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AASLD COVID-19 Working Group Presents

Clinical Insights: COVID-19 and the Liver – Case Studies and Updates

April 7, 2020
5-6 pm ET

Presenters:
Oren K. Fix, MD, MSc, FAASLD
Mark W. Russo, MD, MPH, FAASLD
Elizabeth C. Verna, MD, MS

Moderator:
Robert J. Fontana, MD, FAASLD

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For resources and updates on COVID-19 and the liver, visit aasld.org/COVID19

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Upcoming COVID-19 Webinar

Thursday, April 16, 2020

5-6pm Eastern

Clinical Insights: COVID-19 and the Liver – Case Studies and Updates

Presenters:
Bilal Hameed, MD
Ryan Kwok, MD
Michael Schilsky, MD, FAASLD

Moderator:
Brendan McGuire, MD

Registration: http://www.aasld.org/COVID19

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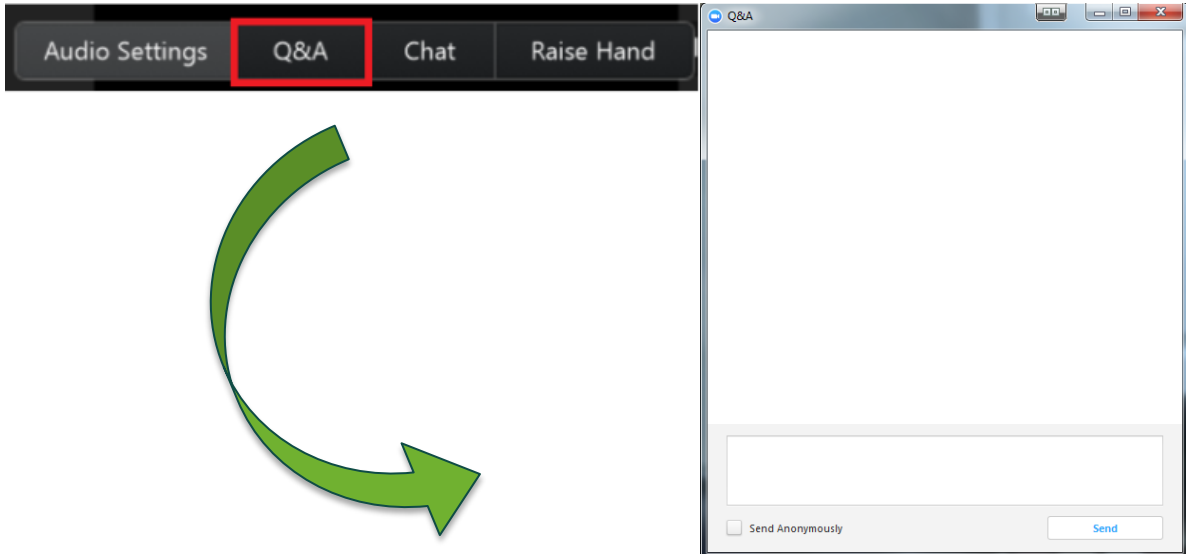
Clinical Insights: COVID-19 and the Liver

Case Studies and Updates

Webinar Series

Updates April 7, 2020

Submit your questions in the Q&A box at the top or bottom of your screen.



Questions will be answered at the end of the presentation.

Moderator

Robert J. Fontana, MD, FAASLD

University of Michigan Hospitals and Health

Presenters

Oren K. Fix, MD, MSc, FAASLD

Swedish Medical Center

Mark W. Russo, MD, MPH, FAASLD

Carolinas Medical Center

Elizabeth C. Verna, MD, MS

Columbia University Medical Center

AASLD COVID-19 Working Group

K. Rajender Reddy, MD, FAASLD	University of Pennsylvania Medical Center
Oren K. Fix, MD, MSc, FAASLD	Swedish Medical Center
Bilal Hameed, MD	University of California, San Francisco
Michael L. Schilsky, MD, FAASLD	Yale New-Haven Hospital
Mark W. Russo, MD, MPH, FAASLD	Carolinas Medical Center
Brendan M. McGuire, MD	University of Alabama at Birmingham
Robert J. Fontana, MD, FAASLD	University of Michigan Hospitals and Health
Ryan M. Kwok, MD	Walter Reed National Military Medical Center
David C. Mulligan, MD, FAASLD	Yale University
Daniel S. Pratt, MD, FAASLD	Massachusetts General Hospital
Jorge A. Bezerra, MD, FAASLD	Cincinnati Children's Hospital Medical Center
Raymond T. Chung, MD, FAASLD	Massachusetts General Hospital

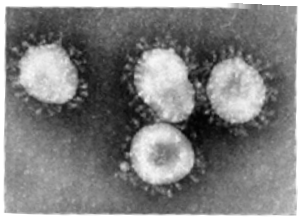
- Welcome and Introduction
  - Robert Fontana, MD, FAASLD
- Clinical Insights Updates
  - Oren K. Fix, MD, MSc, FAASLD
- Rapid Fire Journal Club
  - Mark W. Russo, MD, MPH, FAASLD
- Case Discussion
  - Elizabeth C. Verna, MD, MS
- Q&A
- Closing

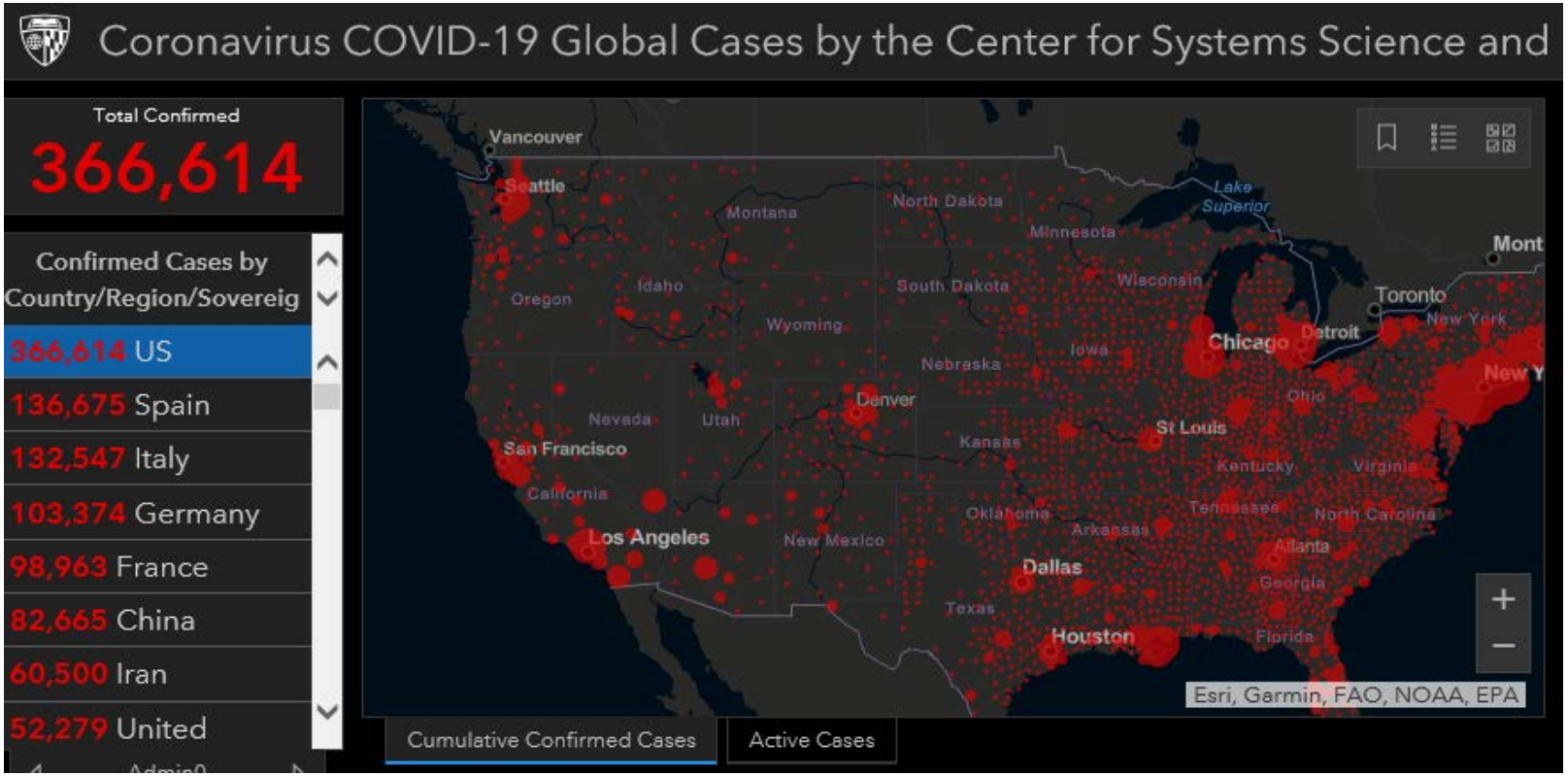
Introduction

Robert J. Fontana, MD, FAASLD
University of Michigan Hospitals and Health

Coronavirus Disease- 2019 (COVID-19)

