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Research Paper

Perceptions and self-reported competency related to testing, management and treatment of hepatitis C virus infection among physicians prescribing opioid agonist treatment: The C-SCOPE study

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ABSTRACT

Background: This study evaluated competency related to HCV testing, management and treatment among physicians practicing in clinics offering opioid agonist treatment (OAT).
Methods: C-SCOPE is a study consisting of a self-administered survey among physicians practicing at clinics providing OAT in Australia, Canada, Europe and USA between April-May 2017. A 7-point scale was used to measure < average competence (score > 4 of 7) related to HCV testing, management and treatment.
Results: Among 203 physicians (40% USA, 45% Europe, 14% Australia/Canada) 21% were addiction medicine specialists, 29% psychiatrists, and 70% were metro/urban [mean PWID managed, 51; years of experience, 11]. The majority perceived HCV testing (82%) and treatment (85%) among PWID as important. The minority reported < average competence with respect to regular screening (12%) and interpretation of HCV test results (14%), while greater proportions reported < average competence in advising patients about new HCV therapies (28%), knowledge of new treatments (37%), and treatment/management of HCV (40%). In adjusted analysis, factors independently associated with < average self-reported competency related to the ability to treat HCV and manage side effects included fewer years in medical practice, fewer numbers of patients treated for HCV infection in the past six months, not having obtained information on screening, diagnosing or treatment of HCV, not having attended any training on HCV in the past year, and not having read or consulted AASLD/IDSA, EASL or other guidelines for HCV.
Conclusion: Physicians treating HCV infection among PWID attending OAT clinics recognized the importance of HCV testing and treatment. However, self-perceived competency related to HCV management and treatment was low, highlighting the importance of improved HCV education and training among physicians practicing in clinics offering OAT.

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Introduction

Hepatitis C virus (HCV) represents a significant public health issue, with 71 million people infected globally (Polaris Observatory HCV Collaborators, 2017), including 6.1 million people with recent injecting drug use (Grebely et al., 2018). In many countries, the majority of new and existing cases of hepatitis C virus (HCV) infection occur among current or former people who inject drugs (PWID) (Hajarizadeh, Grebely, & Dore, 2013). This includes people receiving opioid agonist treatment (OAT) for the management of opioid dependence. The availability of simple and well-tolerated direct-acting antiviral therapies with the ability to cure > 95% of patients offers an unprecedented opportunity to reverse the rising burden of advanced liver disease among people receiving OAT (Dore & Feld, 2015; Grebely, Hajarizadeh, & Dore, 2017). Studies have shown that HCV can be effectively treated among PWID who are receiving OAT (Dore, Altice, & Litwin, 2015; Grebely et al., 2010; Hajarizadeh et al., 2018; Litwin et al., 2015). Importantly, engaged clinicians, accessible treatment pathways and patient support services are needed in the initiation and maintainance of HCV care among people receiving OAT (Bruggmann, 2012).

Despite this evidence, in many settings people receiving OAT and people with recent drug use are still ineligible (Barua et al., 2015; Marshall et al., 2018) or might not be considered suitable by practitioners (Asher et al., 2016) to receive DAAs. Concerns about poor adherence, ongoing substance use, lower responses to therapy, and the potential risk of reinfection are often cited as reasons for not treating HCV among people receiving OAT (Grebely, Oser, Taylor, & Dore, 2013). Given the large burden of HCV infection among PWID receiving OAT and opportunity for scale-up of HCV care in this setting, it is critical to better understand perceptions and competency related to management of HCV infection among physicians prescribing OAT.

In a study of HCV specialists in the era of interferon-based therapy, only 20% would consider providing interferon-based treatment to active PWID (Myles, Mugford, Zhao, Krahn, & Wang, 2011). In a 2016 study of HCV practitioners in the DAA era (72% were gastroenterology and hepatology specialists), only 15% were willing to treat people who are actively injecting drugs with all-oral DAA regimens (Asher et al., 2016). Reinfection, adherence and medication cost were cited as the most important concerns when determining candidacy (Asher et al., 2016). Among general practitioners, a lack of confidence in initiating interferon-based HCV treatment because of low case numbers and inadequate HCV knowledge are noted as factors for persistently low HCV screening, evaluation and treatment rates (Lambert et al., 2011). Whereas a growing body of literature exists promoting effective HCV treatment and models of care among complex or underserved communities (Arora et al., 2011), little data in the DAA era pertain to the competency related to testing, management and DAA treatment for HCV infection among physicians prescribing OAT. Developing strategies to expand access to therapy in the OAT setting will require a better understanding of the barriers and facilitators to HCV management and DAA treatment among physicians.

The C-SCOPE study was an international cross-sectional study to evaluate clinic procedures and services, barriers, competency, and attitudes towards HCV screening, diagnosis or treatment among physicians practicing at clinics providing OAT. Among physicians practicing in clinics offering OAT, the aims of this analysis were to evaluate: 1) perceptions related to HCV testing, management and treatment; 2) competency related to HCV testing, management and treatment; and 3) factors associated with average or less competency in HCV testing, management and treatment.

Methods

Study design, setting and participants

The C-SCOPE study was an international cross-sectional study that recruited physicians practicing at clinics providing OAT from Australia, Canada, Europe (Belgium, France, Germany, Italy, Portugal, Netherlands, Spain, Sweden and the United Kingdom) and the United States (US) from April 14 to May 22, 2017.

Physicians must have spent at least 50% of time in clinics providing OAT treating patients or in management responsibilities, a minimum of 2 years treating patients in a clinic providing OAT, currently treating PWID with OAT and working at a clinic, center, department, or institution that is providing OAT and have been personally certified or allowed to prescribe OAT (Australia, Portugal, Spain, and the US only). Physicians not specialized in addiction medicine/psychiatry must have received training or certification in addiction medicine or to prescribe buprenorphine or methadone (but not in Italy). Physicians were selected from a mix of specialties (such as psychiatry, neurology, internal medicine, general practice, addiction medicine). In Australia, Canada and the US, physicians were selected to ensure their regional representation within each country. Physicians working at the same clinic, center, department, or institution as two previous qualified respondents and those unwilling to comply with the study protocol were excluded.

