Interventions to increase hepatitis B and hepatitis C screening, assessment and monitoring: A literature review
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Aims

This literature review addresses the following three research questions:

1. Which population-level health interventions are effective in increasing the number of people tested for hepatitis B virus (HBV) and hepatitis C virus (HCV)?
2. Which population-level health interventions are effective in increasing the number of people assessed for liver disease stage?
3. Which population-level health interventions are effective in increasing the number of people who are monitored for liver disease?

A literature search uncovered limited research that addressed question 1 and fewer studies addressing questions 2 and 3.

Method

- The Cochrane Database of Systematic Reviews, Medline, Embase, CINAHL, and PsycInfo databases were searched for literature about HBV and HCV screening, vaccination, treatment, and care.
- Studies were included if they: targeted individuals at risk of, or living with, HBV or HCV infection; were randomised controlled trials; reported large, multiple population-level interventions; described an intervention in sufficient detail; and, reported a quantitative evaluation of program effectiveness or patient outcomes relevant to the intervention.
- A final total of 12 articles were included in the review.

Background

- HBV infection mostly affects immigrants to Australia from Asian backgrounds.
- HCV infection is mostly found among people who inject, or who have injected, illicit drugs.
- Interventions to increase rates of HBV and HCV screening, assessment, and monitoring have been trialled in community-based settings, primary health care settings, in other clinical health service settings, such as at opioid substitution treatment clinics, and via combined multi-strategy interventions.
- Theoretically informed and culturally appropriate interventions are required to...
have impact.

- A recently published systematic review [1] evaluated the effects of educational interventions for patients with HBV or HCV infections and found that complex, multimodal educational interventions seem to cause behavioural changes that increase rates of testing, vaccination (for HBV), and treatment.

1. Community-based interventions

- Community-based interventions have used a variety of theoretically informed and culturally appropriate strategies including nurses and lay health workers [LHWs] from CALD communities, role-plays, and the use of a photo-novel.
- Outcomes of community-based studies indicate that HBV-related educational interventions delivered by LHWs can significantly increase HBV screening rates.
- However physicians are also highly influential within Asian immigrant communities and should be central to efforts to increase screening.

2. Primary care-based interventions

- Primary care-based interventions have used strategies such as electronic health record (EHR) prompts to remind primary care providers (PCPs) to screen for HBV infection among their patients from Asian backgrounds, and
- Also employed in this context is a strategy of prompting PCPs to use a clinical reminder sticker attached to patient records to identify patients who were at risk of HCV infection.
- Outcomes of primary care-based studies indicate that electronic physician prompts were effective in improving HBV screening when delivered alongside HBV education and clinical information, e.g., about HBV tests.
- Similarly, a prompt to use a brief risk-screener via a paper-based clinical reminder was effective in increasing HCV testing in primary care settings.

3. Other clinical health service-based interventions:

- Other clinical health service-based interventions have included the use of FibroScan in street-based outreach clinics, nurse-led assessment clinics, education, HAV and HBV vaccinations, review of risk behaviours, referrals, support, risk reduction counselling, and motivational interviewing-enhanced case management assistance.
- US-based clinical settings have successfully addressed the large number of HCV antibody positive patients who did not receive viral testing within six months of a positive antibody test result by: (i) improving the patient-centeredness of the screening process in ambulatory patients; (ii) local implementation of the Department of Veterans’ Affairs national HCV reflex testing policy supported by an
HCV population management application; and (iii) evaluation of the efficiency and effectiveness of local implementation of reflex tests.

- Outcomes of other clinical health service-based interventions indicate that these interventions have successfully (i) engaged people who inject drugs (PWID) with health services; (ii) facilitated hepatitis care coordination in opioid substitution clinics; (iii) integrated infectious disease programming in mental health settings and increased acceptance of such services among clients; (iv) lowered costs of screening and reduced waiting times (e.g., FibroScan vs liver biopsy); and, (v) successfully assessed and triaged PWID and streamlined their pathway through the healthcare system.

4. Combined interventions across multiple settings

- Studies using complex, combined interventions across multiple settings have employed theoretically informed and culturally appropriate strategies such as the building of a coalition of alliances among health and support services, education campaigns delivered in a range of formats, citywide mass media campaigns to raise public awareness, outreach clinics for blood-testing, viral hepatitis-related information presented through entertainment, and advocacy efforts.

- In addition, internet-based HCV screening and referral intervention has been trialled in a bid to engage individuals from hard-to-reach populations with HCV testing and health care. An intervention combined a mass media campaign using television commercials, advertising, and online banners to raise awareness of HCV. The campaign directed people toward a validated internet-based risk-assessment questionnaire and an internet-mediated blood-testing procedure to identify individuals infected with HCV in the general population.

- Outcomes of combined interventions across multiple settings are difficult to evaluate however there are indications that screening for viral hepatitis infections can be increased using combined strategies in a variety of contexts.

5. Studies examining the cost of interventions

- Most intervention trials have not published data regarding their costs.

- Two studies from the US, the ‘STIRR program’ and the ‘RAAT model’ (see below for further details) highlighted the cost-effectiveness of these interventions.

- Interventions to prevent loss to follow-up after screening have attractive cost-effectiveness ratios.

- A range of studies considered the costs associated with hypothetical interventions, and found that the following are likely to be cost-effective interventions: (from Canada) screening all recent arrivals for chronic HBV and treating recent arrivals; (from the UK) an opt-out, general practitioner HCV case-finding intervention; (from the US) interventions targeting multiple points along
the HCV cascade-of-care rather than a single point is reported to provide better outcomes including more attractive cost-effective ratios; and, (from the US) a one-off HCV testing of all people in the birth cohort 1945-1965 (among whom HCV prevalence is highest).

6. Supplementary evidence from other health-related fields

- Findings from studies conducted in chronic disease areas other than viral hepatitis indicate that educational interventions (directed at clinicians or at patients), reminders (again, directed at clinicians or patients), audit and feedback of performance data, case management, and financial incentives have had some success in increasing patient engagement in health care.
1 Introduction

Compared to any other ethnic group, Asian immigrants to western nations such as Australia and the US represent a population which is disproportionately affected by hepatitis B virus (HBV) infection and associated diseases such as liver cancer [2, 3]. Yet, Asian immigrants have low HBV screening and vaccination rates and they have increased mortality from liver cancers (e.g., hepatocellular carcinoma) when compared to the host populations, with higher mortality primarily due to undetected chronic HBV infection [3]. Despite this, there are no systematic programs in most immigrant-receiving countries to screen for HBV infection and immigrants are not routinely offered HBV vaccination outside of universal childhood vaccination programs.