Severe Acute Respiratory Syndrome CoronaVirus 2 (SARS-CoV-2)





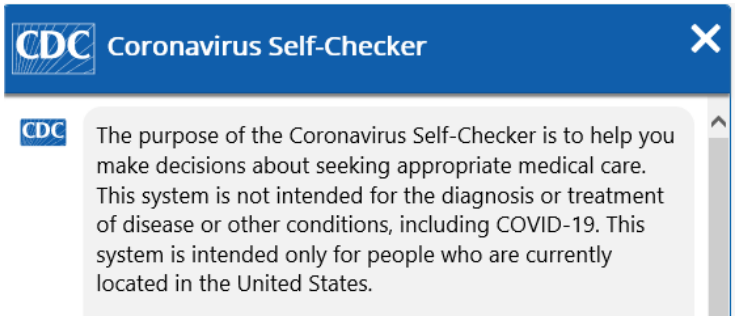
COVID-19

ACE-2 is molecular target of SARS-CoV2

ACE-2 protein	% COVID-19 involvement
Lung	80-100%
Heart	10-20%
Gut	20-30%
Liver	15-40%
Kidney	10-20%

(Yan R Science 2020;1448)
(Hamming J Path 2004; 631)

COVID-19



Personal Protection Equipment

Diagnostics

- RT-PCR
- non-PCR
- IgG, IgM serologies

338 Clinical trials

- Remdesivir
- Favipiraivir
- HCQ ± Azithromycin
- IL-6 receptor inhibitor

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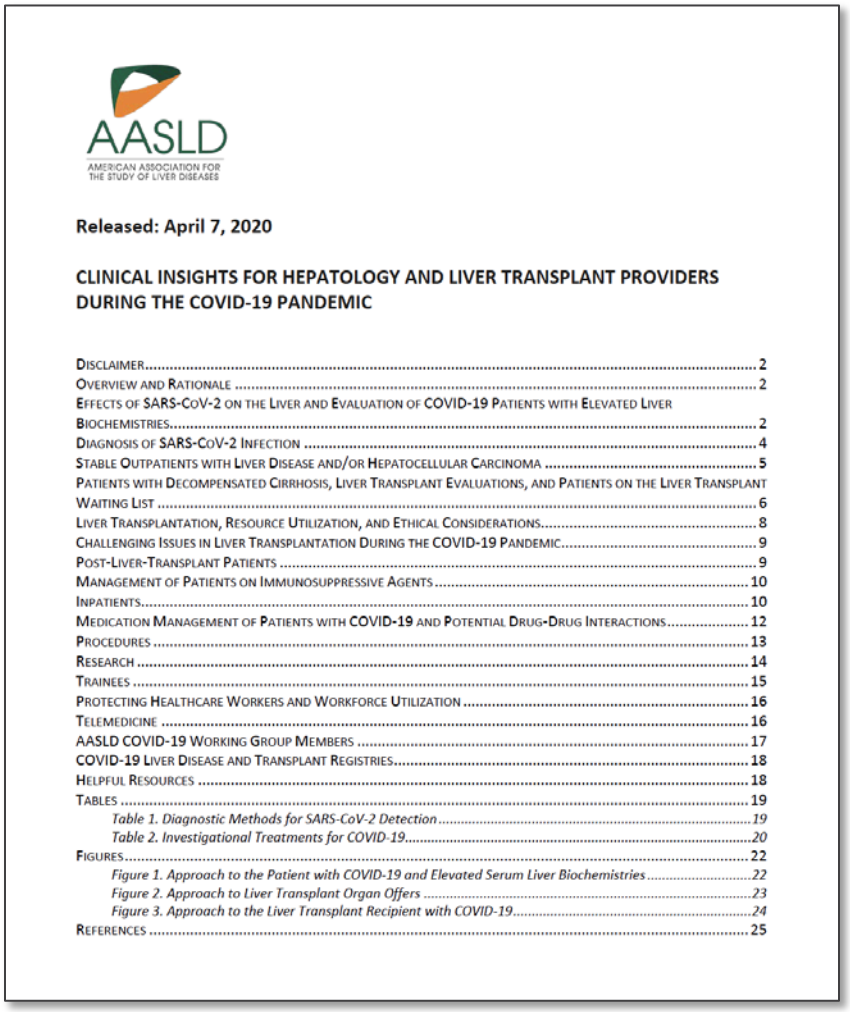
COVID-19 and the Liver: Case Studies and Updates

Oren K. Fix, MD, MSc, FAASLD
Medical Director, Liver Transplant Program
Swedish Medical Center, Seattle, WA

Clinical Associate Professor
Washington State University Elson S. Floyd College of Medicine

Clinical Insights Document

- First published online March 23rd
- Update posted online this morning, April 7th



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Released: April 7, 2020

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

Clinical Insights Document
Major Changes

- New sections:
  - Diagnosis of SARS-CoV-2 Infection
  - COVID-19 Liver Disease/Transplant Registries
- New tables and figures
- Expanded “What We Know” sections
- Rearranged content for clarity

Table 1. Diagnostic Methods for SARS-CoV-2

	Test (method)	Turn around (hours)	Sensitivity	Comments
Routine Bloodwork and Imaging	CBC with hand-differential & platelets	<1	NA	Progressive lymphopenia indicates poor prognosis Elevated WBC and thrombocytopenia indicate poor prognosis
	Comprehensive metabolic panel	<1	NA	Abnormal aminotransferases are common Acute kidney injury indicates poor prognosis
	LDH, D-dimer, CRP, INR, CPK, ferritin	<1	NA	Elevated inflammatory markers associated with poorer outcomes
	Chest CT	<1	80%-90%	Bilateral ground glass opacities (lower lobe and peripheral) seen in >90% of hospitalized cases confirmed by RT-PCR Specificity only 25%
Commercially Available Diagnostics	Nasopharyngeal swab (RT-PCR)	2-48	40%-80%	Peak shedding 12-14 days after infection; Nasopharyngeal higher yield than oropharyngeal Requires frozen transport media if >24 hours False negative common in early in disease
	Qualitative nasopharyngeal swab (non-PCR)	<1	80%-90%	Point of care qualitative test using isothermal detection methods Results in 15 minutes
	Sputum (RT-PCR)	2-48	60%-80%	Should be spontaneous expectorant Do not induce
	Bronchoalveolar lavage (RT-PCR)	2-48	95%	Recommended only for intubated patients with negative nasopharyngeal swab
	Plasma serology (IgG, IgM, IgA)	1-2	70%-90%	Indicative of prior exposure False negative early in disease False positive due to lack of SARS-CoV-2 specificity IgA/IgM positive at 3-6 days after symptom onset May be useful in healthcare workers, close contacts, and epidemiological studies
Investigational Diagnostics	Nasopharyngeal swab (CRISPR)	1-2	NA	Colorometric dipstick in development
	Blood (RT-PCR)	24	15%	May be present in more severe cases
	Stool (RT-PCR)	24	30%	May be detectable throughout disease phase
	Cell culture	>24 (days)	NA	For research purposes only Requires high level safety lab Used for vaccine and antiviral testing

Table 2. Investigational Treatments

	Agent (route/mechanism)	Target population	Safety issues	Efficacy issues*
Antiviral Agents	Remdesivir (IV/nucleotide analogue)	Moderate-severe	Nausea/vomiting Grade 1-2 ALT elevations Drug vehicle accumulation in acute kidney injury *Exclusions:* GFR <30-50 mL/min AST or ALT >5x ULN	Investigational RCT vs placebo and compassionate use protocols Previously tested in Ebola Few DDIs anticipated
	Favipiravir (oral/RNA polymerase inhibitor)	Early to mild disease		Investigational Approved for influenza in Asia Tested with interferon-α aerosol x 14 days Improved viral clearance compared to lopinavir-ritonavir(50)
	Lopinavir-ritonavir (oral/HIV protease inhibitor)	Severe	CYP3A4 substrate Severe DDI with CNI 13% early discontinuation due to side effects	FDA-approved for HIV No survival benefit in RCT vs standard of care x 14 days
	Nitazoxanide (oral/host proteins)	Moderate-severe	Similar to placebo in influenza trials	FDA-approved for Crytosporidium/Giardia In vitro activity against coronaviruses
	Hydroxychloroquine (oral/host proteins)	Moderate-severe	QTc prolongation Nausea and vomiting *Exclusions:* QTc >415 ms Cardiomyopathy G6PD deficiency	FDA-approved for lupus/rheumatoid arthrtitis/malaria Available as emergency use May work by reducing ACE2 receptor-mediated endocytosis or inhibiting endosomal acidification
	Chloroquine (oral/host proteins)	Moderate-severe	QTc prolongation Nausea and vomiting *Exclusions:* QTc >415 ms Cardiomyopathy G6PD deficiency	FDA-approved for malaria May work by reducing ACE2 receptor-mediated endocytosis or inhibiting endosomal acidification Reduced progression of disease and symptom duration in China
	Azithromycin (oral/host proteins)	Moderate-severe	CYP3A4 substrate Moderate DDI with CNI Rare cholestatic hepatitis *Exclusion:* QTc >415 ms	FDA-approved for bacterial infections Combined with hydroxychloroquine in only 6 patients
Immunomodulatory Agents	Toclizumab (IV/monoclonal IL-6 receptor antagonist)	Severe (high IL-6 levels)	Grade 1-2 ALT 20%-40% Grade 3+ ALT 1%-2%. Acute liver failure <1% Neutropenia 3% Thrombocytopenia 2% Opportunistic infections *Exclusions:* ANC <2,000/m^3 Platelets <100,000/m^3 ALT >5 xULN	FDA-approved for RA 8 mg/kg dose
	Sarilumab (SC/monoclonal antibody)	Severe (high IL-6 levels)	Grade 1-2 ALT 15%-25% Neutropenia 5% Thrombocytopenia 1% *Exclusions:* ANC <2,000/mm^3 Platelets <150,000/m^3 ALT >5 ULN	FDA-approved in RA Being tested as IV formulation
	Siltuximab (IV/monoclonal antibody)	Severe (high IL-6)	Grade 1-2 ALT Rash 30% Thrombocytopenia 9% *Exclusions:* ALT >5x ULN	FDA-approved in Castleman's disease
	Convalescent plasma (IV/neutralizing antibodies)	Severe or life-threatening pneumonia	Potential TRALI/ anaphylaxis ICU monitoring needed Must screen donor for other transmissible pathogens	Investigational Open label 400 mL plasma infusion in 5 patients and 200 mL plasma infusion in 10 patients Finding donors with neutralizing IgG activity not well established Reserved for severe/life threatening cases