Physicians were invited to participate via opt-in online web panels (M3 Global Research panel), research databases and/or public and proprietary lists of clinics providing OAT in each country. The M3 Global Research panel is an actively managed double opt-in online panel (i.e. those who join make a conscious decision to regularly participate in surveys). Panelists have to activate their accounts after registration, and no one is included in the panel without their agreement. Upon agreement to join the panel, M3 Global Research has a stringent verification process in order to confirm a respondents' practicing status. In the US, 100% of panelists are verified using the American Medical Association (AMA) database.

Once identified, physicians were contacted via email or telephone and screened against the inclusion/exclusion criteria. Eligible physicians were invited to participate in an online survey in their local language. Physicians were provided an email and link to an online internet-based survey. Approximately two to four days after the initial invitation, people who did not initially respond were sent an e-mail reminder.

All participants gave written informed consent before study procedures started. Physicians received a compensation ranging US$90 to US $165 for completing the survey, depending on the country. Pearl IRB has determined this study meets the exemption requirements under 45CFR46.101(b)(2).

Study assessments

Participants completed a survey to comprehensively assess physicians' perceptions and self-reported competency related to the testing, management and treatment of HCV infection among those being prescribed OAT. Participating physicians were compensated for participation according to fair market value (which varied by country). The survey was designed based on a review of existing literature, consultation with experts, and in-depth interviews with 29 physicians (at least one from each country included) exploring knowledge, attitudes and practice patterns among physicians prescribing OAT. Where applicable, questions were adapted from previously published studies (Cox et al., 2011; Arora et al., 2010; Bruggmann & Litwin, 2013; Grebely et al., 2013, 2015; Litwin et al., 2007; Zeremski et al., 2013). Collectively, this provided the necessary background to ensure that survey items were both appropriate and clear to physicians.

The survey included information on physician characteristics [region (Australia, Canada, Europe, and US), primary specialty, number of years in practice, practice source of funding (public, private for profit, private not for profit), type of OAT institution, proportion of OAT therapy offered, OAT clinic setting (major metropolitan area, urban, suburb of large city, small city, and rural/small town), number of

patients personally managed on OAT in the past 12 months, number of patients managed on OAT who are PWID in past 12 months, the number of patients personally managed on OAT who are PWID with HCV in the past 12 months number of patients treated for HCV in the past 6 months], OAT clinic characteristics (infrastructure, protocols, clinical procedures and services), perceptions of barriers (health system, clinic, patients, other) and attitudes and perceptions towards HCV management.

Study endpoints included physicians' perceptions and opinions regarding the importance of HCV testing, and the management and treatment of HCV in the context of PWID. Specifically, physicians were asked to rate their ability to perform the following: ensure people at risk for HCV are regularly screened, interpret HCV test results and diagnose HCV, assess severity of liver disease in patients with HCV, advise patients about new therapies for HCV, treat HCV patients and manage side effects, educate clinic staff about HCV and to serve as a contact point for questions/issues, and regarding their knowledge of new treatment/regimens for HCV. Participants rated their competence regarding each task from "None or no skill at all" to "Expert, teach others".

Outcomes

We evaluated perceptions related to HCV testing, management and treatment (e.g. the importance of testing PWID for HCV antibodies, HCV RNA, liver disease assessment, and HCV treatment). Physicians were asked: "Using a scale from 1 to 5, where 1 = not at all important and 5 = extremely important, please rate the importance of the following aspects of hepatitis C care for patients at your clinic who are people who inject drugs" with the responses: extremely important, very important, somewhat important, not very important, and not at all important.

We also evaluated competency related to HCV testing, management and treatment. Physicians were asked: "Using the provided scale, please indicate your skill level for each of the following hepatitis C care related competencies" with corresponding responses on a 7-point scale including: 1 = None or no skill at all, 2 = Vague knowledge, skills or competence, 3 = Slight knowledge, skills or competence, 4 = Average among my peers; 5 = Competent; 6 = Very competent; and 7 = Expert, teach others. Competencies included the ability to ensure people at risk of HCV infection are regularly screened, the ability to interpret HCV test results and diagnose HCV, the ability to assess severity of liver disease in patients with HCV, the ability to advise patients about new therapies for HCV, the ability to treat HCV patients and manage side effects, knowledge of new treatments/regimens for HCV, and the ability to educate clinic staff about HCV and to serve as a contact point for questions/issues.

Statistical analysis

Descriptive analyses related to perceptions and competencies related to HCV testing, management and treatment were performed.

Factors associated with average or less competency in HCV testing, management and treatment were assessed. Hypothesized factors included region, primary specialty of physician, number of years in practice, practice source of funding, type of OAT institution, OAT clinic setting, number of patients personally managed on OAT in past 12 months, number of patients managed on OAT who are PWID in past 12 months, the number of patients personally managed on OAT who are PWID with HCV in the past 12 months, and the number of patients treated for HCV in past 6 months, whether they were aware of any documents/tools for the screening, diagnosis or treatment of HCV, whether they had obtained any information on screening, diagnosis or treatment of hepatitis C-infection in the past year, whether they had attended any training on hepatitis C in the past year, whether they had read or consulted any AASLD/IDSA, EASL or other guidelines for HCV, and whether a protocol is in place for hepatitis C testing/diagnosing. Bivariate logistic regression analyses were performed to evaluate covariates potentially associated with competency endpoints. Unadjusted odds ratios were reported along with 95% confidence intervals, p-values for the main effect, and p-values for non-reference levels within covariates.

