

**Criteria Grid**  
**Hepatitis C Research Studies, Tools, and Surveillance Systems**

<b>Best Practice/Intervention:</b>	Shah HA. et al. (2013) Education provides significant benefits to patients with hepatitis B virus or hepatitis C virus infection: a systematic review. <i>Clinical Gastroenterology &amp; Hepatology</i> , 11(8):922-933			
<b>Date of Review:</b>	March 23, 2015			
<b>Reviewer(s):</b>	Christine Hu			
<b>Part A</b>				
<b>Category:</b>	Basic Science <input type="checkbox"/> Clinical Science <input type="checkbox"/> Public Health/Epidemiology <input type="checkbox"/> Social Science <input type="checkbox"/> Programmatic Review <input checked="" type="checkbox"/>			
<b>Best Practice/Intervention:</b>	<b>Focus:</b> Hepatitis C <input checked="" type="checkbox"/> Hepatitis C/HIV <input type="checkbox"/> Other: hepatitis B _____ <b>Level:</b> Group <input checked="" type="checkbox"/> Individual <input type="checkbox"/> Other: _____ <b>Target Population:</b> HBV or HCV patients _____ <b>Setting:</b> Health care setting/Clinic <input checked="" type="checkbox"/> Home <input type="checkbox"/> Other: _____ <b>Country of Origin:</b> Canada _____ <b>Language:</b> English <input checked="" type="checkbox"/> French <input type="checkbox"/> Other: _____			
<b>Part B</b>				
	<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>COMMENTS</b>
<i>Is the best practice/intervention a meta-analysis or primary research?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Systematic review to evaluate the effectiveness of patient education interventions in those at risk or already infected by either hepatitis B or hepatitis C
<i>Has the data/information been used for decision-making (e.g. program funding developments, policies, treatment guidelines, defining research priorities and funding)?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Findings were not used for decision-making.
<i>Do the methodology/results described allow the reviewer(s) to assess the generalizability of the results?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Limitation of the study - Variations among included studies; disparity between educational interventions used,

				<p>methods, background of participants and the outcome measures evaluated.</p> <ul style="list-style-type: none"> <li>- Heterogeneity lead to conclusions only limited to specifics of education interventions used.</li> </ul>
<i>Are the best practices/methodology/results described applicable in developed countries?</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>COMMENTS</b>
<i>Are the best practices/methodology/results described applicable in developing countries?</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The findings can be extended to various countries.
<i>The research study/tool/data dictionary is easily accessed/available electronically</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Available for free download at <a href="http://www.cghjournal.org/">http://www.cghjournal.org/</a>
<i>Is there evidence of cost effective analysis with regard to interventions, diagnosis, treatment, or surveillance methodologies? If so, what does the evidence say? <b>Please go to Comments section</b></i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<i>Are there increased costs (infrastructure, manpower, skills/training, analysis of data) to using the research study/tool/data dictionary?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<i>How is the research study/tool funded? <b>Please got to Comments section</b></i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No funding stated.
<i>Is the best practice/intervention dependent on external funds?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<i>Other relevant criteria:</i> _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<ul style="list-style-type: none"> <li>- Patient educational interventions seem to benefit significantly those at risk of or patients diagnosed with HBV or HCV</li> </ul>
<b>WITHIN THE SURVEILLANCE SYSTEM FOR REVIEW</b>				
<i>Are these data regularly collected?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Studies searched up to August 2012
<i>Are these data regularly collected at and/or below a national level?</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Are these data collected manually or electronically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Electronically: Medline CINAHL, Science Citation Index at the Web of Science, ERIC, EMBASE, Cochrane Database of Systematic Reviews, and PsycINFO
<b>RESEARCH REPORTS</b>				
Has this research been published in a juried journal?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Clinical Gastroenterology &amp; Hepatology</i>
Does the evidence utilize the existing data/surveillance information or has it generated new data and/or information?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Existing data: limited to peer-reviewed journals

## Education Provides Significant Benefits to Patients With Hepatitis B Virus or Hepatitis C Virus Infection: A Systematic Review

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**BACKGROUND & AIMS:** Education of individuals who are at risk for, or have been diagnosed with, chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infections can improve their participation in disease management. We performed a systematic review to evaluate the effects of educational interventions for patients with HBV or HCV infections.

**METHODS:** We searched multiple databases for peer-reviewed studies of individuals with HBV or HCV infection, or those at risk for infection. Our final analysis included 14 studies that evaluated any educational intervention and reported the effectiveness or patient outcomes relevant to the intervention (7 patients with HCV infection, 4 patients with HBV infection, and 3 patients with either). Data extracted from studies included details on educational interventions, patient populations, comparison groups, and outcome measures. The quality of each study was appraised.

**RESULTS:** Types of educational interventions assessed ranged from information websites and nurse-led sessions to community-wide and institutional programs. The educational interventions showed significant ( $P < .05$ ) improvements to patients' knowledge about their disease, behaviors (including testing and uptake of vaccination), willingness to commence and adhere to treatment, and other outcomes such as self-efficacy and vitality or energy scores. These significant benefits were shown in 5 of 7 studies of HBV infection and 8 of 10 studies of HCV infection. On a 20-point quality scale, study scores ranged from 6 to 19.

