Real-World Health Care Resource Utilization and Quality of Life With Glecaprevir/Pibrentasvir Treatment: A Pooled Analysis From Post-Marketing Observational Studies

THU-112

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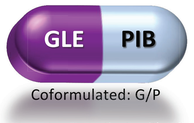
BACKGROUND

- Patients with chronic hepatitis C virus (HCV) infection have diminished health-related quality of life (HRQoL),[1–4] particularly because of the presence of fatigue and other extrahepatic manifestations[5–9]
- To inform HCV treatment decision-making, it is important to understand health care resource utilization (HCRU) and treatment outcomes in routine clinical practice
- Glecaprevir/pibrentasvir (G/P), an interferon-free, ribavirin-free, fixed-dose direct-acting antiviral (DAA) drug combination, was approved in the United States and Europe in 2017 for the treatment of patients chronically infected with HCV genotypes 1–6[10]
- The impact of treatment with G/P on HRQoL and fatigue in patients with chronic HCV has been documented in clinical trials,[11] but is not currently well defined in real-world settings

G/P is Approved for Patients With HCV GT1–6 Infection

Glecaprevir
pangenotypic NS3/4A protease inhibitor



Pibrentasvir
pangenotypic NS5A inhibitor

- 8-week duration approved for treatment-naïve patients with HCV genotype (GT) 1–6 infection and without cirrhosis[10]
- Pangenotypic SVR12 rate of 98% in more than 2200 patients in registrational studies
- Potent against common polymorphisms (eg, Y93H in NS5A and Q80K in NS3)
- Favorable safety profile irrespective of baseline factors
- Recent real-world results demonstrate that G/P achieved high SVR12 rates consistent with those observed in clinical trials[12,13]

G/P dosed as 3 pills taken once daily with food for a total dose of 300 mg/120 mg.
Glecaprevir was identified by AbbVie and Enanta.

OBJECTIVE

- This pooled analysis aims to report on real-world HCRU and HRQoL patient-reported outcomes (PROs) for patients with chronic HCV infection who received G/P in ongoing post-marketing observational studies (PMOS)

METHODS

STUDY DESIGN

- HCRU and PRO data from 6 countries (Austria, Belgium, France, Israel, Italy, and Switzerland) thus far participating in prospective PMOS were pooled and analyzed
- Data were collected from 13 November 2017 to 31 January 2019 for the analysis population
- Patients with chronic HCV genotypes 1–6 were eligible for the PMOS if they were receiving G/P at the treating physician's discretion according to local label, national or international recommendations, and/or local clinical practice
- HCRU was assessed using the total number of study visits per patient; visits were with a health care provider
  - The study protocol recommended 5 visits per patient regardless of treatment duration: 1) baseline (BL), 2) during treatment, 3) end of treatment (EOT), 4) early post treatment, and 5) the visit to assess sustained virologic response at post-treatment Week 12 (SVR12)
  - The actual number of visits was at the provider's discretion based on routine clinical practice
- PROs were collected using the Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) and the Fatigue Severity Scale (FSS)
  - The proportion of patients achieving a minimally important difference (MID) in PROs from BL to the SVR12 visit was reported based on literature definitions of improvement,[14–17] detailed in **Table 1**
- SVR12 was also assessed

METHODS (CONTINUED)

Table 1. PRO Questionnaires

Measure	Description	Scoring
SF-36	• Total of 36 items targeting functional health and well-being[18] • The 2 major summary scores are: – Physical Component Summary (PCS) score, which includes the following domains: Physical Functioning, Role Physical, Bodily Pain, and General Health – Mental Component Summary (MCS) score, which includes the following domains: Vitality, Social Functioning, Role Emotional, and Mental Health • The Vitality domain has been regarded as the most comprehensive well-being measure for a patient who suffers from HCV[9,19,20]	• Total scores on each domain range from 0 to 100 • Higher scores indicate a better HRQoL • An increase of ≥2.5 in PCS or MCS scores is considered to be a MID[14,15] • An increase of ≥5 in individual domain scores is considered to be a MID[16]
FSS	• Total of 9 items designed to rate the extent of fatigue symptoms and their impact on patient functioning including: motivation; exercise; physical function; carrying out duties; and interference with work, family, or social life • Patients assign a score of between 1 (completely disagree) and 7 (completely agree) to each of the 9 items[17,21]	• A total score is calculated based on the mean of the 9 item scores, with a range from 1 to 7 • A higher score indicates greater fatigue • A decrease of ≥0.7 is considered to be a MID[17]

FSS, Fatigue Severity Scale; HCV, hepatitis C virus; HRQoL, health-related quality of life; MID, minimally important difference; PRO, patient-reported outcome; SF-36, 36-item Short Form Health Survey.

DATA ANALYSES

- HRQoL analyses were performed using the core population, defined as all patients treated according to the label with known drug start date
- HCRU and SVR12 analyses were performed on the core population with sufficient follow-up (CPSFU), defined as patients treated according to the label with known drug start date, excluding patients without a HCV ribonucleic acid (RNA) evaluation after post-treatment Day 70 due to reasons not related to safety or efficacy, such as loss to follow-up or unavailable HCV RNA data
- The mean number of visits and the number and percentage of patients who achieved SVR12 were summarized for the analysis population overall and by country and subgroup of interest
- For the SF-36 Physical Component Summary (PCS) score, Mental Component Summary (MCS) score, and 8 individual domain scores, and the FSS total score, the following were reported:
  - Change in total score from BL to the SVR12 visit
  - Number and percentage of patients who experienced an increase of ≥2.5 points in the SF-36 MCS and PCS scores, an increase of ≥5 points in the SF-36 domain scores, or a decrease of ≥0.7 points in the FSS total score, from BL to any visit through the SVR12 visit, along with 2-sided 95% normal confidence intervals (CIs)

RESULTS

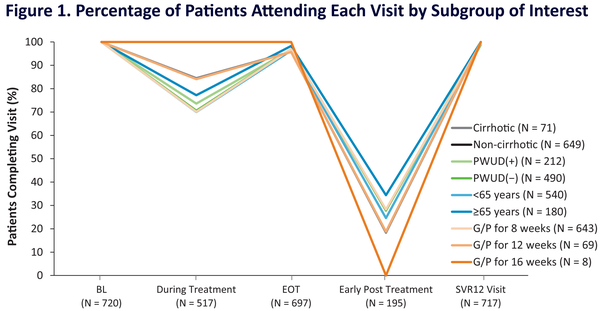
STUDY POPULATION

- A total of 720 patients were included for analysis of whom 643 (89.3%), 69 (9.6%), and 8 (1.1%) were prescribed G/P for 8, 12, and 16 weeks, respectively
- Demographics and clinical characteristics of the overall PMOS population at BL are shown on poster THU-151

HCRU

- Overall, the mean (standard deviation [SD]) number of visits per patient was 4.0 (0.79), which generally included the BL, during treatment, EOT, and SVR12 visits
  - The early post-treatment visit was the visit most likely to be skipped
  - In France and Israel, the majority of patients skipped 2 visits: during treatment and early post-treatment
- The percentage of patients attending each visit is shown in **Figure 1**

Figure 1. Percentage of Patients Attending Each Visit by Subgroup of Interest



BL, baseline; EOT, end of treatment; G/P, glecaprevir/pibrentasvir; PWUD, person who uses drugs; SVR12, sustained virologic response at post-treatment Week 12.

