Research Article
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A simplified algorithm for managing hepatitis c infection by leveraging telemedicine

Abstract

Background: The utilization of alternative modalities to deliver patient care during the coronavirus disease of 2019 (COVID-19) pandemic has catalyzed the widespread adoption and integration of telemedicine into routine practice. These shifts have afforded a pivotal moment to analyze existing guidelines, such as for hepatitis C (HCV), identify opportunities, and streamline algorithms for optimizing disease management in remote settings.

Methods and findings: Toward furthering momentum for targeting global HCV elimination, our cross-specialty expert panel collaborated to develop a simplified treatment algorithm for use in telemedicine environments by non-specialist providers (**Figure 1**). This algorithm includes a framework for delivery of HCV treatment and recommendations for screening, pre-treatment evaluation, on-treatment monitoring, and post-cure follow-up. The use of telemedicine for HCV management is supported by multiple studies demonstrating similar cure rates, measured by sustained virologic response at 12weeks post treatment (SVR12), compared to standard, in-person clinic visits. No laboratory monitoring is necessary for the majority of patients taking pan-genotypic direct-acting antivirals (DAAs), further reinforcing the ease of remote management of HCV treatment. Touchpoints to support medication adherence can be conducted through a variety of technologies, including bidirectional text messaging, electronic portals, and telephone and/or video conferencing.

Conclusion: Telemedicine thus offers a critical opportunity to expand identification, link to care, and treat persons living with HCV.

Keywords: hepatitis C, liver disease, simplified algorithm, HCV treatment, telemedicine

Volume 13 Issue 1 - 2022

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Received: November 21, 2021 | **Published:** January 29, 2022

Abbreviations: HCV, hepatitis C virus; US, united states, HCC, hepatocellular carcinoma; CDC, centers for disease control and prevention; WHO, world health organization; AASLD, american association for the study of liver disease; VA, veteran's affairs; FQHC, federally qualified health centers

Introduction

The most common blood borne infection in the United States, hepatitis C virus (HCV) infection continues to be a significant public health burden despite the availability of curative treatment.[1–5] HCV infection is a leading cause of cirrhosis, hepatocellular carcinoma (HCC) , and liver transplantation in the United States (US).[1,2] Thus, early identification and treatment are crucial to prevent life threatening complications, as well as prevent widespread transmission, with the latter referred to as "treatment as prevention".[6–8] Yet, in 2019, researchers at the POLARIS Observatory estimated that only 66% of Americans with active HCV infection had been diagnosed, and only 47% had been treated.[9]

Multiple organizations across the globe, including the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), and the American Association for the Study of Liver Disease (AASLD) have implemented calls to action for HCV elimination.[237–10]

The CDC set specific goals to eliminate HCV as a public health threat by decreasing new HCV infections by 90%, and HCV-related deaths by 65%, by 2030 (using 2017 baseline data).[15] Nonetheless, in 2018, CDC annual targets for reducing new HCV infections in the general population and in persons who inject drugs failed to achieve annual reduction goals of ≥20% and ≥25%, respectively, and instead increased by approximately 13% for both.[9] New HCV cases, now four-fold higher than a decade ago, are impacting multiple generations beyond baby boomers, with Millennials, now aged 20 to 39, experiencing the greatest increase largely due to the opioid crisis.[3,5,9,10]

The trajectory of HCV elimination globally has potentially been further derailed by coronavirus disease 2019 (COVID-19). Consequent delays in HCV diagnosis and treatment by one year could result in an estimated excess incidence of 121,000 HCV infections, 44,800 HCC, and 72,000 liver-related deaths worldwide by 2030.[9]

Telemedicine and HCV infection

The CDC recognizes telemedicine as a key opportunity to expand identification, link to care, and treat persons living with HCV to achieve HCV elimination in the US by 2030.[410–12] In 2020, the COVID-19 pandemic exponentially facilitated widespread adoption of telemedicine, with many health systems and clinical

practices delivering most, if not all, patient care remotely at the peak of the pandemic. With more patients and providers becoming accustomed to and experiencing the benefits associated with virtual encounters, telemedicine's contributions as an integral part of the health care delivery system are likely to be widely recognized and implemented.