**CONCLUSIONS:** Simple educational interventions for patients with HBV or HCV infection significantly increase patients' knowledge about their disease. More complex, multimodal educational interventions seem to cause behavioral changes that increase rates of testing, vaccination (for HBV), and treatment.

*Keywords:* Liver Disease; Viral Infections; Educational Tools; Evaluation.

Viral hepatitis is a major public health problem. More than 350 million people worldwide are infected chronically with hepatitis B virus (HBV), and 130 million people are infected chronically with hepatitis C virus (HCV).<sup>1</sup> Both HBV and HCV are strongly associated with the development of cirrhosis and hepatocellular carcinoma.<sup>2</sup> HBV accounts for 600,000 to 1,200,000 deaths annually and HCV accounts for 300,000 to 500,000 deaths annually.<sup>3,4</sup> Because viral hepatitis is a chronic silent disease, morbidity and mortality are likely underestimated.<sup>5</sup>

Effective detection and treatment of HBV and HCV can have a significant impact on disease outcomes.<sup>6,7</sup> Close monitoring for complications and sustained suppression of HBV replication spontaneously or with antiviral therapy decreases the risk of progressive liver disease and hepatocellular carcinoma.<sup>8,9</sup> Similarly, successful treatment of HCV, even in patients with advanced disease, prevents liver decompensation and death.<sup>10</sup> Thus, disease detection and ongoing follow-up evaluation are critical to the health outcomes of patients with HBV and HCV. Disease detection requires an awareness of the condition and risk factors, while ongoing follow-up adherence is improved by some knowledge about the natural history of HBV and HCV.

Many people with chronic hepatitis are unaware of their disease status until they develop symptoms of advanced liver disease.<sup>11</sup> Delays in identifying disease status can result in increased likelihood of virus transmission to others, limited treatment options, and worsened patient outcomes.<sup>12</sup> Despite the increasing public awareness of viral hepatitis in the past 2 decades, significant knowledge gaps remain even in the highest-risk populations. A study of injection drug users in New York found that only 37% of those surveyed knew that hepatitis C treatment exists.<sup>13</sup> Knowledge about transmission and natural history of disease also is limited.<sup>14</sup> There is a clear need for improvement in the knowledge base of at-risk groups as well as in those previously diagnosed with viral hepatitis.

Patient education has been defined as a set of planned activities that can be used to influence behavioral changes in

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*Abbreviations used in this paper:* HBV, hepatitis B virus; HCV, hepatitis C virus; HIV, human immunodeficiency virus.

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patients, resulting in changes in knowledge, skills, and attitudes needed to maintain and improve health.<sup>15</sup> In HBV and HCV, patient education programs can be critical in helping patients understand their condition, cope with their disease, and efficaciously participate in management. Patient education also can be implemented in high-risk populations such as intravenous drug users, prison inmates, and individuals born in countries with high disease prevalence to promote HBV vaccination. As a strategy, patient education has the potential to complement proven antiviral therapies to improve disease-related morbidity and mortality.

To date, it is still not clear what strategies for patient education are most effective in either those at risk of viral hepatitis or those already infected by HBV and HCV. This article systematically reviews the effectiveness of patient education interventions in HBV and HCV.

## Materials and Methods

### Data Sources

This review was based on searches of the following databases: Medline (1950 to August 2012), CINAHL (1981 to August 2012), Science Citation Index at the Web of Science (1900 to August 2012), ERIC (1966 to August 2012), EMBASE (1980 to August 2012), Cochrane Database of Systematic Reviews (2000 to August 2012), and PsycINFO (1967 to August 2012).

The search strategy was limited globally to articles in peer-reviewed journals. The search strategy included the following terms: (1) Medline search: subject heading terms used were "patient education," and "hepatitis or hepatitis B or hepatitis C." For the keywords search, terms used included "patient education," "hepatitis," "hepatitis B," "hepatitis C," "effectiveness," "evaluation," "program evaluation."

In addition, manual searches of reference sections of retrieved articles were conducted to identify additional published work.

### Selection Criteria

Studies were considered suitable for inclusion if they met the following criteria.

First, studies had to include targeted individuals at risk of or patients with a diagnosis of HBV or HCV infection. Second, an education intervention was defined as any attempt to inform individuals at risk of or patients with a diagnosis of HBV or HCV infection about their condition to modify knowledge, attitudes, or skills. Strategies that were purely administrative, such as notification of a test result via letter, were excluded. An article was included if it described a patient education intervention in sufficient detail that it could be replicated. Third, studies had to report some qualitative or quantitative evaluation of program effectiveness or patient outcomes relevant to the intervention. Fourth, experimental and quasi-experimental study designs were included.

The initial search identified 117 publications. After initial abstract and title review, 84 articles were excluded. Thirty-three full-text articles were retrieved. After full-text article review, a further 19 articles were excluded because they did not describe a patient education intervention or did not report an evaluation of the patient education intervention. Fourteen articles were included in this systematic review.

