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CLINICAL INSIGHTS FOR HEPATOLOGY AND LIVER TRANSPLANT PROVIDERS DURING THE COVID-19 PANDEMIC

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Overview

Coronavirus disease 2019 (COVID-19), the illness caused by the SARS-CoV-2 virus, is rapidly spreading throughout the world.¹ Hospitals and healthcare providers across the United States are preparing for the anticipated surge in critically ill patients but few are wholly equipped to manage this new disease. Nonetheless, we all must do our part to prepare our patients, clinics, and hospitals for the drastic changes necessary to mitigate the spread of SARS-CoV-2 or we risk overwhelming the capacity of our healthcare system.² In addition, we must continue to manage the care of our patients with liver disease and our liver transplant recipients where unique logistical and pharmacological issues will arise. Given the extraordinary amount of rapidly emerging data on COVID-19, it is difficult for any single clinician to keep up with the flood of information. The goals of this document are to provide data on what is known about COVID-19, and how it may impact hepatologists and liver transplant providers and their patients. Our aim is to provide a basic template for the development of clinical recommendations and policies to mitigate the impact of the COVID-19 pandemic on liver patients and healthcare providers.

Rationale

The experiences of China, Italy and the evolving situation in Europe in responding to the COVID-19 pandemic are a warning to the United States regarding what we should expect in the coming weeks.^{3,4} Hepatologists and liver transplant programs can help their patients, programs, hospitals, and local communities (and hence the country) by immediately implementing containment and mitigation policies

that limit nonessential patient and visitor visits to clinics and hospitals. Our current understanding points to the fact that patients >60 years old, patients with cirrhosis, those with autoimmune hepatitis on immunosuppressive medications, and pretransplant and posttransplant patients on immunosuppressant therapy may be among the patients at highest risk for severe illness if infected with SARS-CoV-2. Considering SARS-CoV-2 can be transmitted from asymptomatic individuals, including children, and it can be detected in stool after viral clearance from the respiratory tract,⁵ these recommendations have been created to protect our patients, communities, and healthcare workers. Data from China, Italy, and Spain are staggering with reports from Italy indicating that up to 20% of healthcare workers may become infected.⁴ If we do not contain the spread of SARS-CoV-2 quickly, our healthcare system's capacity will be overwhelmed, including insufficient availability of ICU beds, ventilators, and healthcare workers.

Effects of SARS-CoV-2 on the Liver and Evaluation of COVID-19 Patients with Elevated Liver Biochemistries

What we know

- The incidence of elevated serum liver biochemistries in hospitalized patients with COVID-19 (primarily elevated AST and ALT, and slightly elevated bilirubin) ranges from 14% to 53%.^{1,6-10}
 - Liver injury occurs more commonly in more severe COVID-19 cases than in mild cases.¹⁰
 - Liver injury in mild COVID-19 cases is usually transient and does not require specific treatment.¹⁰
- Low serum albumin on hospital admission is a marker of COVID-19 severity.^{9,11}
- SARS-CoV-2 binds to target cells through angiotensin-converting enzyme 2 (ACE2) (as does SARS-CoV, the virus responsible for SARS in 2003-2004).⁷
 - Because ACE2 occurs abundantly on liver and biliary epithelial cells, the liver is a potential target for infection.⁷
- Elevated liver biochemistries may reflect a direct virus-induced cytopathic effect and/or immune damage from the provoked inflammatory response.^{7,12}
- Therapeutic agents used to manage symptomatic COVID-19 may be hepatotoxic. These include statins, remdesivir, and tocilizumab.
- Patients with chronic liver disease, especially viral hepatitis B and/or C, may be more susceptible to liver damage from SARS-CoV-2, as was the case with SARS-CoV, but supporting data are lacking.⁹
- It is unknown whether SARS-CoV-2 infection exacerbates cholestasis in those with underlying cholestatic liver disease such as PBC or PSC or with underlying cirrhosis.¹⁰
- Rare cases of severe acute liver injury have been described in patients with COVID-19.⁹
- It will be difficult to differentiate whether increases in liver biochemistries are due to SARS-CoV-2 infection itself, its complications, or a drug-induced liver injury.^{10,13}
- In liver transplant recipients or patients with autoimmune hepatitis on immunosuppressive therapy, acute cellular rejection or disease flare, respectively, should not be presumed in the face of active COVID-19.