Fig 1. Approach to the Patient with COVID-19 and Elevated Serum Liver Biochemistries

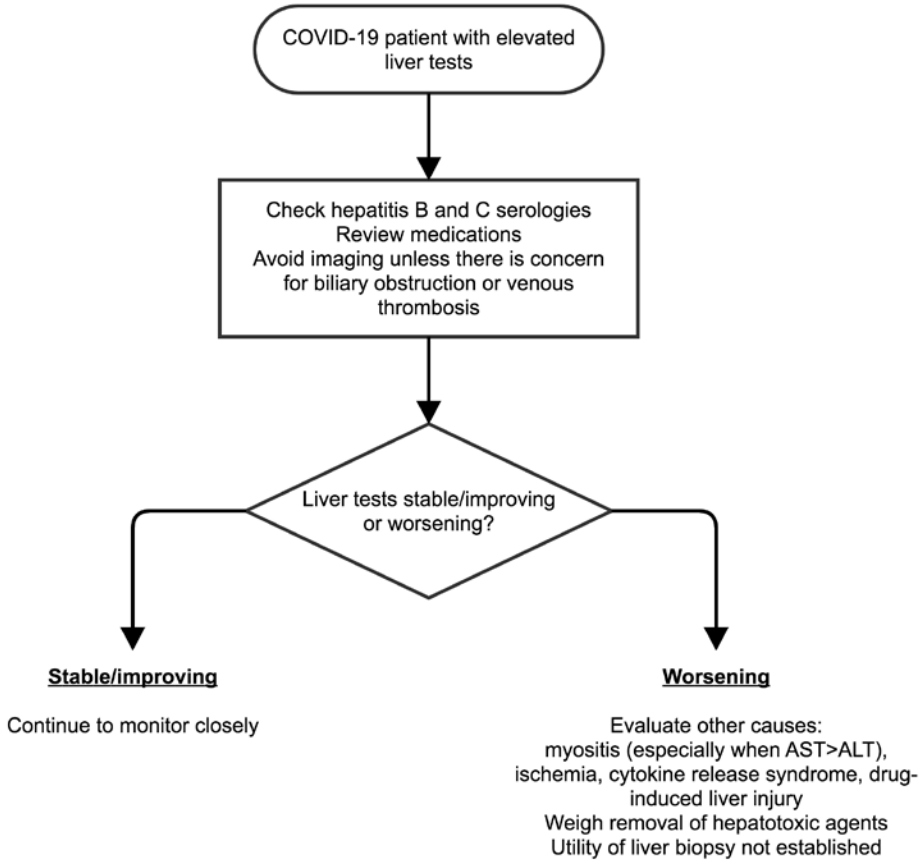


Fig 2. Approach to LT Organ Offers

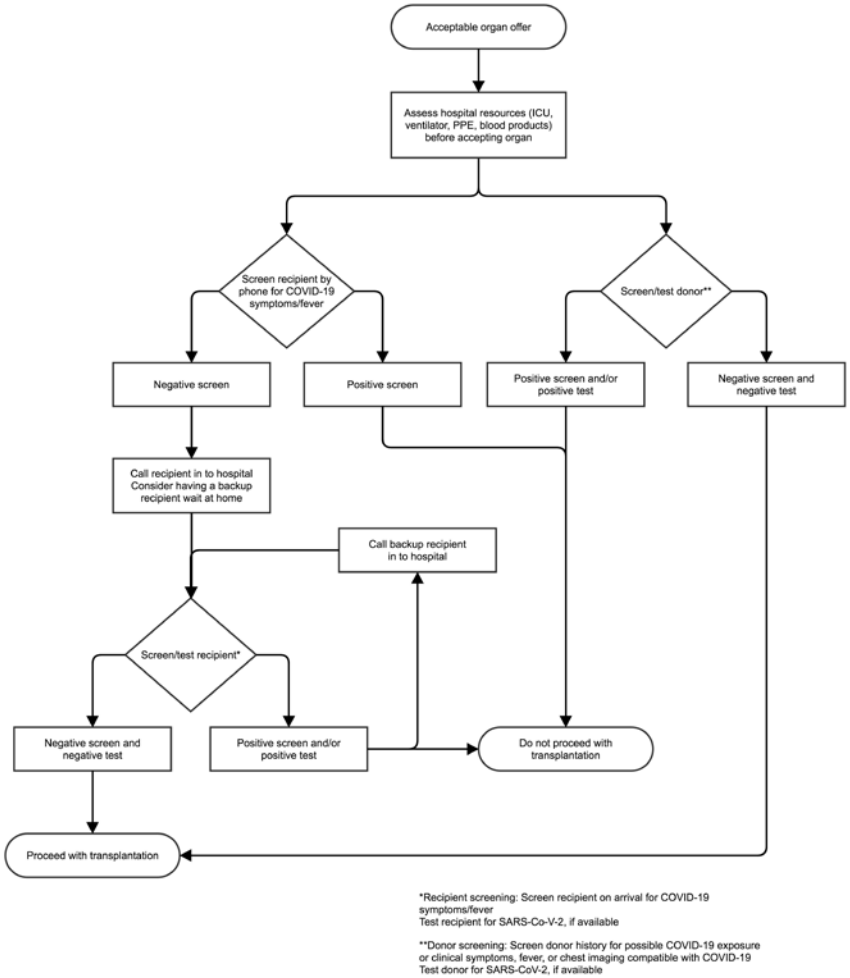
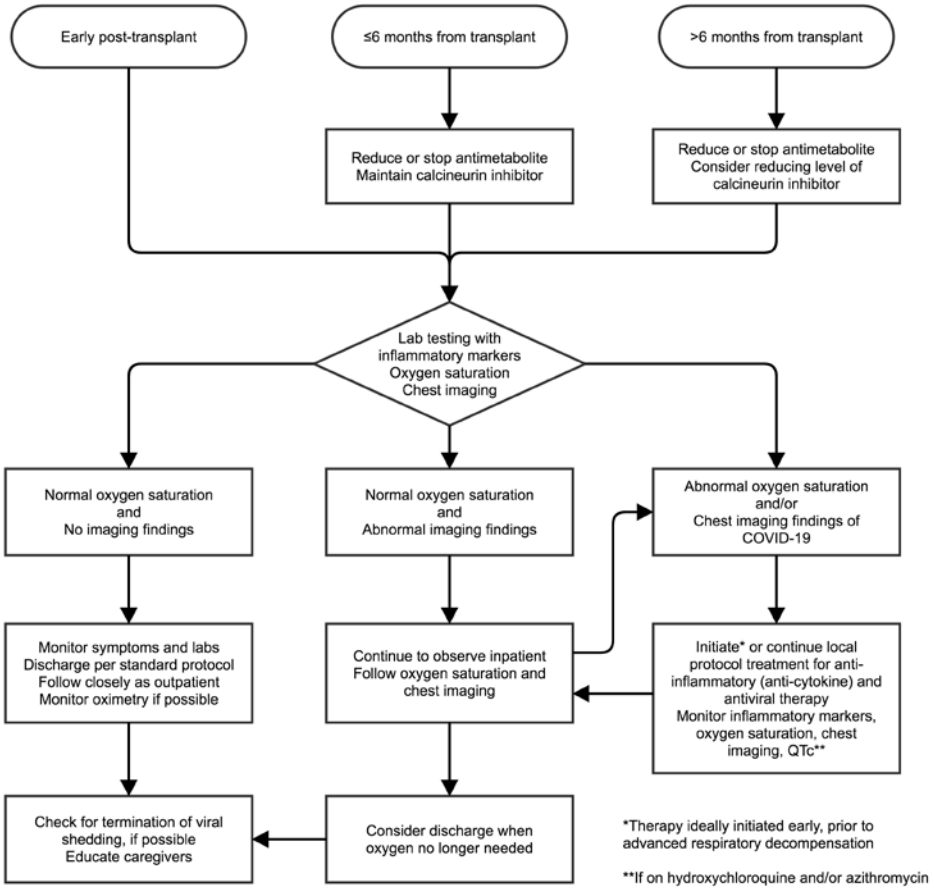