Multivariable analyses for the C-SCOPE study included logistic regression models predicting the probability of average or lower competency for each of the self-reported competency endpoints (see study endpoints above). Competency endpoints were dichotomized by greater than average competence and average or lower competence. Variable selection was based on a stepwise selection procedure that is a modification of a forward selection process. The modification is that predictors selected for entry into the model do not necessarily stay there. In the process candidate covariates are selected for inclusion based on the p-value of their unadjusted main effect. After a candidate is included in the model, covariates in the model that have a p-value above a prespecified threshold are removed. The p-value required for a candidate covariate to enter the model was 0.20, while the threshold for remaining in the model was a p-value of 0.10 or lower. The selection process terminates when no remaining covariates have effects satisfying the p-value required to enter the model. The thresholds for the selection process were selected based on the C-SCOPE study sample size, allowing for flexible entry into the model ($p < 0.20$) and keeping covariates that at least exhibited associations reflective of non-significant trends ($p < 0.10$) Adjusted odds ratios were reported for all covariates that remained in the model after completion of the selection process, along with 95% confidence intervals, p-values for the main effects, and p-values for non-reference levels within covariates.

Results

Participant characteristics

Among 660 physicians contacted for this study, 203 physicians were enrolled (Table 1). Among the 457 who did not enrol in the study, 266 did not meet the inclusion criteria; 91 started the survey and did not complete it; and 100 were "over quota" (by the time they responded to the survey, the quota for the target sample size for their country had already been met and they were not permitted to enrol in the survey).

Overall, 45% (n = 92) of participants were from Europe, 40% (n = 82) were from the United States, 8% (n = 16) were from Canada, and 6% (n = 13) were from Australia. The most common primary specialties among physicians included psychiatry (29%, n = 58), addiction medicine (21%, n = 43), addiction psychiatry (20%, n = 40), and general practice/family medicine (19%, n = 39). The median number of years in practice was 10 years [interquartile range (IQR), 5–15].

The majority of physicians practiced in publicly funded clinics (53%, n = 108), while among those practicing in privately funded clinics (47%, n = 95), 30% (n = 60) practiced in private for-profit clinics and 17% (n = 35) practiced in private not-for-profit clinics. Physicians practiced in a variety of different institutions providing OAT with 38% (n = 77) primarily working in substance use clinics/centers, 20% (n = 42) working in a hospital department that provides treatment to people receiving OAT, 15% (n = 31) working in an OAT clinic/center, and 27% (n = 54) working in other institutions/offices that provide treatment for people receiving OAT.

Overall, 73% (n = 148) of physicians were aware of any documents/tools for the screening, diagnosis or treatment of HCV and 65% (n = 131) had obtained any information on screening, diagnosis or treatment of HCV-infection in the past year. However, only 37% (n = 75) had attended any training on HCV in the past year and 37% (n = 76) had read or consulted the American Association of the Study of Liver Diseases (AASLD)/Infectious Diseases Society of America (IDSA), European Association for the Study of the Liver (EASL) or any other country specific guidelines.

Table 1
Enrolment characteristics of physicians in the C-SCOPE study (n = 203).

Variables	Overall n (%)
Region	
Europe	92 (45%)
United States	82 (40%)
Canada	16 (8%)
Australia	13 (6%)
Primary specialty of physician	
Psychiatry	58 (29%)
Addiction Medicine	43 (21%)
Addiction Psychiatry	40 (20%)
General Practice/Family Medicine	39 (19%)
Internal Medicine	14 (7%)
Neurology	6 (3%)
Other physician specialty	3 (2%)
Number of years in practice	
Mean (SD)	11 (8)
Median (Q1, Q3)	10 (5, 15)
Type of funding	
Public	108 (53%)
Private, for profit	60 (30%)
Private, not for profit	35 (17%)
Type of OAT institution	
Substance use clinic/center	77 (38%)
Hospital department that treats people on OAT	42 (20%)
OAT clinic/center	31 (15%)
Other institution/office that treats people on OAT	54 (27%)
Percent of patients receiving OAT	
Methadone	42% (35)
Buprenorphine	47% (35)
Heroin or diacetyl-morphine	4% (10)
Other OAT	7% (18)
Setting of OAT clinic	
Major metropolitan area, population > 500,000	82 (40%)
Urban area, population between 100,000 and 500,000	59 (29%)
Suburb of a large city, population > 100,000	26 (13%)
Small city, population between 30,000 and 100,000	27 (13%)
Rural or small town, population < 30,000	9 (4%)
Number of patients personally managed on OAT who are PWID	
Mean (SD)	51 (101)
Median (Q1, Q3)	20 (6, 50)
Number of patients personally managed who are PWID with HCV	
Mean (SD)	24 (50)
Median (Q1, Q3)	10 (2, 30)
Are you aware of any documents/tools for the screening, diagnosis or treatment of hepatitis C?	
Yes	148 (73%)
No	55 (27%)
Have you obtained any information on screening, diagnosis or treatment of hepatitis C-infection in the past year?	
Yes	131 (65%)
No	72 (36%)
Have you attended training on hepatitis C in the past year?	
Yes	75 (37%)
No	128 (63%)
Have you read or consulted the AASLD/IDSA, EASL or any other country specific guidelines?	
Yes	76 (37%)
No	127 (63%)

Note: Percentages indicate column percentages; OAT, opioid agonist therapy; SD, standard deviation; Q1, first quartile; Q3, third, quartile.

Self-reported perceptions and opinions related to HCV management for recent PWID

Physicians were asked to rate the importance of a variety of aspects of HCV care for PWID at their clinic. As shown in Fig. 1 and Supplementary Table 1, over 80% of all physicians recognized that it was extremely or very important to perform HCV antibody testing among PWID (86%, n = 174), perform HCV RNA testing in those who are HCV antibody positive (81%, n = 165), and for people with a detectable HCV RNA test to be linked to a healthcare professional treating HCV (83%, n = 168), and receive a liver disease assessment (80%, n = 162). Also, over 80% of all physicians reported that it was extremely or very important for PWID diagnosed with HCV to initiate HCV treatment (82%, n = 167) and achieve a sustained virological response (81%, n = 164). However, only 69% (n = 140) reported that they felt that it was extremely or very important for them to be able to prescribe and treat HCV for PWID.