Recommendations

- Serologic testing for hepatitis B and C is warranted when assessing patients with COVID-19 and elevated liver biochemistries.
- To limit unnecessary transport of patients with COVID-19, ultrasound or other advanced imaging (e.g., MRI/MRCP) should be avoided unless there is a clinical suspicion for biliary obstruction, cholangitis, or venous thrombosis.

- The presence of abnormal liver biochemistries should not be a contraindication to using investigational or off-label therapeutics for COVID-19 (e.g., remdesivir, tocilizumab, chloroquine, hydroxychloroquine, statins).
- Regular monitoring of liver biochemistries should be performed in all COVID-19 patients, particularly those treated with remdesivir or tocilizumab, regardless of baseline values.
- Follow guidance in your clinical study protocol and/or by the [FDA](#) for monitoring of liver biochemistries and discontinuation of study drug used to treat COVID-19.

Stable Outpatients with Liver Disease or Hepatocellular Carcinoma

What we know

- Both immunocompetent and immunosuppressed patients can contribute to SARS-CoV-2 spread even if they are asymptomatic.
- Children are less likely to become ill from SARS-CoV-2 infection but can still contribute to spread of the virus.¹⁴
 - Severe or critical COVID-19 is uncommon in children (largely affecting children <5 years old) and is associated with minimal or no increase in ALT or AST.¹⁴
- It is unknown whether patients with hepatocellular carcinoma (HCC) are at increased risk for severe COVID-19 by virtue of their malignancy. However, one case series reported an association between worse COVID-19 outcomes and other, non-hepatic types of cancer.¹⁵

Recommendations

Outpatient visits

- Severely limit outpatient visits to only patients who must be seen in person, even in areas without significant COVID-19 community spread.
 - Consider seeing in person only new adult and pediatric patients with urgent issues and clinically significant liver disease (e.g., jaundice, elevated ALT or AST >500 U/L, recent onset of hepatic decompensation).
 - Stagger patient arrival times, and if possible, room patients immediately on arrival to clinic to avoid patients congregating in the waiting area. If patients or caregivers are in the waiting area, appropriate distancing and decontamination of the waiting area should be practiced.
 - Limit the number of family members/friends who accompany patients to their visits. Have these persons wait outside the clinic unless their presence is required for clinical decision making. Enable critical caregivers to participate in the visit by phone or video if possible.
 - Strongly consider phone visits or telemedicine as appropriate and available to replace in-person visits.
- Screen all patients for symptoms of COVID-19 or recent exposure (i.e., fever, cough, contact with known COVID-19 patients, history of recent travel) before entry into the clinical space (e.g., phone call 24 hours prior to scheduled visit), and again at registration or as they enter the clinic.
- Check each patient's temperature when they arrive to the clinic or registration desk.
 - Patients with fever (>100 °F) should be referred to the hospital's protocol for symptomatic patients.
- Consider evaluating patients with COVID-19 symptoms in an outpatient clinic or a site dedicated for this purpose. Personal protective equipment (PPE) should be prioritized to that site. Patients with COVID-19 symptoms should not be evaluated in the hepatology/liver transplant clinic.

- Follow [CDC recommendations](#) for cleaning and disinfecting rooms or areas visited by individuals with suspected or confirmed COVID-19.

Patients with hepatocellular carcinoma

- Consider reviewing images of new referrals for patients with liver masses in tumor board or with expert radiologists prior to scheduling an in-person visit.
 - Consider virtual visits to discuss diagnosis and management of HCC and other liver tumors.
- Continue usual surveillance imaging in patients with HCC if possible. Ideally, these patients should not wait until the pandemic abates to undergo imaging because the prospective duration of the pandemic is unknown. Based on patient and facility-based circumstances, an arbitrary delay of 2 months is reasonable.
- Proceed with HCC treatments rather than delaying them due to the pandemic.

Patients with Decompensated Cirrhosis, Liver Transplant Evaluations, and Patients on the Liver Transplant Waiting List

What we know

- Information is limited regarding the effects of SARS-CoV-2 infection in patients with chronic liver disease.
- There are currently no clear data on the effects of SARS-CoV-2 infection in patients with decompensated cirrhosis or those awaiting liver transplantation.
- Nearly all Organ Procurement Organizations (OPOs) now test for SARS-CoV-2 RNA and will proceed with negative donors; however, the capacity to test recipients shortly before proceeding with transplant may be limited.