### Data Extraction

The following categories of data were extracted. First, the methodology of the study. Second, the type of education intervention and its characteristics, including the lead provider. One-time informational sessions were classified as simple educational interventions, educational interventions that were provided over 2 or more sessions or educational interventions that involved more than a single mode of delivery were classified as multimodal educational interventions.

Third, if applicable, the selection criteria for patient recruitment and allocation to different groups. Fourth, the results of qualitative and quantitative analysis of program effectiveness. Outcomes were analyzed within the framework of the Kirkpatrick model.<sup>16</sup> Positive-effect studies were those in which there was a significant change in at least one major outcome; negative-effect studies showed no important change in any major outcome; and inconclusive-effect studies failed to show a change but also lacked the statistical power to do so.

### Quality Assessment

Studies were assigned a quality score based on methodology, intervention, results, data analysis, and discussion. Table 1 shows the complete scoring system used, which was derived by modifications of the methodologies and scales previously described in the literature.<sup>17-19</sup> The highest possible score was 20 and the lowest possible score was 1. A higher score indicated better quality.

### Reporting Outcomes

Outcome measures were reported as statistically significant if the *P* value was less than .05.

**Table 1.** Scoring Sheet Used to Assess Study Quality

Characteristic	Maximum score (total = 20)
Methodology	
Design (RCT, 3; comparison group, 2; no comparison group, 0)	3
Study sample (well described, 2; good sample, not well described, 1; poor sample, 0)	2
Educational intervention	
Type of program (well described, 2; poorly described, 1; no description, 0)	2
Follow-up evaluation after program (>3 mo, 3; 1-3 mo, 2; 0-1 mo, 1)	3
Analysis	
Statistical analysis (tests of significance used, 1; absent, 0)	1
Results	
Baseline characteristics or measurements (measured, 1; not measured, 0)	1
Satisfaction (measured, 1; not measured, 0)	1
Patient knowledge (objective, 2; subjective, 1; not measured, 0)	2
Patient behaviors (objective, 2; subjective, 1; not measured, 0)	2
Patient outcomes (objective, 2; subjective, 1; not measured, 0)	2
Discussion	
Discussed confounding factors (yes, 1; no, 0)	1

RCT, randomized controlled trial.

## Results

The article search and selection process found 14 articles that met all inclusion criteria and were adequate for analysis. Four articles focused solely on patients with HBV and 7 articles focused solely on patients with HCV. Three articles studied both patient groups.

### *Hepatitis B*

Seven studies evaluated the effectiveness of HBV patient education (Table 2). All the studies were of noninfected individuals; none of the studies evaluated programs in HBV-infected patients.

#### *Hepatitis B: Population and Study Setting*

Three of the studies took place in clinics for substance use disorders and recruited individuals at high risk of being exposed to viral hepatitis.<sup>20-22</sup> All of these clinics were described as multidisciplinary in nature and had the infrastructure to deliver patient education in place. One study took place in the offices of general practitioners and obstetrician-gynecologists across the United States by providing resources to facilitate patient education.<sup>23</sup> Patients in these offices were moderate risk, either having been diagnosed previously with a sexually transmitted infection in the past 12 months, having 1 or more sexual partners in the past 6 months, or having a current sex partner who is injecting drugs. Another program recruited homeless individuals from shelters, drug treatment facilities, and from outdoor spaces.<sup>24</sup> The study by Cox et al<sup>25</sup> recruited participants from those attending sexual disease clinics, which places these individuals at an increased risk for contracting HBV. A single study recruited individuals online and little is known about these participants other than they completed viewing of the intervention slide set.<sup>26</sup>

#### *Hepatitis B: Educational Interventions*

Four of the 7 educational interventions were nurse-led and required attendance at a one-time session with variable follow-up evaluation.<sup>20-22,24</sup> Nurse-led programs focused on improving knowledge of viral hepatitis, transmission modes, impact of alcohol use, and diagnostic testing. Hepatitis Warning and Response Effort (Hepatitis B-WARE), another educational intervention, focused on providing physicians' offices with the educational resources and administrative infrastructure to improve knowledge transfer to patients.<sup>23</sup> This intervention aimed to increase the amount of viral hepatitis counseling received by patients in the physicians' offices. One of the studies<sup>25</sup> used a computer-based information and interview session, at the end of which the participants' intentions in obtaining HBV vaccination were assessed. Only one study provided a widely accessible web-based module in the form of a slide set that could be accessed by anyone with an internet connection; this program focused on issues around perinatal transmission of HBV and was designed for pregnant women.<sup>26</sup>

#### *Hepatitis B: Outcomes and Effects*

Five of the 7 studies showed positive effects of the educational interventions, and the remaining 2 studies were inconclusive. Three of the 7 studies found improvements in participants' knowledge.<sup>21,22,26</sup> In these studies, Hagedorn

et al<sup>21</sup> and Nyamathi et al<sup>22</sup> both assessed knowledge improvements with pre- and post-educational intervention tests. Hagedorn et al<sup>21</sup> showed a significant improvement on a multiple choice test from 55.8% to 79.4%; the post-test was administered immediately after program completion. Nyamathi et al<sup>22</sup> reported significant improvements in postintervention compared with pre-intervention scores but did not provide the point or percentage improvements in the scores. On the other hand, Wilson<sup>26</sup> reported that 196 of 228 (86%) survey respondents indicated their knowledge improved after viewing the online slide set, but there were no objective quantifiable measurements reported.