RESULTS (CONTINUED)

SVR12

- The mean number of visits and rates of SVR12 by country and subgroup of interest are shown in **Table 2**
  - The overall SVR12 rate was 98.9%
  - SVR12 rates were consistently high across all countries and subgroups, regardless of the number of visits
  - Of 712 patients who achieved SVR12, 13 (1.8%) attended 2 visits, 185 (26.0%) attended 3 visits, 319 (44.8%) attended 4 visits, 192 (27.0%) attended 5 visits, and 3 (0.4%) attended 6 visits (1 more visit than recommended in the protocol)

Table 2. Mean Number of Visits per Patient and Rates of SVR12 by Country and Subgroup of Interest

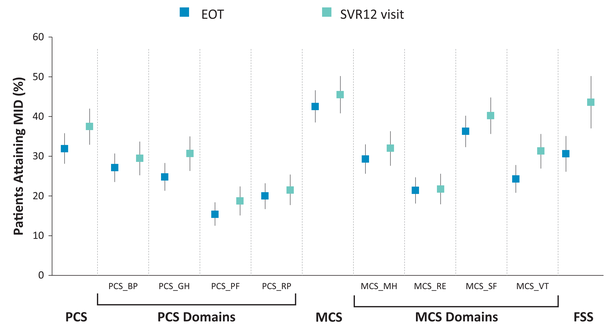
	Patients						
Subgroup	Austria N = 59	Belgium N = 102	France N = 106	Israel N = 62	Italy N = 318	Switzerland N = 73	Total population N = 720
Cirrhotic							
Patients, % (n/N)	8.5 (5/59)	24.5 (25/102)	8.5 (9/106)	3.2 (2/62)	8.2 (26/318)	5.5 (4/73)	9.9 (71/720)
Visits per patient, mean ± SD	4.2 ± 0.84	4.0 ± 0.58	3.8 ± 0.83	3.5 ± 0.71	4.2 ± 0.86	4.8 ± 0.50	4.1 ± 0.76
SVR12 rate, % (n/N)	100 (5/5)	96.0 (24/25)	100 (9/9)	100 (2/2)	96.2 (25/26)	100 (4/4)	97.2 (69/71)
Non-cirrhotic							
Patients, % (n/N)	91.5 (54/59)	75.5 (77/102)	91.5 (97/106)	96.8 (60/62)	91.8 (292/318)	94.5 (69/73)	90.1 (649/720)
Visits per patient, mean ± SD	4.0 ± 0.78	4.2 ± 0.66	3.6 ± 0.85	3.2 ± 0.51	4.2 ± 0.79	4.1 ± 0.41	4.0 ± 0.80
SVR12 rate, % (n/N)	98.1 (53/54)	98.7 (76/77)	99.0 (96/97)	100 (60/60)	99.7 (291/292)	97.1 (67/69)	99.1 (643/649)
PWUD(+)							
Patients, % (n/N)	49.0 (24/49)	44.0 (44/100)	42.3 (44/104)	16.1 (10/62)	16.4 (52/318)	55.1 (38/69)	30.2 (212/702)
Visits per patient, mean ± SD	3.6 ± 0.82	4.3 ± 0.66	3.7 ± 0.91	3.5 ± 0.53	4.2 ± 0.82	4.2 ± 0.49	4.0 ± 0.79
SVR12 rate, % (n/N)	95.8 (23/24)	100 (44/44)	100 (44/44)	100 (10/10)	98.1 (51/52)	94.7 (36/38)	98.1 (208/212)
PWUD(-)							
Patients, % (n/N)	51.0 (25/49)	56.0 (56/100)	57.7 (60/104)	83.9 (52/62)	83.6 (266/318)	44.9 (31/69)	69.8 (490/702)
Visits per patient, mean ± SD	4.3 ± 0.75	4.0 ± 0.62	3.6 ± 0.79	3.2 ± 0.50	4.2 ± 0.79	4.1 ± 0.34	4.0 ± 0.80
SVR12 rate, % (n/N)	100 (25/25)	96.4 (54/56)	98.3 (59/60)	100 (52/52)	99.6 (265/266)	100 (31/31)	99.2 (486/490)
<65 years							
Patients, % (n/N)	79.7 (47/59)	75.5 (77/102)	85.8 (91/106)	82.3 (51/62)	66.7 (212/318)	84.9 (62/73)	75.0 (540/720)
Visits per patient, mean ± SD	3.9 ± 0.78	4.2 ± 0.64	3.6 ± 0.88	3.2 ± 0.52	4.1 ± 0.77	4.1 ± 0.47	3.9 ± 0.79
SVR12 rate, % (n/N)	97.9 (46/47)	97.4 (75/77)	98.9 (90/91)	100 (51/51)	100 (212/212)	96.8 (60/62)	98.9 (534/540)
≥65 years							
Patients, % (n/N)	20.3 (12/59)	24.5 (25/102)	14.2 (15/106)	17.7 (11/62)	33.3 (106/318)	15.1 (11/73)	25.0 (180/720)
Visits per patient, mean ± SD	4.3 ± 0.75	4.0 ± 0.65	3.7 ± 0.62	3.4 ± 0.50	4.3 ± 0.85	4.0 ± 0.00	4.1 ± 0.79
SVR12 rate, % (n/N)	100 (12/12)	100 (25/25)	100 (15/15)	100 (11/11)	98.1 (104/106)	100 (11/11)	98.9 (178/180)
G/P for 8 weeks							
Patients, % (n/N)	88.1 (52/59)	72.5 (74/102)	91.5 (97/106)	95.2 (59/62)	91.8 (292/318)	94.5 (69/73)	89.3 (643/720)
Visits per patient, mean ± SD	4.0 ± 0.79	4.2 ± 0.67	3.6 ± 0.85	3.2 ± 0.51	4.2 ± 0.79	4.1 ± 0.41	4.0 ± 0.8
SVR12 rate, % (n/N)	98.1 (51/52)	98.6 (73/74)	99.0 (96/97)	100 (59/59)	99.7 (291/292)	97.1 (67/69)	99.1 (637/643)
G/P for 12 weeks							
Patients, % (n/N)	8.5 (5/59)	23.5 (24/102)	8.5 (9/106)	3.2 (2/62)	7.9 (25/318)	5.5 (4/73)	9.6 (69/720)
Visits per patient, mean ± SD	4.2 ± 0.84	4.0 ± 0.59	3.8 ± 0.83	3.5 ± 0.71	4.2 ± 0.88	4.8 ± 0.50	4.1 ± 0.77
SVR12 rate, % (n/N)	100 (5/5)	95.8 (23/24)	100 (9/9)	100 (2/2)	100 (25/25)	100 (4/4)	98.6 (68/69)
G/P for 16 weeks							
Patients, % (n/N)	3.4 (2/59)	3.9 (4/102)	0.0 (0/106)	1.6 (1/62)	0.3 (1/318)	0.0 (0/73)	1.1 (8/720)
Visits per patient, mean ± SD	4.0 ± 0.00	4.0 ± 0.00	–	4	4	–	4.0 ± 0.0
SVR12 rate, % (n/N)	100 (2/2)	100 (4/4)	–	100 (1/1)	0.0 (0/1)	–	87.5 (7/8)
Overall							
Visits per patient, mean ± SD	4.0 ± 0.78	4.1 ± 0.64	3.6 ± 0.85	3.2 ± 0.52	4.2 ± 0.80	4.1 ± 0.44	4.0 ± 0.79
SVR12 rate, % (n/N)	98.3 (58/59)	98.0 (100/102)	99.1 (105/106)	100 (62/62)	99.4 (316/318)	97.3 (71/73)	98.9 (712/720)

PWUD included patients with current illicit drug use, patients with illicit drug use within 12 months prior to screening, and patients with illicit drug use more than 12 months prior to screening.
G/P, glecaprevir/pibrentasvir; PWUD, person who uses drugs; SD, standard deviation; SVR12, sustained virologic response at post-treatment Week 12..

HRQoL

- The mean (SD) change from BL to the SVR12 visit was 1.59 (7.06), 2.61 (9.48), and -0.73 (1.49) for the SF-36 PCS, SF-36 MCS, and FSS scores, respectively
  - The mean (SD) change from BL to the SVR12 visit for each of the SF-36 domains was as follows: Bodily Pain, 1.88 (9.82); General Health, 2.60 (8.44); Mental Health, 2.25 (9.91); Physical Functioning, 1.39 (8.09); Role Emotional, 2.46 (11.04); Role Physical, 1.88 (9.45); Social Functioning, 2.08 (10.18); and Vitality, 2.75 (9.04)
  - Of all SF-36 domains, the largest mean increase in score was observed for Vitality, as shown in other HCV populations[22]
- The percentages of patients who demonstrated MID in PROs are presented in **Figure 2**
  - 43.6% of patients showed a clinically meaningful improvement in fatigue from BL to the SVR12 visit

Figure 2. Patients Who Demonstrated MID in SF-36 PCS (≥2.5 Increase) and MCS (≥2.5 Increase) Scores, SF-36 Domain Scores (≥5 Increase), and FSS Scores (≥0.7 Decrease), From BL Through the EOT and SVR12 Visits



Error bars represent 95% CI. BL, baseline; BP, Bodily Pain; CI, confidence interval; EOT, end of treatment; FSS, Fatigue Severity Scale; GH, General Health; MCS, Mental Component Summary; MH, Mental Health; MID, minimally important difference; PCS, Physical Component Summary; PF, Physical Functioning; RE, Role Emotional; RP, Role Physical; SF, Social Functioning; SF-36, 36-Item Short Form Health Survey; SVR12, sustained virologic response at post-treatment Week 12; VT, Vitality.