Fig 3. Approach to the LT Recipient with COVID-19



Major Changes: SARS-CoV-2

- Virology of SARS-CoV-2
- Liver histology in COVID-19
- Expanded COVID-19 symptoms for screening:
  - sore throat, diarrhea, new loss of sense of taste or smell
- Expanded COVID-19 complications when evaluating patients with elevated liver tests
  - myositis, cytokine release syndrome, ischemia/hypotension, DILI

Major Changes: Chronic Liver Disease

- Clarified recommendations for treatment of patients with liver disease
  - Continue treatment for HBV and HCV
  - Consider delaying initiation of HCV treatment
  - Removed specific 10 mg recommendation when tapering high-dose prednisone in patients with COVID-19
  - Recommend initiating immunosuppressive therapy in patients with liver disease who have strong indications for treatment (e.g., autoimmune hepatitis, graft rejection)

Major Changes: HCC

- Clarified recommendations for monitoring patients with HCC and surveillance of patients at risk for HCC
- Arbitrary delay of 2 months is reasonable based on tumor doubling time and COVID-19 circumstances

Major Changes: COVID-19 Treatment

- Expanded section on Medication Management to include new information about investigational agents
- Link to University of Liverpool Drug Interactions Group

Immunosuppressants

	ATV	LPV/r	RDV	FAVI	CLQ	HCLQ	RBV	TCZ	IFN-β
Adalimumab	↔	↔	↔	↔	↔	↔	↔	↔	↔
Anti-thymocyte globulin	↔	↔	↔	↔	↔	↔	↔	↔	↔
Azathioprine	↔	↔	↔	↔	↔	↔	↑	↔	↔
Basiliximab	↔	↔	↔	↔	↔	↔	↔	↔	↔
Belatacept	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ciclosporin	↑	↑	↔	↔	↑	↑	↔	↓	↔
Mycophenolate	↔	↑↓	↔	↔	↔	↔	↔	↔	↔
Pirfenidone	↔	↓	↔	↔	↔	↔	↔	↔	↑
Sirolimus	↑	↑	↔	↔	↑	↑	↔	↓	↔
Tacrolimus	↑	↑	↔	↔	↑	↑	↔	↓	↔

Major Changes: Procedures

- Added transient elastography to list of elective/ non-urgent procedures
- Revised list of procedures that may need to be performed
- Revised PPE recommendations for endoscopic procedures to include N95 masks and double gloves

Available Resources from AASLD

- Updated document available today at: https://www.aasld.org/about-aasld/covid-19-resources
- Spanish and Portuguese translations coming soon
- Future updates planned
- Manuscript in preparation

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RAPID FIRE JOURNAL CLUB

Mark W. Russo, MD, MPH, FAASLD

Clinical presentation

Study	Design	Presentation	Course
Bhatraju PK et al, NEJM	Retrospective study 9 Seattle hospitals of 24 adult pts in ICU	Symptoms 1 wk prior to admission 54% contact with ill person 50% no fever 75% lymphopenia	Among 24 in ICU 75% ventilated 50% died, 70% men 62%>65 died 37%<65 died
Onder G, et a. JAMA	Retrospective in Italy	Among fatalities 30% heart disease 35% diabetes 20% active cancer 2.7 preexisting diseases Per fatality	Fatality (%) age Italy China 60-69 3.5 3.6 70-79 12.8 8.0 80-89 20.2 14.8
Lu X, et al NEJM Letter, pediatrics Wuhan Childrens hospital	Retrospective N=171 peds Median age 6.7 60% male	16% asymptomatic 65% pneumonia 3 pts in ICU & vent all had comorbidities	59% no fever 3.5% lymphopenia 149 discharged

Commentary: Clinical Presentation

- Fever may not be present in 50% or more of adults or children
- Serious illness although uncommon in children, occurs and reported in those with comorbidities
- Lymphopenia common adults, not common in children
- Fatality rates are confounded by testing strategies, implicated causes of death
- Liver injury was not reported on initial studies of COVID-19
- Patients may present with GI symptoms (diarrhea, vomiting) (AJG)

Treatment

Study	Design &Treatment	Study population	Outcome
Cao, B NEJM Wunan	Lopinavir-ritonavir x 14d 99 treated vs 100 SOC Open label RCT	O2 sat<94% PAO2:FiO2<300 Excluded cirrhotics & ALT, AST >5XULN	No difference in clinical improvement btwn groups GI side fx with Lop/Rit
Gautret P, Int J Antimicro Agents France	Single arm n=36 Hydroxychloroquine+/- azithromycin Untreated controls n=16	Age >12 Excluded –retinopathy,G6PD def QT prolonged	Virologic cure day 6 70% treated group 12.5% controls p=0.001
Molina, et at Med Mal Infect France	11 patients, hydroxychlorquine+ azithromycin, same design as gautret	Mean age 58.7 (20-77) 8 patients had significant comorbidities	1 patient died 4 patients dc'd due to prolonged QT interval 8 pts remained PCR+
Chen, et al, MedRxiv Wuhan (not peer reviewed)	Prospective, multicenter open label RCT favipiravir n=116 vs arbidol (umifenovir) n=120	≥18 y/o, symptoms within 12 days and COVID pneumonia Excl AST/ALT>5xULN 3 groups: ordinary, DM+HTN, severe	7 day clinical recovery in "ordinary group" 56% arbidol group 71% favipravir group p=0.0199
Shen C JAMA 2020 Shenzhen	Convalescent plasma administered 10-22 after admission	5 critically ill patients with ARDS ventilated Age 36-65	4 pts resolution of ARDS 12 days post infusion,3 discharged

Commentary: Treatment

- Lopinavir-ritonavir was not associated with clinical improvement in clinical trial. May see studies in less ill populations or in combination with other antivirals
- Hydroxychloroquine +/- azithromycin with 1 positive and 2 negative trials. Larger, randomized studies with clinical outcomes awaited.
- Be aware of drug interactions with ritonavir, prolongation of QT interval with hydroxychloroquine, azithromycin
- Study from nonpeer reviewed article reported favipiravir led to improved clinical course compared to umifenovir in subgroup analysis of patients with mild disease. Results need to be reproduced.
- Convalescent plasma studied in small group that was severely ill with ARDS and ventilated and these patients were on multiple antivirals. Preliminary results encouraging but need validation.
- Data on remdesivir, tocilizumab, others eagerly awaited

Liver related studies

Study	Design	Findings
Zhang Y et al. Liver Int Mar	N=115, COVID pts N=119 ComAcqPneum pts Retrospective.	No difference AST, ALT elevations btwn groups Albumin lower in COVID group
Bangash MN, et al. Lancet GI Hep Mar	Correspondence -review of 7 studies	AST, ALT 1-2x ULN Most severe COVID cases AST, ALT 2x ULN, Elevations in CK
Xiao, Y, et al Lancet GI Hep Mar	111 Decompensated cirrhosis enrolled in prevention study, WeChat messaging every 3 days total times	0 decomp cirrhosis had COVID symptoms at authors' hospital vs 17% decomp cirrhotics at other Wuhan hospitals
Qin J et al. Hepatology 2020 Mar	Case report 37 y/o man OLT for HBV, HCC	Recovered, received oseltamivir and antivirals
D'Antiga et al. Liver Transpl 2020	Bergamo - Peds, Transplant center experience	No sig. COVID disease among, 200 LT recipients,100 AIH pts, 3 recipients test positive
Andrea, et al AJT Mar	Milan- transplant center experience	Presents an algorithm for dedicated transplant pathway

Commentary: Liver and Transplant

- Significant liver test abnormalities uncommon from COVID-19 disease
- If significant liver test elevations, evaluate for other causes including drugs, positive pressure ventilation-congestion, ischemia, myositis
- Increased morbidity and mortality from coronaviruses including SARS-CoV-2 has not been associated with immunosuppression in liver transplant recipients
- No evidence to support routinely reducing immunosuppression in uninfected liver transplant recipients, patients with autoimmune hepatitis