Multiple studies have demonstrated the value of telemedicine in the management of HCV infection in various settings, including primary care medical practices, community health centers, prison-based settings, Veteran's Affairs (VA) health care, and substance use treatment programs.[10–21] Compared to standard, in-person clinic visits, the use of telemedicine for HCV management is associated with:

- Similar cure rates, as measured by sustained virologic response at 12 weeks post treatment (SVR12)[25–27, 29,32,10]
- Increased uptake of HCV treatment initiation[23,26,30]
- Decreased time to HCV treatment and greater treatment completion[23,26,30]
- Adherence to SVR laboratory testing[24]
- Higher patient satisfaction rates and preference for virtual visits[10]
- Reduction in visit time (reduces need for travel and missed workdays)[25]

Methods

A committee comprised of 10 experts who specialize in different aspects of HCV care and demonstrated experience in utilizing in telemedicine was identified to serve as authors. There was representation from various clinical settings, including primary care, federally qualified health centers (FQHC), hepatology referral centers, and infectious disease practices. Based on each specialist's clinical and research interests, six sub-committees were formed (Testing and Screening, Pre-treatment Work-up, Treatment, Monitoring, and Post-treatment and HCC Screening). Each sub-committee was tasked with objectives that were presented at the consensus meeting in October 2020. Each sub-committee presented data and supportive evidence and a collaborative decision was reached about content to be included in the telemedicine algorithm.

Results

Screening Tele-Video Visit

Screening for HCV should be integrated alongside other routine care practices measures in the primary care setting. While an in-person visit is preferred, screening can be conducted via a video conferencing visit if necessary. Recently, the US Preventive Services Task Force (USPSTF) updated and simplified their screening guidelines to recommend universal, one-time screening for all adults aged 18 to 79 years, as well as for all persons with risk exposures and at prenatal testing with each pregnancy (Figure 1 and Table 1).[5] A key component of telemedicine is to ensure testing is streamlined by combining tests where appropriate and avoiding unnecessary laboratory visits. In alignment with the USPSTF guidelines, we recommend HCV "reflex testing," by which blood samples testing positive for HCV antibodies (indicating current or past HCV infection) are automatically tested for HCV RNA by polymerase chain reaction (PCR; indicating current infection).

In patients with a negative HCV RNA test, no further action is required for patients with no risk exposures. In patients with ongoing risk behaviors, at least annual HCV testing (HCV antibody test with reflex to HCV RNA) should be conducted; in addition, risk-reduction resources and support should be provided (Table 1). Patients with a positive HCV antibody test, but undetectable HCV RNA likely experienced a past infection. Patients who have detectable HCV RNA should be informed that they have an active HCV infection and could benefit from further evaluation and curative treatment.

Table 1 HCV screening eligibility and interpretation of test results[a]

HCV Screening Eligibility		
• One-time testing for all adults 18 to 79 years of age • Prenatal testing with each pregnancy • All persons with risk exposures[b] (periodic, repeat testing may be warranted) • Annual testing for those with ongoing risk behaviors[c]		
Interpretation of test results		
Test results	**Action items**	**Patient education and counseling**
Negative HCV antibody test	• No further action required[d] • At least annual HCV testing in patients with ongoing risk behaviors	• Inform patient they are not infected by HCV • Offer resources (e.g., risk-reduction strategies, social support) to patients with ongoing risk behaviors
Positive HCV antibody test Undetectable HCV RNA	• No further action required[e] • At least annual HCV testing with HCV RNA in patients with ongoing risk behaviors	• Inform patient they do not have a current HCV infection, but results suggest a resolved past infection • Counsel on preventing exposure to another HCV infection • Offer resources (e.g., risk-reduction strategies, social support) to patients with ongoing risk behaviors
Positive HCV antibody test Detectable HCV RNA	• Proceed to pre-treatment consultation for further evaluation	• Inform patient that active HCV infection would benefit from curative treatment and that further evaluation is needed • Counsel on preventing transmission of HCV to others • Offer resources (e.g., risk-reduction strategies, social support) to patients with ongoing risk behaviors