This report reviews a larger number of research papers about HBV as well as hepatitis C virus (HCV) screening (question 1) relative to papers published on assessment of their impact (question 2) and monitoring of liver disease (question 3). In our literature searches, we located one paper that discussed the use of FibroScan for assessing liver damage and which reported an outcome in the context of screening for HCV infection. Papers that focus on interventions to increase screening sometimes included information about assessment and monitoring however very few published papers have specifically focused on interventions to increase liver disease assessment and monitoring. This is partly because interventions to increase viral hepatitis screening lead to the identification of affected individuals, initiating a cascade of care whereby the assessment and monitoring of liver disease commonly follows. In the research literature, viral hepatitis screening interventions are often a proxy for interventions to increase uptake of vaccination, treatment and care. However, we acknowledge further research is required to ascertain the extent and facilitators of retention in care for HBV and HCV.

The following sections review 12 papers, mostly published between 2010 and 2015, from studies of HBV and HCV screening among affected populations. Many of the studies from which the papers derive were conducted in the United States (US) however the findings are in general relevant to an Australian context. Similar to the US, HBV in Australia mostly affects people from Asian backgrounds, and rates of screening, vaccination, treatment and care are low. Likewise, HCV mostly affects people who inject drugs (PWID), or have injected drugs in the past, in both the US and Australia and these populations report many common barriers to screening, treatment and care. This report draws mostly upon US-based research, as the literature review identified only two Australian-based studies and papers regarding interventions to increase HBV or HCV screening among affected populations.
2 Method

2.1 Review questions

This report reviews the research literature regarding population level interventions to increase the uptake of HBV and HCV testing, assessment and monitoring. Specifically, the review was undertaken to address the following three research questions:

1. Which population level health interventions are effective in increasing the number of people tested for HBV and HCV?
2. Which population level health interventions are effective in increasing the number of people assessed for liver disease stage?
3. Which population level health interventions are effective in increasing the number of people who are monitored for liver disease?

2.2 Literature search

The Cochrane, Medline, Embase, CINAHL and PsycInfo databases were searched for literature about HBV and HCV screening, vaccination, treatment and care. Keywords used to search the literature in title, abstract and keyword fields were:

- Assess*
- Health behaviour
- Health education
- Health promotion
- Health screening
- Hepatitis B
- Hepatitis C
- Intervention
- Mass screening
- Monitor*
- Liver disease
- Population surveillance
- Primary health care

From these searches, the titles and abstracts for 736 articles were collated and
individually assessed for relevance to Questions 1, 2 and 3 regarding population level interventions to increase screening for HBV and HCV infections, and interventions to increase assessment and monitoring of liver disease. From these, a total of 72 articles contained information that addressed, or partially addressed the inclusion/exclusion criteria.

Studies were considered suitable for inclusion if they: targeted individuals at risk of, or patients with, HBV or HCV infection; were randomised controlled trials; reported large, multiple population level interventions; described an intervention in sufficient detail; and, reported a quantitative evaluation of program effectiveness or patient outcomes relevant to the intervention. Following the removal of duplicate titles a final total of 12 articles were included in the review.

The studies cited in this review used a mix of methods including randomised controlled trials, cross-sectional surveys, prospective cohort studies, and studies using qualitative methods. We were unable to find a body of literature that reported upon population level interventions to increase assessment and monitoring of liver disease. Small amounts of information about approaches to liver disease staging and monitoring are contained within articles that comprise the HBV and HCV screening literature. This literature suggests that for many affected people, screening for HBV and HCV facilitates linkage to further care, including vaccination, liver disease staging, monitoring of liver disease progression and uptake of viral hepatitis treatments.

Each study reviewed was allocated a grade (see Table 1) based upon the method of conducting an intervention trial, the quality of the trial and the clarity of the outcome reported (see Table 2). The grade for each study is presented in Table 2, which also comprises a brief summary of reviewed studies.

Table 1: Criteria used for grading scientific evidence

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<td>Ia</td>
<td>Strong</td>
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<tr>
<td>Ib</td>
<td>Good</td>
</tr>
<tr>
<td>IIa</td>
<td>Moderate</td>
</tr>
<tr>
<td>IIb</td>
<td>Moderate</td>
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<tr>
<td>III</td>
<td>Weak</td>
</tr>
<tr>
<td>IV</td>
<td>Very weak</td>
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- **Ia** Strong: Evidence obtained from meta-analysis of randomised controlled trials
- **Ib** Good: Evidence obtained from at least one randomised controlled trial
- **IIa** Moderate: Evidence obtained from at least one well-designed controlled study without randomisation
- **IIb** Moderate: Evidence obtained from at least one type of well-designed quasi-experimental study
- **III** Weak: Evidence obtained from well-designed, non-experimental descriptive studies, such as comparative studies, correlation studies and case control studies
- **IV** Very weak: Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities
3 Findings

This review identified two key settings where interventions were trialled to increase viral hepatitis screening, assessment of liver damage and monitoring of hepatitis-related conditions, namely the community and within the healthcare sector. Community-based interventions included city-wide general population- and health service-focused campaigns and targeted ethnic community-based campaigns. Healthcare sector interventions comprised campaigns delivered within primary healthcare settings such as private general practice and via clinical services that were redesigned to enable blood-borne virus testing for example within methadone maintenance programs for people in treatment for drug dependence. Across all settings, most interventions were evaluated via randomised controlled trials however some interventions were assessed via evidence of measurable increases in the uptake of screening, vaccination, treatment or engagement with health practitioner and health services.

The following review highlights the most rigorously validated intervention studies identified in a literature search of academic databases regarding viral hepatitis screening, assessment and monitoring. While grey materials were included in the search none are presented in the final review, either because their content had also been published in peer-reviewed articles or the documents contained little or no information about outcomes of interventions. Therefore, the final articles presented in this literature review are all peer-reviewed.

3.1 Community-based settings

Community-based intervention studies, which at the very least have demonstrated a measureable increase in rates of screening, have utilised a variety of strategies to achieve their aims. These include education campaigns delivered in a range of formats, information presented through entertainment, role-play, and the use of a photo-novel. These interventions have been delivered in people’s homes and via ethnic community-based organisations by bilingual and bicultural lay health workers and researchers.

The consensus across community-based studies of HBV infection among immigrant populations was that interventions to increase uptake of screening, vaccination, treatment and care should be culturally appropriate when focused upon specific populations. Importantly, a theoretical foundation is necessary for understanding and predicting health behaviour and for developing interventions to promote health [4].