Recommendations

Outpatient management

- Limit the number of patients coming to clinic for transplant evaluations.
 - Consider evaluating only patients with HCC or those patients with severe disease and high MELD scores who are likely to benefit from immediate liver transplant listing.
- Develop a policy to decide which listed patients need to be seen in person.
- Consider telemedicine alternatives in place of outreach clinics.
- Obtain labs and imaging only as clinically necessary.
 - Patients should not be asked to update labs simply to update their MELD score (see recent [OPTN policy changes](#)).
- Ensure that patients have refills available for essential medications. Provide prescriptions for 90-day supplies instead of 30-day supplies. Many insurance companies are waiving early medication refill limits.
- Consider instructing patients to avoid attending community recovery support meetings such as Alcoholics Anonymous and provide alternative telephone or online resources.
- Advise patients not to travel during the COVID-19 pandemic.

Patient transplant education and consultations

- Conduct patient transplant education and social work, dietitian, and financial consultations by video conference, telemedicine, or telephone whenever possible.
- Avoid multiple patients in one room for patient education.

- Consider developing internet-based education sessions for patients and family members that can be deployed either by in-room computers or at home prior to patient evaluation.

Inpatient management

- Avoid direct hospital admission for patients with fever and respiratory symptoms, particularly admission to a transplant unit.
- Consider evaluating patients with liver disease with new onset encephalopathy for COVID-19.
- Evaluate all children with elevated AST or ALT for underlying liver diseases and coexisting infections as COVID-19 is not commonly associated with abnormal liver enzymes in children.¹⁴
- Have a low threshold for aggressive airway management in COVID-19 patients with underlying pulmonary diseases such as hepatic hydrothorax, portopulmonary hypertension, or hepatopulmonary syndrome.

Organ allocation

- Develop a policy for dealing with deceased organ donor offers.
 - Consider recipient age and comorbidities prior to organ acceptance.
 - Confirm with hospital personnel the availability of ICU beds, ventilators, PPE, and an adequate supply of blood products.
- Screen potential recipients with an acceptable organ offer for COVID-19 symptoms before they are called in from home for transplantation.
- When an organ offer becomes available, call in potential transplant recipients at the latest possible time to minimize exposure to the hospital environment.
- Consider testing of recipients and donors for SARS-CoV-2 before transplantation, if testing is available.
 - Consider the risk of false negatives and testing turnaround time in your area.
 - Nasal swabs are more sensitive (63%) than pharyngeal swabs (32%) while bronchoalveolar lavage fluid specimens are the most sensitive (93%).¹⁶ Testing samples from multiple sites may improve sensitivity and reduce false negative results.
 - Review as much donor history as possible for fever, respiratory symptoms and radiographic findings.
- Consider having backup transplant recipients wait at home or away from the transplant center.
- Consider suspending living donor liver transplant programs during the pandemic, except for pediatric patients with acute liver failure.¹⁷

Liver Transplantation, Resource Utilization, and Ethical Considerations

What we know

- Resource utilization and ethical considerations are inherently tied to liver transplantation. This is a critical and challenging area for which protocols and policies need to be carefully considered and developed. There is no over-arching policy that can or should be applied to every transplant center; these issues will need to be discussed and developed locally.
- Although the Centers for Medicare and Medicaid Services (CMS) recommends limiting all non-essential planned surgeries and procedures until further notice, they specifically exclude transplant surgery from [this recommendation](#).
- People who test positive for SARS-CoV-2 are medically ineligible for [organ donation](#).

Recommendations

- Consider resource utilization including ICU beds, ventilators and supply of blood products (especially platelets and type-specific packed red cells) in the decision to proceed with liver transplantation.
- Consider notifying patients that the COVID-19 pandemic may impact their waiting time on the transplant list.
- Screen potential donors for exposure and clinical symptoms compatible with COVID-19.¹⁷
- Screen donors for COVID-19 symptoms regardless of COVID-19 test results.
- See the latest updates regarding COVID-19 related [OPTN policy changes](#).