Citation: Cave B, Serper M, Box T, et al. A simplified algorithm for managing hepatitis c infection by leveraging telemedicine. *Gastroenterol Hepatol Open Access.* 2022;13(1):12–20. DOI: 10.15406/ghoa.2022.13.00488

AASLD, American Association for the Study of Liver Diseases; ALT, alanine aminotransferase; HCV, hepatitis C virus; HCWs, healthcare workers; IDSA, Infectious Diseases Society of America; PrEP, pre-exposure prophylaxis.

a. Based on the 2020 USPSTF, 2020 CDC, and 2020 AASLD/IDSA guidelines and recommendations.[3,36,37]

b. Risk exposures include: current or past injection or intranasal illicit drug use; men who have sex with men; children born to HCV-infected women; occupational sharps or mucosal exposure (e.g., HCWs); percutaneous/ parenteral exposures in an unregulated setting (e.g., unlicensed tattoo parlor); long-term hemodialysis; prior transfusion or organ transplant; incarceration; HIV infection; chronic liver disease and /or chronic hepatitis; including elevated ALT; sexually active persons about to start PrEP for HIV; and solid organ donors.

c. Ongoing risk behaviors include injection drug use, HIV-infected men who have unprotected sex with men, and men who have sex with men taking PrEP.

d. If recent HCV exposure is suspected, test HCV RNA or follow-up HCV-antibody testing ≥ 6 months after exposure.

e. If recent HCV exposure is suspected within past 6 months, clinical evidence of HCV disease, concern regarding handling or storage of specimen, or if distinction between true positive and false-positive is needed, repeat HCV RNA testing ≥6months.

Pretreatment tele-video evaluation

A pretreatment visit should be scheduled as soon as possible after a detectable HCV RNA by PCR is received. The objectives of this visit are two-fold: (1) to obtain relevant signs and symptoms, clinical history, and laboratory tests, determine fibrosis stage, whether or not referral to specialist is warranted, and identify factors that may impact HCV treatment, and (2) to educate the patient about HCV, its modes of transmission and reinfection, and treatment expectations, alongside connecting them with support services to reduce high risk behaviors.[37] In the event an in-person visit is not feasible, a telemedicine appointment with video conferencing is recommended in order to inspect for stigmata of cirrhosis and other extra-hepatocellular manifestations.

Physical examination

Key stigmata of cirrhosis and extra-hepatic manifestations can be reasonably assessed via telemedicine through visual examination of signs of portal hypertension and cirrhosis. For instance, the eyes (e.g., jaundice); the skin and nails, especially palms, hands, and face (e.g., erythema, jaundice, purpura, spider hemangiomas, temporal wasting); the abdomen (e.g., ascites and gynecomastia); and general demeanor (e.g., fatigue, coordination, orientation, response latency) are all signs that can be seen via video conferencing (Table 2). Inquiring about fatigue, changes in the mental state or gait, and any other symptoms the patient may be having can also provide insight into possible encephalopathy or other complications. Most patients with cirrhosis are asymptomatic, and will not exhibit these signs until end stage of disease.

Blood work and fibrosis assessment

Laboratory evaluation should be comprehensive to minimize the need for multiple lab visits. Laboratory tests to assess liver and kidney function, and co-infection with HIV and HBV should be performed, if they have not been performed in the past 6 months (Table 2).[37] HCV genotype testing can be performed but is not necessary or recommended with the use of pan-genotypic DAAs.[11] Patients who would benefit from a referral to a specialist, whether for HCV treatment or for specialist co-management include previous HCV infection, cirrhosis, HBV or HIV coinfection, low platelets, known or suspected HCC, current pregnancy, renal impairment, and uncontrolled comorbidities (Figure 1). Other laboratory tests may be required by the individual's insurance carrier for approval and thus should be considered for inclusion in the initial blood work to minimize the treatment delays.