Self-reported competency related to HCV management for recent PWID

We sought to evaluate areas of lower self-reported competency related to HCV management for PWID and physicians were asked to indicate their skill level for of a variety of competencies related to HCV care for PWID. As shown in Fig. 2 and Supplementary Table 2, competence related to HCV testing and diagnosis was reasonable. Thirty-four percent (n = 69) of physicians self-reported average or less competence with respect to their ability to ensure that people at risk of HCV infection are regularly screened. Thirty-nine percent (n = 80) of physicians self-reported average or less competence with respect to their ability to interpret HCV test results and diagnose HCV. Fifty-two percent (n = 105) of physicians self-reported average or less competence with respect to their ability to assess severity of liver disease in patients with HCV. Although just over half of physicians (53%, n = 108) self-reported average or less competence with respect to their ability to advise patients about new therapies for HCV, 65% (n = 131) self-reported average or less competence with respect to their ability to treat HCV and manage side effects and 64% (n = 129) self-reported average or less competence with respect to their knowledge of new treatments for HCV. Fifty-eight percent (n = 118) of physicians self-reported average or less competence to educate clinic staff about HCV and to serve as a contact point for questions/issues.

Factors associated with self-reported competency related to the ability to ensure people at risk of HCV are regularly screened

The proportion with average or less self-reported competency to ensure people at risk of HCV are regularly screened stratified by key characteristics is shown in Table 2. In adjusted analysis, factors independently associated with average or less self-reported competency to ensure people at risk of HCV are regularly screened included having a fewer number of patients receiving OAT, not having used any documents/tools for the screening, diagnosis or treatment of HCV, not having obtained any information on screening, diagnosis or treatment of HCV infection in the past year, and not knowing whether a protocol is in place for HCV testing/diagnosis at their clinic.

Factors associated with self-reported competency related to the ability to treat HCV and manage side effects

The proportion with average or less self-reported competency related to the ability to treat HCV and manage side effects stratified by key characteristics is shown in Table 3. In adjusted analysis, factors independently associated with average or less self-reported competency related to the ability to treat HCV and manage side effects included fewer years in medical practice, fewer numbers of patients treated for HCV infection in the past six months, not having obtained information on screening, diagnosing or treatment of HCV, not having attended any training on HCV in the past year, and not having read or consulted AASLD/IDSA, EASL or other guidelines for HCV.

Factors associated with self-reported competency for other competencies related to HCV care for PWID

Adjusted analyses of factors independently associated with average or less competence related to the ability to interpret HCV test results and diagnose HCV, the ability to assess severity of liver disease in

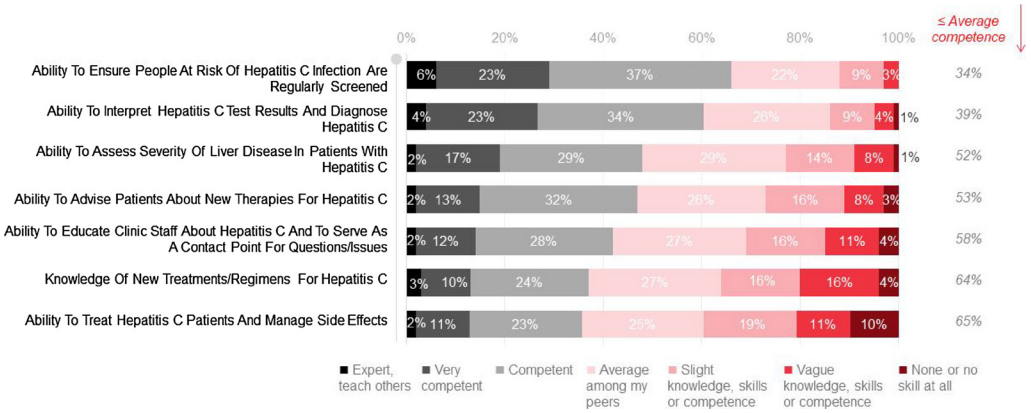

Fig. 1. Self-reported perceptions and opinions among physicians enrolled in the C-SCOPE study related to the importance of aspects of HCV testing, management and treatment for recent PWID (n = 203).

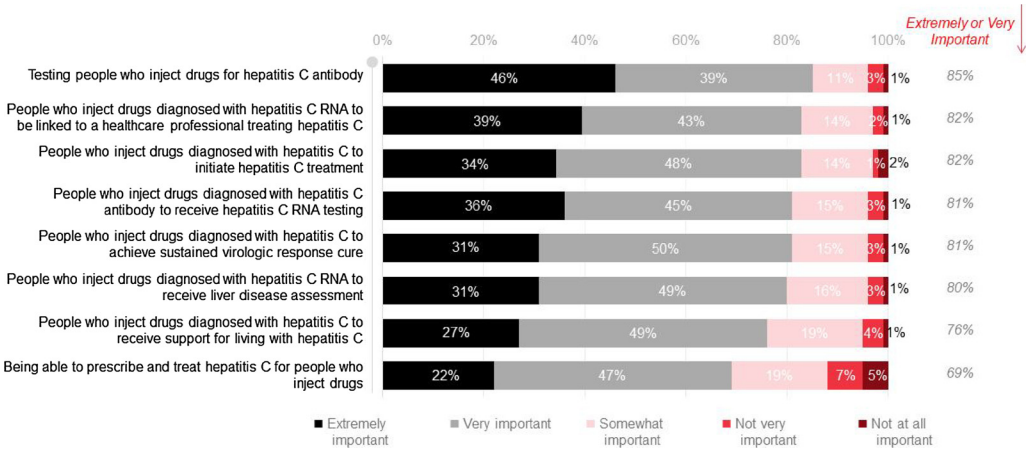

Fig. 2. Self-reported competency related to HCV testing, management and treatment among physicians enrolled in the C-SCOPE study (n = 203).

patients with HCV, the ability to advise patients about new therapies for HCV, knowledge of new treatments/regimens for HCV, and the ability to educate clinic staff about HCV and serve as a contact point for questions/issues are shown in Table 4. The factors that frequently emerged as being associated with average or less self-reported competency included fewer years in clinical practice, fewer number of patients treated for HCV infection, not having obtained any information on HCV screening, diagnosis or treatment in the past year, not having attended any training on HCV in the past year, and not having read or consulted any AASLD/IDSA, EASL or other guidelines for HCV. Additional results for these competency endpoints, stratified by key characteristics, are shown in Supplementary Tables 3–7.