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Case Discussion

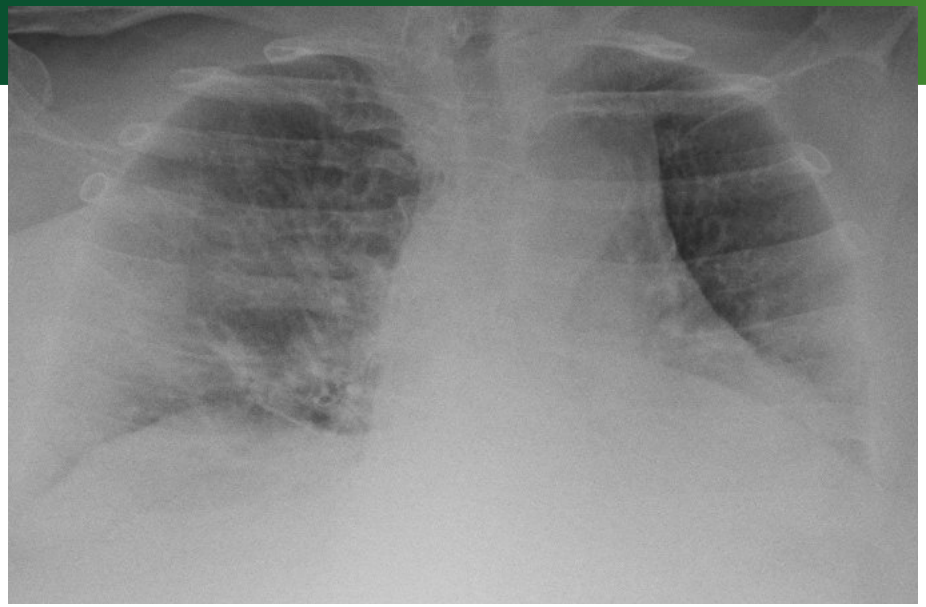
Elizabeth C. Verna, MD, MS
Columbia University Medical Center

52 year old woman with…

- Chief complaint: Subjective fever, cough, shortness of breath and headache
  - Onset of symptoms 7 days ago, initially with fever and headache, and now presents to the ER due to significant shortness of breath
  - No recent travel, husband also with about 10 days of fever and diarrhea
  - She and her husband were started on hydroxychloroquine empirically by her internist 4 days ago
  - They were not tested for COVID or other respiratory viruses
- Medical history: Hypothyroidism, stable on replacement therapy
- Surgical history: Cholecystectomy in 2011 for symptomatic cholelithiasis
- Social history: Works part time as a pharmacist, no alcohol or tobacco use, lives with husband and 34 year old son

- At initial presentation:
  - **Vitals**: Temperature 38.5 C, HR 111, BP 102/68, RR 28, O2 saturation 90% on RA at rest
  - **Physical Exam**:
    - Well nourished and well developed, moderate respiratory distress, difficulty speaking in full sentences
    - Anicteric sclera
    - Chest with mild diffuse crackles
    - Tachycardia, regular rate and rhythm
    - Abdomen soft, nontender, nondistended, no hepatosplenomegaly appreciated
    - No edema, no cyanosis

- Initial diagnostic work up:
  - WBC: 4.1, 86% PMN, 7% lymphocytes
  - Hgb 13.4, platelets 167,000
  - Creatinine 1.37 mg/dl, eGFR 43ml/min
  - AST 266 U/L, ALT 234 U/L, TB 0.4 mg/dl
  - INR 1.1, Ddimer 0.5 ug/ml
  - CRP 99 mg/l, ESR 45
- Nasopharyngeal swab for SARS-CoV2 positive



- **Chest x-ray**: Bilateral patchy airspace opacities, no pleural effusion, normal cardiac silhouette
- **EKG**: Sinus tachycardia

- **Clinical course**:
  - Patient isolated and with mask upon initial ER intake assessment
  - O2 saturation increased to 95% on 4L NC and more comfortable appearing

Initial treatment:

- Supplemental oxygen was slowly titrated up
- Continued hydroxychloroquine to complete 5 day course
- 5-day course of azithromycin started as well
- Evaluated for additional treatment options and clinical trials including:
  - Antivirals:
    - Remdesivir - nucleotide analogue
  - Immune modulation:
    - IL-6 inhibitors Tocilizumab, Sarilumab
    - High dose steroids, IVIG

- Work up of elevated liver tests:
  - Liver tests had been normal 4 months ago
  - HCV Ab negative, HBsAg negative, HAV IgG positive
  - EBV and CMV negative
  - Ferritin 7800, CK 405
- Ultrasound deferred in order to minimal exposures

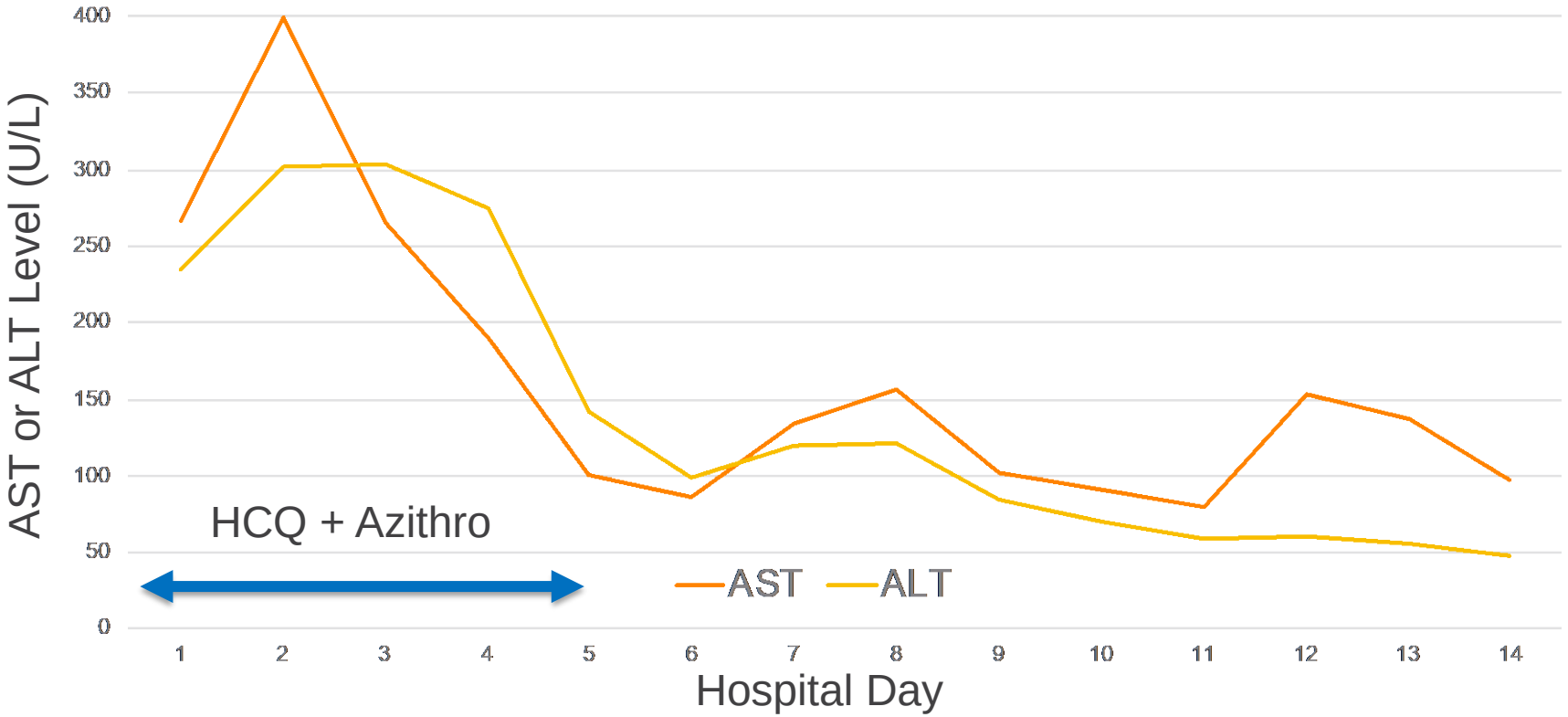
Preliminary analysis of *1076 patients* with confirmed COVID at CUIMC