Table 2 Pretreatment Tele-Video Evaluation[a]

Physical examination
• Stigmata of cirrhosis (i.e., jaundice, palmar erythema, ascites, spider hemangiomas, gynecomastia, encephalopathy)
• Extra-hepatic manifestations (i.e., jaundice, edema, vasculitis, renal disease, diabetes, fatigue)
Clinical history
• Risk of HCV acquisition
• Prior HCV therapies
• Diabetes, metabolic syndrome, renal disease, other liver diseases
• Alcohol consumption
• Current medications (including PRN drugs, OTC drugs, vitamins, and supplements)
• Assess for potential drug-drug interactions
• Screen for STDs; review family planning
• Ensure up to date with vaccinations (COVID-19 vaccine, influenza, Prevnar 13 and Pneumovax 23, HBV, HAV, consider HPV)[b]
Laboratory tests (if not performed in past 6 months)
• CBC and metabolic panel (including AST, ALT, total bilirubin, albumin, and creatinine)
• INR
• HBsAg, anti-HBs, anti-HBc total
• Anti-HIV
• Anti-HAV total
• Pregnancy test for all women of childbearing potential
• Assess for fibrosis (calculate FIB-4 or other equivalent test[c])
Patient education
• Modes of HCV transmission and measures to prevent reinfection
• Drug and alcohol treatment, counseling, and harm-reduction services
• Treatment (specialty pharmacy process, dosing/administration, food effects, adverse effects, drug-drug interactions, importance of adherence)

Severity of liver disease and fibrosis assessment should be determined for every patient with HCV who is being considered for treatment. The AASLD and Infectious Diseases Society of America (IDSA) guidelines recommend assessment of liver disease severity either by directed physical exam, blood-based tests, or transient elastography.[37] Several serology-based tests can be employed to accurately assess the degree of fibrosis in patients with chronic

HCV infection (Table 2).[37] Patients with blood tests indicating advanced fibrosis (e.g., Fibrosis-4 [FIB-4] score of >3.25, AST-to-platelet ratio index [APRI] >1.5, FibroTest™/Fibrosure® >0.58, and FibroMeter™ >0.786) may be treated in the PCP setting in the absence of decompensated cirrhosis.[6,7,8,11–14] Patients with advanced fibrosis should additionally undergo a complete abdominal ultrasound and alpha-fetoprotein (AFP) to exclude hepatocellular carcinoma (HCC) and to assess for signs of portal hypertension. Those with decompensated cirrhosis (e.g., any signs of portal hypertension, hepatic encephalopathy, ascites, and/or edema evident during the physical exam conducted by telemedicine) or platelet levels less than 100,000/mL should be co-managed or referred to a specialist (Figure 1).

Table 3 Recommended Pan-Genotypic Direct-Acting Antiviral Regimens in Treatment-Naïve Patients[a,b]

	Sofosbuvir 400 mg/Velpatasvir 100 mg (SOF/VEL)	**Glecaprevir 100 mg/Pibrentasavir 40 mg (GLE/PIB)**
Dosage and administration	1 tablet daily with or without food	3 tablets once daily with food
No cirrhosis/compensated cirrhosis (CTP Class A)	12 weeks	8 weeks
Decompensated cirrhosis (CTP B and C)	12weeks in combination with ribavirin	Not indicated
Use in renal impairment	No dosage adjustment necessary with any degree of renal impairment, including dialysis	
Use in hepatic impairment	No dosage adjustment necessary for CTP Class A, B, or C[c]	No dosage adjustment necessary for CTP Class A Contraindicated in CTP Class B or C
Common side effects (≥5% of patients)	Headache, fatigue, nausea, asthenia, and insomnia	Headache, fatigue, and nausea
Key drug-drug interactions[d]	Anticonvulsants, efavirenz, rifampicin, protease inhibitors, St. John's wort, statins	
	Amiodarone, proton pump inhibitors	Dabigatran, ethinyl estradiol, cyclosporine
Common drugs without interactions	ARBs, methadone, buprenorphine, CCBs, lamotrigine, progestin-only contraceptives	

ARBs, angiotensin II receptor blockers; CCBs, calcium channel blockers; CTP, Child-Turcotte-Pugh; DAA, direct-acting antiviral.

a. Based on the prescribing information for EPCLUSA® and MAVYRET®.[44,45]

b. In treatment-experienced patients, care should be initiated with co-management of specialist.

c. No safety data in patients with both decompensated cirrhosis and severe renal impairment.

d. Health care providers should consult prescribing information, their local pharmacist, and/or online tools (e.g., HEP Drug Interactions) to confirm interaction or lack of interaction for specific drugs within a class, as exceptions may exist.