Discussion

This study describes the perceptions and self-reported competency related to testing, management and treatment of HCV infection in an international sample of physicians prescribing OAT. Physicians treating HCV infection among PWID attending OAT clinics recognized the importance of HCV testing and treatment. However, many physicians lacked awareness of utilization of resources for HCV screening, diagnosis, and treatment and had not had formal training or followed formal guidelines. Self-perceived competency related to HCV management and treatment was variable. The factors that frequently emerged as being associated with average or less self-reported competency related to HCV management and treatment included fewer years in clinical practice, fewer number of patients treated for HCV infection, not having obtained any information on HCV screening, diagnosis or treatment in the past year, not having attended any training on HCV in the past year, and not having read or consulted any AASLD/IDSA, EASL or other guidelines for HCV. To our knowledge, this is the first study to evaluate perceptions and competency related to HCV care among drug treatment providers in the era of DAA therapy. The current study results possess several implications for policy development and clinical practice and underscore the need for the development and widespread implementation of programs to enhance HCV education and improve clinical practice among physicians prescribing OAT.

In this study, physicians prescribing OAT perceived that HCV detection (86%) and treatment (82%) among PWID is important. Also, 69% of physicians prescribing OAT felt that it was important that they be able to prescribe and treat HCV among people with ongoing injecting drug use. In contrast, in surveys of specialists (e.g. gastroenterologists, hepatologists and infectious disease) in the interferon-era (Myles et al., 2011) and the interferon-free era (Asher et al., 2016), only 15–20% would be willing to provide HCV treatment to someone with ongoing injecting drug use. It is encouraging that physicians prescribing OAT believed that they should play a role in both HCV testing and treatment for PWID.

Only a minority of participants self-reported average or less competency related to the ability to ensure that people are regularly screened for HCV (34%) and in the ability to interpret HCV test results (39%). However, greater proportions self-reported average or less competency related to the ability to assess liver disease (52%), the ability to treat HCV and manage side effects (65%) and knowledge of new HCV treatments (64%), consistent with findings from previous studies among competency related to HCV infection among primary care providers (Arora et al., 2010; Falade-Nwulia et al., 2016). These findings highlight that educational programs targeted towards drug

Table 2
Factors associated with ≤ average competence to ensure people at risk of hepatitis C infection are regularly screened among physicians enrolled in the C-SCOPE study (n-203).

Variables	< Average competence n (%)	> Average competence n (%)	Odds Ratio (95% CI)	*P* value	Adjusted Odds Ratio (95% CI)	*P* value
Region						
Australia	2 (15%)	11 (85%)	1	**0.386**		
United States	26 (32%)	56 (68%)	2.55 (0.53, 12.36)	0.244		
Europe	34 (37%)	58 (63%)	3.22 (0.67, 15.42)	0.143		
Canada	7 (44%)	9 (56%)	4.28 (0.71, 25.92)	0.114		
Primary specialty of physician						
General Practice/Family Medicine/Internal Medicine	14 (26%)	39 (74%)	1	**0.472**		
Addiction Psychiatry	13 (33%)	27 (68%)	1.34 (0.55, 3.30)	0.523		
Addiction Medicine	15 (35%)	28 (65%)	1.49 (0.62, 3.58)	0.370		
Psychiatry	22 (38%)	36 (62%)	1.70 (0.76, 3.82)	0.197		
Other physician specialty	5 (56%)	4 (44%)	3.48 (0.82, 14.83)	0.092		
Number of years in practice (stratified by Q1, Q3)						
15 or more years	14 (27%)	38 (73%)	1	**0.266**		
5 to < 15 years	42 (34%)	80 (66%)	1.43 (0.70, 2.92)	0.334		
< 5 years	13 (45%)	16 (55%)	2.21 (0.85, 5.73)	0.104		
Type of funding						
Private, for profit	17 (28%)	43 (72%)	1	**0.523**		
Private, not for profit	12 (34%)	23 (66%)	1.32 (0.54, 3.23)	0.544		
Public	40 (37%)	68 (63%)	1.49 (0.75, 2.95)	0.255		
Type of OAT institution						
Opioid agonist therapy clinic/center	7 (23%)	24 (77%)	1	**0.189**		
Substance use clinic/center	24 (31%)	53 (69%)	1.55 (0.59, 4.10)	0.374		
Other institution/office that treats people on OAT	19 (35%)	35 (65%)	1.86 (0.68, 5.11)	0.228		
Hospital department that treats people on OAT	19 (46%)	22 (54%)	2.96 (1.05, 8.39)	0.041		
Setting of OAT clinic						
Suburb/small city/rural or small town (< 100,000)	20 (32%)	42 (68%)	1			
Metropolitan/urban (> 100,000)	49 (35%)	92 (65%)	1.12 (0.59, 2.11)	0.730		
Number of patients managed on OAT in past 12 months (stratified by Q1, Q3)						
100 or more patients	16 (24%)	50 (76%)	1	**0.098**		
20 to < 100 patients	32 (36%)	56 (64%)	1.79 (0.88, 3.64)	0.110		
< 20 patients	21 (43%)	28 (57%)	2.34 (1.06, 5.21)	0.037		
Number of patients managed on OAT who are PWID in past 12 months (stratified by Q1, Q3)						
50 or more patients	14 (22%)	51 (78%)	1	**0.041**	1	**0.061**
6 to < 50 patients	35 (40%)	53 (60%)	2.41 (1.16, 4.99)	0.018	2.54 (1.15, 5.63)	0.022
< 5 patients	20 (40%)	30 (60%)	2.43 (1.07, 5.51)	0.034	2.29 (0.92, 5.68)	0.075
Number of patients managed on OAT who are PWID with HCV in past 12 months (stratified by Q1, Q3)						
30 or more patients	14 (27%)	37 (73%)	1	**0.171**		
2 to < 30 patients	39 (33%)	79 (67%)	1.31 (0.63, 2.69)	0.472		
< 1 patients	16 (47%)	18 (53%)	2.35 (0.94, 5.85)	0.066		
Number of patients treated for HCV in past 6 months (stratified by Q1, Q3)						
5 or more patients	18 (29%)	44 (71%)	1	**0.194**		
1 to < 5 patients	14 (48%)	15 (52%)	2.28 (0.92, 5.68)	0.076		
0 patients	37 (33%)	75 (67%)	1.21 (0.61, 2.37)	0.587		
Aware of any documents/tools for the screening, diagnosis or treatment of hepatitis C						
No	16 (29%)	39 (71%)	1		1	
Yes	53 (36%)	95 (64%)	1.36 (0.69, 2.66)	0.370	3.37 (1.39, 8.14)	0.007
Obtained any information on screening, diagnosis or treatment of hepatitis C-infection in the past year						
Yes	34 (26%)	97 (74%)	1		1	
No	35 (49%)	37 (51%)	2.70 (1.47, 4.94)	0.001	3.57 (1.68, 7.60)	0.001
Attended any training on hepatitis C in the past year						
Yes	17 (23%)	58 (77%)	1			
No	52 (41%)	76 (59%)	2.33 (1.22, 4.45)	0.010		
Have read or consulted any AASLD/IDSA, EASL or other guidelines for HCV						
Yes	23 (30%)	53 (70%)	1			
No	46 (36%)	81 (64%)	1.31 (0.71, 2.41)	0.386		
Protocol is in place for hepatitis C testing/diagnosing						
No, but published guidelines	21 (24%)	66 (76%)	1	**0.004**	1	**0.006**
Yes	26 (35%)	49 (65%)	1.67 (0.84, 3.30)	0.143	2.04 (0.97, 4.32)	0.062
No, not protocol or guidelines	11 (41%)	16 (59%)	2.16 (0.87, 5.38)	0.098	2.40 (0.89, 6.49)	0.085
I don't know	11 (79%)	3 (21%)	11.52 (2.94, 45.25)	0.001	11.26 (2.64, 48.07)	0.001