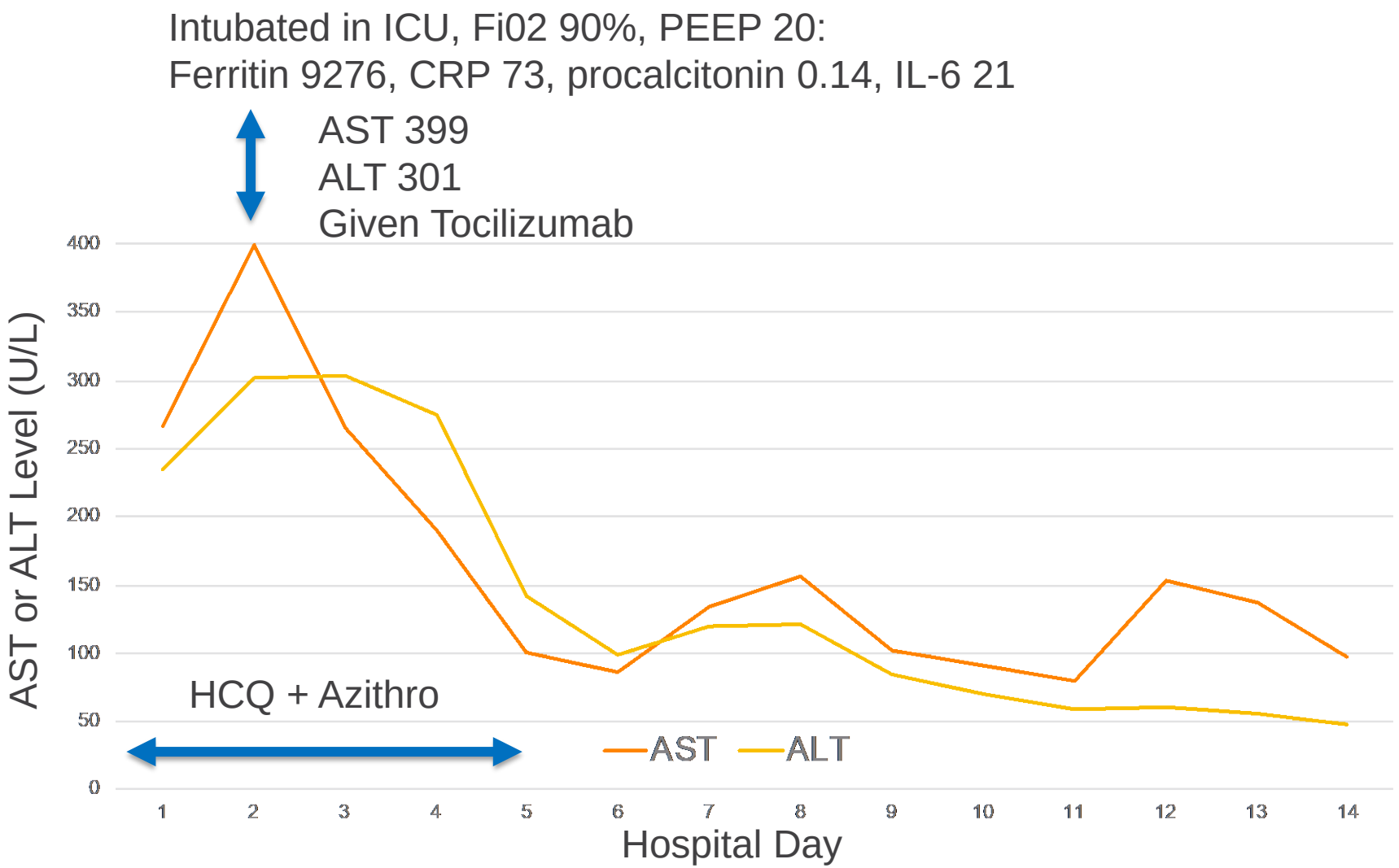
	AST (U/L)	ALT (U/L)
Initial value, median (IQR)	37 (24, 60)	27 (18, 45)
> ULN, n (%)	353 (33%)	221 (21%)
>2x ULN, n (%)	107 (10%)	62 (5.8%)
>5x ULN, n (%)	26 (2.4%)	17 (1.6%)

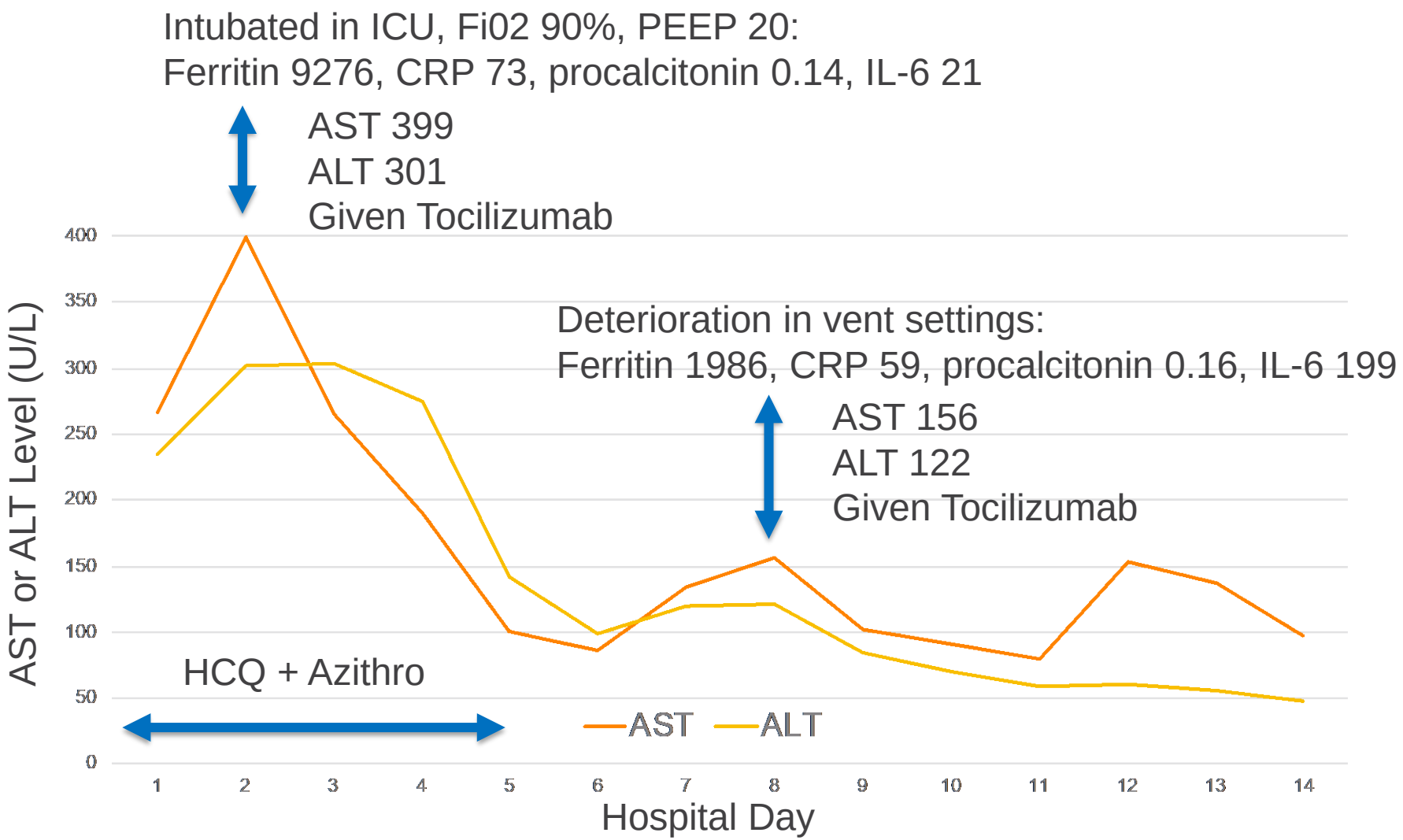
- AST or ALT > ULN in 33%, >2x ULN in 10% and > 5x ULN in 2.4%
- AST elevation in more common than ALT and likely reflects contribution of AST sources outside the liver

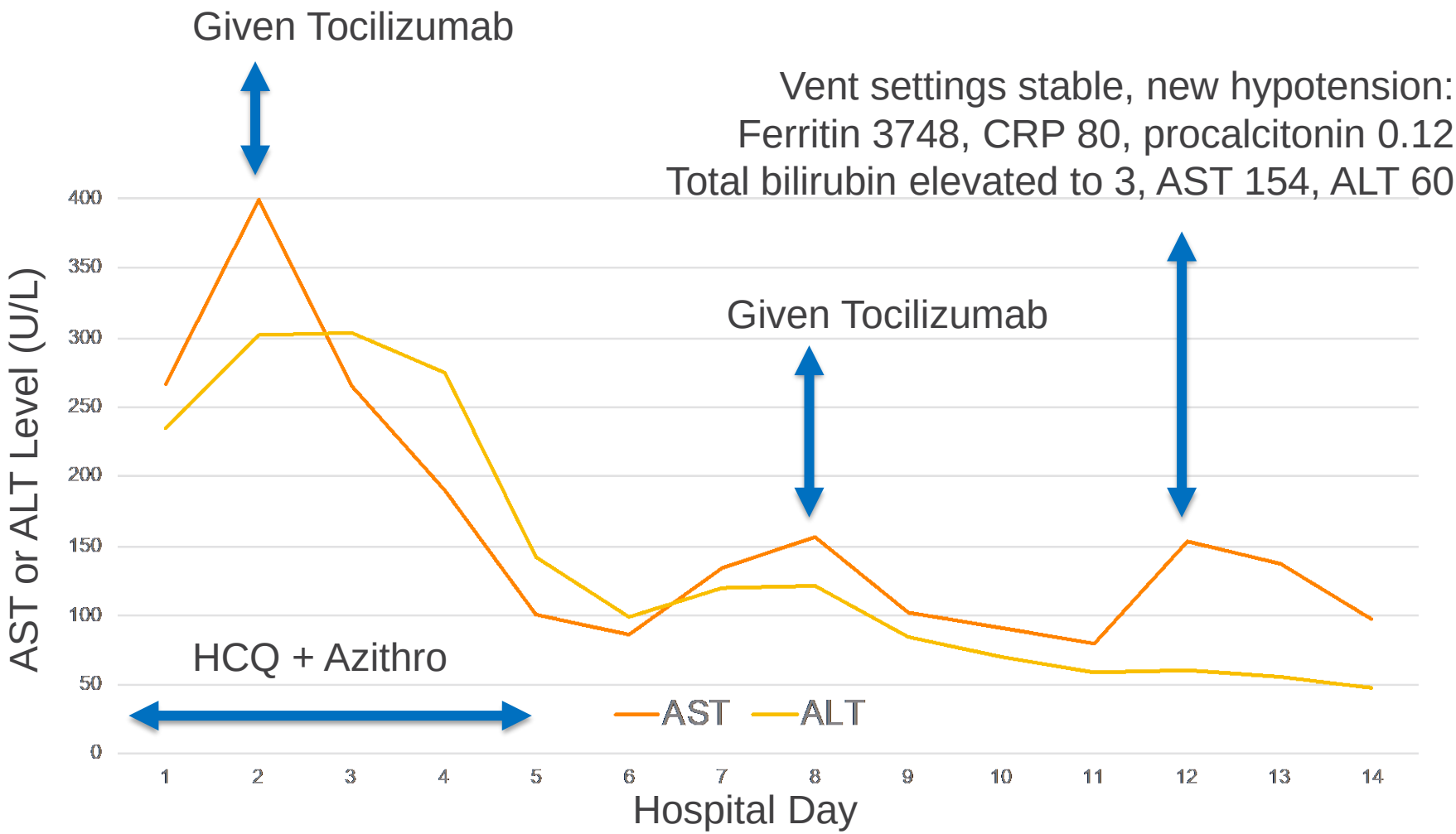
- On first night of hospitalization:
  - Progressive hypoxemic respiratory failure and increased work of breathing
  - Placed on non-rebreather but with progressive decline in O2 saturation
  - Ultimately intubated and moved to ICU on hospital day 2