Table 4 Hepatitis C and Telemedicine Resources

2019 expert consensus on a simplified algorithm for HCV management	Dieterich et al, 2019 https://www.gastroenterologyandhepatology.net/supplements/a-simplified-algorithm-for-the-management-of-hepatitis-c-infection
Free and low-cost device and mobile/broadband Internet services	Lifeline https://www.fcc.gov/lifeline-consumers National Digital Inclusion Alliance https://www.digitalinclusion.org/free-low-cost-internet-plans/
Provider consultation/ online resources on hepatitis C	National Clinician Consultation Center https://nccc.ucsf.edu/clinician-consultation/hepatitis-c-management/ (844) HEP-INFO or (844) (844) 437-4636 (Monday–Friday, 9 a.m–8 p.m. ET AASLD/IDSA guidelines https://www.hcvguidelines.org/ CDC's A Guide to Comprehensive Hepatitis C Counseling and Testing (sample patient conversations) https://www.cdc.gov/hepatitis/resources/professionals/pdfs/counselingandtestingpc.pdf HEP Drug Interactions https://www.hep-druginteractions.org/

Citation: Cave B, Serper M, Box T, et al. A simplified algorithm for managing hepatitis c infection by leveraging telemedicine. *Gastroenterol Hepatol Open Access.* 2022;13(1):12–20. DOI: 10.15406/ghoa.2022.13.00488

Table Continued...

Telemedicine provider resources	American College of Physicians (practice workflow, technology guidance, regulations, billing/coding) https://www.acponline.org/practice-resources/business-resources/telehealth AMA state directives to expand telemedicine in response to COVID-19 https://www.ama-assn.org/system/files/2020-04/telemedicine-state-orders-directives-chart.pdf AMA telehealth implementation playbook https://www.ama-assn.org/system/files/2020-04/ama-telehealth-playbook.pdf
Patient resources/ handouts	CDC's general info on hepatitis C https://www.cdc.gov/hepatitis/HCV/PDFs/HepCGeneralFactSheet.pdf CDC's What to Expect When Getting Tested https://www.cdc.gov/hepatitis/hcv/pdfs/HepCGettingTested.pdf CDC's Hepatitis C and Injection Drug Use https://www.cdc.gov/hepatitis/hcv/pdfs/FactSheet-PWID.pdf CDC's Viral Hepatitis–Information for Gay and Bisexual Men https://www.cdc.gov/hepatitis/Populations/PDFs/HepGay-FactSheet.pdf American Liver Foundation (brochures, videos, support groups) https://liverfoundation.org/for-patients/about-the-liver/diseases-of-the-liver/hepatitis-c/diagnosing-hepatitis-c/
Syringe exchange programs	North American Syringe Exchange Network https://www.nasen.org/map/