Challenging Topics in Liver Transplantation During the COVID-19 Pandemic

- Should we decide who is more in need of limited resources, i.e., COVID-19 patients vs. patients in urgent need of liver transplantation? It is impossible to weigh the value of the life of a patient with COVID-19 against that of a patient in need of life-saving liver transplantation. We should not compound the pandemic by risking the lives of patients in need of liver transplantation and our goal should be to ensure that an ICU bed is available for every patient who requires one.
- An argument that has been put forward to justify deferring some transplants is concern about immunosuppressing patients during the COVID-19 pandemic. However, it is possible that immunosuppressed patients may not be at increased risk for severe COVID-19.¹⁸ Nevertheless, immunosuppressed patients have higher viral titers and may be more infectious than immunocompetent individuals.¹⁷
- CMS has clarified that transplants fall into [Tier 3b](#) and should not be postponed.
- Is there a point at which we need to ration who will receive a liver transplant? If so, we may need to prioritize patients who are most likely to die on the waitlist and defer those who can wait longer.
- These issues are likely to arise in many transplant programs and predominantly center on the need for limited ICU beds, ventilators, and blood products. Each program will need to establish its institutional capacity to perform liver transplantation and a process for determining whether or not to proceed when an organ is available.
- These decisions should ideally be made in consultation with local medical ethics committees.²

Post-Liver-Transplant Patients

What we know

- Data suggest the innate immune response may be the main driver for pulmonary injury due to COVID-19 and immunosuppression may be protective.^{8,18} It is too early to know if immunosuppressed patients are at greater risk for more severe COVID-19; however, posttransplant recipients aged >60 years old and immunosuppressed patients are more likely to acquire SARS-CoV-2 infection.
- Post-transplant immunosuppression was not a risk factor for mortality associated with SARS (2003-2004) or MERS (2012-present).¹⁸

- Immunosuppression may prolong viral shedding in posttransplant patients with COVID-19.¹⁷

Recommendations

- Do not reduce immunosuppression or stop mycophenolate for asymptomatic post-transplant patients.
- Emphasize prevention measures post-transplant patients already know well: frequent hand washing, cleaning frequently touched surfaces, staying away from large crowds, staying away from individuals who are ill, etc.
- Advise patients not to travel during the COVID-19 pandemic.¹⁷
- Minimize in-person visits for post-transplant patients by maximizing use of telemedicine.
- Consider advocating for telework options, appropriate excuses from work or leaves of absence for post-transplant patients and their primary caregivers.

Inpatients

What we know

- Healthcare workers and other hospital staff are at risk for COVID-19.⁴
- Healthcare workers with SARS-CoV-2 may spread the virus to patients and should remain away from in-person work until approved to return by local health authorities.
- Minimizing interactions among healthcare workers and between healthcare workers and patients is critical to reducing the spread of SARS-CoV-2.
- Minimizing the transport of patients within and between healthcare facilities could reduce the spread of SARS-CoV-2.

Recommendations

- Conduct medical and surgical rounds with the minimum number of personnel needed to provide care at a given time.
- Limit the number of team members who enter a patient's room for patient examinations and encounters.
 - The same rule applies to inpatient consultations involving other medical or surgical services for the care of patients with liver disease or transplant evaluation. Limit the personnel permitted to enter patient rooms to the minimum needed for the performance of consultative care.
 - Consider conducting virtual visits for updates not requiring direct examination. This will reduce contact risks as well as unnecessary utilization of PPE thereby preserving hospital supplies for essential needs.
- Discourage in-person multidisciplinary rounds with dietary, pharmacy, social work, and care coordination staff.
 - Consider the use of virtual conferencing to reduce direct staff interactions.
- Consider restricting the direct patient care of providers at higher risk (age >70 years, serious underlying medical conditions, immunocompromised).
- Limit or even prohibit the presence of non-essential team members in the hospital (e.g., students, observers, research staff) to minimize exposure risk and prioritize the use of PPE.
- Consider use of telephone or virtual language translation services as needed to reduce contact with patients.
- Limit the number of visitors who may see inpatients.

- Ideally, no visitors should be permitted in patient rooms except in specific circumstances such as hospice care or when a patient is being discharged following transplantation.
- Immediately, identify caregivers and legal representatives (and collect their emergency contact information) to provide informed consent if a patient is impaired, and to enable provision of regular status updates to them while visitors are not permitted in patient rooms.
- Carefully consider all requests for imaging and procedures on patients, including blood draws. Order only studies essential for care to reduce institutional resource utilization, including patient transport between hospital locations.
- Consider developing a policy for review and triage of hospital inpatient transfers. For example, consider accepting for transfer only patients with acute liver failure or those in need of urgent liver transplant evaluation during their hospital stay.
 - Consider accepting for transfer only other liver patients with a unique need for inpatient interventions at the transplant center.
- Perform a needs assessment prior to patient discharge to determine whether the patient can have follow-up encounters by phone or telemedicine, and encourage early monitoring by these means to reduce early postdischarge, in-person visits.
- Coordinate with outpatient services for admission and discharge planning to prevent unnecessary admissions and reduce unplanned re-admissions after discharge.
- Patients with active viral shedding on discharge should [remain in isolation at home](#) and appropriate precautions should be taken for caregivers or family members who live with the patient.
- Consider the capacity of local rehabilitation centers to accept complex patients as beds in those facilities may become limited during the COVID-19 pandemic.
 - Review the possibility of enhanced home services during the admission to expedite discharge.