CONCLUSIONS

- G/P treatment of patients with chronic HCV infection in real-world clinical settings such as these PMOS resulted in high SVR rates and clinically meaningful improvement in HRQoL, irrespective of treatment duration, cirrhosis, illicit drug use, or age
- HCRU, based on the mean number of visits observed for patients, was less than that recommended in the protocol, with some variability between countries
  - The early post-treatment visit was the visit most likely to be skipped
  - Despite such differences in HCRU, consistently high SVR rates were achieved with G/P
- Greater than 40% of patients experienced a clinically meaningful improvement in the mental components of HRQoL. A similar percentage of patients experienced a clinically meaningful decrease in fatigue
- These PMOS will continue to monitor and analyze HRQoL and HCRU in multiple real-world clinical settings

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DISCLOSURES

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AbbVie sponsored the study; contributed to its design; and participated in the collection, analysis, and interpretation of the data and in the writing, reviewing, and approval of the presentation. All authors had access to relevant data, and participated in the writing, review, and approval of the presentation.

REFERENCES

1. Loria A, et al. *Am J Phys Med Rehabil.* 2014;93:470–6.
2. Kondo Y, et al. *J Gastroenterol Hepatol.* 2007;22:197–203.
3. Sobhonslidsuk A, et al. *World J Gastroenterol.* 2006;12:7786–91.
4. Gutteling JJ, et al. *Aliment Pharmacol Ther.* 2006;23:1629–35.
5. Younossi ZM. *Gastroenterology.* 2001;120:305–7.
6. Gutteling JJ, et al. *Psychosomatics.* 2010;51:157–65.
7. Gutteling JJ, et al. *Neth J Med.* 2007;65:227–34.
8. Häuser W, et al. *Clin Gastroenterol Hepatol.* 2004;2:157–63.
9. Yang SS, Kao JH. *Expert Rev Gastroenterol Hepatol.* 2015;9:9–20.
10. MAVYRET (US package insert); AbbVie 2018/MAVIRET (SmPC); AbbVie 2019.
11. Cacoub P, et al. *Hepatology.* 2018;68:94A–95A (abstract #150).
12. Wiegand J, et al. *Hepatology.* 2018;68:364A (abstract #611).
13. D'Ambrosio R, et al. *J Hepatol.* 2019;70:379–87.
14. Coteur G, et al. *Aliment Pharmacol Ther.* 2009;29:1032–41.
15. Strand V, et al. *Health Qual Life Outcomes.* 2013;11:82.
16. Bjorner JB, et al. *Curr Med Res Opin.* 2007;23:731–9.
17. Rosa K, et al. *Health Qual Life Outcomes.* 2014;12:90.
18. Ware JE, CD Sherbourne. *Med Care.* 1992;30:473–83.
19. Younossi ZM. *Gastroenterology.* 2001;120:305–7.
20. Afendy A, et al. *Aliment Pharmacol Ther.* 2009;30:469–76.
21. Kleinman L, et al. *Health Qual Life Outcomes.* 2012;10:92.
22. Thuluvath PJ, Savva Y. *Clin Transl Gastroenterol.* 2018;9:149.

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Achieving accelerated elimination of hepatitis C virus infection by 2025: a case study in France

SAT-259

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INTRODUCTION

- With the introduction of curative therapies for hepatitis C virus (HCV) infection and removal of restrictions on antiviral treatment by fibrosis score, France is on track to achieve the World Health Organization's (WHO) targets for elimination of HCV as a public health threat by 2030[1]

OBJECTIVES

- To inform the path towards accelerated elimination, this analysis evaluates the clinical and economic impact of HCV elimination in France by 2025

METHODS

- A Markov disease progression model was developed to assess the impact over 2019-2030 from expanding HCV diagnosis and treatment, populated with demographic and epidemiological inputs and price data[2–3] from France
- Historical incidence of HCV was calibrated to match 110,000 chronically infected adults (with 40,000 diagnosed) in 2018
- Future incidence was assumed to change at the same annual rate as prevalence
- Two scenarios were compared:
  - Maintaining 15,000 annual treatments and 4.1 million annual HCV antibody (AB) screens[4] over 2019-2030 (the "status quo")
  - "Accelerated elimination by 2025," requiring 13,700 diagnoses (HCV RNA+ confirmed after AB+ test) and 18,650 treatments annually over 2019–2025
- Clinical outcomes of cases of decompensated cirrhosis, hepatocellular carcinoma, liver transplantation, liver-related deaths, and quality-adjusted life years (QALYs) were analyzed
- Economic outcomes of costs of screening, antiviral treatment, liver-related complications, and extra-hepatic manifestations were analyzed
- QALYs and total medical costs were used to calculate the incremental cost-effectiveness ratio (ICER) of accelerated HCV elimination relative to the status quo

LIMITATIONS

- Number of HCV antibody screens and treatments, and unit costs of screening and treatment were assumed to stay constant annually, which may differ from future trends
- Model forecasts may differ from results observed in the real world

RESULTS

- Compared to the status quo, accelerated elimination in France would require screening of two times more people annually, or 28 million additional HCV AB screens, over 2019–2025
- By 2030, accelerated elimination would avert:
  - 7,244 new HCV infections,
  - 74 cases of decompensated cirrhosis
  - 144 cases of hepatocellular carcinoma
  - 16 liver transplantations
  - 107 liver-related deaths
- By 2030, accelerated elimination would yield cost savings of €162 million, with an ICER of €-9,635/QALY

Table 1. Clinical and economic outcomes, by scenario

	Status quo	Accelerated elimination by 2025
Clinical burden over 2019–2030, incident cases		
HCV infection	21,840	14,597
Decompensated cirrhosis	118	44
Hepatocellular carcinoma	240	95
Liver transplantations	25	9
Liver-related deaths	177	70
Medical costs over 2019–2030, million €		
Screening	712	768
Antiviral treatment	3,136	3,238
Liver-related complications	150	98
Extra-hepatic manifestations	708	441
Total medical costs	**4,706**	**4,544**