The literature comprises reports of studies that used randomised controlled trials (RCT) to assess community-based interventions aimed at increasing screening for viral hepatitis infections. Drawing on the Health Behaviour Framework and culturally relevant
materials to inform development of interventions, Chen and colleagues [5] and Taylor and colleagues [6] conducted RCTs among 260 Hmong American adults and 250 Cambodian Americans, respectively. Both interventions were delivered during home visits, either by teams of indigenous Hmong lay health workers (LHW) or bilingual and bicultural Cambodian American LHWs. Both RCTs comprised an education intervention with HBV content (for the intervention arm) or general information about nutrition and/or physical activity (for the control arm). Taylor and colleagues’ HBV materials included an educational flipchart (available in Khmer and English) and an accompanying pamphlet, as well as a motivational Khmer language DVD presented in an educational-entertainment format to reinforce information provided in the flipchart and pamphlet. The flipchart and pamphlet provide basic information about HBV including the prevalence of chronic infection among Cambodians, ways the virus can and cannot be transmitted, importance of serologic testing, indications for vaccination, and consequences of chronic infection (e.g. liver cancer).

Based on pre- and post-test surveys, the outcome of Chen and colleagues’ RCT [5] showed that intervention group participants were more likely to report receiving testing for HBV and showed a greater mean increase in knowledge scores than control group participants. However the most often cited reason for HBV testing was a doctor’s recommendation. The authors concluded that LHWs can significantly increase HBV screening rates for Hmong but a doctor’s recommendation is highly influential and should be central to efforts to increase screening. Similarly, in Taylor and colleagues’ trial [6], 22% of the intervention group reported HBV testing compared to only 3% of the control group (p<0.001) six months following the intervention, suggesting that LHWs are effective conduits for disseminating HBV-related information to increase uptake of screening among Asian immigrant populations.

These findings are supported by those of a cluster RCT by Juon and colleagues (2014)[7] who utilised bilingual researchers, performing a similar role as the LHWs, to deliver a culturally tailored liver cancer education program to increase HBV screening among Chinese, Korean, and Vietnamese Americans residing in the Baltimore and Washington metropolitan areas, from November 2009 through June 2010. The intervention group (n=441) received a 30-minute educational program, and the control group (n=436) received an ‘educational brochure’, but no further detail about this brochure was provided. Using images of Asian people, the educational intervention comprised a 30-minute session containing a slide presentation about HBV, a role-play video showing ideal patient-provider interaction, and an ethnicity-specific photo-novel. After attending the educational program, the intervention group completed a post-education survey. Six months later, all participants were followed up by telephone. Participants in the education-intervention arm were up to five times more likely to self-report HBV screening than participants in the control arm, and this effect size was consistent across the three ethnic groups, although the intervention was slightly more effective among Chinese and Vietnamese participants than among Koreans.

3.1.1 Applicability of evidence to the NSW context

Compared to North America, particularly the US, relatively little is known about the health seeking behaviours of Asian immigrant populations in NSW and throughout Australia.
because much less research into the lives of people in these communities has occurred. A lack of understanding for example of the most productive avenues for disseminating information about HBV screening (e.g., through ethnic media, doctors or internet?) and how health-related information is interpreted and used represent substantial differences between conditions in Australia and the US. However, with regards to the possibility of training LHWs to perform similar roles as those in US-based RCTs, there appear to be few impediments to replicating these studies and a high likelihood of obtaining similar positive outcomes. Given that Chinese, Vietnamese, Cambodian, Laotian and other Asian immigrants in NSW are geographically concentrated in the Sydney metropolitan area, and given that many Asian-Australians attend medical practices with doctors and specialists of similar ethnic backgrounds, the dissemination of culturally appropriate educational interventions for example by LHWs, researchers and medical practitioners with Asian language skills to communities throughout Sydney appears feasible.

3.2 Primary care-based settings

In the literature, primary care settings provided opportunities to trial interventions to increase viral hepatitis screening, however this review identified only two rigorous studies that reported clear outcomes after using electronic or other forms of prompting of physicians. Electronic physician prompts have been shown to be effective in improving screening for a variety of health conditions such as breast, cervical and colorectal cancers and this strategy has been used within US primary healthcare settings with some success [8]. For example, in California Hsu and colleagues (2013) [8] conducted an RCT to explore the effectiveness of electronic health record (EHR) prompts to remind primary care providers (PCPs) to screen for HBV infection among their Asian patients. Seventy-six PCPs in the study were randomly allocated to an intervention or control arm and 175 of their outpatients who had Chinese or Vietnamese surnames and no history of HBV screening, participated. PCPs in the intervention arm received an electronic prompt 24 hours before their patient’s scheduled appointment that identified the patient as a candidate for HBV testing and the prompt urged the provider to evaluate the patient for testing. The message sent by a hepatologist to the PCP’s EHR inbox included CDC recommendations for HBV testing in at-risk Asian populations, information about the high prevalence of HBV in Asia, and a list of the appropriate laboratory tests for HBV screening. The results showed that EHR-based provider prompts significantly increased HBV testing in Chinese and Vietnamese patients when compared to ‘usual care’.

Similarly, Drainoni and colleagues (2012) [9] conducted a RCT among PCPs working at three clinics in the Bronx (NYC) using a risk-based screening intervention to increase awareness of HCV infection and to identify patients who were at risk of HCV infection. The risk-based screening intervention involved prompting PCPs with a clinical reminder sticker attached to patient records to order HCV tests if a patient reported any of 12 specific HCV-related risks. In addition, intervention training included on-site educational sessions for all clinic staff, regular communication between the researchers and clinicians, a weekly scientific article on HCV sent to all PCPs, and physical reminders such as buttons, pocket cards, and posters. Researchers visited each clinic twice per week to place stickers on all
progress notes, to encourage adherence to screening protocols, and to elicit feedback from PCPs and other clinic staff. Furthermore, each clinic had a ‘physician champion’, a member of the research team who regularly visited the clinic to maintain PCPs’ engagement in the intervention. All PCPs were supplied with a script (in English and Spanish) to standardize and normalize the introduction of the risk-screener. Each PCP was asked to complete the sticker at every visit for patients who had not been tested for HCV in the preceding 12 months and to order an HCV antibody test if any risk factor was identified. The risk-based screening intervention was conducted over a 15-week period from November 2008 to March 2009. Of 3250 screened patients with risk factors, 55.4% were tested for HCV. The authors concluded that a brief risk-screener with a paper-based clinical reminder was effective in increasing HCV testing in primary care settings.

3.2.1 Applicability of evidence to the NSW context

Based on the results of US research, the prompting of doctors (either via EHR or paper-based risk screening), who practice in Sydney or in other areas with large Asian populations affected by HBV could be successful if implemented in NSW. However there is little to no Australian research which explores the views and practices of for example Chinese and Vietnamese medical practitioners regarding viral hepatitis screening, assessment, monitoring and treatment. While similar issues to those found in the US may also be common features in the local context (e.g., of poor hepatitis awareness and knowledge among primary care physicians, and inconsistent attention to screening), further research is needed to determine the acceptability and practicalities associated with physician prompts.