Management of Patients on Immunosuppressive Agents

What we know

- The effects of immunosuppression on COVID-19 are not well established.
- Rapid pulmonary deterioration in COVID-19 is due to a systemic/ pulmonary inflammatory response associated with increased serum IL-6, IL-8 and TNF- α levels.¹⁹
- The World Health Organization recommends avoiding corticosteroids for treatment of COVID-19 unless indicated for another therapeutic purpose.²⁰
- The potential role of corticosteroids for the prevention of progression of mild COVID-19 to severe pneumonia is unknown.
- Reducing the dosage or stopping immunosuppressants may cause a flare in a patient with autoimmune hepatitis or precipitate acute rejection in a liver transplant recipient.

Recommendations

- In immunosuppressed liver disease patients **without** COVID-19:
 - Do not make anticipatory adjustments to current immunosuppressive drugs or dosages.
- In immunosuppressed liver disease patients **with** COVID-19:
 - Consider minimizing the dosage of high-dose prednisone but maintain a dosage of at least 10 mg/day to avoid adrenal insufficiency.

- Consider reducing azathioprine or mycophenolate dosages, especially in the setting of lymphopenia, fever or worsening pneumonia attributed to COVID-19.
- Consider reducing but not stopping daily calcineurin inhibitor dosage, especially in the setting of lymphopenia, fever or worsening pulmonary status attributed to COVID-19.
- In patients with COVID-19, use caution in initiating prednisone or other immunosuppressive therapy where the potential benefit might be outweighed by the risks (e.g., alcohol-associated hepatitis).

Medication Management of Patients with COVID-19 and Potential Drug-Drug Interactions

What we know

- An open-label, randomized, controlled trial of lopinavir-ritonavir vs. standard of care in adults hospitalized with severe COVID-19 showed no clinical benefit.²¹ Treatment was stopped early in some patients taking lopinavir-ritonavir due to adverse events.
- Lopinavir-ritonavir are potent inhibitors of CYP3A4, which is involved in the metabolism of calcineurin inhibitors, sirolimus, and everolimus.
 - If lopinavir-ritonavir are used, reduce tacrolimus dosage to 1/20-1/50 of baseline due to drug-drug interaction.
- Treatment with ACE inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) results in upregulation of ACE2, the target for SARS-CoV-2 entry into cells.²² Increased ACE2 expression *theoretically* facilitates infection with SARS-CoV-2.
- Animal studies suggest that ACEIs and ARBs may protect against serious lung complications with COVID-19 but, to date, there are no data in humans.²³
- The Council on Hypertension of the [European Society of Cardiology](#) highlighted the lack of evidence demonstrating harmful effects of ACEIs and ARBs in the setting of COVID-19 infection and recommends that patients should continue with their usual antihypertensive therapy, including ACEIs and ARBs.

Recommendations

- The evidence thus far does not support the use of lopinavir-ritonavir for the treatment of COVID-19.
- Patients receiving ACEIs and ARBs should remain on them even in the setting of COVID-19.
- Acetaminophen at a daily dosage of ≤ 2 g/d is the preferred analgesic and anti-pyretic for patients with known or suspected COVID-19.
- NSAIDs may also be used or continued [as needed](#).

Procedures

What we know

- There is potential for fecal-oral SARS-CoV-2 transmission,^{1,5,12,24} and the virus is detected in saliva.^{1,12,25}
- The joint GI societies [recommend](#) to “strongly consider rescheduling non-urgent endoscopic procedures.”
- [CMS](#), the [US Surgeon General](#) and the [American College of Surgeons](#) recommend postponing elective surgeries.

- Endoscopic procedures should be considered aerosol-generating.²⁶
- When performing procedures, in addition to standard PPE (gloves, gown, eyewear), the Association for Operating Room Nurses recommends headwear and masks for those with potential droplet exposure during endoscopic procedures.