Figure 1. Scenario assumptions, 2019–2025

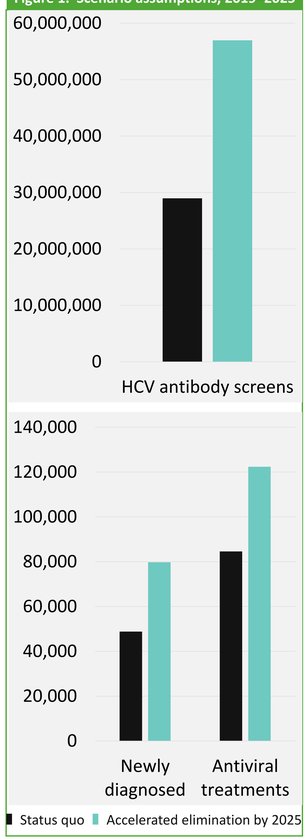


Figure 2. Clinical burden, by scenario

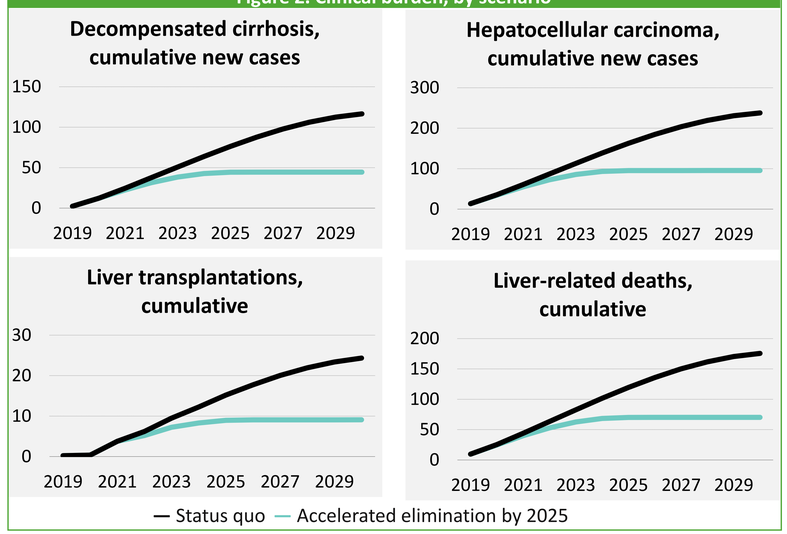


Figure 3. Economic burden, by scenario

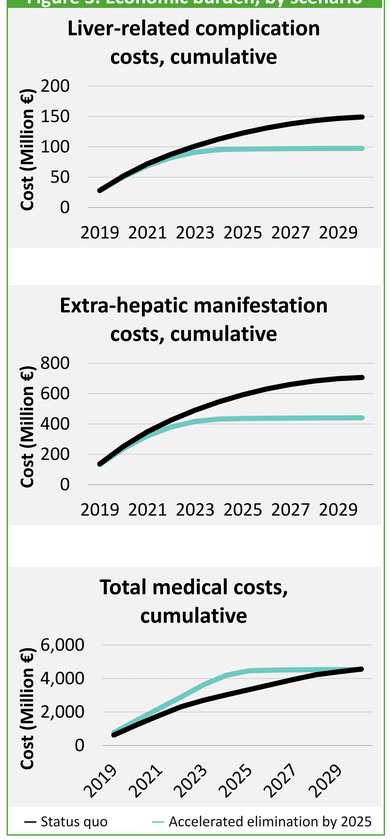
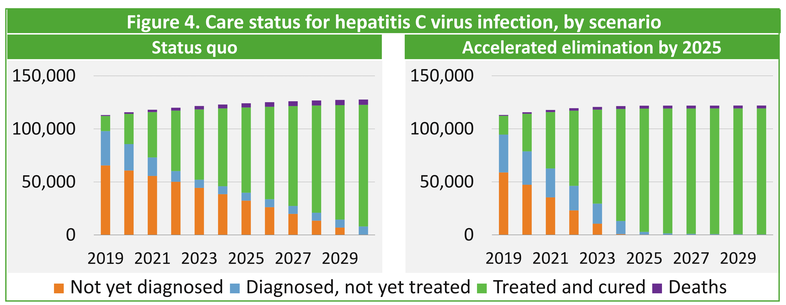


Figure 4. Care status for hepatitis C virus infection, by scenario



CONCLUSIONS

- While France is on track to eliminate HCV as a public health threat by 2030, an expansion of screening to 28 million more people would be necessary to accelerate elimination by 2025
- This accelerated elimination path would further reduce the clinical and economic burden of HCV and be cost-saving by 2030

DISCLOSURES

- The design, study conduct, and financial support for the study were provided by AbbVie. AbbVie participated in the interpretation of data, review, and approval of this publication
- Victor de Ledinghen is an employee of CHU de Bordeaux. He has received consulting fees from AbbVie, Gilead, MSD, Pfizer, Intercept Pharma, Echosens and Supersonic Imagine
- Christophe Bureau is an employee of CHU de Toulouse. He has received consulting fees from AbbVie, Gilead, Intercept, Norgine and Gore
- Yuri Sanchez Gonzalez is an employee of AbbVie Inc. and may own AbbVie stock or stock options.
- Fabrice Ruggeri is an employee of AbbVie France Ltd. and may own AbbVie stock or stock options
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REFERENCES

1. WHO. Global Health Sector Strategy on Viral Hepatitis 2016–2021. Towards Ending Viral Hepatitis: World Health Organization, 2016.
2. Deuffic-Burban S, Obach D, Canva V, Pol S, Roudot-Thoraval F, Dhumeaux D, et al. Cost-effectiveness and budget impact of interferon-free direct-acting antiviral-based regimens for hepatitis C treatment: the French case. Journal of Viral Hepatitis. 2016;23(10):767–79.
3. Ethgen O, Sanchez Gonzalez Y, Jeanblanc G, Duguet A, Misurski D, Juday T. Public health impact of comprehensive hepatitis C screening and treatment in the French baby-boomer population. Journal of medical economics. 2017;20(2):162–70.
4. Pioche C, Léon L, Vaux S, Brouard C, Lot F. Dépistage des hépatites B et C en France en 2016, nouvelle édition de l'enquête LaboHep. Bull Epidémiol Hebd. 2018(11):188–95.

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Immediate versus delayed hepatitis C treatment in the United Kingdom: A pan-genotypic cost-effectiveness analysis

SAT-263

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BACKGROUND

- Patients with hepatitis C virus (HCV) face increased healthcare costs due to hepatic complications and extrahepatic manifestations affecting cardiovascular, renal, central nervous system, immune, rheumatologic, and endocrine systems.[1,2]
- Treatment of HCV infection has shown to reduce the risks and associated costs of hepatic and extrahepatic complications.[1,2]
- In spite of these benefits, treatment is often delayed for patients with early stages of liver disease. [3,4]

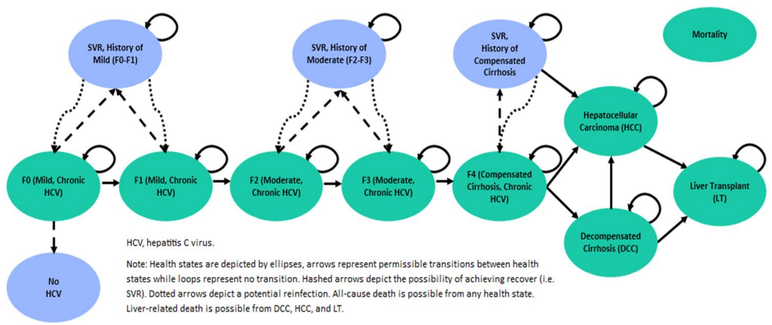
OBJECTIVES

- This study explored the clinical and economic burden of delaying pan-genotypic hepatitis C treatment and the cost-effectiveness of immediate versus delayed treatment in the United Kingdom (UK).

METHODS

- A Markov state transition model of the natural history of HCV was developed to forecast liver-related and economic outcomes over a lifetime from the UK National Health Service (NHS) perspective.
- The model was based on health state frameworks in the academic literature.[5,6] The natural history of HCV infection is shown in Figure 1.
- The analysis focused on the immediate treatment of patients with HCV genotypes 1-6 and fibrosis stages F0–F2 vs delayed treatment in later years.
- In the base case, there was no patient loss to follow-up (LTFU) due to treatment delay.
- In scenario analyses, annual LTFU rates of 1%, 5%, 10%, and 20% were considered.
- Health outcomes included lifetime risks of decompensated cirrhosis (DCC), hepatocellular carcinoma (HCC), liver transplantation (LT), and liver-related death (LrD).

Figure 1. Model schematic



METHODS (Continued)

- Other outcomes included: (i) total healthcare (hepatic, extrahepatic and treatment) costs, (ii) quality-adjusted life years (QALYs) valued at £20,000, and (iii) net monetary benefit (NMB = Δ QALYs * £20,000 – Δ Costs [Δ represents difference between immediate vs. delayed treatment]).
- Future QALYs and costs were discounted at 3.5% yearly.[7]
- Regression analysis was performed to assess the impact of treatment delay and LFTU on total costs and NMB.

MODEL INPUTS

- Patient demographics as well as hepatic and extrahepatic costs were drawn from UK sources;[2,3,6,8,9] transition probabilities and health state utilities were based on published literature.[10-12]
- Treatment attributes were based on clinical trials of glecaprevir (identified by AbbVie and Enanta) and pibrentasvir.[13]

Table 1: Baseline patient characteristics

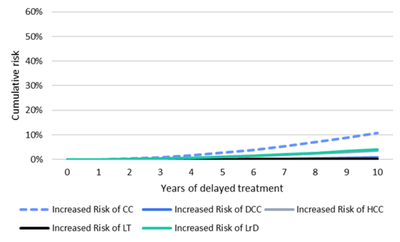
Demographics	Base Case Value
Genotype distribution[8]	
GT1	52.0%
(of whom %GT1a)[14]	(68.1%)
GT2	12.0%
GT3	23.0%
GT4	11.0%
GT5	1.0%
GT6	1.0%
Age (in Years)[8]	43.0
Male [8]	66.0%
Fibrosis distribution[8]	
F0	37.3%
F1	47.5%
F2	15.3%
F3	0.0%
F4	0.0%

Sources:
[8] Adelphi Patient Chart Tracking Study
[14] Harris et al. (1999)

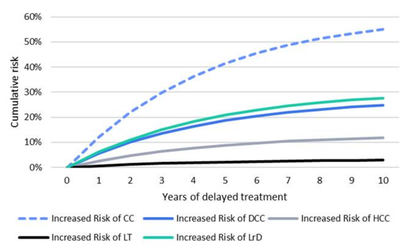
RESULTS

- Delaying treatment with glecaprevir/pibrentasvir increased long-term risks of compensated cirrhosis (CC), DCC, HCC, LT, and LrD; LTFU further aggravated these risks.
- Assuming no LTFU (= 0%), long-term liver-related outcomes increased with length of treatment delay. For instance, at year 5, there was an increased risk of CC of 2.7%, DCC (0.01%), HCC (1.0%), LT (0.05%), and LrD (1.0%). (Figure 2A)
- Assuming LTFU = 20%, the long-term risks at year 5 increased to 41.4% (CC), 18.6% (DCC), 8.9% (HCC), 2.2% (LT), and 20.8% (LrD). (Figure 2B)

