Executive summary of the 2018 KDIGO Hepatitis C in CKD Guideline: welcoming advances in evaluation and management

Michel Jadoul1, Marina C. Berenguer2,3,4, Wahid Doss5, Fabrizio Fabrizi6, Jacques Izoquet7,8, Vivekanand Jha9,10, Nassis Kamar11,12,13, Bertram L. Kasiske14,15, Ching-Lung Lai16,17, José M. Morales18, Priti R. Patel19, Stanislas Pol20, Marcelo O. Silva21,22, Ethan M. Balk23, Craig E. Gordon24, Amy Earley25, Mengyang Di25,26 and Paul Martin27

1Department of Nephrology, Cliniques universitaires Saint-Luc, Université catholique de Louvain, Brussels, Belgium; 2Department of Gastroenterology, Hepatology Unit & Instituto de Investigación La Fe, Hospital Universitari i Politècnic La Fe, Valencia, Spain; 3Centre de Investigación Biomédica en Red de Enfermedades Hepáticas y Digestivas (CIBERehd), Valencia, Spain; 4School of Medicine, University of Valencia, Valencia, Spain; 5National Hepatology and Tropical Medicine Research Institute, Cairo, Egypt; 6Division of Nephrology, Maggiore Hospital and IRCCS Foundation, Milano, Italy; 7Department of Virology, Hepatitis E Virus National Reference Centre, Toulouse University Hospital, Toulouse, France; 8Toulouse-Purpan Centre for Pathophysiology, INSERM UMR1043/CNRS UMR 5282, CPTP, Toulouse University Paul Sabatier, Toulouse, France; 9George Institute for Global Health, New Delhi, India; 10University of Oxford, Oxford, UK; 11Departments of Nephrology and Organ Transplantation, CHU Rangueil, 12INSERM U1043, IFR-BMT, CHU Purpns; 13Université Paul Sabatier, Toulouse, France; 14Department of Medicine, Hennepin County Medical Center, Minneapolis, Minnesota, USA; 15Scientific Registry of Transplant Recipients, Minneapolis Medical Research Foundation, Minneapolis, Minnesota, USA; 16Department of Medicine, Queen Mary Hospital, The University of Hong Kong, Hong Kong, China; 17State Key Lab for Liver Research, The University of Hong Kong, Hong Kong, China; 18Nephrology Department, Research Institute, Hospital 12 Octubre, Madrid, Spain; 19Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia, USA; 20Hepatology Department, Hospital Cochin, Université Paris Descartes, INSERM U-1223, Institut Pasteur, Paris, France; 21Hepatology and Liver Transplant Unit, Hospital Universitario Austral, Pilar, Provincia de Buenos Aires, Buenos Aires, Argentina; 22Latin American Liver Research, Educational and Awareness Network (LALREAN), Pilar, Provincia de Buenos Aires, Buenos Aires, Argentina; 23Center for Evidence Synthesis in Health, Brown University School of Public Health, Providence, Rhode Island, USA; 24Renal Section, Boston University Medical Center, Boston, Massachusetts, USA; 25Evidence, Waltham, Massachusetts, USA; 26Rhode Island Hospital, Alpert Medical School, Brown University, Providence, Rhode Island, USA; and 27Division of Hepatology, University of Miami, Miami, Florida, USA

Infection with the hepatitis C virus (HCV) has adverse liver, kidney, and cardiovascular consequences in patients with chronic kidney disease (CKD), including those on dialysis therapy and in those with a kidney transplant. Since the publication of the original Kidney Disease: Improving Global Outcomes (KDIGO) HCV Guideline in 2008, major advances in HCV management, particularly with the advent of direct-acting antiviral therapies, have now made the cure of HCV possible in CKD patients. In addition, diagnostic techniques have evolved to enable the noninvasive diagnosis of liver fibrosis. Therefore, the Work Group undertook a comprehensive review and update of the KDIGO HCV in CKD Guideline. This Executive Summary highlights key aspects of the guideline recommendations.