Note: Omnibus p-values for predictors with more than 2 levels are indicated in bold font. HCV, hepatitis C virus; CI, confidence interval; Q1, first quartile; Q3, third quartile; OAT, opioid agonist therapy; PWID, people who inject drugs; AASLD, American Association of the Study of Liver Diseases; IDSA, Infectious Diseases Society of America; EASL, European Association for the Study of the Liver.

treatment providers and primary care providers must include educational objectives to improve knowledge of assessment of liver disease and DAA therapies to enhance competency in these areas.

Several differences emerged in the factors associated with perceived competency for testing and diagnosis of HCV as compared to treatment. Seeing fewer patients, not accessing or utilizing available documents on this topic, and being unaware of whether a protocol was in place to guide this clinical practice was associated with poorer perceived

Table 3
Factors associated with ≤ average competence in the ability to treat hepatitis C patients and manage side effects among physicians enrolled in the C-SCOPE study (n-203).

Variables	< Average competence n (%)	> Average competence n (%)	Odds Ratio (95% CI)	*P* value	Adjusted Odds Ratio (95% CI)	*P* value
Region						
Australia	6 (46%)	7 (54%)	1	**0.201**		
Canada	8 (50%)	8 (50%)	1.17 (0.27, 5.05)	0.837		
Europe	59 (64%)	33 (36%)	2.09 (0.65, 6.73)	0.219		
United States	58 (71%)	24 (29%)	2.82 (0.86, 9.26)	0.088		
Primary specialty of physician						
Addiction Medicine	24 (56%)	19 (44%)	1	**0.166**		
General Practice/Family Medicine/Internal Medicine	31 (58%)	22 (42%)	1.12 (0.50, 2.52)	0.792		
Addiction Psychiatry	25 (63%)	15 (38%)	1.32 (0.55, 3.18)	0.536		
Other physician specialty	6 (67%)	3 (33%)	1.58 (0.35, 7.17)	0.551		
Psychiatry	45 (78%)	13 (22%)	2.74 (1.16, 6.49)	0.022		
Other physician specialty			(1.51, 5.10)			
Number of years in practice (stratified by Q1, Q3)						
15 or more years	27 (52%)	25 (48%)	1	**0.013**	1	**0.023**
5 to < 15 years	47 (72%)	18 (28%)	1.70 (0.88, 3.29)	0.114	1.70 (0.78, 3.71)	0.180
< 5 years	79 (65%)	43 (35%)	5.79 (1.77, 18.97)	0.004	6.50 (1.69, 24.97)	0.007
Type of funding						
Private, not for profit	21 (60%)	14 (40%)	1	**0.701**		
Public	69 (64%)	39 (36%)	1.18 (0.54, 2.58)	0.679		
Private, for profit	41 (68%)	19 (32%)	1.44 (0.60, 3.43)	0.412		
Type of OAT institution						
Hospital department that treats people on OAT	21 (51%)	20 (49%)	1	**0.089**		
Substance abuse clinic/center	49 (64%)	28 (36%)	1.67 (0.77, 3.59)	0.193		
Other institution/office that treats people on OAT	36 (67%)	18 (33%)	1.91 (0.83, 4.39)	0.130		
Opioid agonist therapy clinic/center	25 (81%)	6 (19%)	3.97 (1.35, 11.70)	0.013		
Setting of OAT clinic						
Metropolitan/urban (> 100,000)	87 (62%)	54 (38%)	1			
Suburb/small city/rural or small town (< 100,000)	44 (71%)	18 (29%)	1.52 (0.80, 2.89)	0.205		
Number of patients managed on OAT in past 12 months (stratified by Q1, Q3)						
100 or more patients	40 (61%)	26 (39%)	1	**0.320**		
20 to < 100 patients	55 (63%)	33 (38%)	1.08 (0.56, 2.09)	0.811		
< 20 patients	36 (73%)	13 (27%)	1.80 (0.81, 4.02)	0.152		
Number of patients managed on OAT who are PWID in past 12 months (stratified by Q1, Q3)						
50 or more patients	37 (57%)	28 (43%)	1	**0.234**		
6 to < 50 patients	58 (66%)	30 (34%)	1.46 (0.76, 2.83)	0.258		
< 5 patients	36 (72%)	14 (28%)	1.95 (0.88, 4.28)	0.098		
Number of patients managed on OAT who are PWID with HCV in past 12 months (stratified by Q1, Q3)						
30 or more patients	28 (55%)	23 (45%)	1	**0.040**		
2 to < 30 patients	75 (64%)	43 (36%)	1.43 (0.74, 2.79)	0.291		
< 1 patient	28 (82%)	6 (18%)	3.83 (1.36, 10.85)	0.011		
Number of patients treated for HCV in past 6 months (stratified by Q1, Q3)						
5 or more patients	25 (40%)	37 (60%)	1	< **0.001**	1	**0.038**
1 to < 5 patients	19 (66%)	10 (34%)	2.81 (1.12, 7.05)	0.027	1.92 (0.68, 5.41)	0.220
0 patients	87 (78%)	25 (22%)	5.15 (2.62, 10.11)	< 0.001	2.75 (1.26, 5.98)	0.011
Aware of any documents/tools for the screening, diagnosis or treatment of hepatitis						
Yes	86 (58%)	62 (42%)	1			
No	45 (82%)	10 (18%)	3.24 (1.52, 6.93)	0.002		
Obtained any information on screening, diagnosis or treatment of hepatitis C-infection in the past year						
Yes	71 (54%)	60 (46%)	1		1	
No	60 (83%)	12 (17%)	4.23 (2.08, 8.58)	< 0.001	2.25 (0.99, 5.15)	0.054
Attended any training on hepatitis C in the past year						

(*continued on next page*)

Table 3 (*continued*)

Variables	< Average competence n (%)	> Average competence n (%)	Odds Ratio (95% CI)	*P* value	Adjusted Odds Ratio (95% CI)	*P* value