In areas of NSW where there are high rates of injecting drug use, the use of EHR and other forms of prompting to remind doctors in primary care settings to screen for HCV among patients is a feasible approach to increasing awareness of viral hepatitis among doctors and for lifting rates of screening, assessment and monitoring.

3.3 Other clinical health service-based settings

Two RCTs from the US which were conducted within clinical health services other than primary care practices provide clear evidence of effective interventions to increase screening among mental health clients [10] and among methadone maintenance clients [11]. Rosenberg and colleagues’ [10] study was designed to facilitate integrated infectious disease programming in mental health settings and to increase acceptance of such services among clients. The ‘STIRR program’ intervention was tested on 236 mental health clients [10]. Similarly, Masson and colleagues [11] evaluated the efficacy of a hepatitis care coordination intervention (n=244) to improve linkage to hepatitis A virus (HAV) and HBV vaccinations and clinical evaluation of HCV infection among 489 methadone maintenance patients (controls n=245). In these two trials, both intervention groups received screening for HIV and viral hepatitis infections, HAV and HBV vaccinations, a review of risk behaviours, referrals for an HCV evaluation or other care, support [10] or motivational interviewing-enhanced case management assistance [11], and education and/or risk reduction counselling.
The STIRR intervention (n=118) provided services directly to participants at the site of mental health treatment. The control group (n=118) received information about blood-borne diseases and about referral, such as local community health sources for blood testing, immunization for HAV and HBV, and treatment as needed. At six months post-intervention, clients randomly assigned to the STIRR intervention, and who were untested at baseline, were more likely to be tested for HBV and HCV, to be immunized against HAV and HBV, to have increased knowledge about viral hepatitis and to have reduced their substance use compared to controls. However, they showed no reduction in risk behaviour, were no more likely to be referred to care, and showed no increase in HIV knowledge. STIRR appears to be effective in providing a basic package of interventions for clients with co-occurring disorders [10].

Similarly, in Masson and colleagues’ trial [11], compared with the control group, the intervention group participants were significantly more likely to receive their first vaccine dose within 30 days and to receive an HCV evaluation within six months. A combined intervention adherence outcome that measured adherence to HAV-HBV vaccination, HCV evaluation, or both, strongly favoured the intervention group. The findings of this RCT demonstrated that hepatitis care coordination was efficacious in increasing adherence to HAV-HBV vaccination and HCV clinical evaluation among methadone patients [11].

A prospective, descriptive correlational design study by Foucher et al [12] was one of the only studies that we identified that partially addressed questions two and three of the literature review regarding population level interventions to increase assessment and monitoring of liver disease. This study was conducted to assess the acceptance of FibroScan, an instrument used for hepatitis screening, assessment and management, in two street-based outreach settings among 298 people who use drugs in Bordeaux, France from January 2006 to January 2007. All drug users who attended the outreach clinics were offered evaluation of liver fibrosis with FibroScan. Other patient parameters were recorded with a structured, face-to-face questionnaire by outreach workers. HCV-RNA positivity was found in 83 cases, and 45 of these participants agreed to meet a hepatologist for follow-up care. The authors concluded that in a street-based outreach service for drug users, the acceptance of FibroScan was excellent and that use of this instrument may facilitate screening and management of drug users for HCV infection.

Similarly, an Australian study that at least partially addressed questions two and three of this review was conducted in Victoria by Biddle and colleagues [13]. The study evaluated a new nurse-led assessment clinic that was established in the liver clinic of a large urban hospital to utilise the expertise of nurses to assess and triage new patients and streamline their pathway through the healthcare system. This study also aimed to assess the advantages and disadvantages of the nurse-led clinic. Patient data were extracted retrospectively from clinical records of new patients at the liver clinic and quarterly one-month periods were recorded over two years. Patients were categorised according to the path through which they saw a physician, including missed and rescheduled appointments. There was a longer waiting time of 10 days for physician appointments if seen by the nurse first however there was also a reduction in the number of missed appointments at the subsequent physician clinic. Other advantages included effective triage of patients and the
organisation of appropriate investigations from the initial nurse assessment, suggesting that nurse-led models of care can increase engagement between health services and people who use drugs.

In a study by Whitty and colleagues [14], researchers compared costs and waiting times of conventional HCV outpatient management with liver biopsy to a streamlined specialist outpatient based approach of assessing patients with chronic HCV using a rapid access to assessment and treatment (RAAT) model of care that utilises Transient Elastography (i.e., FibroScan). Over a three month period, prospective patient audit data related to the implementation of the RAAT model was collected and compared to retrospective data on the conventional management and screening of HCV patients with liver biopsy. The authors reported that patients who had received RAAT had lower costs (n=27, median AU$2,716) and shorter time to treatment (median 194 days) than patients receiving conventional management (n=13, medians $5,005, 420 days; p<0.01), with the differences related to the lower FibroScan test costs and the lower cost of consultations between first medical review and establishment of a treatment plan. As this study was based on real world audit data, the evaluation suggests that a RAAT model of care saves health system costs in the short term and reduces waiting times. The authors concluded by recommending that future research should undertake a full economic evaluation at a whole of service level, to consider a more comprehensive and longer term assessment of the costs and benefits associated with HCV management.

A study by Hirsch and colleagues [15] conducted at a Department of Veterans Affairs (DVA) medical centre, aimed to address the large number of HCV antibody positive patients who did not receive viral testing within six months of a positive antibody test result. After implementing three sequential improvements, all HCV antibody positive patients went on to have a PCR viral test. The three sequential improvements/intervention phases were: (i) improving patient-centeredness of screening process in ambulatory patients; (ii) local implementation of the DVA national HCV reflex testing policy supported by an HCV population management application; and (iii) evaluation of the efficiency and effectiveness of local implementation of reflex tests. Following implementation of the first two phases, including reflex testing where two blood samples are drawn from each patient presenting for their antibody test, significant improvements in testing rates occurred. Following the third improvement phase that addressed remaining process problems related to the reflex testing process, there was a sustained rate of 100% completion of timely viral testing (up from 45% previously).

Finally, a literature review by Shah and colleagues [1] was conducted to evaluate the effects of educational interventions for patients with HBV or HCV infections. Fourteen studies were identified that evaluated any educational intervention, from information websites and nurse-led sessions to community-wide and institutional programs. To be included, studies must have reported the effectiveness or patient outcomes relevant to the intervention. The educational interventions reviewed were reported to improve patients’ knowledge, increase testing and vaccination uptake, improve their willingness to be treated and to adhere to treatment, as well as positively impacting on other areas of health and wellbeing. The authors reported that complex, multimodal educational interventions seem to cause behavioural
changes that increase rates of testing, vaccination (for HBV), and treatment [1].