Correspondence: Michel Jadoul, Cliniques universitaires Saint-Luc, Nephrology, Université catholique de Louvain, Avenue Hippocrate 10, Brussels 1200, Belgium. E-mail: Michel.Jadoul@Uclouvain.be; and Paul Martin, Division of Gastroenterology and Hepatology, Miller School of Medicine, University of Miami, Miami, Florida 33136, USA. E-mail: pmartin2@med.miami.edu

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The high prevalence of hepatitis C virus (HCV) in the chronic kidney disease (CKD) population has been recognized since diagnostic testing became available in the early 1990s, as was its transmission within dialysis units. Subsequent studies identified the adverse consequences of HCV infection in the CKD population, as well as its detrimental effect on recipient and graft outcomes following kidney transplantation. Although screening of blood products for HCV reduced its acquisition by blood transfusion, the unique aspects of the epidemiology of HCV infection in the CKD population were apparent. Studies established that transmission was frequent in dialysis patients and typically reflected insufficient attention to body fluid precautions. Also confounding the management of HCV in the CKD population was an absence of biochemical liver dysfunction in most
HCV-infected hemodialysis patients, which contributed to the lack of recognition of its presence and clinical significance. Furthermore, the toxicity of interferon (IFN) in this population underscored the need for effective and tolerable antiviral agents to treat HCV.

The initial Kidney Disease: Improving Global Outcomes (KDIGO) guideline, published in 2008, provided recommendations for the prevention, diagnosis, and management of HCV in CKD. Since then, there have been major advances in HCV management, particularly with the advent of direct-acting antiviral (DAA) therapy. In addition, diagnostic testing has evolved for the assessment of chronic liver disease. Therefore, we undertook a comprehensive review and update of the KDIGO HCV Guideline in patients with CKD. All guideline recommendations are listed in Box 1, but it is beyond the scope of this Executive Summary to discuss each recommendation statement. Instead, we highlight significant concepts underlying the recommendations.

Chapter 1: Detection and evaluation of HCV in CKD

**Initial screening.** The majority of individuals with HCV infection are asymptomatic, making screening necessary to detect infection in high-risk populations; this is particularly true for hemodialysis patients in whom signs or symptoms of HCV infection are rarely recognized. Indeed, the prevalence of HCV infection is greater in CKD patients than in the general population, especially in those with advanced CKD who are not yet on dialysis therapy. In addition, HCV has been identified as an independent risk factor for both CKD onset and rapid CKD progression in multiple studies. Thus, HCV screening is recommended at the time of initial evaluation of CKD. HCV screening is also indicated for patients starting in-center maintenance hemodialysis and for those who transfer from another dialysis facility or modality. In dialysis units with a high prevalence of HCV, initial nucleic acid testing (NAT) should be considered. An HCV antibody (anti-HCV)–negative, NAT-positive profile strongly suggests acute HCV infection.

Screening of peritoneal dialysis and home hemodialysis patients should be considered upon initiation of dialysis to document baseline HCV infection status. If these patients transiently receive in-center hemodialysis, they should undergo HCV infection screening as per the recommendations for in-center hemodialysis patients. Kidney transplantation candidates should be tested for HCV infection during evaluation for transplantation for optimal management and planning.

**Follow-up screening.** Hemodialysis patients who are not infected with HCV should be screened for the presence of new HCV infection every 6 months using immunoassay. Acute HCV infection in a hemodialysis patient should be reported to the appropriate public health authorities, and all other patients in the same facility should promptly be evaluated by NAT to identify additional cases.

For anti-HCV-positive patients with chronic HCV infection who become HCV NAT-negative with a sustained virologic response (SVR) to DAA therapy, NAT screening should be initiated 6 months after documentation of SVR. SVR is assessed based on the results of NAT testing ≥12 weeks after the conclusion of therapy.

For patients with spontaneous resolution of acute HCV infection as documented by a negative test for HCV RNA at ≥6 months after the onset of acute infection, NAT screening should begin 6 months after documented resolution of infection.

Monthly monitoring of serum alanine aminotransferase is an inexpensive way to ensure that hemodialysis patients are assessed for possible acquisition of infection between regular antibody or NAT screenings. Even minor, unexplained alanine aminotransferase increases should raise the suspicion of acute HCV infection.

**Evaluation of liver disease.** All HCV-infected patients with kidney failure should undergo a noninvasive biochemical and/or morphological evaluation to stage liver fibrosis, determine the role and timing of antiviral therapies, and facilitate the choice of kidney or combined liver/kidney transplantation in cirrhotic patients. When biochemical and morphological evaluations yield discordant results or when liver comorbidities are suspected, liver biopsy is suggested.