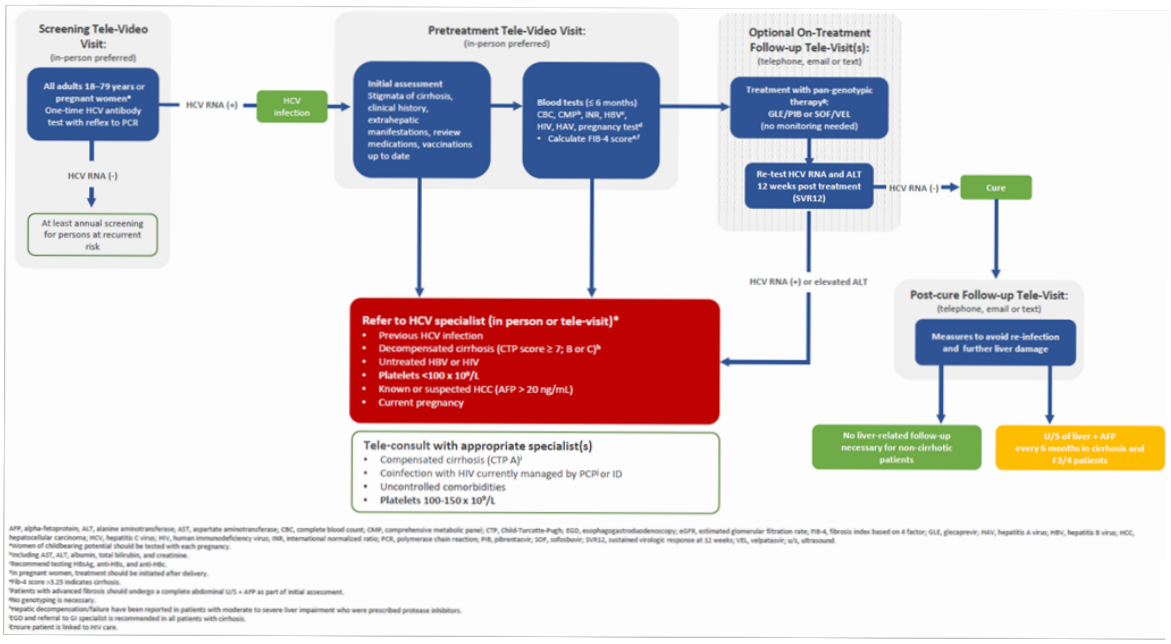

Figure 1 HCV Telemedicine Simplified Algorithm

Studies have supported that patients with compensated cirrhosis and HCV infection can be appropriately treated in the PCP setting, while patients with decompensated cirrhosis or hepatocellular carcinoma (HCC) should be referred to a specialist with expertise in liver transplantation and cancer treatment.[22–25,27,32] We recommend that non-specialists develop relationships with expert HCV specialists who can offer guidance on specific management questions. An example of such collaboration is The National Clinician Consultation Center at the University of California, San Francisco; offers free phone and online consultation from national experts, as well as a variety of materials, including online HCV educational courses. Another option for support is participation in Project ECHO's telementoring program, which offers a mentor/collaborative care relationship with specialists.

Patient education and counseling

Once a patient receives a confirmatory positive HCV RNA and has agreed to set up a telemedicine visit, we recommend discussing best contact number and alternate contact information; patient portal registration, if available; and mobile and/or broadband internet access to help identify patient preference in communication, as well as uncover any potential barriers. Of note, programs are available to offer more affordable devices and broadband plans to low-income consumers (Table 4).

The AASLD/IDSA guidelines recommend that patient education and harm reduction interventions be offered over the entire HCV care continuum to reduce the risk of liver disease progression and to prevent HCV transmission.[37] Videos, patient brochures, and other patient educational materials are available online (Table 4). Of note, patients may prefer to view these materials in private due to their sensitive subject matter and associated stigma. Assessing for ongoing substance use disorder, educating patients regarding its effect on worsening of fibrosis, and connecting patients with appropriate supportive services are important to the long-term management of HCV patients in order to target harm reduction services and gauge risk for reinfection. Persons who actively inject drugs should be prioritized for HCV treatment, as they are likely to transmit HCV to others, and curative treatment can prevent transmission. Moreover, treatment of opioid use disorder can be initiated concurrently with HCV treatment,[14] as no drug-drug interactions have been reported between methadone or buprenorphine and the pan-genotypic direct-acting antiviral (DAA) regimens in the treatment algorithm (Table 3).[14,15]

Finally, discussions with patients about expectations for their course of treatment are integral to patient engagement and treatment success. These discussions should include the process of obtaining the medication from a specialty pharmacy, any potential for drug interactions, the importance of adherence, and the need for blood work to confirm cure once treatment is complete.