Trajectory of Liver Enzymes and Clinical Course





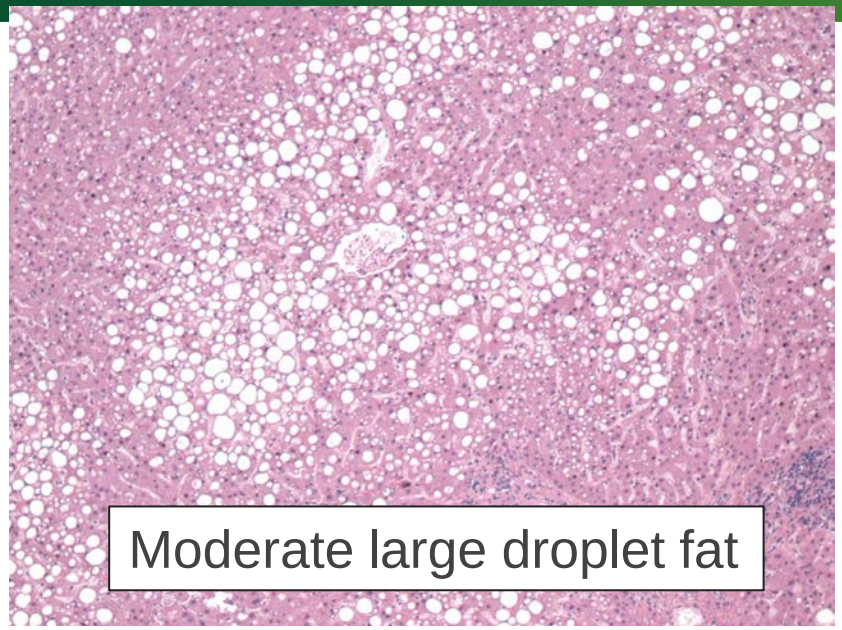


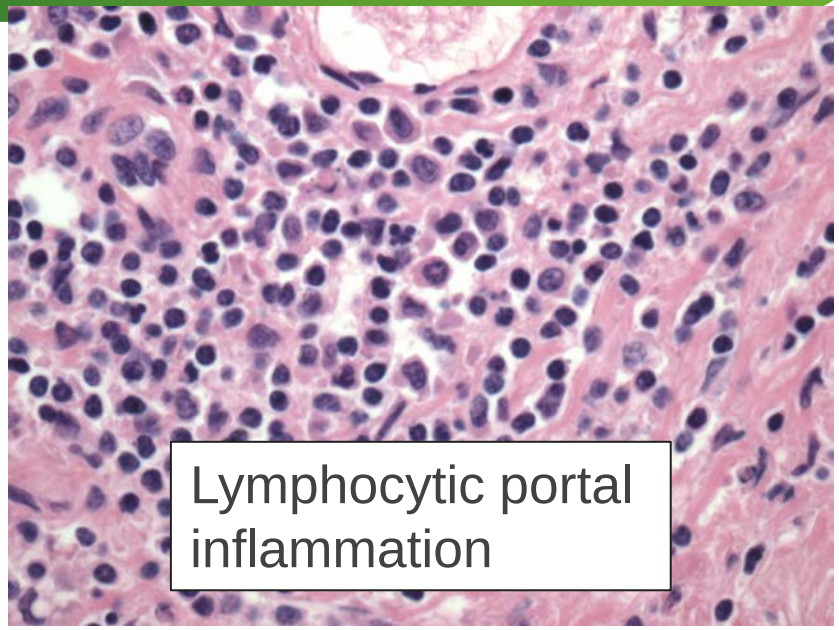


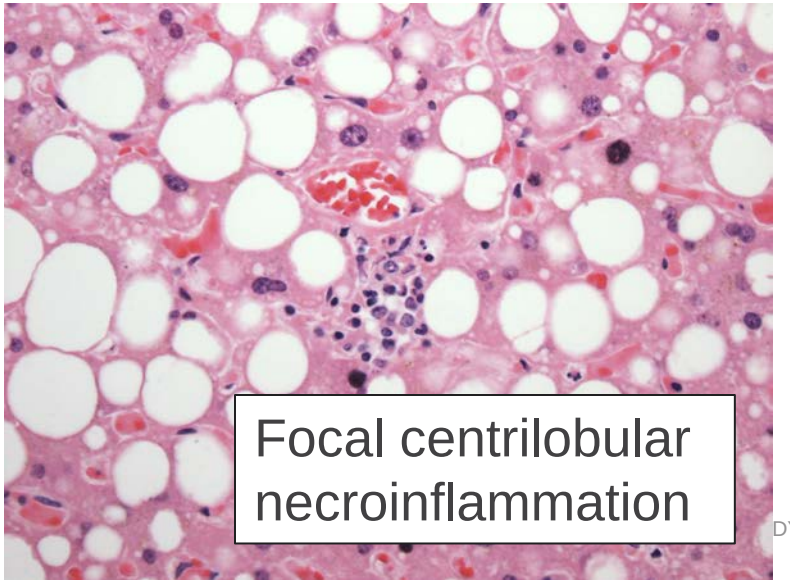
- Clinical course continued:
  - Abdominal ultrasound with heterogeneous appearing liver, normal bile ducts, no splenomegaly, no thrombosis
  - Blood and urine cultures positive for E. Coli, started on antibiotics
  - TTE with EF 65%, no significant valvular abnormalities
- Hospital day 14:
  - Off pressors, on antibiotics
  - Improved vent settings: FiO2 40% with PEEP 15
  - AST 98, ALT 48, total bilirubin 1.2

- Take away points:
  - Mild liver enzyme elevation is relatively common in COVID-19
  - More severe elevations >5x ULN occur in <10% of patients and are more likely in severe disease
  - Liver enzyme elevation may impact COVID-19 treatment strategies
  - In critically ill patients, liver enzyme abnormalities are likely to be multifactorial
  - Liver injury from COVID-19 likely reflects both direct viral-mediated injury as well as inflammatory response and may mimic the clinical course of the COVID-19 syndrome