**Other testing.** Although HCV infection predominantly causes liver disease, it is also associated with extrahepatic manifestations, including kidney disease. However, the relationship between HCV infection and CKD is complex. Based on current evidence, patients with HCV infection should be considered at increased risk of CKD, regardless of the presence of conventional risk factors for kidney disease. As such, all patients should be assessed for kidney disease at the time of HCV infection diagnosis with urinalysis and estimated glomerular filtration rate (eGFR) with repeat follow-up screenings if they are still viremic. Patients with HCV and CKD should be followed regularly to monitor progression of kidney disease.

An increasing body of evidence has implicated HCV infection in CKD progression. Based on epidemiologic data, repeat testing for proteinuria and of eGFR in anti-HCV–positive/HCV NAT–positive patients is recommended. Overall, multiple studies have shown that HCV infection is associated with an increased risk of developing CKD, probably by multiple pathways, including accelerated atherosclerosis.

HCV is a blood–borne pathogen and shares routes of transmission with hepatitis B virus (HBV) and HIV. Although hepatitis A virus (HAV) infection is frequently benign in healthy individuals, superinfection with HAV and HBV in patients with liver disease (including chronic HCV infection) may result in significant morbidity and mortality. Thus, as HAV and HBV infections are preventable by vaccine, appropriate vaccination should be encouraged. However, it should be noted that response rates to vaccinations are diminished in patients with advanced CKD.

Chapter 2: Treatment of HCV infection in patients with CKD

Treatment recommendations are presented by CKD GFR category. For most CKD patients, as in the general population, the potential benefits of DAA treatment outweigh
potential harms. However, some patients may not be expected to live long enough to benefit from therapy (e.g., those with metastatic cancer). The Work Group was hesitant to specify a minimum life expectancy that would justify treatment, given the inaccuracy of predictions and the need to individualize treatment decisions.

IFN is often poorly tolerated in CKD G4–G5 patients who have prolonged IFN exposure due to decreased renal clearance. Ribavirin is also associated with substantial adverse events. Because DAAs are effective, well tolerated, and some regimens do not require dose reductions in those with CKD, it is clearly desirable to avoid IFN completely in all patients and to minimize the use of ribavirin in patients with advanced CKD.

**CKD G1–G2b.** For patients with CKD G1–G3b (eGFR $\geq 30$ ml/min per 1.73 m$^2$), the choice of DAA is not
Box 1 | Summary of KDIGO HCV Recommendations

CHAPTER 2: TREATMENT OF HCV INFECTION IN PATIENTS WITH CKD

2.1: We recommend that all CKD patients infected with HCV be evaluated for antiviral therapy (1A).

2.1.1: We recommend an interferon-free regimen (1A).

2.1.2: We recommend that the choice of specific regimen be based on HCV genotype (and subtype), viral load, prior treatment history, drug—drug interactions, glomerular filtration rate (GFR), stage of hepatic fibrosis, kidney and liver transplant candidacy, and comorbidities (1A).

2.1.3: Treat kidney transplant candidates in collaboration with the transplant center to optimize timing of therapy (Not Graded).

2.2: We recommend that patients with GFR ≥ 30 ml/min per 1.73 m² (CKD G1—G3b) be treated with any licensed direct-acting antiviral (DAA)—based regimen (1A).

2.3: Patients with GFR < 30 ml/min per 1.73 m² (CKD G4—G5D) should be treated with a ribavirin-free DAA-based regimen as outlined in Figure 1.

2.4: We recommend that all kidney transplant recipients infected with HCV be evaluated for treatment (1A).

2.4.1: We recommend treatment with a DAA-based regimen as outlined in Figure 1 (1A).

2.4.2: We recommend that the choice of regimen be based on HCV genotype (and subtype), viral load, prior treatment history, drug—drug interactions, GFR, stage of hepatic fibrosis, liver transplant candidacy, and comorbidities (1A).