3.3.1 Applicability of evidence to the NSW context

The findings of studies conducted in other clinical health services in the US, France, Queensland and Victoria may be directly applicable to the NSW context, as viral hepatitis testing, assessment and monitoring already occur within some local services, for example in opioid substitution clinics and HIV-related clinics.

As FibroScan is a non-invasive procedure and unlike liver biopsy, a painless procedure, it is likely that wide-spread use of mobile, outreach FibroScan clinics in NSW would be acceptable to PWID and other population groups at risk of, or living with, viral hepatitis infections.

Nurse-led models have become a feature of the health system in NSW and across Australia over recent years, as evidenced in the Victorian study. Nurse-led models can offer some patient population groups, such as people with viral hepatitis, a quicker, more convenient and personalised experience of screening, assessment and monitoring than is often obtainable via large tertiary liver clinics.

Reflex testing is a convenient, time-efficient method of increasing completion of HCV screening. Further research is needed to explore its appropriateness in the NSW context. The three sequential improvements/intervention phases outlined in the US-based service are replicable and should be trialled within selected NSW clinics.

All evidence presented in a recent review of education-based interventions for people with HBV and/or HCV is relevant to the NSW context and indicate the power of awareness raising and information provision for promoting screening and other important viral hepatitis-related health practices among affected populations.

3.4 Combined interventions across multiple settings

Two studies combined a range of interventions and applied these across a variety of community-based settings, clinics, social support services and via the internet. The interventions included: the building of a coalition of alliances among health and support services; education campaigns; mass media campaigns; advocacy; and, information presented through entertainment. These interventions were delivered by bilingual and bicultural researchers, community members, and medical practitioners, including nurses. A primary example of a theoretically informed and culturally appropriate intervention is the citywide San Francisco Hep B Free (SFHBF) campaign conducted between 2007 and 2010 [2]. The scale of this intervention was quite unique within the literature, as its overarching strategy was the formation of a diverse public/private coalition of alliances, which had the effect of unifying the Asian and Pacific Islander (API) communities, health care system, policy makers, businesses, and the general public in San Francisco. More than 150 organizations contributed approximately $1,000,000 in resources to the SFHBF campaign and 40 educational events reached 1,100 healthcare providers, with half of primary care physicians pledging to screen APIs routinely for HBV. Community events and fairs reached over 200,000 members of the general public, with 3,315 API clients tested at seven stand-
alone screening sites created by the campaign, of which 6.5% were found to have chronic HBV infection and were referred to follow-up care. Specific SFHBF campaign interventions to increase screening comprised: continuing medical education and advocacy around HBV aimed at physicians and other health care providers; mass-media and community grassroots messaging about HBV using billboards and public service announcements in the general media and the API media, and advertisements on taxis, at train stations and on buses and at bus shelters; and seven stand-alone hospital and clinic-affiliated free HBV testing and low-cost vaccination sites independently funded, staffed, and managed by the institutions. While the campaign did not include an evaluation, results from laboratories serving the San Francisco area reported a steady increase in HBV testing from 2006 through to 2008 [2].

During 2007 and 2008, an internet-based HCV screening and referral intervention was trialled in Amsterdam and South Limburg, the Netherlands in an effort to engage individuals from hard-to-reach populations with HCV testing and health care [16]. The intervention combined a mass media campaign using television commercials, advertising, and online banners to raise awareness of HCV with an internet risk assessment and an internet-mediated blood-testing procedure to identify individuals infected with HCV in the general population. People from HCV risk groups were referred to an online, previously validated risk-assessment questionnaire. Individuals at risk could download a referral letter for a free, anonymous HCV blood test in a nonclinical setting and the test results could be obtained online one week following testing, using a personal log-in code. People with a HCV-positive antibody test result were asked to attend the Public Health Service to have a PCR RNA test to confirm current infection and people who were found to be chronically HCV-infected were referred for treatment. Of 1480 people who reported HCV risk practice and were eligible for blood testing, 420 opted for testing (28%) and HCV antibodies were detected in 3.6% of these people. This intervention study highlighted participants’ high rates of picking up their test results, and high rates of people with positive antibody tests going to clinic for confirmatory testing. The authors of the study concluded that internet-mediated risk-based testing for HCV proved to be a feasible and effective strategy to identify undiagnosed HCV infection in the general population. The uptake of testing was 28%, which the authors report is high for an online project that includes blood testing. This strategy holds promise for future HCV screening because internet-mediated testing is low-cost.

3.4.1 Applicability of evidence to the NSW context

Similarities between San Francisco and Sydney are widely noted: both cities have roughly the same population and climate, and share similar infrastructure and significant cultural features such as sophisticated health systems and large, diverse Asian immigrant populations affected by HBV infection that are serviced by well-established communities which include a rich variety of ethnic-based media. As such an adaptation of the SFHBF campaign could be conducted in Sydney with an expectation of similar outcomes to the SFHBF campaign results.

Similarly, an internet-based intervention that replicated the study from the Netherlands could feasibly be reproduced in Sydney with success. Australia has a high level of internet
use and these levels continue to increase each year. With the development of a regional mass media advertising strategy that efficiently targeted ‘hard-to-reach- populations’ of CALD and PWID, it is possible an internet risk assessment and an internet- mediated blood-testing procedure could lead to increased uptake of viral hepatitis screening.

3.5 Studies examining the cost of interventions

Few of the interventions outlined above included analysis of the cost of these initiatives. Indeed, only two studies published additional information in this regard. Hence, additional scans of the literature were undertaken to ascertain additional studies that could provide information about cost and cost-effectiveness of approaches to promote testing, care and monitoring for HBV and HCV.

3.5.1 Analysis of the costs of interventions

The STIRR intervention outlined above (blood-borne virus testing for people with severe mental illness) [10] included an analysis of the costs associated with providing this intervention [17]. The costs for this intervention included: training and setting up STIRR programs in four participating services, blood draws and tests (HBV, HCV and HIV), vaccine supplies, consumer products provided to clients and counselling and case management around referral to medical care and reminders about upcoming appointments. The average cost (in Canadian dollars) of the intervention was $423+/-90 per participant, which was $399 more than enhanced usual care (education and referral to off-site care). During the first year of operation, the STIRR program cost $482,000, resulting in the testing of an additional 683 persons for HCV, 621 persons for HBV and 133 persons for HIV (as well as providing vaccinations for HAV and HBV to an additional 859 persons). The cost- effectiveness of the program was not calculated but was discussed as being sensitive to whether the volume of new participants remains consistent.