Recommendations

- Cancel all elective/non-urgent procedures (e.g., endoscopy, liver biopsy).²⁶
- Some procedures may need to be performed, e.g., liver biopsy to rule out rejection or diagnose autoimmune hepatitis, therapeutic paracentesis, TIPS, endoscopy for variceal bleeding, follow-up band ligation in those with history of variceal bleeding, biliary procedures (IR or endoscopic).
- Designated hats and surgical masks should be made available to all healthcare staff involved with performing procedures. Gloves, gowns, and masks should be changed for each case. Hats may be worn for the entire day. Eyewear (personal or disposable) should be cleaned with an alcohol wipe between cases. Disposable eyewear should be disposed of at the end of the day unless visibly soiled, in which case it should be immediately discarded.
- Consider limiting the involvement of fellows in endoscopies and other procedures to conserve PPE.²⁶
- Follow [CDC recommendations](#) for cleaning and disinfecting rooms or areas visited by individuals with suspected or confirmed COVID-19.

Research

What we know

- The [FDA](#) and [NIH](#) have posted guidance documents for the conduct of clinical trials during the COVID-19 pandemic.

Recommendations

- Limit clinical trial activity to essential clinical trials, defined as those that enroll or follow patients with life-threatening or serious conditions for which participation in the clinical trial holds out the clear prospect of directly benefiting the patient. Patients already enrolled in clinical trials who are undergoing safety and efficacy assessments fall within this definition.
 - Continue in-person research visits for participants already enrolled in essential clinical trials if required for patient safety and/or participation in the clinical trial is an integral part of the patient's treatment plan.
 - The study physician – in consultation with the study team, the patient's physician, the patient, and the patient's family – should carefully assess the necessity and risks of an in-person visit.
- Do not initiate new clinical trials at this time unless meeting the definition of an essential clinical trial.
- Strongly consider not enrolling new research participants into existing clinical trials unless meeting the definition of an essential clinical trial.
 - Postpone all other in-person clinical research visits.
- Research staff should make efforts to use alternative methods to conduct research visits or perform testing such as check-ins with participants by phone and/or performing research-related lab testing at lab testing centers if feasible.
- Research staff should work remotely, unless their presence is required for the safe conduct of the trial.

- Discuss options for conducting telehealth study visits with clinical research organizations (CROs) and study sponsors.
- Principal investigators should notify commercial sponsors that opening new nonessential clinical trials and enrolling subjects into ongoing “non-essential” clinical trials should be temporarily postponed.
- Arrange for research medications to be sent to subjects by the study sponsor if the research pharmacy is unavailable.
- Institutional policies on clinical research may be more restrictive and should supersede the recommendations contained here.
- Laboratory/basic science research may also need to be restricted based on local policies.

Residents/Fellows

What we know

- The [ACGME](#) has suspended some activities during the COVID-19 pandemic, including self-studies, accreditation site visits, CLER program site visits, and resident/fellow/faculty surveys.
- The ACGME issued new requirements to allow residents/fellows to participate in telemedicine.
- The ACGME requirements for work hour limitations and adequate supervision have not changed.

Recommendations

- Ensure appropriate supervision of trainees working remotely if they are conducting patient care activities (telephone/telemedicine visits).
- Change all educational conferences to virtual conferences.
- Consider assigning fellows and other trainees to indirect patient care activities and/or telemedicine visits.

Protecting Healthcare Workers and Workforce Utilization

What we know

- The infection rate of healthcare workers may be up to 20%, as reported in Italy.⁴

Recommendations

- Cancel all in-person meetings (even small meetings) and change to virtual meetings.
- Practice social distancing even in meetings, e.g., keep an empty chair between each person.
- Consider staggering work shifts for physicians, providers, nurses, and staff.
- Create a backup schedule for physicians and surgeons in the event of quarantine or illness.
- Consider assigning backup personnel for providers in leadership positions.
- Consider checking temperatures of all providers and staff as they arrive to the office or clinic. There should be a zero-tolerance policy for presenting to work with fever or symptoms of COVID-19.

