tumors an in-person or virtual multidisciplinary evaluation with tumor board review, which is the new gold standard. The rising incidence of primary liver cancers and the complexity of diagnostic and treatment options, including surgery or transplantation, and an increasing array of immunotherapies make this an ideal disease state for a multidisciplinary team approach. Such a hybrid model increases access to care for patients with all stages of disease, introduces palliative care early in the evaluation process, facilitates increased physician participation in treatment planning, and culminates in expedited time to treatment for most patients. Areas for future study includes the impact of the single-day model on the patient experience, clinical outcomes, and cost-effectiveness of this high-resource model.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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