<table>
<thead>
<tr>
<th>Kidney function</th>
<th>HCV genotype</th>
<th>Recommended regimen(s)</th>
<th>Strength of evidence</th>
<th>Alternate regimen(s)</th>
<th>Strength of evidence</th>
</tr>
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<tr>
<td>CKD G4—G5</td>
<td>1a</td>
<td>Grazoprevir/elbasvir</td>
<td>1B</td>
<td>Ritonavir-boosted paritaprevir, ombitasvir, and dasabuvir (also known as ProD or 3D regimen) with ribavirin</td>
<td>2D</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Gileadprevir/ribavirantivir</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b</td>
<td>Grazoprevir/elbasvir</td>
<td>1B</td>
<td>Ritonavir-boosted paritaprevir, ombitasvir, and dasabuvir (also known as ProD or 3D regimen)</td>
<td>2D</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Gileadprevir/ribavirantivir</td>
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<td>1B</td>
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<td>4</td>
<td>Grazoprevir/elbasvir</td>
<td>2D</td>
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<td>Gileadprevir/ribavirantivir</td>
<td>1B</td>
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<tr>
<td></td>
<td>5, 6</td>
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<td>2D</td>
<td></td>
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<td>CKD G5 PD</td>
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<tr>
<td>KTR</td>
<td>1a</td>
<td>Sofosbuvir with ledipasvir, daclatasvir or simeprevir</td>
<td>1B</td>
<td>Sofosbuvir/ribavirin</td>
<td>2D</td>
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<td>Gileadprevir/ribavirantivir</td>
<td>1C</td>
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<tr>
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</tbody>
</table>

Figure 1 | Recommended direct-acting antiviral (DAA) treatment regimens for patients with chronic kidney disease (CKD) G4—G5D and kidney transplant recipients (KTRs), by hepatitis C virus (HCV) genotype.a Duration of therapy for all these regimens is usually 12 weeks, but readers should consult American Association for the Study of Liver Diseases (AASLD) or European Association for the Study of the Liver guidelines for the latest information. aWe recommend that CKD patients with glomerular filtration rates (GFRs) ≥ 30 ml/min per 1.73 m² (CKD G1—G3b) be treated with any licensed DAA regimen. bThere is little published evidence to guide treatment regimens in KTRs with GFR < 30 ml/min per 1.73 m² (CKD G4—G5T). Regimens in KTRs should be selected to avoid drug—drug interactions, particularly with calcineurin inhibitors. cBased on Reau et al.³ dAs suggested in AASLD guidelines (https://www.hcvguidelines.org). HD, hemodialysis; n/a, no data/evidence available; PD, peritoneal dialysis.

2.4: We recommend that all kidney transplant recipients infected with HCV be evaluated for treatment (1A).

2.4.1: We recommend treatment with a DAA-based regimen as outlined in Figure 1 (1A).

2.4.2: We recommend that the choice of regimen be based on HCV genotype (and subtype), viral load, prior treatment history, drug—drug interactions, GFR, stage of hepatic fibrosis, liver transplant candidacy, and comorbidities (1A).
restricted by impaired kidney function. However, recommended drugs and dosages are constantly evolving, and clinicians should consult the latest guidelines from the American Association for the Study of Liver Diseases (AASLD; www.hcvguidelines.org/unique-populations/renal-impairment) or European Association for the Study of the Liver (EASL; www.easl.eu/research/our-contributions/clinical-practice-guidelines) for the most up-to-date information.

**CKD G4–G5 and G5D.** Because DAAs have variable renal elimination, advanced CKD (CKD G4–G5D), when present, is an important determinant in the choice of agent. Algorithm 1 summarizes the recommended choices of DAAs according to the level of kidney function and HCV genotype. We recommend that patients with CKD G4–G5 (eGFR < 30 ml/min per 1.73 m²) and G5D (on dialysis) be treated with a ribavirin-free, DAA-based regimen. As before, clinicians should consult the AASLD and EASL guidelines for the most current treatment information.

**Kidney transplant recipients.** Although published data on DAAs in kidney transplant recipients are less abundant, the results appear as satisfactory as those observed in liver transplant recipients. Drug–drug interactions are an important factor in the choice of a DAA regimen, and clinicians should systematically consult this online resource (http://www.hep-druginteractions.org). Algorithm 2 summarizes the recommended choices of DAAs for kidney transplant recipients according to the level of kidney function and HCV genotype. Again, clinicians should consult the AASLD and EASL guidelines for the most current treatment information.