Optional on-treatment follow-up tele-visit

Treatment: Aside from those whose short life expectancy cannot be improved by HCV therapy or liver transplantation, all patients with HCV infection should be treated, including persons who use drugs and/or alcohol.] We recommend the use of one of two highly effective, pan-genotypic therapies for HCV treatment, each included in the algorithm: Glecaprevir/Pibrentasvir (GLE/PIB) and Sofosbuvir/Velpatasivir (SOF/VEL). Each of these therapies demonstrates SVR12 cure rates of ≥ 95% in registration trials and real-world experience, and they share similar safety profiles.[9101114–18] A comparison of the two treatments is provided in Table 3.

Of note, hepatic impairment and potential drug interactions may direct the decision between the two treatments and will determine the type of monitoring or dose duration modifications that may be necessary. Protease inhibitors, such as glecaprevir in GLE/PIB, are contraindicated in those with suspected/history of decompensated liver disease (Child-Turcotte Pugh Class B or C).[45] We recommend the use of specialty pharmacies, as they typically offer assistance with the prior authorization process and with access to patient financial assistance programs.

Monitoring

It is important to observe that AASLD recommends, and our expert panel is in agreement, that no laboratory monitoring is required during HCV treatment. Recent findings from a multinational, minimal monitoring (MINMON) study (n= 400) have shown that minimal monitoring, (no pre-treatment genotyping, no scheduled on-treatment clinic or labs, and telemedicine touchpoint at Weeks 4 and 22) and 84-days supply of SOF/VEL provided at start of treatment resulted in 95% SVR rate (95% CI, 92.4, 96.7).[17] Other minimal monitoring studies have reported similar results.[17,18] Unique instances that may require special laboratory monitoring include a patient taking warfarin; and then international normalized ration (INR) should be monitored periodically.[37] Patients with diabetes are not at risk of hypoglycemia due to DAAs and in fact may exhibit improvements in insulin resistance with eradication of HCV.[17] Some clinicians may choose to order additional labs during treatment for cirrhotic patients or those with secondary causes of liver disease.

Touchpoints, such as an electronic portal, bidirectional text messaging with reminders, telephone, and/or video conferencing, are encouraged throughout the treatment course. These touchpoints can support medication adherence; monitor for adverse events and any drug interactions potentially arising from new medications started after the pre-treatment visit; and connect patients with support services if needed.[37]A meta-analysis of touchpoint effectiveness conducted by Thakkar and colleagues showed that text messaging was associated with a two-fold increase in medication adherence in adults with chronic diseases.[17] Frequency of these touchpoints, as well as type of communication pathway should be individualized based on the needs of each patient, especially those who may have social and/or psychological barriers that may require other supportive services. Providers can also coordinate care with patient navigators, nurse coordinators, social workers, and pharmacists to take an active role in tracking and monitoring patients through the HCV care continuum. A video conference appointment can be used in the event a patient experiences side effects, skin findings, swelling, or other issue that may require a physical examination.

HCV RNA by PCR and an ALT should be collected at least 12weeks after treatment completion to document HCV cure (SVR12). Undetectable viral load at 12 weeks after completion of treatment confirms eradication. Presence of viral load may be indicative of recurrent viremia (post-treatment virologic relapse or HCV re-infection). In either case, an HCV infection is present, and the patient should undergo another course of HCV treatment tailored to the patient's circumstances.[37]

Post-cure follow-up tele-visit

A telemedicine appointment should be scheduled after SVR12 results are received to provide positive reinforcement toward achieving SVR12, as well as to emphasize measures to avoid re-infection and further liver damage. In non-cirrhotic and/or low-stage fibrosis (F0 and F1) patients, no further liver workup is necessary; however, patients with intermediate stage of fibrosis (F2) and/or ongoing concern for progression of fibrosis, should undergo annual fibrosis assessment. For patients with advanced fibrosis or cirrhosis (fibrosis stage F3 and F4), HCC surveillance (a liver ultrasound with AFP) is recommended every 6months. Telemedicine platforms can be employed to improve HCC surveillance[60] (currently only 24% of patients receiving HCC surveillance according to the guidelines),[17] such as patient reminder/recall systems, patient education, and other population health outreach strategies.[60]