Autopsy Histology: AST 48, ALT 23



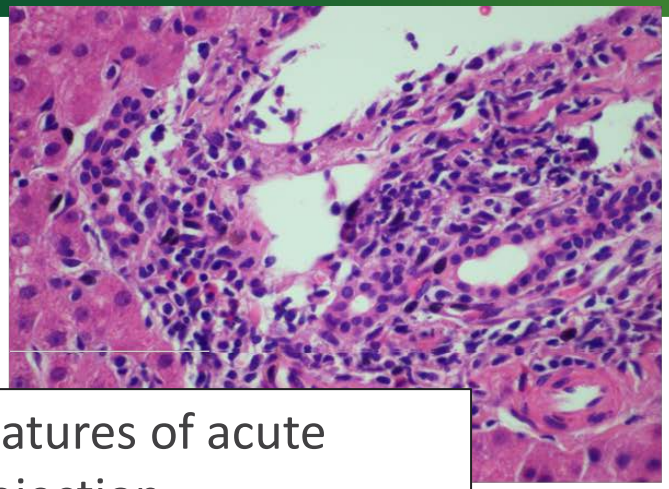




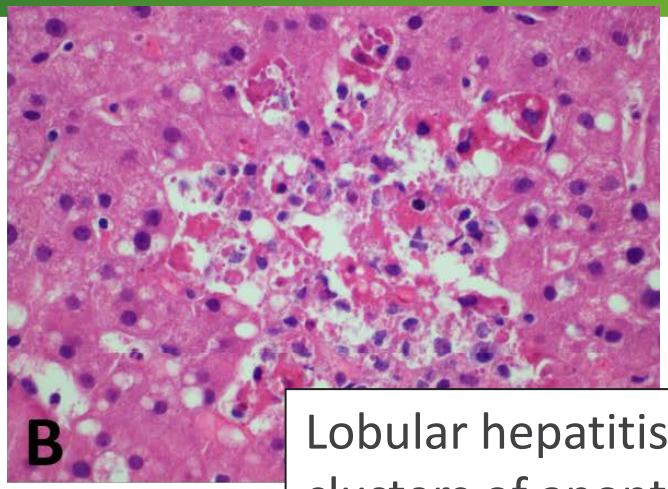
- Overall changes most consistent with NAFLD
- Uncertain whether any of these represent COVID-specific changes

Courtesy of Jay Lefkowitch

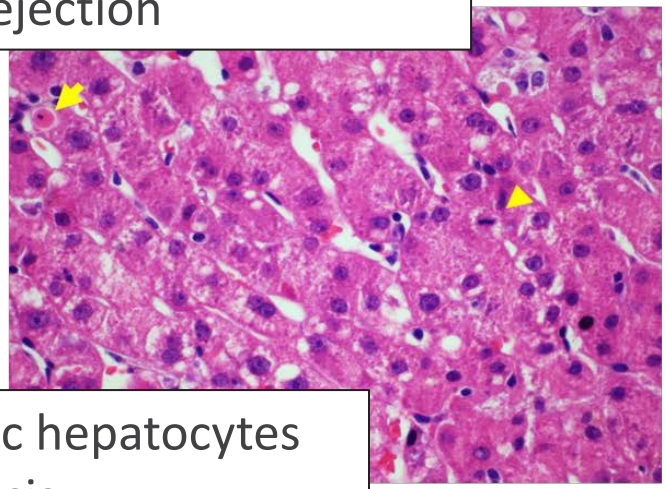
Post-Liver Transplant: POD 7



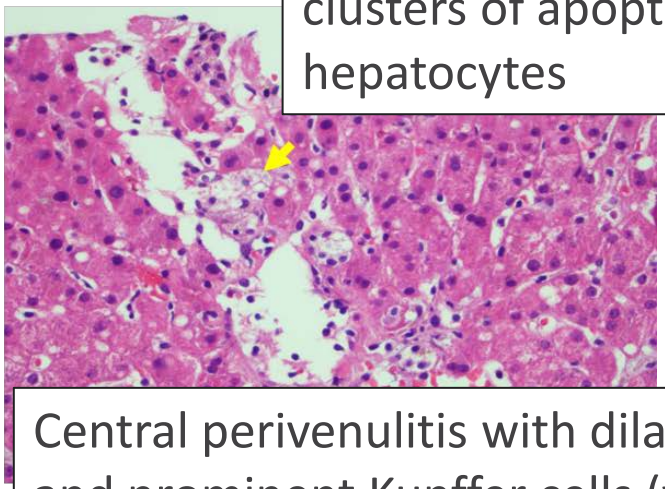
Typical features of acute cellular rejection



Lobular hepatitis, prominent clusters of apoptotic hepatocytes



Apoptotic hepatocytes and mitosis



Central perivenulitis with dilated sinusoids and prominent Kupffer cells (yellow arrow) may relate to rejection, however such changes have also been described in MERS hepatitis.

Lagana, S et al. Submitted

o Take away points:

- There is not yet a complete description of liver histological changes with COVID-19
- Underlying liver disease will impact liver enzyme and liver histology abnormalities
- Liver biopsy is not indicated unless there is a strong suspicion for additional pathology that will influence urgent treatment decisions (i.e. allograft rejection)

Panel Discussion

Please submit your questions to the Q&A Chat now.

AASLD
AMERICAN ASSOCIATION FOR THE STUDY OF LIVER DISEASES

Upcoming COVID-19 Webinar

Thursday, April 16, 2020

5-6pm Eastern

Clinical Insights: COVID-19 and the Liver – Case Studies and Updates

Presenters:
Bilal Hameed, MD
Ryan Kwok, MD
Michael Schilsky, MD, FAASLD

Moderator:
Brendan McGuire, MD

Registration: http://www.aasld.org/COVID19

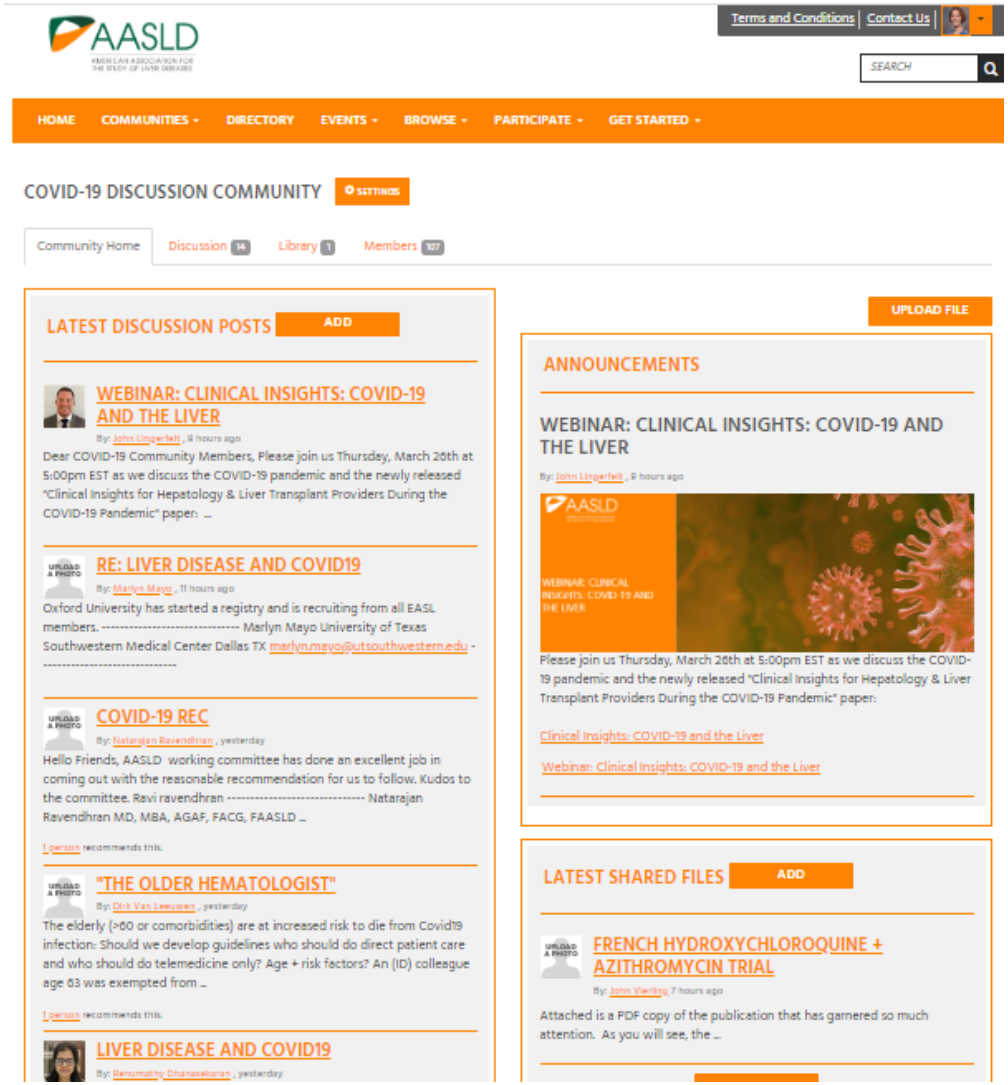
- **COVID-19 websites**
  - **CDC https://www.cdc.gov/coronavirus/2019**
  - **NIH https://clinicaltrials.gov/**
  - **FDA https://www.fda.gov/emergency-preparedness**
  - **AASLD http://www.aasld.org/COVID19**
  - **Endoscopy https://www.aasld.org/sites/default/files/2020-04/JointSocietyMessage-ProceduresInTimeOfCOVID19-FINAL.pdf**
  - **UNOS https://unos.org/covid/**
  - **UW Transplant registry**

AASLD's COVID-19 Resources

Follow/Share: COVID-19 Resources Webpage: https://www.aasld.org/about-aasld/covid-19-resources

Join/Engage: COVID-19 Care Community on AASLD's online community, Engage. Open to all members. Log in to Engage with your AASLD user name and password.

Submit: *Hepatology, Liver Transplantation, Hep Commun* all accepting and fast tracking review of COVID-19 original articles, case reports



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