Figure 2. Cumulative hepatic risks from delayed treatment – (A) LTFU=0% and (B) LTFU=20%



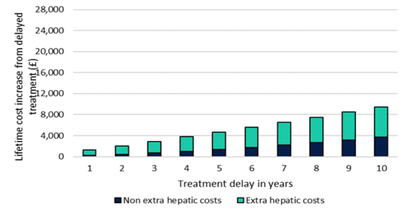
(A)



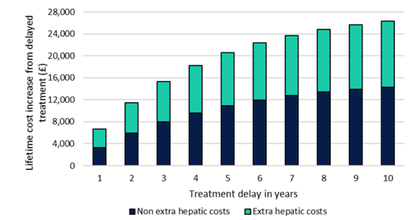
(B)

- Delaying treatment substantially increased lifetime healthcare costs, especially due to the risk of LTFU.
- Assuming no LTFU, the share of total cost attributable to extrahepatic cost fell from 81% to 61% as treatment was delayed from one to ten years (Figure 3A).
- When LTFU=20%, the lifetime cost from delayed treatment increased at least 3-fold (vs. LTFU=0%), with similar shares attributable to hepatic vs extrahepatic costs (Figure 3B).
- In regression analysis, total costs were predicted to increase by £1,318 (95% confidence interval: £1,214-£1,421) for every year of treatment delay and by £667 (95% confidence interval: £598-£737) for each additional percentage increase in patients LTFU.
- The NMB of immediate vs delayed treatment with glecaprevir/pibrentasvir also increased with years of treatment delay (Figure 4).

Figure 3: Costs increase generated by treatment delay by extra-hepatic and non-extra-hepatic costs - (A) LTFU=0% and (B) LTFU=20%

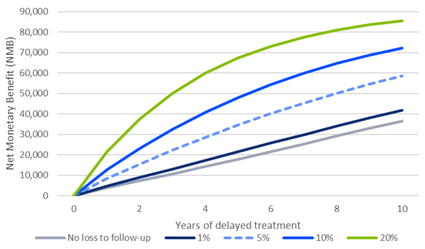


(A)



(B)

Figure 4: Impact of treatment delay and patients LTFU on the NMB



- Immediate treatment was a dominant strategy regardless of time of delay as it delivered more QALYs at lower costs (NMB>0). Moreover, the NMB associated with delayed treatment increased with higher risk of LTFU. (Figure 4)
- In regression analysis, the NMB of immediate treatment was estimated to increase by £4,556 (95% confidence interval: £4,236-£4,876) for every year treatment was delayed and by £1,981 (£1,766-£2.197) per every 1% increase in LTFU.

LIMITATIONS

- A patient who progressed to advanced liver disease (CC and beyond) within the period of treatment delay was assumed to remain untreated. This may not be observed in routine clinical practice if patients are not LTFU.
- The model assumed that there was no spontaneous remission from F0. Moreover, viral reinfection rates were based on expert opinion. Further research is needed to inform these parameters.

LIMITATIONS (Continued)

- There was limited information on the demographics of patients with chronic HCV in the UK; baseline data for patient distribution across genotypes, treatment history and fibrosis distribution were extracted from the Adelphi Patient Chart Tracking Study.[8]
- Results were based on a model forecast and may differ from those observed in routine clinical practice.
- We assumed a willingness-to-pay threshold of £20,000 per QALY per NICE guidelines. Increasing the threshold to less conservative levels would further strengthen the rationale for immediate treatment.

CONCLUSIONS

- Immediate versus delayed hepatitis C treatment decreased hepatic and extrahepatic costs and was a dominant strategy in the UK as it delivered more QALYs at lower cost.
- Immediate treatment mitigated the hepatic and extrahepatic burden of HCV as well as the risk of LFTU, thus maximizing the value of treatment to patients and payers.

DISCLOSURES AND CONFLICTS OF INTEREST

The design, analysis, and financial support of this study were provided by AbbVie Inc.. AbbVie Inc. participated in the interpretation of data, review, and approval of the study.
John Dillon is an employee of NHS. In addition, Dr Dillon has received funding from AbbVie Ltd. for a collaborative research study, grants and personal fees from Gilead, Merck, Janssen, Roche, and also reports being on the speakers' bureau these companies.
Dominic Mitchell is a contractor to Medicus Economics LLC, a consulting company that conducts economic evaluations in a variety of therapeutic areas for pharmaceutical companies.
Suchin Virabhak is an employee of Medicus Economics LLC.
Monika Hermansson and Svetlana Kalabina are employees of AbbVie Ltd and may own AbbVie stock.
Yuri Sanchez Gonzalez is an employee of AbbVie Inc. and may own AbbVie stock.
AbbVie Inc. is the manufacturer of glecaprevir/pibrentasvir.

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REFERENCES

1. Younossi Z, Park H, Henry L, Adeyemi A, Stepanova M. Extrahepatic Manifestations of Hepatitis C: A Meta-analysis of Prevalence, Quality of Life, and Economic Burden. Gastroenterology 150(7), 1599-1608 (2016).
2. Cacoub P, Buggisch P, Carrion J et al. Direct Medical Costs Associated with the Extrahepatic Manifestations of Hepatitis C Infection. EASL 2017 (2017).
3. Reau N, Vekeman F, Wu E, Bao Y, Gonzalez YS. Prevalence and economic burden of extrahepatic manifestations of hepatitis C virus are underestimated but can be improved with therapy. Hepatology Communications 1(5), 439-452 (2017).
4. Kraus MR, Kleine H, Thonnes S, Pignot M, Sanchez Gonzalez Y. Improvement of Hepatic and Extrahepatic Complications from Chronic Hepatitis C After Antiviral Treatment: A Retrospective Analysis of German Sickness Fund Data. Infectious diseases and therapy 7(3), 339-352 (2018).
5. Saab S, Parise H, Virabhak S et al. Cost-effectiveness of currently recommended direct-acting antiviral treatments in patients infected with genotypes 1 or 4 hepatitis C virus in the US. Journal of medical economics 19(8), 795-805 (2016).
6. Hartwell D, Jones J, Baxter L, Shepherd J. Peginterferon alfa and ribavirin for chronic hepatitis C in patients eligible for shortened treatment, re-treatment or in HCV/HIV co-infection: a systematic review and economic evaluation. Health technology assessment (Winchester, England). 2011;15(17):i-xii, 1-210.
7. NICE. Guide to the methods of technology appraisal 2013. London: National Institute for Health and Care Excellence; 2013.
8. Adelphi Research UK. Adelphi Patient Chart Tracking Study (project reference 22968). Adelphi Research UK;2017.
9. Backx M, Lewszuk A, White JR, et al. The cost of treatment failure: resource use and costs incurred by hepatitis C virus genotype 1-infected patients who do or do not achieve sustained virological response to therapy. Journal of viral hepatitis. 2014;21(3):208-215.
10. Thein HH, Yi Q, Dore GJ, Krahn MD. Estimation of stage-specific fibrosis progression rates in chronic hepatitis C virus infection: a meta-analysis and meta-regression. Hepatology. 2008;48(2):418-431.
11. Kanwal F, Kramer JR, Ilyas J, Duan Z, El-Serag HB. HCV genotype 3 is associated with an increased risk of cirrhosis and hepatocellular cancer in a national sample of U.S. Veterans with HCV. Hepatology. 2014;60(1):98-105.
12. Cardoso AC, Moucari R, Figueiredo-Mendes C, et al. Impact of peginterferon and ribavirin therapy on hepatocellular carcinoma: incidence and survival in hepatitis C patients with advanced fibrosis. Journal of hepatology. 2010;52(5):652-657.
13. AbbVie. Clinical Study Reports. Data on file.
14. Harris KA, Gilham C, Mortimer PP, Teo CG. The most prevalent hepatitis C virus genotypes in England and Wales are 3a and 1a. Journal of medical virology. 1999;58(2):127-131.