All patients should be reminded that re-infection is possible with repeat exposure to HCV infected blood. In addition, patients should be educated that the HCV antibody test will always remain positive if tested in the future – and does not protect from reinfection. Annual

testing with HCV RNA by PCR is recommended in those who continue behaviors associated with risk of HCV infection, such as people who inject drugs and unprotected sex.[37] Patients should be linked to community-based harm reduction services, such as syringe service programs (SSPs), treatments for substance use and mental health disorders, and support services for food insecurity and homelessness. Addressing these risks will reduce the likelihood of HCV reinfection and the acquisition of other infections, such as HIV and other sexually transmitted infections.[14]

Syringe service programs are of particular interest as they can significantly impact HCV transmission. It is estimated that a complete mitigation of shared needles could prevent 43% of all HCV cases globally and 77% of cases in North America by 2030.[17] Providing long-term care for HCV patients through telemedicine can preserve privacy, lessen the fear of discussing sensitive subjects, be less burdensome on patients, and improve outcomes. A randomized trial of patients with substance use disorders found that those receiving telephone-based continuing care had higher rates of abstinence over 2 years, and that their care cost less than a standard continuing care or relapse prevention program.[18]

Conclusion

Telemedicine has been shown to provide the same level of patient care, if not better, as standard in-person visits for the management of HCV. Current guidelines need to be adapted for real-world applications that can be feasibly achieved in telemedicine settings without compromising patient care and outcomes. By leveraging a variety of technological modalities, including video conferencing, bidirectional text messaging, and electronic portals along the HCV care continuum, continuity of care can be provided where in-person visits are not practical, such as during a pandemic or for patient-specific barriers to in-person care at a clinic. Telemedicine thus represents both an opportunity and a tool in the provider armamentarium, one that, implemented, can stand as a key driver towards achieving national and worldwide targets and ultimately global elimination.

Acknowledgements

Jamie Kelly, Pharm D reviewed citations to ensure accuracy and provided medical writing support for the manuscript and algorithm.

Conflicts of interest statement

DD has served in a consulting capacity for Intercept Pharmaceuticals and Gilead. MS has served in a consulting/advisory capacity to BioMarin, Immunocore, Arbutus and has received research grants from AbbVie, Gilead Sciences, Assembly Biosciences and Janssen Pharmaceuticals. In addition, MS sat on the Data Monitoring Committee for Gilead. AD was a speaker for Intercept Pharmaceuticals and served in a consulting/advisory capacity at Genfit and Expert Connect. BC has served on advisory boards at Gilead, AbbVie and Dova; and was a speaker for Gilead and AbbVie. BC has received research support from Intercept, Conatus and Janssen Pharmaceuticals. CR has served in a consulting/advisory capacity for Gilead, AbbVie, ViiV and Merck. MS has served Gilead in a consulting/advisory capacity. NC has served Abbot, Gilead, and AbbVie in a consulting/advisory capacity. ST has served on Gilead's Advisory Board. TS has received a research grant from Gilead and served as a speaker for Gilead and AbbVie. TB has sat on the advisory boards of Gilead, Mallinckrodt Pharmaceuticals, and Intercept; has been a speaker for Gilead and Intercept and served in a consulting capacity for Mallinckrodt.

Declaration of funding interests

The meeting and manuscript were funded by Gilead Sciences. Project management support for the meeting was provided by The Kinetix Group and funded by Gilead Science. Writing support was provided by Jamie Kelly, PharmD of JK Clinical Solutions, LLC and was funded by The Kinetix Group. Gilead Science's role was limited to attendance of the consensus meeting. Opinions expressed in the manuscript are indicative of the providers involved in the consensus meeting.

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Citation: Cave B, Serper M, Box T, et al. A simplified algorithm for managing hepatitis c infection by leveraging telemedicine. *Gastroenterol Hepatol Open Access.* 2022;13(1):12–20. DOI: 10.15406/ghoa.2022.13.00488

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Citation: Cave B, Serper M, Box T, et al. A simplified algorithm for managing hepatitis c infection by leveraging telemedicine. *Gastroenterol Hepatol Open Access.* 2022;13(1):12–20. DOI: 10.15406/ghoa.2022.13.00488