**Reactivation of hepatitis B virus infection after DAA therapy.** Several reports have described apparent reactivation of HBV infection in individuals after successful therapy for HCV infection with DAA-based therapy. As part of routine evaluation of patients with HCV and CKD, serum markers of HBV infection (e.g., hepatitis B surface antigen [HBsAg], HBV DNA) should be assessed before starting

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**Algorithm 1 | Treatment scheme for chronic kidney disease (CKD) G1 to G5D.** (See Algorithm 2 for kidney transplant recipients.) Recommendation grades (1–2) and strength of evidence (A–D) are provided for each recommended treatment regimen and hepatitis C virus (HCV) genotype; see full guideline.¹ DAA, direct-acting antiviral; GFR, glomerular filtration rate; NAT, nucleic acid testing.
antiviral therapy. Initiation of therapy with an oral HBV suppressive agent is recommended if criteria for HBV therapy are met based on initial testing before HCV therapy or during follow-up after HCV. If HBsAg is initially absent, but markers of previous HBV infection (positive antibody to hepatitis B core antigen [HBcAb] with or without antibody to hepatitis B surface antigen [HBsAb]) are detected, patients should be monitored for HBV reactivation with serial HBV DNA and liver function tests during DAA therapy.

**Chapter 3: Preventing HCV transmission in hemodialysis units**

The prevalence of HCV infection in hemodialysis patients is usually higher than in the general population. HCV is transmitted parenterally, primarily through percutaneous exposure to blood. Several studies confirmed nosocomial HCV transmission in dialysis units using epidemiological and phylogenetic data from viral sequencing. These data were further supported by the observed decline in infection rates after routine implementation of infection control practices and virological follow-up to detect anti-HCV using sensitive, specific, new-generation serological tests. Nevertheless, according to data from the US Centers for Disease Control and Prevention (CDC), >50% of all health care–associated HCV outbreaks in the US reported to the CDC from 2008 to 2015 occurred in hemodialysis settings. Nosocomial transmission of HCV was also repeatedly observed in hemodialysis units from other high-, low-, and middle-income countries.²

**Infection control.** Infection control lapses responsible for HCV transmission contribute to transmission of other pathogens; hence, improvement efforts will have broader salutary effects. HCV transmission can effectively be prevented through adherence to currently recommended general infection control practices. Root cause analyses of confirmed nosocomial outbreaks that revealed lapses in infection control were associated with transmission of HCV infection among patients in dialysis units. Mishandling of parenteral medications was implicated frequently in transmissions.

It should be emphasized that blood contamination of both environmental surfaces and equipment can be present even in the absence of visible blood. In most reported HCV outbreaks in hemodialysis centers, multiple lapses in infection control were identified, and involved practices such as hand hygiene and glove use, injectable medication handling, and environmental surface disinfection.

Implementation of infection control practices can be advanced by establishing a list of evidence-based interventions as discussed in the full guideline¹ and by regularly assessing and reinforcing adherence to practice through observational audits.

**Isolation.** Isolating HCV-infected patients (or patients awaiting HCV screening results) during hemodialysis sessions is defined as physical segregation from others for the express purpose of limiting direct or indirect transmission of HCV.
Although the complete isolation of HBV-infected patients (by room, thus including machines, equipment, and staff) has proven invaluable in halting the nosocomial transmission of HBV within hemodialysis units, evidence for using isolation of HCV-infected patients during hemodialysis is weak. In fact, isolation would have a negative impact on the implementa-
tion and reinforcement of basic hygiene measures in the unit as a whole. Several experts and guidelines acknowledge that, as HCV transmission can effectively be prevented by adher-
ance to currently recommended practices, considering isola-
tion of HCV-positive patients indicates failure of adherence to the current standard.

**Dedicated dialysis machines.** Evidence of HCV trans-
mission through internal pathways of the modern single-pass dialysis machine has not been demonstrated. Although contaminated external surfaces of dialysis machines may facilitate the spread of HCV, other surfaces in the dialysis treatment station are likely to have the same impact, which diminishes the purported value of using dedicated machines. In addition, using dedicated machines may trigger the perception that there is no longer a risk of nosocomial HCV transmission, and thus reduce the attention devoted by he-
modialysis staff members to body fluid precautions.

**Reuse.** During the reuse procedure, patient-to-patient transmission can take place if: (i) the dialyzers or blood port caps are switched between patients and not sterilized effectively; (ii) if there is spillage of contaminated blood; or (iii) mixing of reused dialyzers occurs during transport. These situations can be eliminated by adherence to standard hy-
gienic precautions and appropriate labeling.

**Other considerations.** Audits and use of surveillance data to implement prevention steps are critical to any infection control program. Although no randomized controlled trials have examined the impact of audits on transmission of HCV infection in dialysis units, observational studies showed reduction in the rates of bloodstream infections after implementation of regular audits and evidence-based intervention. Screening for HCV infection is essential for identifying transmission in hemodialysis units, as discussed in Chapter 1 of the Guideline.