The Rapid Access to Assessment and Treatment (RAAT) trialled in Queensland provided costs associated with conventional and RAAT models of care [14]. Approximately twice as many patients with chronic HCV could progress to the development of a treatment plan in the RAAT model for the same cost as conventional treatment (mean costs were AUD$2782 and $5822). The difference in costs between the models was associated with the cost of liver biopsy for conventional care (compared with FibroScan) as well as efficiencies derived from redesign of the clinical service (that is, better access to relevant information for the specialist physicians making the treatment decisions).

3.5.2 Additional cost-effectiveness studies

Four studies have examined the cost-effectiveness of a range of hypothetical approaches to screening for HBV and/or HCV infections. Rossi and colleagues (2013) [18] examined the relative cost-effectiveness of four strategies of HBV screening and vaccination of recently arrived adult Canadian immigrants and refugees: (1) universal vaccination (no serological screening); (2) screening for prior immunity and vaccination; (3) chronic HBV screening and treatment; (4) combined screening for HBV and prior immunity. Strategy #3 was the most cost-effective option (noting that HBV prevalence could be as low as 3% in the target
The model estimates that targeted screening of all immigrants upon arrival would result in an additional 1675 productive life-years gained for every 250,000 immigrants screened, relative to no target screening. However, this paper notes that there is currently no program of routine health-care for adult immigrants to Canada, hence new infrastructure would be required including education targeting immigrants and health workers.

The modelling study of Miners and colleagues [19] also examined the cost-effectiveness of screening among migrant populations, this time for HCV among immigrants to the UK from the Indian sub-continent. The results of this study suggested that an opt-out GP case-finding intervention could be cost effective, particularly when simultaneous testing for HBV is included (which was not part of this study). However the authors concluded that further research is needed to produce stronger evidence for policy.

Using a “cascade of care” approach for HCV, Linas and colleagues [20], examined the cost-effectiveness of hypothetical interventions to decrease loss to follow up at various stages (from patients who had obtained screening and who had returned for results, to initiated therapy, adhered to therapy and achieved SVR). The results of this study showed that loss to follow-up along the care-cascade reduced the effectiveness of current HCV therapy by 75%, hence, interventions to prevent loss to follow-up have attractive cost-effectiveness ratios. The modelling study results suggested that interventions targeting multiple points along the cascade such as patient navigators or integrated case management, rather than a single point, will provide better outcomes including more attractive cost-effective ratios.

Finally, a systematic review aimed to determine the cost-effectiveness of HCV interventions (prevention, screening, treatment) targeting substance users [21]. The authors concluded that it was not possible to draw a clear consensus regarding which type of intervention represented a better investment and suggested that policy-makers choose relevant studies from those reviewed and apply their own willingness to pay thresholds.

3.5.3 A specific case: USA recommendations for birth cohort screening for HCV infection

Recent recommendations from the US Center for Disease Control focus on implementing a one-off test for all people in the birth cohort 1945-1965 (among whom HCV prevalence is highest). Rein and colleagues [22] examined the cost-effectiveness of this recommendation, that is, exploring whether the increased expenditure to screen this cohort would translate to health benefits. The results of this study demonstrated that compared with risk-based approaches to screening, screening of this cohort with subsequent treatment would reduce deaths at QALY comparable to those for cervical cancer and cholesterol screening; that is, identify an additional 808,580 cases of HCV infection and prevent 82,000 deaths at a cost of $2,874 per new case identified and $15,700 per QALY saved using conventional treatments and $35,700 using direct acting antivirals (DAA) with standard therapy.
3.6 Supplementary evidence from other health-related fields

Given the relatively low number of papers that provide evidence regarding the ways in which screening for HBV and HCV and monitoring of liver disease can be enhanced, the search was broadened to include evidence from other fields. Population level and provider-focused interventions comprised five major categories: educational interventions (directed at clinicians or at patients), reminders (again, directed at clinicians or patients), audit and feedback of performance data, case management, and financial incentives [23]. As the possible field for this additional literature search is very broad, the Cochrane Library was searched to ensure that synthesised evidence of the highest quality was included. The literature around cancer screening for patient-focused interventions was considered the most relevant to explore. Within this field, there were two main types of intervention identified: community- and opportunistic clinic-based (i.e., a person already attending a health service). The literature was focused primarily on community-based interventions and included invitations/reminders and education. There were variations in the ways in which these were delivered and some studies examined combinations of approaches.

Interventions for breast cancer [24] and cervical cancer screening [25] showed that letters of invitation produced significant effects. The type of invitation used in each community breast cancer screening program was influenced by the methods available and methods used to identify eligible women (via electoral roll, general practice lists, etc.) and the data that each contains (e.g., address, phone number etc.). For breast cancer screening, five interventions were effective: single letters of invitation at 12 and 24 months of follow-up; the mailed educational material; letter of invitation plus a phone call; individual phone call; and, training activities plus reminders for the women. For cervical cancer screening, invitations were dependent on robust administrative procedures and a comprehensive, accurate, up-to-date register being maintained.

Two interventions were found not to be effective: home visits and letter of invitation to multiple examinations plus educational material. The authors further commented ‘Combined actions have been mostly addressed to poorer women or those living in a multiethnic context for exploring alternatives to the conventional channels of communication (letter, phone)’. It appears that the combination of a letter and phone call achieves a better response than those interventions separately, although no direct comparisons among interventions were considered in this review. The combined initiatives may be more costly than the individual letter or phone call, and therefore, considerations about respective cost-effectiveness should always be borne in mind. The simplest and cheapest actions reach a very acceptable response rate, and therefore, any costly intervention to be added should be based on sound effectiveness data. Unfortunately, no data about costs from the included studies are available to permit that kind of assessment here. It appears that the attendance rate in the breast cancer screening services is higher if recruitment is individually addressed and not merged with other examinations. The simplest and cheapest interventions, such as letters and phone calls, either separately or combined, are very good alternatives to consider at the first instance.

Some additional insights were provided by the review of interventions to increase
cervical cancer screening when reminders containing fixed or open appointments were sent to women. The authors concluded that it was unclear as to whether sending invitation letters with appointments was any more effective than sending invitation letters alone. However, there was some evidence to suggest that invitation letters with fixed appointments were more effective than invitations with open appointments. The review showed that letters from a GP/local authority were favoured over other sources. Further the authors added: ‘No trial showed a cost-effectiveness benefit of any alternative invitation method over the standard care (usually a letter). Given the effectiveness of invitation letters in encouraging uptake and that no other intervention has been shown to be more cost effective, it remains appropriate to use existing invitation approaches. It must be recognised that for this approach to be effective, robust administrative procedures must be in place and a comprehensive, accurate, up-to-date register maintained.’