Yes	33 (44%)	42 (56%)	1		1	
No	98 (77%)	30 (23%)	4.16 (2.25, 7.67)	< 0.001	1.97 (0.93, 4.15)	0.075
Have read or consulted any AASLD/IDSA, EASL or other guidelines for HCV						
Yes	30 (39%)	46 (61%)	1		1	
No	101 (80%)	26 (20%)	5.96 (3.17, 11.19)	< 0.001	3.41 (1.68, 6.93)	0.001
Protocol is in place for hepatitis C testing/diagnosing						
Yes	42 (56%)	33 (44%)	1			
				0.028		
No, but published guidelines	54 (62%)	33 (38%)	1.29 (0.69, 2.41)	0.433		
No, not protocol or guidelines	22 (81%)	5 (19%)	3.46 (1.18, 10.11)	0.023		
I don't know	13 (93%)	1 (7%)	10.21 (1.27, 82.11)	0.029		

Note: Omnibus p-values for predictors with more than 2 levels are indicated in bold font. HCV, hepatitis C virus; CI, confidence interval; Q1, first quartile; Q3, third quartile; OAT, opioid agonist therapy; PWID, people who inject drugs; AASLD, American Association of the Study of Liver Diseases; IDSA, Infectious Diseases Society of America; EASL, European Association for the Study of the Liver.

competency concerning the screening and diagnosis of patients. Fewer years practicing medicine, treating fewer patients, and not accessing published treatment guideline was associated with poorer perceived competency in the treatment of HCV among PWID. These results suggest that broad efforts encompassing training and education, as well as increasing awareness of published guidelines, will be needed to fully address provider perceptions of competency in this clinical arena.

Treating a greater number of patients for HCV in the past six months was associated with increased competency among providers. Similar findings were reported by Cox and colleagues in a 2011 study of family physicians. Those providers who practiced in a rural setting, and were thus were more likely to treat patients for HCV reported greater levels of competency in this domain (Cox et al., 2011). Further, several factors related to education, training and the consultation of treatment guidelines were associated with self-reported competency among surveyed providers. Specifically, providers with average or less self-competency were less likely to have attended HCV-related trainings, accessed information pertaining to HCV screening, diagnosis or treatment, or consulted published treatment guidelines for HCV.

There are several limitations to this study. Participants were invited to participate via opt-in online web panels (M3 Global Research panel), research databases and/or public and proprietary lists of clinics providing OAT in each country. It is possible that there is a selection bias and those who were recruited are not representative of the broader population of physicians prescribing OAT. Physicians must have the time, motivation, and ability to participate in these kinds of surveys, and therefore, we might be underrepresenting those who do not. However, it should be noted that the membership of the US M3 Global Research panel closely matches the demographics of the American Medical Association statistics with respect to region, age, and gender, which provides some confidence in the observed results. In addition to the limitations about recruitment of the study sample, the sample recruited physicians prescribing OAT across multiple different regions and countries. As such, there is likely to be considerable heterogeneity in the availability of healthcare services, education and training, and policies for HCV testing and treatment between countries which may have influenced responses. This may be further influenced by regional differences in which providers are able to prescribe DAA therapy (Barua et al., 2015; Marshall et al., 2016, 2018) and thus form part of the HCV care team. In addition, US sampling was hetereogenous, which may be due to the differences that exist in state-by-state approaches to funding and opioid agonist treatment. The cross-sectional nature of the study methodology does not allow causality to be determined among the study variables and the outcomes of interest. For example, it cannot be claimed that the higher observed competency among people who received HCV education and training was directly due to this factor (it is possible that other unmeasured factors were attributed this observed effect). However, despite this limitation, it does appear that people who were more likely to attend education and training or read guidelines were more likely to be competent. Lastly, the data in the current study was collected from a self-reported physician survey and therefore the responses are subject to recall bias.