With the availability of DAAs, dialysis units may reasonably start HCV-infected patients on these agents in the hope of curing the infection and preventing transmission to uninfected patients. However, use of treatment alone as an infection control measure may place patients at increased risk of HCV and other blood-borne infections from other sources. Indeed, even in the setting of low HCV prevalence, rigorous adherence to key infection control practices is necessary (Table 1).

Despite compelling evidence about the benefits of infec-
tion control practices, adherence to recommended practices
remains suboptimal. Improved training and education is needed to address knowledge and adherence gaps.

Chapter 4: Management of HCV-infected patients before and after kidney transplantation

HCV infection remains more prevalent in CKD G5 (eGFR < 15 ml/min per 1.73 m²) patients compared with the general population. Kidney transplant candidates may have acquired HCV infection before developing CKD or requiring dialysis, within a dialysis unit, when they received a previous transplant, or if they received a blood transfusion in the era before systematic screening for HCV. Because of the deleterious effects of HCV infection in dialysis and kidney transplant patients, it is critical to
evaluate disease severity and the need for antiviral therapy.

**Evaluation and management.** In patients with HCV infection, survival is significantly lower when they are being treated by dialysis than when they are kidney graft recipients. Thus, eligible patients should be considered for kidney transplantation regardless of their HCV status. DAAs now allow successful HCV clearance in nearly all patients before or after transplantation.

Anti-HCV-positive patients who are candidates for kidney transplantation should be evaluated for the presence of cirrhosis using either a noninvasive fibrosis-staging method, or, on occasion, a liver biopsy. The choice of method is discussed in Chapter 1 of the Guideline.

In patients with compensated cirrhosis without portal hypertension, isolated kidney transplantation is recommended. HCV clearance halts the progression of liver disease and may even induce regression of liver fibrosis. Patients with cirrhosis who have major hepatic complications, despite having achieved SVR, should be evaluated for combined liver–kidney transplantation.

Considerations for planning therapy include a living donor versus a deceased donor, wait-list time by donor type, center-specific policy for acceptance of organs from HCV-positive deceased donors, specific HCV genotype, and severity of liver fibrosis.

In patients with compensated cirrhosis without portal hypertension, if living donor kidney transplantation is anticipated without a long wait, HCV therapy can be deferred until after transplantation. If living donor kidney transplantation is likely to be delayed >24 weeks (to allow 12 weeks of therapy and 12 weeks of follow-up to prove SVR), then HCV therapy can be offered before or after transplantation, based on specific HCV genotype and proposed treatment regimen.

Twice yearly surveillance for hepatocellular carcinoma is indicated in cirrhotic patients. In addition, endoscopic surveillance for varices is indicated. Evaluation for complications of cirrhosis is indicated, irrespective of whether the patient receives antiviral therapy.

**Use of kidneys from HCV-infected donors.** The use of kidneys from NAT-positive donors into NAT-positive recipients will limit the risk of HCV transmission from these donors without loss of organs from the donor pool. Such use of kidneys from NAT-positive donors is an acceptable approach. The capacity to use DAAs shortly after transplantation should allow safe use of these organs.

Potential living donors with HCV infection should be treated as in the general population. First, the extent of liver fibrosis should be established, and then, if there is no evidence of cirrhosis, they can receive DAAs based on genotype. SVR can then be assessed at 12 weeks with monitoring of kidney function and proteinuria during and after DAA therapy. In the absence of severe hepatic fibrosis, living donation is then feasible.

Two clinical trials on the use of HCV-positive donor kidneys in HCV-negative recipients followed by treatment with DAAs have been reported, but until more information is available regarding long-term safety of this approach, it should be considered strictly investigational.

**Maintenance immunosuppressive regimens.** In HCV-infected kidney transplant recipients, viral load increases after transplantation because immunosuppression facilitates viral replication. There are limited data on the influence of steroids in kidney transplant patients with HCV infection. One important concern with new DAAs for the treatment of HCV infection in kidney transplant patients is drug–drug interaction with immunosuppressive agents. Because these agents are metabolized in the liver by cytochrome P450, as are most DAAs, substrate competition can occur, which influences their elimination. We suggest consulting the Hepatitis Drug Interactions website (www.hep-druginteractions.org) for the latest guidance on potential drug–drug interactions before DAA use.