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Global timing of hepatitis C virus elimination: estimating the year countries will achieve the World Health Organization elimination targets

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SAT-260

INTRODUCTION

- The introduction of highly efficacious pan-genotypic therapies for hepatitis C virus (HCV) infection has made the elimination of HCV an attainable goal

OBJECTIVES

- This study assessed the progress made in 45 high-income countries and territories towards meeting the 2030 HCV elimination targets[1] set by the World Health Organization (WHO) for incidence, mortality, diagnosis, and treatment

METHODS

- A previously published Markov disease progression model[2] of HCV infection was populated with demographic and epidemiological inputs for 45 high-income countries and territories from the United Nations World Population Prospects[3] and the Polaris Observatory,[4] respectively
- Primary modification to the published model was the calculation of incidence:
  - Incident cases of HCV were separated into vertically[5] and horizontally acquired infections
  - Future incidence was assumed to change at the same annual rate as prevalence
    - F0 (on METAVIR scale) prevalence was used where treatment was restricted by fibrosis score, and overall prevalence was used where treatment was not restricted to simulate the impact of treatment as prevention
- Maintaining the standard of care in 2017 (number of new diagnoses and antiviral treatments, treatment eligibility, and average sustained virologic response) was defined as the status quo
- Modeled outcomes for prevalence, incidence, liver-related deaths due to HCV infection, as well as reported data on diagnosis and antiviral treatment were analyzed to determine the year in which a country or territory would meet the WHO's 2030 targets to eliminate HCV:
  - 80% reduction in incidence of chronic HCV infections between 2015 and 2030
  - 65% reduction in liver-related deaths due to chronic HCV infection between 2015 and 2030
  - 90% diagnosis coverage of HCV-infected population in 2015
  - 80% treatment coverage of eligible HCV-infected population in 2015
- Additionally, the minimum number of annual treatments necessary to achieve the treatment target for HCV elimination, starting in 2020, was calculated

RESULTS

- Of 45 high-income countries and territories, 30 were projected to not eliminate HCV before 2050
  - Nine (Australia, France, Iceland, Italy, Japan, South Korea, Spain, Switzerland, and the United Kingdom) were on track towards eliminating HCV by 2030,
  - Three (Austria, Germany, and Malta) were projected to eliminate HCV by 2040, and three more (Ireland, the Netherlands, and Saudi Arabia) by 2050
- The number of high-income countries and territories that failed to meet each WHO target for HCV elimination was: 34 (incidence), 30 (mortality), 20 (diagnosis), and 26 (treatment)

CONCLUSIONS

- Despite the introduction of curative therapies, 80% of high-income countries and territories are not on track to meet the WHO's targets that would eliminate HCV as a public health threat by 2030, and 67% are off-track by at least 20 years.
- Immediate action to improve HCV diagnosis and treatment is needed to make the global elimination of HCV by 2030 an attainable goal.

REFERENCES

1. WHO. Global Health Sector Strategy on Viral Hepatitis 2016–2021. Towards Ending Viral Hepatitis: World Health Organization, 2016.
2. Blach S, Zeuzem S, Manns M, et al. Global prevalence and genotype distribution of hepatitis C virus infection in 2015: a modelling study. The Lancet Gastroenterology & Hepatology 2017; 2(3): 161–76.
3. United Nations, Department of Economic and Social Affairs, Population Division (2017). World Population Prospects: The 2017 Revision
4. The CDA Foundation. Hepatitis C. Lafayette, CO: CDA Foundation, 2019. Available from http://cdafound.org/polaris/ (Accessed January 14, 2019)
5. Benova L, Mohamoud YA, Calvert C, Abu-Raddad LJ. Vertical transmission of hepatitis C virus: systematic review and meta-analysis. Clin Infect Dis 2014; 59(6): 765–73.

Disclosures: The design, analysis, and financial support of this study were provided by AbbVie Inc.. AbbVie Inc. participated in the interpretation of data, review, and approval of the study. Homie Razavi is an employee of Center for Disease Analysis (CDA). CDA has received funding from AbbVie Inc. for this project. CDA has also received research funding from AbbVie, Gilead, and Intercept. Yuri Sanchez Gonzalez is an employee of AbbVie Inc. and may own AbbVie stock or stock options. Andreas Pangerl was an employees of AbbVie Inc. at the time this study was conducted and may own AbbVie stock or stock options Markus Cornberg is an employee of Medizinische Hochschule Hannover and is a consultant for AbbVie Inc.. He is also a consultant/speaker for Gilead and MSD Sharp & Dohme.

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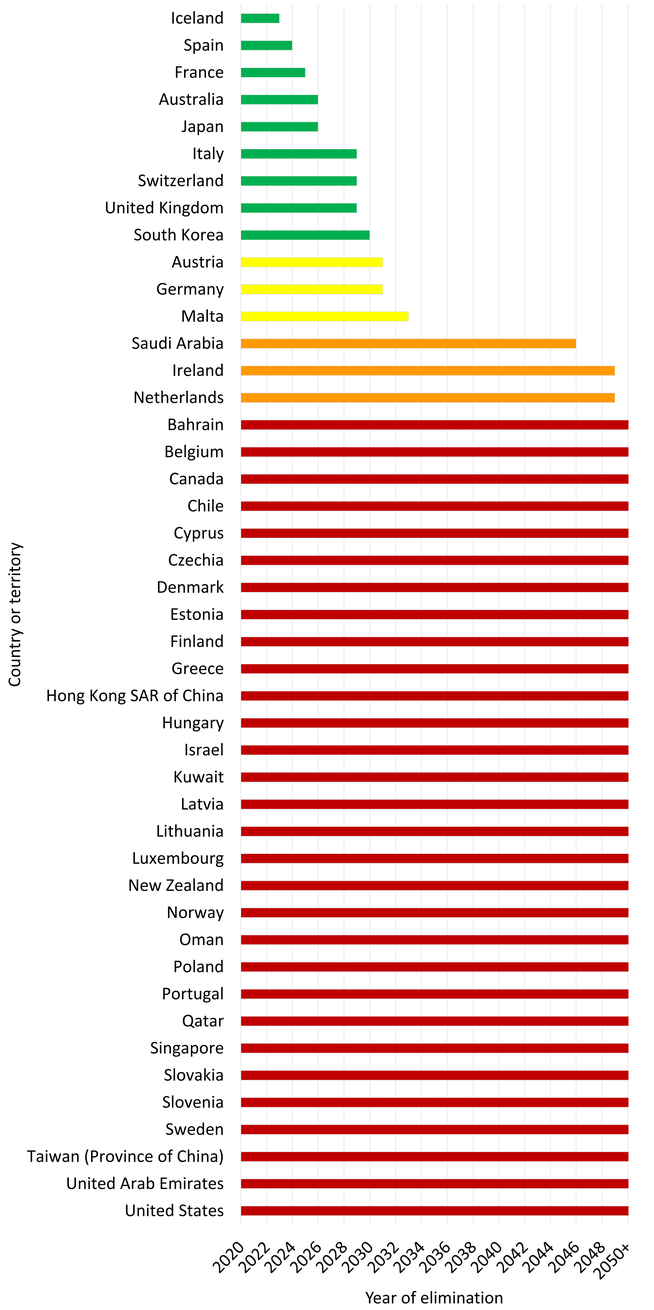
Table 1. Year of elimination of HCV by country or territory

Country or territory	Year in which the WHO's 2030 target was met				Annual treatments necessary to achieve WHO's 2030 treatment target	Restrictions on treatment by fibrosis score in 2017	Year of elimination
	Incidence	Mortality	Diagnosis	Treatment			
Australia	2026	2024	2016	2021	5,400	No	2026
Austria	2031	2021	2026	2022	560	No	2031
Bahrain	–	–	–	–	1,100	Yes	–
Belgium	2042	2039	2029	2042	3,900	Yes	–
Canada	2043	2029	2022	2029	10,000	Yes	–
Chile	2050	–	–	–	2,300	Yes	–
Cyprus	2042	–	–	–	200	Yes	–
Czechia	–	–	2046	–	3,100	Yes	–
Denmark	–	–	2030	–	1,100	Yes	–
Estonia	2041	–	–	2048	930	Yes	–
Finland	–	–	2017	2046	1,300	Yes	–
France	2025	2023	2016	2021	4,100	No	2025
Germany	2027	2029	2031	2030	9,600	No	2031
Greece	–	2046	2028	–	6,100	Yes	–
Hong Kong SAR of China	–	–	2045	–	1,100	Yes	–
Hungary	–	–	2042	2044	2,800	Yes	–
Iceland	2023	2019	2016	2017	*	No	2023
Ireland	2046	2049	2028	2035	1,600	No	2049
Israel	2035	–	–	–	6,100	Yes	–
Italy[a]	2028	2023	[a]	2029	40,900	No	2029
Japan[b]	2026	2023	[b]	[b]	[b]	No	2026
Kuwait	–	–	2040	–	1,400	No	–
Latvia	–	2019	2023	2042	2,100	Yes	–
Lithuania	–	–	2040	2048	1,900	Yes	–
Luxembourg	2040	–	2032	2033	260	No	–
Malta	2028	2033	2015	2023	40	No	2033
Netherlands	2045	2049	2033	2028	980	No	2049
New Zealand	2041	2037	2033	2027	2,200	No	–
Norway	–	–	2020	2030	940	Yes	–
Oman	–	2042	2037	2041	860	Yes	–
Poland	–	–	2047	2041	8,100	No	–
Portugal	–	–	–	2048	5,100	No	–
Qatar	2041	–	2026	–	2,000	Yes	–
Saudi Arabia	2042	2046	2034	2030	4,800	No	2046
Singapore	2049	–	2030	–	990	Yes	–
Slovakia	–	–	–	–	2,300	Yes	–
Slovenia	–	–	2029	2040	340	Yes	–
South Korea	2025	2029	2029	2030	11,000	No	2030
Spain	2024	2020	2021	2020	5,300	No	2024
Sweden	–	2022	2016	2030	1,600	Yes	–
Switzerland	2029	2026	2024	2024	1,600	No	2029
Taiwan (Province of China)	–	2031	2041	–	30,300	Yes	–
United Arab Emirates	–	–	2030	–	7,800	No	–
United Kingdom	2029	2028	2025	2023	5,800	No	2029
United States	–	2022	2025	2026	106,000	Yes	–