Cervical cancer interventions have also included educational components. There was insufficient evidence to support any particular educational intervention, but overall the findings favour educational interventions over the no intervention/usual care control. Amongst ethnic minority groups there appeared to be some limited evidence to support the use of lay members of the community in presenting culturally-tailored information, particularly when performed ‘face-to-face’.

A final review was considered which examined the evidence for computerised prompts delivered to the provider at point of care [26]. These reminders, embedded into computerised provider order entry systems or electronic health records, alert providers to important clinical information relevant to a targeted clinical task at the time the provider is engaged in performing the task. As with their use in studies of viral hepatitis, the review showed that such interventions have achieved variable improvements in target behaviours and processes of care. The authors noted that the current literature does not detail which features of the reminder systems, the systems with which they are delivered, or which target problems might consistently predict larger improvements.
There is limited literature of high quality from which to draw conclusions and recommendations, especially for questions 2 and 3. Additional research, particularly in relation to cascade of care issues, is warranted in these fields.

Interventions targeting improvements in HBV testing and management had been conducted primarily in community and primary care settings, with less evidence available from studies attempting re-design of tertiary or other clinical services. Efforts in HCV research appear to be focused in the area of redesign of clinical services and less in the community sphere, with the notable exception of an internet-mediated prompt for testing (which also included an element of service redesign).

Recommendations from the available literature and consideration of its applicability to NSW suggest:

- Interventions with the affected community should be theory-based, culturally appropriate and be delivered by bilingual workers as appropriate.
- Interventions targeting Asian immigrant communities should involve medical practitioners (especially those from within the target community) who can endorse the intervention publicly and within the clinical encounter (that is, providing recommendations to patients that they should undertake HBV testing).
- Enhancing communication and intervention with target communities for HBV testing and care via community events and community-based strategies.
- Enhanced efforts with primary care organisations in priority locations to implement strategies to prompt primary care providers to undertake HBV screening of target populations.
- Interventions that involve clinical re-design appear useful such as:
  - Continued investment in HCV services in OST
  - Efforts to make tertiary liver clinic services more efficient and effective
- Reflex testing (drawing blood once for HCV antibody and PCR testing) appears a strategy worthy of further consideration as a first step in the cascade of care and retention pathway, including studies of the cost-effectiveness of such strategies and the feasibility of implementation.
- Combined interventions across multiple settings, such as a linked community-based and health service re-design strategies via internet-mediated risk assessment and referral should be considered, including its potential use for HBV screening.


## Table of Reviewed Papers

Which population health-level health interventions are effective in increasing the number of people: (1) tested for HBV/HCV; (2) assessed for liver disease stage; (3) monitored for liver disease?

<table>
<thead>
<tr>
<th>Source and Evidence Type</th>
<th>Study Type/ Method</th>
<th>Population/ Setting/ Health Issue</th>
<th>Intervention/ Outcome measure</th>
<th>Brief Findings</th>
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<tbody>
<tr>
<td><strong>1. COMMUNITY-BASED INTERVENTIONS</strong></td>
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<tr>
<td>Taylor et al., (2013) [6], USA Peer reviewed paper</td>
<td>Randomised controlled trial Cambodian descent, aged 20-64 years, and able to speak Khmer or English</td>
<td>Interventions: Experimental group - HBV lay health worker intervention (home visit using flip chart, pamphlet and DVD); control group - physical activity lay health worker intervention. Outcomes: HBV testing completion within six months of randomization (by self-report).</td>
<td>Significant difference in HBV testing: 22% of experimental group participants and 3% of control group participants reported they had received a HBV test in the six-month interval after randomization.</td>
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<td>Chen et al., (2013) [5], USA Peer-reviewed paper</td>
<td>Randomised controlled trial Hmong adults aged 18-64 years</td>
<td>Intervention: Experimental group - HBV lay health worker intervention (home visit using flip chart, pamphlet and DVD); control group - physical activity/nutrition lay health worker intervention. Intervention informed by the Health Behavior Framework. Outcome: HBV testing completion within six months of randomization (by self-report).</td>
<td>Proportion reporting serological testing for HBV during the study period at post-test was significantly greater in the intervention group than the control group (24% vs. 10%, p=0.0056).</td>
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<td>Juon et al., (2014) [7], USA Peer-reviewed paper</td>
<td>Cluster randomized controlled trial</td>
<td>Asian Americans aged 18 years or older</td>
<td>Intervention: Experimental group - 30-minute educational session consisting of 1) a slide presentation of comprehensive HBV information 2) a role-play video showing ideal patient–physician communication at the clinic, and 3) an ethnicity-specific photonovel. Intervention informed by PRECEDE–PROCEED planning model. Outcome: HBV screening test in the 6 months following the intervention.</td>
<td>The intervention group had higher HBV screening rates at follow-up than the control group (33.6% vs 9.7%).</td>
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<td>Hsu et al., (2013) [8], USA Peer-reviewed paper</td>
<td>Randomized controlled trial</td>
<td>Primary care providers caring for outpatient adults with Chinese or Vietnamese surnames, urban setting</td>
<td>Intervention: experimental - electronic prompt 24 hours before patient’s scheduled appointment sent by hepatologist, identifying patient as candidate for HBV testing, recommending HBsAg, anti-HBs and anti-HBc. Also included CDC recommendations for HBV testing in at-risk Asian populations, the high prevalence of HBV in Asia, and a list of the appropriate laboratory tests for proper HBV screening, explanation of how to evaluate the results of the viral markers. The message was directly linked to the patient’s EHR chart to facilitate laboratory test ordering. Control group – did not receive electronic message (“usual care”). Outcome: (1) rates of HBsAg ordering by providers and (2) HBsAg test completion by patients. Secondary outcomes included providers initiated actions based on the laboratory test results.</td>
<td>Significantly more patients care for by providers in the experimental group received HBsAG test (40.9% vs 1.1%, p&lt;0.001). 34.1% of patients in experimental group and 0% in control group completed HBV tests p&lt;0.001). Secondary outcome: Follow-up actions - the patients who tested HBsAg positive or HBV non-immune were tracked for 3 months after the intervention. Two patients with HBV infection were referred to a specialist, and the other 2 did not receive any actions by their PCP.</td>
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<td>Drainoni et al., (2012) [9], USA</td>
<td>Descriptive study</td>
<td>Primary care providers</td>
<td>Intervention: prompting physicians with a clinical reminder sticker to ask whether a patient had any of 12 specific HCV-related risks and to order HCV tests according to the presence of those risks. In addition: on-site educational sessions prior to and once during the intervention period, regular communication between the research team and clinical leadership, electronic provision of a weekly scientific article on HCV to all PCPs, and environmental reminders (HepCAT buttons, pocket cards, and posters). Also, project staff visited each clinic twice per week to place stickers on all progress notes, encourage adherence to screening protocols, and elicit feedback from PCPs and other clinic staff. Each clinic had a &quot;physician champion,&quot; a member of the research team who regularly visited the clinic to maintain PCPs' engagement in the intervention. Outcome: anti-HCV antibody test was performed within 90 days of the clinic visit date.</td>
<td>During the intervention, 13.1% of all patients seen in the clinics were tested for HCV. However, this level of testing was driven primarily by screening: 25.3% of screened patients were tested, as opposed to only 6.2% of unscreened patients.</td>
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### 3. OTHER CLINICAL HEALTH SERVICE-BASED INTERVENTIONS