Telemedicine

What we know

- Telemedicine can mitigate the exposure of patients and healthcare workers to COVID-19.²⁷
- Emergency funding legislation [HB 6074](#) waived some of the long-standing restrictions to the use of telehealth for Medicare recipients, including: rural area requirements for originating sites

(i.e., patient location); allowing a patient’s home to be an eligible originating site; allowing phones with two-way, real-time interactive audio and visual capabilities to be used; and allowing the provider to conduct a telemedicine encounter from their home.²⁸

- The Department of Health and Human Services [Office of Civil Rights](#) announced that it would not impose penalties for the good faith provision of telemedicine during the COVID-19 public health emergency, even if remote communication technologies used for such services may not fully comply with the requirements of the HIPAA Rules.
- Telemedicine limitations include patient access to the electronic health record patient portal; access to a computer, phone, or tablet with video/audio capabilities; and ability to manage the technology.
- Issues regarding crossing state lines are potentially waived. See local regulations.
- See the [joint GI society message about telehealth](#).

Recommendations

- Consider phone visits or telemedicine as appropriate and available to replace in-person visits.
- Conduct patient education and social work, dietitian, and financial consultations by video conference, telemedicine or telephone for liver transplant evaluations.
- Consider telemedicine alternatives in place of outreach clinics.
- Minimize in-person visits for posttransplant patients by maximizing use of telemedicine.

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Helpful Resources

- Centers for Disease Control and Prevention, [COVID-19 Website](#)
 - CDC [recommendations](#) for cleaning and disinfecting rooms or areas visited by individuals with suspected or confirmed COVID-19
- The [Transplantation Society Guidance](#) on Coronavirus Disease 2019 (COVID-19) for Transplant Clinicians
- Association of Organ Procurement Organizations [COVID-19 Bulletin](#)
- [FDA Guidance](#) on Conduct of Clinical Trials of Medical Products During COVID-19 Pandemic
- [Guidance for NIH-funded](#) Clinical Trials and Human Subjects Studies Affected By COVID-19
- [Medicare Telemedicine](#) Health Care Provider Fact Sheet (updated March 17, 2020)
- [ACGME's Response](#) to the Coronavirus (COVID-19)
- [CMS Adult Elective Surgery](#) and Procedures Recommendations:
- [Joint GI Society](#) Message for Gastroenterologists and Gastroenterology Care Providers
- Joint GI Society Message about [Telehealth](#)
- [SECURE-Cirrhosis Registry](#) (PHI-free reporting registry of COVID-19 in patients with cirrhosis and post-liver-transplant patients)

References

1. Guan W, Ni Z, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med* 2020 Feb 28. doi: 10.1056/NEJMoa2002032. [Epub ahead of print]
2. Chopra V, Toner E, Waldhorn R, Washer L. How should U.S. hospitals prepare for coronavirus disease 2019 (COVID-19)? *Ann Intern Med* 2020 Mar 11. doi: 10.7326/M20-0907. [Epub ahead of print]
3. Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in Lombardy, Italy. *JAMA* 2020 Mar 13. doi: 10.1001/jama.2020.4031. [Epub ahead of print]
4. Remuzzi A, Remuzzi G. COVID-19 and Italy: what next? *Lancet*. 2020 Mar 13. doi: 10.1016/S0140-6736(20)30627-9. [Epub ahead of print]
5. Xiao F, Tang M, Zheng X, Liu Y, Li X, Shan H. Evidence for gastrointestinal infection of SARS-CoV-2. *Gastroenterology* 2020 Feb 27. doi: 10.1053/j.gastro.2020.02.055. [https://www.gastrojournal.org/article/S0016-5085\(20\)30282-1/pdf](https://www.gastrojournal.org/article/S0016-5085(20)30282-1/pdf). Accessed March 2020. [Epub ahead of print]
6. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020;395:507-513.
7. Fan Z, Chen L, Li J, Tian C, Zhang Y, Huang S, et al. Clinical features of COVID-19-related liver damage. *medRxiv* 2020. doi.org/10.1101/2020.02.26.20026971. <https://doi.org/10.1101/2020.02.26.20026971>
8. Huang C, Wang, Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020;395:497-506.
9. Xu L, Liu J, Lu M, Yang D, Zheng X. Liver injury during highly pathogenic human coronavirus infections. *Liver Int* 2020 Mar 14. doi: 10.1111/liv.14435. [Epub ahead of print]
10. Zhang C, Shi L, Wang FS. Liver injury in COVID-19: Management and challenges. *Lancet Gastroenterol Hepatol* 2020 Mar 4. doi: 10.1016/S2468-1253(20)30057-1. [Epub ahead of print]
11. Liu W, Tao ZW, Lei W, et al. Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. *Chin Med J (Engl)* 2020 [Epub ahead of print].