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**Box 1** Summary of KDIGO HCV Recommendations

**CHAPTER 5: DIAGNOSIS AND MANAGEMENT OF KIDNEY DISEASES ASSOCIATED WITH HCV INFECTION**

5.1: We recommend that a kidney biopsy be performed in HCV-infected patients with clinical evidence of glomerular disease (Not Graded).

5.2: We recommend that patients with HCV-associated glomerular disease be treated for HCV (1A).

5.2.1: We recommend that patients with HCV-related glomerular disease showing stable kidney function and/or non-nephrotic proteinuria be treated initially with DAA (1C).

5.2.2: We recommend that patients with cryoglobulinemic flare, nephrotic syndrome, or rapidly progressive kidney failure be treated, in addition to DAA treatment, with immunosuppressive agents with or without plasma exchange (1C).

5.2.3: We recommend immunosuppressive therapy in patients with histologically active HCV-associated glomerular disease who do not respond to antiviral therapy, particularly those with cryoglobulinemic kidney disease (1B).

5.2.3.1: We recommend rituximab as the first-line immunosuppressive treatment (1C).
Management of HCV-related complications. Kidney transplantation outcomes in patients with HCV without extensive fibrosis, who are successfully treated before transplantation, should be equivalent to outcomes in uninfected transplant recipients. With achievement of SVR, viral relapse is unlikely, although kidney transplant recipients with unexplained hepatic dysfunction should undergo HCV and HBV testing.

Kidney transplantation in patients with active HCV infection may result in liver disease and extrahepatic complications. Therefore, patients with persistent HCV RNA should be re-evaluated for liver disease and possible DAA treatment.

HCV infection has been reported as a risk factor for the development of proteinuria in kidney transplant recipients. After HCV NAT-positive patients have undergone kidney transplantation, clinicians should screen for proteinuria and microhematuria. For HCV-related glomerular disease, DAA therapy is indicated as well, as discussed in the next section.

Chapter 5: Diagnosis and management of kidney diseases associated with HCV infection

In addition to chronic liver disease, HCV also leads to extrahepatic manifestations, including kidney disease and mixed cryoglobulinemia. Glomerular disease is the most frequent type of kidney disease associated with HCV.

A kidney biopsy should be performed in HCV-positive patients with clinical evidence of glomerular disease. Patients with mild or moderate forms of HCV-associated glomerulonephritis with stable kidney function and/or non-nephrotic proteinuria should be managed first with a DAA regimen. Patients with severe cryoglobulinemia or severe glomerular disease induced by HCV (i.e., nephrotic proteinuria or rapidly progressive kidney failure) should be treated with immunosuppressive agents (generally with rituximab as the first-line agent) with or without plasma exchange in addition to DAA therapies. Patients with HCV-related glomerular disease who do not respond to or are intolerant of antiviral treatment should also be treated with immunosuppressive agents. In all cases, achievement of SVR after DAA treatment, changes in kidney function, evolution of proteinuria, and side effects from antiviral therapy must be carefully monitored. Treatment with antiproteinuric agents such as angiotensin-converting enzyme inhibitors and/or angiotensin-receptor blockers should be given to patients with HCV-associated glomerular disease. When appropriate, diuretics and antihypertensive drugs should be administered to achieve recommended target blood pressure goals for patients with CKD.

Conclusion

As detailed in this guideline, there have been major advances in the evaluation and therapeutic management of HCV in CKD. However, current access to DAs remains limited, reaching only 7.4% of those diagnosed globally; low- and middle-income countries (LMICs) accounted for approximately 75% of people living with HCV worldwide in 2016. Financial barriers to treatment adoption persist, although discounts as high as 99% have been achieved in certain LMICs. A multitude of other factors (e.g., availability of generics, company voluntary license discounts, or insurance reimbursement) also account for the large variation in DAA access even within LMICs and upper-middle and high-income countries. It has been the philosophy of KDIGO to provide recommendations based on the best available scientific evidence without direct consideration of costs because they vary widely across countries, and DAA access is likely to evolve quickly over time (e.g., increased market competition, government support programs). Nevertheless, KDIGO recognizes that differences in DAA cost and availability are highly jurisdictional, and as such attempts were made by the Work Group to provide alternative treatment options if available (Figure 1). We hope the guidance from this updated guideline represents another step toward attaining the World Health Organization’s goal of eliminating viral hepatitis as a public health problem by 2030.
REFERENCES