Behavioral changes among participants were assessed in 4 studies.<sup>20,23-25</sup> The first of these studies<sup>20</sup> assessed the impact of the educational interventions on HBV testing rates and showed a significant result. In the retrospective comparison cohort only 20 of 104 (19.2%) patients were tested for hepatitis B surface antigen and after the intervention 113 of 115 (98.3%) were tested.<sup>20</sup> The remaining 3 studies assessed the impact of the educational interventions on the vaccination rates.<sup>23-25</sup> Margolis et al<sup>23</sup> showed a statistically significant improvement in a moderate-risk population, patients who elected to begin vaccination doubled (4% to 8%) and patients who completed vaccination tripled (1% to 3%). Nyamathi et al<sup>24</sup> showed that 226 of 332 (68%) patients completed the HBV vaccine in the nurse-case managed sessions vs only 136 of 252 (54%) in the standard practice group, which represents a statistically significant improvement in the rates of HBV vaccination in the intervention compared with the standard practice group. Cox et al<sup>25</sup> showed that in study participants with perceived high short-term barriers to HBV vaccination (discomfort and inconvenience), the act of assessing their intentions of obtaining HBV vaccination after a computer-based information and interview session had a significant impact on the subsequent acceptance rate of HBV vaccination. Assessing participants' intentions resulted in 72 of 130 (55%) receiving the first dose of HBV vaccine, compared with 43 of 132 (33%) in the control group. Moreover, this finding held true for receiving the second and third doses of the vaccine. Two of the 7 studies reported on patient satisfaction immediately after the educational intervention.<sup>21,26</sup> In one of these studies, Hagedorn et al<sup>21</sup> reported 79 of 102 (77.5%) respondents were very or somewhat satisfied with the Healthy Liver Group Session; whereas the other study by Wilson<sup>26</sup> reported 194 of 228 (85%) online survey respondents found the slide set information helpful. None of the studies reported high-level outcomes such as incidence of new infections. The highest quality score was 18 and the lowest was 6.

### *Hepatitis C*

Ten studies evaluated the effectiveness of HCV patient education (Table 3). Five of the 10 studies targeted noninfected individuals and 4 studies recruited individuals with HCV. One study recruited those with or at risk of HCV.

#### *Hepatitis C: Population and Study Setting*

Four studies took place in a substance use facility of some kind.<sup>20-22,27</sup> These patients were all active or recent drug users at high risk of exposure to HCV. These clinics were multidisciplinary in nature with existing infrastructure for patient education. One study took place in the English and Welsh

**Table 2.** Comparison of HBV Studies

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
Cox et al <sup>25</sup>	Participants completed an ACASI (information about HBV and its vaccine, HBV risk factors, benefits and risks of HBV vaccine) followed by a series of 5 questions (self-prediction group) on the participants' intentions to receive HBV vaccine or recommend it to others This was a multimodal educational intervention (N = 578)	Participants only completed the ACASI without the 5 questions at the end about their intentions to receive the HBV vaccine (control group) N = 597	Randomized controlled trial	Individuals attending clinics for diagnosis and treatment of sexually transmitted diseases	Significant increase in HBV vaccination uptake in patients with perceived high short-term vaccination barriers (perceived discomfort and inconvenience of vaccine) in self-prediction group compared with control group HBV vaccination uptakes in patients with perceived low short-term vaccination barriers were not influenced by self-prediction intervention	17	Positive
Hagedorn et al <sup>20</sup>	Healthy Liver Group Session: 60-minute intervention (30 minutes with group and 30 minutes individually) This was a multimodal educational intervention (N = 171)	Historical chart audit (N = 104)	Prospective/retrospective cohort study	Patients presenting to Substance Use Disorder Clinic	Significant increase in testing rates for HBsAg and anti-HBsAb	12	Positive
Hagedorn et al <sup>21</sup>	Healthy Liver Group Session: 60-minute intervention (30 minutes with group and 30 minutes individually with nurse) This was a multimodal educational intervention (N = 102)	None	Prospective cohort study	Patients attending sessions at Substance Use Disorder Clinic	High levels of patient satisfaction; and significant improvements in patient HBV knowledge scores	12	Positive