12. Gu J, Han B, Wang J. COVID-19: gastrointestinal manifestations and potential fecal-oral transmission. *Gastroenterology* 2020 Mar 3. doi: 10.1053/j.gastro.2020.02.054. [Epub ahead of print]
13. Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *Lancet Respir Med* 2020 Feb 18. doi: 10.1016/S2213-2600(20)30076-X. [Epub ahead of print]
14. Lu X, Zhang L, Du H, et al. SARS-CoV-2 infection in children. *N Engl J Med* 2020 [Epub ahead of print].
15. Liang W, Guan W, Chen R, Wang W, Li J, Xu K, et al. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. *Lancet Oncol* 2020;21:335-337.
16. Wang W, Xu Y, Gao R. Detection of SARS-CoV-2 in different types of clinical specimens. *JAMA* 2020 [Epub ahead of print].
17. American Society of Transplantation. 2019-nCoV (Coronavirus): FAQs for organ donation and transplantation. Updated 20 Mar 2020. <https://www.myast.org/sites/default/files/COVID19%20FAQ%20Tx%20Centers%2003.20.2020-FINAL.pdf>.
18. D'Antiga, L. Coronaviruses and immunosuppressed patients. The facts during the third epidemic. *Liver Transpl* 2020 [Epub ahead of print].
19. Gong J, Dong H, Xia Q, Huang Z, Wang D, Zhao Y, et al. Correlation analysis between disease severity and inflammation-related parameters in patients with COVID-19 pneumonia. *medRxiv* 2020. doi: 10.1101/2020.02.25.20025643. <https://www.medrxiv.org/content/10.1101/2020.02.25.20025643v1.full.pdf>
20. World Health Organization. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected: interim guidance, 13 March 2020. <https://apps.who.int/iris/handle/10665/331446>. Published March 13, 2020. Accessed March 2020.
21. Cao B, Wang Y, Wen D, Liu W, Wang J, Fan G, et al. A trial of lopinavir-ritonavir in adults hospitalized with severe covid-19. *N Engl J Med* 2020 Mar 18. doi: 10.1056/NEJMoa2001282. [Epub ahead of print]
22. Fang L, Karakiulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *Lancet Respir Med* 2020 Mar 11. doi: 10.1016/S2213-2600(20)30116-8. [Epub ahead of print]
23. Kuba K, Imai Y, Rao S, Gao H, Guo F, Guan B, et al. A crucial role of angiotensin converting enzyme 2 (ACE2) in SARS coronavirus-induced lung injury. *Nat Med* 2005;11:875-879.
24. Holshue ML, DeBolt C, Lindquist S, Lofy KH, Wiesman J, Bruce H, et al; Washington State 2019-nCoV Case Investigation Team. First case of 2019 novel coronavirus in the United States. *N Engl J Med* 2020;382:929-936.
25. To KK, Tsang OT, Chik-Yan Yip C, Chan KH, Wu TC, Chan JMC, et al. Consistent detection of 2019 novel coronavirus in saliva. *Clin Infect Dis* 2020 Feb 12. doi: 10.1093/cid/ciaa149. [Epub ahead of print]
26. Soetikno R, Teoh AYB, Kaltenbach T, Lau JYW, Asokkumar R, Cabral-Prodigalidad P, Shergill A. Considerations in performing endoscopy during the COVID-19 pandemic. *Gastrointest Endosc* 2020. [https://els-jbs-prod-cdn.literatumonline.com/pb/assets/raw/Health%20Advance/journals/ymge/GIE-D-20-00499%20 Roy-1584643794760.pdf](https://els-jbs-prod-cdn.literatumonline.com/pb/assets/raw/Health%20Advance/journals/ymge/GIE-D-20-00499%20Roy-1584643794760.pdf). Accessed March 2020. [Epub ahead of print]
27. Terry K. Telehealth seen as a key tool to fight COVID-19. *The Hospitalist* 2020 Mar 6. <https://www.the-hospitalist.org/hospitalist/article/218574/coronavirus-updates/telehealth-seen-key-tool-help-fight-covid-19>

28. Coronavirus Preparedness and Response Supplemental Appropriations Act, 2020. H.R. 6074. 116th Congress (2019-2020). <https://congress.gov/bill/116th-congress/house-bill/6074>. Published March 6, 2020. Accessed March 2020.