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<td>Foucher et al., (2009) [12], France</td>
<td>Descriptive correlational design</td>
<td>PWID attending street-based outreach services</td>
<td>Intervention: Offer of fibroscan in outreach setting; offer of follow-up hepatologist consult in storefront centre. Outcome: acceptance of Fibroscan screening; acceptance of HCV test.</td>
<td>100% (n=298) accepted Fibroscan screening. 76% undertook HCV screening.</td>
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<tr>
<td>Biddle et al., (2014) [13], Australia</td>
<td>Descriptive correlational design</td>
<td>People attending Liver Clinic at Geelong Hospital</td>
<td>Intervention: nurse-led clinic to ensure required interventions prior to physician appointment. Outcome: days to physician appointment; attendance at physician appointment.</td>
<td>Patients who attended nurse-led clinic showed significant improvement in attendance compared with those who attended appointments with physician only (p=.023). Nurse-led model increased wait time to physician appointment by 10 days (from 220 to 231 days, p=.033).</td>
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<td>Masson et al., (2013) [11], USA Peer reviewed paper Ib</td>
<td>Randomised controlled trial</td>
<td>Clients attending MMT programs</td>
<td>Intervention: experimental - on-site screening, motivational-enhanced education and counseling, vaccination and case management. Individual 2 sessions delivered using motivational interviewing style. Control – individual 2 session manual-guided HIV and viral hepatitis counselling and education.</td>
<td>Intervention participants were more likely to receive HCV evaluation in 6 months (65% vs 37%) and to receive this earlier than control group (84 vs 337 days).</td>
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<td>Hirsch, et al., (2014) [15], USA Peer-reviewed paper IIb</td>
<td>Continuous quality improvement, electronic medical chart review</td>
<td>Clients attending Veterans Affairs Medical Centre</td>
<td>Intervention: Intervention: (1) improving patient-centredness of screening processes in ambulatory care (2) local implementation of VA national HCV reflex testing policy (take 2 blood draws at appointment to enable PCR testing without a second appointment) (3) local evaluation of the local reflex testing implementation.</td>
<td>Achieved goal of 100% timely HCV testing completions from baseline of 45%.</td>
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<tr>
<td>Rosenberg et al., (2010) [10], USA Peer-reviewed paper Ib</td>
<td>Randomised controlled trial</td>
<td>People with co-occurring mental health and substance use disorders attending publicly funded mental health programs</td>
<td>Intervention: experimental – 3 sessions (1) education, screening, risk reduction counselling (2) results of screening and follow-up (3) risk reduction reinforced. Control – information, referral for screening (2) research assessment.</td>
<td>86% of intervention participants were tested for HCV and 99% returned for second session. No data available for control participants. Nonsignificant difference (via self-report) of medical visit for HCV (81% vs 75%).</td>
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<td>Shah et al., (2013) [1], global Ia</td>
<td>Systematic review</td>
<td>People with HBV or HCV</td>
<td>Interventions: education interventions including information websites, nurse-led sessions, community-wide, institutional programs.</td>
<td>14 studies in total. 2 studies evaluated impact on testing (2003, 2007). The 2007 study involving people attending substance use disorder clinic showed positive effects on HBV and HCV testing. The 2003 study involving prison inmates showed a negative effect on HCV tests.</td>
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<td>Whitty et al., (in press) [14], Australia III</td>
<td>Prospective and retrospective audit of medical charts</td>
<td>People with chronic HCV attending public hospitals in Queensland</td>
<td>Intervention: Rapid Assessment and Treatment model (RAAT) – obtaining as much data as possible from patient’s GP prior to consultation with included fibroscan and consultation with hepatologist. Outcome: time to development of a treatment plan post.</td>
<td>Convention treatment resulted in significantly longer waiting time compared with RAAT cohort (119 days for test; 226 days longer for treatment plan).</td>
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### 4. COMBINED INTERVENTIONS ACROSS MULTIPLE SETTINGS

<p>| Bailey et al., (2011) [2], USA. Peer reviewed paper III | Evaluation with process monitoring and pre-post (no control) | High risk Asians and Pacific Islanders (APIs) | Intervention: culturally targeted strategies to increase hepatitis B testing, vaccination, and treatment services in the high-risk API community. Provider education and advocacy: ongoing grand rounds, continuing medical education; development of quick-reference hepatitis B diagnostic flowchart; all health care providers asked to sign a pledge form stating that they would follow the CDC recommendations to test every API patient for HBV. General community: grassroots community organizing, outdoor advertising on billboards, taxi tops, train stations, and bus panels and shelters, and advertising and news coverage in major mass-media covering the general and Asian print, radio, television, and internet markets. Health services: Hospital and clinic-affiliated testing and vaccination sites were funded, staffed, and managed by their independent institutions. Seven standalone public sites providing free hepatitis B testing and low-cost vaccination. Sites were manned by bilingual hospital/clinic staff and trained volunteers. Outcome: HBV testing. | 3,315 API people tested. From laboratory monitoring: this represented a 4% increase in pre-intervention year for HBsAg and 3% increase for anti-HBs. In second year of intervention, testing rates were up 8% and 17%, respectively in relation to pre-intervention year. |</p>
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<td>Zuure et al., (2011) [16], Netherlands III</td>
<td>Evaluation with process monitoring (no control; no pre-intervention measure)</td>
<td>Individuals in HCV risk groups</td>
<td>Intervention: a limited, regional mass media campaign (e.g., with regional TV commercials, advertisements, and online banners) aiming to motivate individuals to assess their risk for HCV using the project’s website and then to be tested. Website: previously validated risk-assessment questionnaire, with downloadable referral for a free, anonymous HCV blood test in a nonclinical setting. Results were available online. Anti-HCV-positive participants were requested to visit the Public Health Service for confirmation and RNA testing. Chronically HCV-infected individuals were referred for treatment.</td>
<td>The website attracted 40,902 visitors. Of the 9,653 who completed the questionnaire, 2,553 were at risk for HCV (26.4%). Of the 1,480 eligible for the blood test, 420 opted for testing (28%). HCV antibodies were detected in 3.6%; of the 12 with a chronic HCV infection, six began treatment.</td>
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