**Table 2.** Continued

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
Margolis et al <sup>23</sup>	Hepatitis B-WARE program, which included comprehensive mailings to patients consisting of patient information letters, educational brochures, and counseling guidelines Physicians' offices contacted patients for follow-up evaluation and counseling This was a multimodal educational intervention (N = 126)	Brochures in MD office only (N = 261)	Cluster-randomized, controlled trial	Patients attending obstetrician/gynecologist or family physician for treatment of sexually transmitted diseases or those with >1 sex partner or if sex partner is injecting drugs	Significant improvement in uptake of patient counseling Significant improvement in patients commencing HBV vaccination, and in patients completing the vaccination course	18	Positive
Nyamathi et al <sup>24</sup>	Nurse-case managed sessions plus targeted hepatitis education, incentives, and tracking This was a multimodal educational intervention (N = 332)	Targeted education, incentives and tracking only (N = 281) Targeted education and incentives only (N = 252)	Prospective, cluster-randomized, quasi-experimental design	Noninfected homeless adults recruited from 12 shelters, 4 drug treatment facilities, and outdoor locations	Nonsignificant improvement in completion rates of HBV vaccine series	15	Inconclusive
Nyamathi et al <sup>22</sup>	Nurse-led hepatitis health promotion This was a multimodal educational intervention (N = 87)	Motivational interviewing group session (N = 79) Motivational interviewing single session (N = 90)	Randomized controlled trial	Patients attending methadone clinic with moderate-heavy alcohol use	Significant improvements in patient HBV knowledge scores	15	Positive
Wilson <sup>26</sup>	Hepatitis B and You Online Slide set, an online educational tool using bullet points, images, and graphics to communicate complex concepts in simple English language This was a simple educational intervention (N = 228)	None	Quasi-experimental online survey	Patients completing online survey after viewing freely available slide set	Self-reported satisfaction and improvements in hepatitis B knowledge	6	Inconclusive

ACASI, audio computer-assisted self-interview; HBsAb, hepatitis B surface antibody; HBsAg, hepatitis B surface antigen.

**Table 3.** Comparison of HCV Studies

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
Abou-Saleh et al <sup>27</sup>	Enhanced prevention counseling: four 60-minute sessions of manual-guided intervention within 8 weeks focusing on risk behaviors, behavior change, health belief models, and reasoned action  This was a multimodal educational intervention (N = 43)	Simple education counseling (10-minute intervention on risk factors) (N = 52)	Randomized controlled trial	Patients in drug treatment services that are noninfected	Nonsignificant improvement in knowledge from baseline and nonsignificant trend to decreased incidence of new HCV infection in intervention group; no difference between groups	19	Inconclusive
Groessler et al <sup>33</sup>	HCV-self management program (HCV-SMP) consisting of 6 weekly workshop sessions (2–2.5 h, co-led by a health professional and a peer-leader) that included a variety of group activities: HCV information dissemination, problem solving, development of action plans that participants aim to accomplish during the week between sessions, copy of the book "Living a healthy life with chronic conditions," <sup>44</sup> a compact disc containing relaxation exercises, and an HCV-specific information booklet  This was a multimodal educational intervention (N = 69)	Home study group only received the HCV-specific information booklet (N = 63)	Randomized controlled trial	Patients with HCV not on antiviral treatment  Patients recruited from a variety of settings including HCV, primary care, substance abuse, and psychiatry and psychology clinics; recovery homes; and homeless shelters	Improvement in 18 of 22 outcome variables assessed from baseline in the HCV-SMP compared with home study group  This included significant improvements in HCV knowledge, self-efficacy, and vitality/energy scores	17	Positive
Gupta et al <sup>29</sup>	HCV questionnaire was completed by each patient, followed by a	None	Prospective cohort study	Patients in waiting room of tertiary hepatology	Significant improvement in willingness to undergo treatment; and	12	Positive

Table 3. Continued

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
	single 20-minute educational intervention (information on virus, modes of transmission, risk factors, long-term effects, precaution, and treatment) 3-4 weeks later each patient was contacted to answer any further questions they had and to complete a questionnaire This was a multimodal educational intervention (N = 30)			center known to have HCV	significant improvement in patient HCV knowledge		
Hagedorn et al <sup>20</sup>	Healthy Liver Group Session: 60-minute intervention (30 minutes with group and 30 minutes individually) This was a multimodal educational intervention (N = 171)	Historical chart audit (N = 104)	Prospective/ retrospective cohort Study	Patients presenting to Substance Use Disorder Clinic	Significant increase in testing rates for anti- HCV antibody	12	Positive
Hagedorn et al <sup>21</sup>	Healthy Liver Group Session: 60-minute intervention (30 minutes with group and 30 minutes individually with nurse) This was a multimodal educational intervention (N = 102)	None	Prospective cohort study	Patients attending sessions at Substance Use Disorder Clinic	High levels of patient satisfaction, and significant improvements in patient HCV knowledge scores	12	Positive
Larrey et al <sup>30</sup>	Follow-up medical consultation by investigating physician followed by consultation with a nurse specialist (30-40 min) at day 0, and at weeks 4, 8, 12, 24, and 36 of treatment The nurse evaluated the patient's	Follow-up medical consultation by investigating physician only without nurse specialist input (N = 121)	Open-label randomized comparative study	Patients with HCV in hospital specialist clinics who underwent peginterferon and ribavirin treatment	Nurse follow-up evaluation resulted in significant improvements in treatment adherence and virologic response to treatment	18	Positive