HCV — hepatitis C virus; WHO — World Health Organization; * — treatment target has already been achieved; "–" — elimination target was not met by 2050; Hong Kong SAR of China — Hong Kong Special Administrative Region of China;
[a] Due to high all-cause and liver-related mortality among the HCV-infected population, caused by an older prevalent population, the diagnosis target was excluded while assessing the year of elimination
[b] Due to high all-cause and liver-related mortality among the HCV-infected population, caused by an older prevalent population, the diagnosis and treatment targets were excluded while assessing the year of elimination

Figure 1. Year of elimination of HCV by country or territory



HCV — hepatitis C virus; Hong Kong SAR of China — Hong Kong Special Administrative Region of China

Patient Flow Across Physician Specialties Over the Course of the Hepatitis C Care Cascade: A Real-World Analysis From the United States

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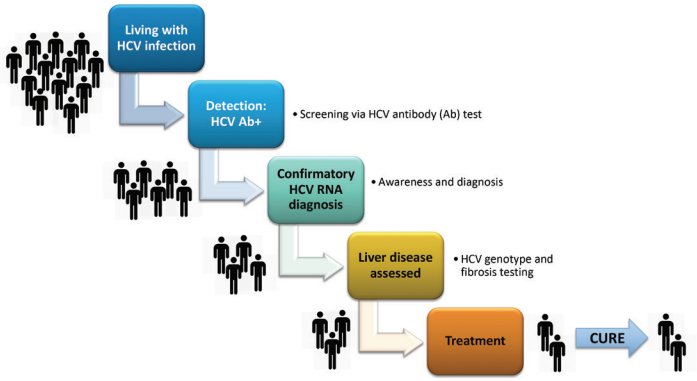
INTRODUCTION

- An estimated 2.4 million people in the United States are infected with hepatitis C virus (HCV), a major cause of liver disease and cirrhosis[1]
- With the advent of direct-acting antivirals, high cure rates for HCV are achievable but rely on closing key gaps in the HCV care cascade to meet the HCV elimination targets set by the World Health Organization (WHO)[2,3]
- Guidelines outline the standard patient journey from screening to cure[4–6]
- A 2014 meta-analysis found large gaps at each step of the HCV care cascade, including only 50% of patients being diagnosed and aware of their HCV infection and only 16% of patients receiving treatment[7]

Gaps in HCV Care Cascade



OBJECTIVES

AIMS

- To assess the flow of HCV patients across physician specialties in the United States over the course of care
- To identify trends and gaps in the HCV care cascade in a real-world setting

METHODS

- Data from 2 de-identified national laboratory datasets (January 2013 – December 2016)[8]
  - Patients in this study represent the majority of US patients screened for HCV Ab and / or tested for HCV RNA between 2013 and 2016
  - Screening: Patients who received HCV Ab test
  - Awareness: Patients who received HCV RNA viral load test irrespective of HCV Ab test
  - Diagnosis: Patients who had a positive HCV RNA viral load test
  - Linkage to care: Patients with positive HCV RNA viral load test who visited a physician to receive liver function test and / or genotype assessments and received treatment
    - Liver function was assessed per modified Fibrosis-4 (FIB-4) Index scoring based on alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels and platelet count
    - Treatment was not directly observed but inferred via change in viral load
- The number and proportion of patients at each step in the care cascade was calculated per physician specialty
- Sankey diagrams were used to visualize the flow of patients across physician specialties at various steps in the care cascade, with the width of each arrow / arm proportional to the patient flow quantity

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RESULTS

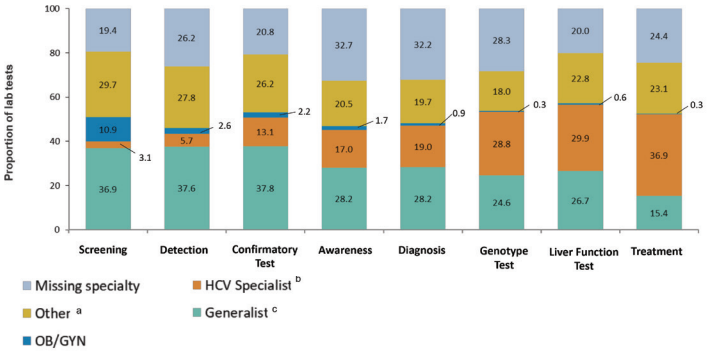
Frequency of Patients at Each Step in HCV Care Cascade

Step in HCV Care Cascade	Frequency (N)	Proportion of Indicated Population
Screening (first Ab test)	17,177,546	–
Detection (first positive Ab test)	974,277	5.7% of screened
Confirmatory test (first HCV RNA test [positive or negative] following positive Ab test)	527,340	54.1% of Ab+
HCV RNA+ (first positive HCV RNA test following positive Ab test)	337,846	64.1% of Ab+ RNA-tested
Awareness (first HCV RNA test irrespective of Ab test)	1,721,020	–
Diagnosis (first positive HCV RNA test irrespective of Ab test)	913,529	53.1% of RNA-tested
Genotype test (first genotype test following positive HCV RNA test)	487,263	53.3% of RNA+
Liver function test (first liver function test following positive HCV RNA test)	390,162	42.7% of RNA+
Diagnosis and linkage to care (positive HCV RNA test & ≥2 HCV RNA lab tests)	172,835	–
Treatment (after diagnosis)	18,220	10.5% of diagnosed linked to care

= gap in HCV care cascade

HCV Care Cascade by Physician Specialty

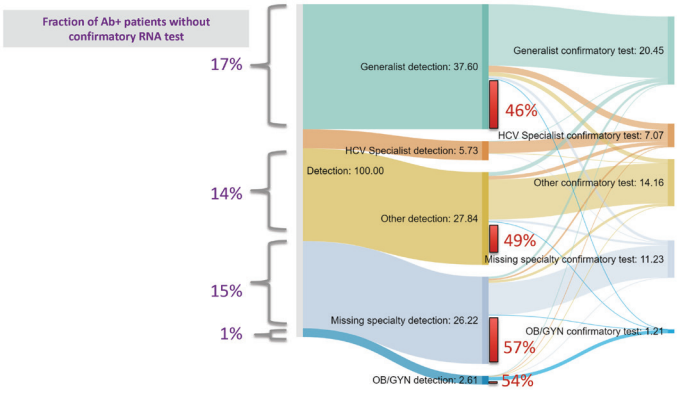
- Over the course of the care cascade:
  - Decreased proportion of lab tests ordered by generalists and obstetrician / gynecologists (OB/GYN)
  - Increased proportion of lab tests ordered by HCV specialists



[a]Other includes all other physician specialties; [b]HCV Specialist includes hepatologist, gastroenterologist, and infectious disease specialist; [c]Generalist includes primary care, family practice, internal medicine