Irrespective of these limitations, to our knowledge, this is one of the first studies to evaluate attitudes, perceptions and self-reported competency towards HCV management in the DAA era. The current study possesses several implications for clinical practice and further research in this domain. The development and dissemination of national guidelines could provide an important foundation for clinical practice and standardization of care, thus ensuring a greater number of patients gain access to treatment. Further, our results emphasize the need for increased education and training initiatives, particularly around HCV treatment and HCV management. There is a growing body of literature to guide efforts targeting education and clinical practice, including opportunities beyond specialist training, including task-shifting among team members (Kattakuzhy et al., 2017) and scaling-up alternative care models (Rich et al., 2016; Arora et al., 2011; Fraser et al., 2018).

Table 4
Adjusted analyses of factors associated with ≤ average competence related to HCV testing among physicians enrolled in the C-SCOPE study (n-203).

Variables	Ability to ensure people at risk of HCV are regularly screened	Ability to interpret HCV test results and diagnose HCV	Ability to assess severity of liver disease in patients with HCV	Ability to advise patients about new therapies for HCV	Ability to treat HCV patients and manage side effects	Knowledge of new treatments/ regimens for HCV	Ability to educate clinic staff about HCV and serve as a contact point for questions/ issues
Region							
Australia	–	–	1.00	1.00	–	–	1.00
Canada	–	–	1.45 (0.15, 14.05)	0.42 (0.06, 2.67)	–	–	4.04 (0.64, 25.35)
Europe	–	–	12.46 (2.06, 75.46)	2.56 (0.67, 9.86)	–	–	5.88 (1.38, 25.06)
United States	–	–	12.44 (1.98, 78.38)	2.05 (0.53, 7.93)	–	–	7.29 (1.62, 32.85)
Primary specialty of physician							
GP/Family/Internal Medicine	–	–	1.00	–	–	–	–
Addiction Medicine	–	–	1.36 (0.50, 3.70)	–	–	–	–
Addiction Psychiatry	–	–	2.52 (0.91, 6.94)	–	–	–	–
Psychiatry	–	–	2.47 (0.94, 6.46)	–	–	–	–
Other physician specialty	–	–	7.09 (1.29, 39.08)	–	–	–	–
Number of years in practice							
15 or more years	–	–	1.00	1.00	1.00	–	1.00
5 to < 15 years	–	–	2.72 (1.22, 6.05)	1.38 (0.67, 2.84)	1.70 (0.78, 3.71)	–	1.27 (0.61, 2.66)
< 5 years	–	–	3.79 (1.17, 12.28)	4.42 (1.41, 13.79)	6.50 (1.69, 24.97)	–	4.13 (1.26, 13.50)
Number of patients managed on OAT who are PWID in past 12 months							
50 or more patients	1.0	–	–	–	–	–	–
6 to < 50 patients	2.54 (1.15, 5.63)	–	–	–	–	–	–
< 5 patients	2.29 (0.92, 5.68)	–	–	–	–	–	–
Patients treated for HCV (past 6 months)							
5 or more patients	–	–	1.00	–	1.00	–	1.00
1 to < 5 patients	–	–	8.81 (2.45, 31.64)	–	1.92 (0.68, 5.41)	–	5.51 (1.74, 17.46)
0 patients	–	–	1.98 (0.89, 4.38)	–	2.75 (1.26, 5.98)	–	2.05 (0.97, 4.35)
Aware of any documents/tools for HCV screening, diagnosis or treatment	3.37 (1.39, 8.14)	–	–	–	–	–	–
Did not obtain any information on HCV screening, diagnosis or treatment in the past year	3.57 (1.68, 7.60)	3.69 (1.92, 7.08)	–	–	2.25 (0.99, 5.15)	1.92 (0.90, 4.10)	–
Did not attend any training on HCV in the past year	–	–	2.95 (1.38, 6.32)	2.92 (1.48, 5.77)	1.97 (0.93, 4.15)	2.28 (1.15, 4.51)	2.16 (1.07, 4.38)
Have not read or consulted any AASLD/ IDSA, EASL or other guidelines for HCV	–	–	–	2.86 (1.47, 5.55)	3.41 (1.68, 6.93)	2.77 (1.44, 5.30)	2.93 (1.45, 5.89)
Protocol is in place for HCV testing/ diagnoses							
No, but published guidelines	1.00	–	1.00	–	–	–	–
Yes	2.04 (0.97, 4.32)	–	2.72 (1.24, 6.00)	–	–	–	–
No, not protocol or guidelines	2.40 (0.89, 6.49)	–	3.15 (1.04, 9.53)	–	–	–	–
I don't know	11.26 (2.64, 48.07)	–	4.44 (0.84, 23.56)	–	–	–	–

Finally, in recognition of the involvement of multiple health care professionals in the effective management of HCV among the PWID population, efforts should be made among OAT prescribers to emphasize the importance of HCV care and ensure appropriate referrals.

The majority of physicians treating HCV infection among PWID attending OAT clinics view HCV testing and treatment as important. Despite viewing testing and treatment of HCV as important, several physicians self-reported average or less competency related to HCV management, and treatment. Self-reported competency for HCV testing was higher. These low levels of reported competency in HCV management and treatment highlight a critical need for improved HCV education and training in how to manage and treat HCV among PWID.

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MT is a consultant/advisor for Gilead Sciences and Merck Sharp & Dohme Corp.

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Appendix A. Supplementary data

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