Table 3. Continued

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
	understanding of disease and side effects of treatment, and answered patient's questions and provided information to improve patient's adherence to treatment						
	This was a multimodal educational intervention (N = 123)						
Nyamathi et al <sup>22</sup>	Nurse-led hepatitis health promotion	Motivational interviewing group session (N = 79)	Randomized controlled trial	Patients attending methadone clinic with moderate-heavy alcohol use	Significant improvements in patient HCV knowledge scores	15	Positive
	This was a multimodal educational intervention (N = 87)	Motivational interviewing single session (N = 90)					
Proeschold-Bell et al <sup>32</sup>	Intervention to educate about HCV conducted at 4 levels to patients living with HIV: intrapersonal (mental health and substance abuse counseling), interpersonal (monthly support groups), community (jails, homeless shelters, substance use transition homes, and launching website), institutional (face sheet placed at front of every patient's chart in HIV clinic detailing their HCV status, education of staff in HIV clinic)	None	Prospective cohort study	HIV-positive patients either with or without HCV co-infection, recruited from 2 HIV clinics	Significant improvements in HCV knowledge scores compared with pre-intervention scores Nonsignificant improvements in talking to medical provider about HCV and getting tested for and knowing one's HCV status	14	Positive
	This was a multimodal educational intervention (N = 259)						
Skipper et al, <sup>28</sup> 2003	Nurse specialist led clinic (1-hour health awareness seminar on risk factors for blood-borne illnesses)	None	Prospective cohort study	Participants were new inmates registering into 1 of 4 prisons	Tracking of inmates requesting anti-HCV testing and subsequent positive tests	7	Negative
	This was a simple educational						

**Table 3.** Continued

Study	Education intervention	Comparison group(s)	Methodology	Population	Outcomes	Quality score	Overall effect
Surjadi et al <sup>31</sup>	intervention (N = 1618) HCV education session (2 h) given by a nurse specialist and consisted of PowerPoint (Microsoft Corporation, Redmond, WA) presentation This was followed by an interactive discussion, and resources for obtaining further HCV health care and specialist access This was a multimodal educational intervention (N = 197)	None	Prospective cohort study	HCV-infected individuals referred to hepatology clinic by primary care provider	Improvements in all 6 categories of HCV knowledge scores from baseline; 3 of these categories showed significant improvements	9	Positive

prison systems in a nurse-specialist-led prison outreach clinic.<sup>28</sup> Approximately 19.6% of inmates were incarcerated for drug-related offenses, indicating a moderate-/high-risk population. Three studies recruited hepatitis C patients from specialist hepatology clinics.<sup>29-31</sup> One study enlisted human immunodeficiency virus (HIV)-positive patients from HIV clinics.<sup>32</sup> The final study recruited patients from a variety of settings including primary care, hepatology, substance abuse, psychology, psychiatric clinics, recovery homes, and homeless shelters.<sup>33</sup>

**Hepatitis C: Educational Interventions**

Six of the 10 educational interventions exclusively were nurse-led. Two of these programs were identical, with a 30-minute group session followed by a 30-minute individual session with a trained nurse.<sup>20,21</sup> Two of these nurse-led programs were in nurse-specialist clinics, in which either a health awareness group seminar on risk factors for blood-borne illnesses or a presentation on HCV was conducted.<sup>28,31</sup> Another nurse-led intervention consisted of a specialist nurse consultation at various time points during HCV antiviral treatment as detailed in Table 3.<sup>30</sup> The last nurse-led intervention was a hepatitis health promotion program.<sup>22</sup> One program used either a nurse or a physician to run their educational intervention.<sup>29</sup> This intervention was a 20-minute presentation using a flip chart at Flesch-Kincaid grade level 3.7 with information about HCV, modes of transmission, risk factors, long-term effects, precautions necessary, and treatment side effects. One study ran weekly workshop sessions over a 6-week period for participants.<sup>33</sup> The sessions were co-led by a health care professional and a peer-leader. One of the studies used multilevel educational interventions aimed at those with HIV infection with or without HCV co-infection.<sup>32</sup> The final study used trained therapists to deliver the intervention. In this intensive program, participants attended four 60-minute sessions of manual guided intervention within an 8-week period focusing on risk behaviors based on principles of motivational psychology, behavioral change, health belief models, and reasoned action.<sup>27</sup>