Patient Flow Across Physician Specialty: Gaps in Detection to Confirmatory Test

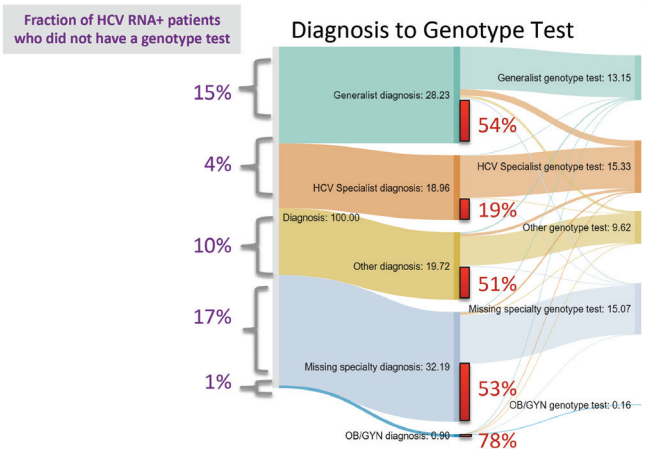
- Among patients who tested HCV Ab+, 46% of patients did not receive confirmatory RNA testing

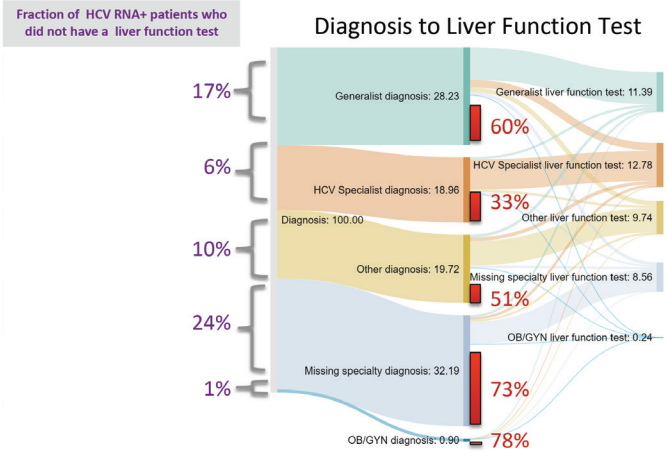


Gap, percentage of Ab+ patients seen by physician group who did not have a confirmatory HCV RNA test by that physician group

Patient Flow Across Physician Specialty: Gaps in Diagnosis to Genotype or Liver Function Testing

- **46.7%** of patients diagnosed by HCV RNA test did not have an HCV genotype test
- **57.3%** of patients diagnosed by HCV RNA test did not have a liver function test



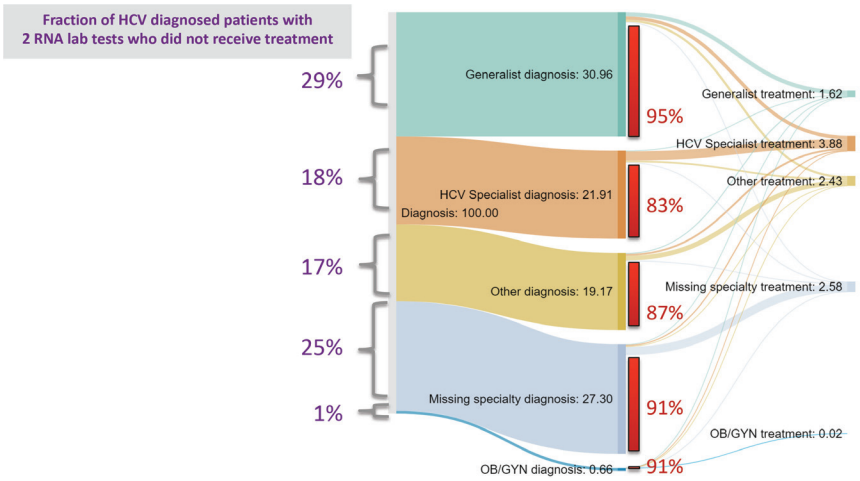


Gap, percentage of HCV RNA+ patients seen by physician group who did not have a genotype of liver function test by that physician group

RESULTS (CONTINUED)

Patient Flow Across Physician Specialty: Gaps in Diagnosis[a] to Treatment

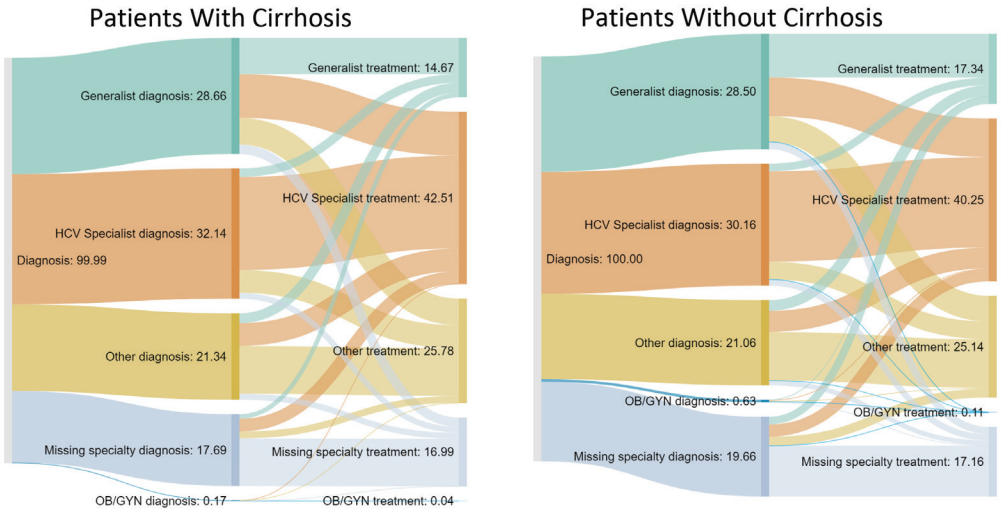
- Out of patients who received at least 2 HCV RNA lab tests as part of HCV diagnosis, 90% did not receive treatment



[a]Diagnosis indicates ≥2 HCV RNA lab tests
Gap, percentage of patients who had ≥2 HCV RNA tests by physician group but did not receive treatment from that physician group

Patient Flow Across Physician Specialty From Diagnosis to Treatment In Cirrhotic vs. Non-Cirrhotic Patients

- Among treated patients (n=18,220), there were no meaningful differences in patient flow trends between patients whose disease was classified as cirrhotic[a] (n=2,296) vs. those whose HCV was non-cirrhotic (n=9,159)



[a]Cirrhosis defined as FIB-4 score >5.2

LIMITATIONS

- The analysis cannot distinguish treatment from spontaneous clearance, as it relies on changes in viral load laboratory tests rather than prescription of treatment
- The analysis did not include patients without an HCV RNA test during or after therapy
- Liver fibrosis was assessed by ALT, AST, and platelet lab values and not diagnosis codes
- Although the study is based on a large dataset of laboratory data, results may not be generalizable beyond the study sample

CONCLUSIONS

- Significant gaps were identified in all stages of the HCV care cascade, particularly from screening to diagnosis and from diagnosis to treatment
- Data indicate that although generalists initiate HCV screening in greater than one third of patients, a growing proportion of patients receive further assessments and treatment by HCV specialists
- Timely screening, monitoring, and linkage to care by generalists and immediate treatment upon HCV diagnosis by specialists could help to reduce the gaps in the care cascade to accelerate HCV elimination

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AbbVie participated in interpretation of data, review, and approval of the data presented. All authors contributed to development of this presentation and maintained control over final content

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REFERENCES

1. Centers for Disease Control and Prevention (CDC). Hepatitis C Questions and Answers for Health Professionals, Overview and Statistics. cdc.gov/hepatitis/hcv/hcvfaq.htm. Accessed February 1, 2019.
2. WHO. *Global Hepatitis Report*, 2017. Amsterdam, the Netherlands: WHO; 2017.
3. Zuckerman A, et. al. *PLoS One*. 2018;13(6):e0199174.
4. US Preventive Services Task Force. Final Recommendation Statement, Hepatitis C: Screening. uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/hepatitis-c-screening. Accessed February 1, 2019.
5. CDC. Testing for HCV Infection: An Update of Guidance for Clinicians and Laboratorians. *MMWR Morb Mortal Wkly Rep*. 2013;62(18)362–5.
6. American Association for the Study of Liver Diseases; Infectious Diseases Society of America. Recommendations for Testing, Managing, and Treating Hepatitis C. hcvguidelines.org. Accessed February 1, 2019.
7. Yehia BR, et al. *PLoS One*. 2014;9(7):e101554.
8. Chirikov VV, et al. *Adv Ther*. 2018;35(7):1087–102.

DISCLOSURES

Sanika Rege: PhD student at the College of Pharmacy, University of Houston, and financially supported for graduate research work by AbbVie Inc. as a part of a summer internship.

Yuri Sanchez Gonzalez, **Steven Marx**, and **Shivaji Manthena:** Employees of AbbVie Inc. and may own stocks and / or options of the company.

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