**Hepatitis C: Outcomes and Effects**

Eight of the 10 studies showed positive effects of the educational interventions, 1 was inconclusive, and 1 had a negative effect. Six studies reported significant improvements in knowledge scores.<sup>21,22,29,31-33</sup> Hagedorn et al<sup>21</sup> and Nyamathi et al<sup>22</sup> reported results for both hepatitis B and C knowledge together. Hagedorn et al<sup>21</sup> showed significant score improvements in the pre-educational compared with the posteducational intervention tests (55.8% vs 79.4%, respectively); whereas Nyamathi et al<sup>22</sup> showed significant improvements in pre-intervention and postintervention scores immediately after intervention and in postintervention scores at 6 months but did not report on the point or percentage improvements of these scores. Gupta et al<sup>29</sup> reported that before the intervention, participants scored a mean of 78.6% on a 30-question knowledge survey and postintervention they scored 94.4%, a statistically significant improvement in HCV knowledge. Surjadi et al<sup>31</sup> showed improvements in HCV knowledge scores. Specifically in this study, the overall HCV knowledge score consisted of 6 categories and there was significant improvement in 3 of these categories compared with baseline: HCV transmission knowledge increased by a mean of 10 points, general HCV knowledge

increased by a mean of 16 points, and health care maintenance knowledge increased by a mean of 17 points after intervention. In the study by Proeschold-Bell et al<sup>32</sup> the HCV knowledge scores were obtained at various time points, both before and after the onset of the intervention. The results showed that the mean of the knowledge scores after the intervention was significantly higher than the mean score after the start of the intervention. In the study by Groessl et al<sup>33</sup> there was an improvement in the differences between the 2 groups from baseline for 18 of 22 outcome measures. However, in only 3 of these outcome measures did the difference reach statistical significance. These were HCV knowledge, self-efficacy, and vitality/energy scores.

Behavioral changes among participants were assessed in 4 studies.<sup>20,28-30</sup> Hagedorn et al<sup>20</sup> reported that before the educational intervention 75 of 104 (72%) patients were tested for anti-HCV antibody but that after the intervention 113 of 115 (98%) were tested, a statistically significant increase in the number tested. Skipper et al<sup>28</sup> reported that 137 of 1618 (8%) inmates requested HCV testing after an educational intervention program; however, no comparison group was provided in this epidemiologic study. Gupta et al<sup>29</sup> reported a significant increase in the proportion of patients willing to undergo treatment after the educational intervention, with 7 of 17 (41%) patients choosing to be treated before the educational intervention and 15 of 17 (88%) accepting HCV therapy after the intervention. Larrey et al<sup>30</sup> showed a significant improvement in treatment adherence and virologic response to treatment when the planned duration of treatment was 48 weeks, with 60 of 164 (70%) vs 41 of 164 (53%) patients completely adhering to their treatment plan in the education intervention compared with the control group, respectively. Similarly, 24 weeks after the end of antiviral treatment 26 of 164 (30%) vs 10 of 164 (13%) patients in the intervention compared with the control group, respectively, showed a sustained virologic response. One study reported 79 of 102 (77.5%) respondents were very or somewhat satisfied after the program using the same post-test as for the HBV patients in this study.<sup>21</sup> The highest quality score for any study was 19 and the lowest was 7.

## Discussion

In this systematic review on the effectiveness of educational interventions in individuals at risk of, or patients diagnosed with, HBV or HCV, we can report that the large majority of studies displayed a significant beneficial effect of educational interventions on patient disease knowledge, patient behavioral modifications including testing for the disease and uptake of vaccination, willingness to commence and adhere to treatment, and other outcomes such as self-efficacy and vitality/energy scores. In HBV, 5 of 7 studies showed this significant effect of the educational interventions, whereas in HCV 8 of 10 studies showed significant benefits. Collectively, these studies provide an insight into the most effective ways to design and deliver patient education programs.

Most of the educational interventions in this review were targeted to noninfected but high-risk individuals attending drug and substance use centers. The research on these patients shows that patient education in these settings can be effective. Because many of these centers already have existing infrastructure for patient education (staff, space, knowledge), increasing

programs in these settings could help improve long-term outcomes. However, the good outcomes in this review could be the result of selection bias. These patients may be different from other high-risk individuals because they already have shown they are able to overcome common barriers to accessing special care: fear of investigations, knowledge of testing site locations, and other overwhelming socioeconomic problems.<sup>34</sup> Many individuals at high risk of HBV and HCV in the community at large may not present to these facilities at all.<sup>35</sup> Another risk as to how representative these results are of the true effectiveness, or otherwise, of educational interventions in the setting of HBV and HCV is from publication bias. This mainly stems from authors selectively submitting manuscripts containing statistically significant results and from the selective acceptance by journals of manuscripts with statistically significant results.<sup>36,37</sup> Although publication bias may be an explanation as to why the majority of studies in this review showed an overall positive effect of educational interventions on participants' outcomes, there have been no published studies assessing the contribution of publication bias in overestimating the true effectiveness of educational interventions in HBV and HCV.

The majority of the most effective interventions in this review were nurse-led. This observation does not imply that interventions led by other providers are ineffective, it simply reflects the paucity of available evidence. In general, nurses are well positioned in multidisciplinary clinics to devote time and expertise to patient education. Specialty nurses often have a more integrated approach than other providers and will consider social as well as medical determinants of health in their approach.<sup>38</sup> Moreover, funding models may discourage physicians from participating in these programs. This observation has important resource implications for providers of HBV and HCV care. If one considers patient education an important role of health care systems, then clinics should have access to nurse-led educational interventions. This approach may require reallocation of resources. It is likely worthwhile, however, because these nurse-led interventions can alter patient knowledge, behaviors, and possibly clinical outcomes.

The educational interventions identified in this review included both simple one-time educational sessions and more complex multimodal sessions. All interventions included teaching about risk factors and transmission modes. Both simple and multimodal session interventions showed improved knowledge and behaviors. The simple programs were more poorly studied in terms of assessing outcomes at long-term follow-up evaluation. The multimodal session programs were of higher quality in this regard. In addition to improvements in patients' knowledge, previous studies in other health conditions have shown significant effects of more complex multimodal educational interventions on patients' behaviors and patient-related outcomes. The significant improvements included better compliance with treatment in depression<sup>39</sup>; improvements in symptom severity, gastrointestinal-specific anxiety, and health-related quality of life in irritable bowel syndrome<sup>40</sup>; improvements in hemoglobin A1c (HbA1c) and fasting glucose levels, body weight, and patient satisfaction in diabetes mellitus<sup>41</sup>; and significant improvements in colonoscopy uptake rates in colorectal cancer screening programs.<sup>42</sup> Even for simple one-time educational sessions, studies have shown these can improve long-term knowledge in other diseases such as rheumatoid arthritis,<sup>43</sup> so it is likely to be true of HBV and HCV as well.

From the perspective of resource use, single interventions are more likely to be implemented widely. Not only can these single interventions, as shown in the research articles identified in this review, be used in clinics and offices, but they could be extended to the community. In this respect, there is an opportunity of a greater role for public health teams in HBV and HCV patient education.

In this review 4 of the included studies did not show statistically significant positive effects on assessed outcomes. One of these studies<sup>28</sup> had an overall negative effect, indicating that despite adequate powering of the study, no statistically significant effects of the educational intervention were observed. Important reasons for this lack of effect included a low quality score (7 of 20) and hence study design and implementation that was inadequate to detect important changes in assessed outcomes; and the educational intervention consisted of a simple 1-hour health awareness seminar on HCV, which in all likelihood was inadequate to make any significant differences in the assessed outcomes in this prison population. The remaining 3 studies<sup>24,26,27</sup> had inconclusive effects, with the common important reason underlying this lack of effect of the educational interventions in all 3 studies being an inadequate power to detect significant changes.

Furthermore, the design of all 3 studies was of poor quality, and in all probability this resulted in an inability to detect significant changes of the educational interventions on assessed outcomes. Nyamathi et al<sup>24</sup> assessed the effect of the educational intervention on the completion of a 6-month course of HBV vaccination in homeless individuals. Such a population cohort is more likely to lead erratic lives, less likely to adhere to a prescribed course of vaccination spread over a 6-month period, and more likely to be lost to follow-up evaluation. Wilson<sup>26</sup> used an online educational module on perinatal transmission of HBV and targeted pregnant women. The patient population that completed the module could not be ascertained and objective assessment of the educational module effectiveness was not possible. Finally, Abou-Saleh et al<sup>27</sup> recruited individuals from drug addiction clinics and assessed the incidence of new HCV infections over a 6- to 12-month period after the educational intervention. Drug addicts are more likely to be lost to follow-up evaluation, and a follow-up period of 6 to 12 months is insufficient to monitor behavioral changes resulting in reduced rates of new HCV infections.

The main limitation of this review pertains to the variations among the included studies. For example, there was disparity between the educational interventions used, the methods by which they were delivered, the settings in which they were delivered, by whom they were delivered, the background of the participants in the studies, and the outcome measures evaluated. This heterogeneity among the included trials makes it difficult to compare one study with another, and any conclusions drawn would be limited to the specifics of the educational interventions used. Another limitation was that none of the articles provided any information on cost effectiveness, despite some of the studies using multilevel educational techniques<sup>32</sup> that seemingly would require large resources incurring significant costs. Future research studies should assess the cost effectiveness of educational programs in the setting of HBV and HCV. They also should aim to use standardized educational intervention tools; standardized methods of delivery to patients; and assess the effects of educational interventions on 3 groups

of outcome measures: patient knowledge improvement; patient behaviors such as abstaining from high-risk behaviors that increase the risk of infection transmission, getting tested for infection status, and getting vaccinated for HBV; and patient-related outcomes such as vitality/energy levels and psychological well-being.

Educational interventions have great potential to help health care providers improve their patients' understanding of their disease and participate in their own care. If they are well designed and implemented, these interventions are likely to be well received by patients as evidenced by the high satisfaction scores reported in some of the studies in this review. These interventions have the ability to improve patient knowledge levels significantly. They also are likely to improve behaviors and outcomes.

In conclusion, patient educational interventions that teach about HBV and HCV risk factors and transmission modalities; prevention strategies including vaccination, disease testing, treatment options, and side effects; and disease natural history all seem to benefit significantly those at risk of or patients diagnosed with HBV or HCV. It appears that simple educational interventions such as informational presentations impart significant improvements in patients' knowledge, whereas more complex multimodal educational interventions seem to confer behavioral changes in individuals resulting in increased rates of testing, vaccination (for HBV), and treatment for HBV or HCV infection.

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#### Conflicts of interest

The authors disclose no conflicts.