

Enhancing Assessment and Treatment of Hepatitis C in the Custodial Setting

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Acute and chronic hepatitis C (HCV) infections are prevalent in custodial settings worldwide, yet provision of antiviral therapies is uncommon. This disparity between the burden of disease and hepatitis service delivery reflects the marginalized patient population, which features high rates of injection drug use and poor mental health. In addition, the prison environment is intended for deprivation of liberty and not healthcare. Screening for HCV infections is provided in most jurisdictions, but uptake rates remain low. Assessment and treatment of inmates is often provided only by community-based services. Despite these challenges, assessment and treatment of inmates with chronic HCV via prison-based services has been shown to be feasible and effective. These services offer the potential to substantively increase HCV treatment uptake and reduce the burden of disease for the community at large. Improvements in the efficacy of HCV therapies via direct-acting antivirals, which also offer reduced treatment duration and decreased toxicities, mean that prison health services will be well placed for the treatment of large numbers of people with HCV who do not access health services in the community.

Keywords. hepatitis C; health assessment; health infrastructure; antiviral treatment; correctional centers.

More than 10.1 million people are imprisoned worldwide, including 2.3 million in the United States [1], which has the highest custodial population rate in the world (743 per 100 000 compared with a mean of 146 per 100 000 worldwide). Custodial populations are growing in all 5 continents, and rose by >1 million from the late 1990s to 2006–2008 [2].

THE HEALTH OF PRISONERS

This review utilizes the term *prisons* to inclusively refer to all places used for the confinement of individuals in lawful detention, especially those convicted of crimes, noting that in the United States the alternative term *jails* is also used to refer to detention centers for those on remand and for those with sentences <1 year.

Prisoners bear a substantially greater burden of both physical and psychiatric disease relative to the general population [2]. This health disparity has been attributed to both behavioral and socioeconomic factors, including high rates of substance abuse and poor mental health, as well as low literacy and substandard health-care utilization. Ethnic minorities are also typically overrepresented in prisons [3]. A review of prison reception studies noted that 17%–30% of men and 10%–24% of women were diagnosed with alcohol abuse or dependence, and 10%–48% of men and 30%–60% of women misused or were dependent on illegal drugs upon incarceration [4]. A significant minority of prisoners also suffer from mental illness. A systematic review of 62 surveys encompassing 23 000 prisoners found pooled prevalence rates of 10% for major depression in men and 12% in women, 4% for psychotic disorder, and 47% and 21% for antisocial personality disorder in men and women, respectively [5]. Several infectious diseases are more common in prisoners than in the general population in many countries, including human immunodeficiency virus (HIV), hepatitis B and C [6], and tuberculosis [7]. These high rates appear to

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Clinical Infectious Diseases 2013;57(S2):S70–4

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DOI: 10.1093/cid/cit265

reflect both the behavioral and socioeconomic characteristics of those imprisoned and transmission within prisons [2, 8]. While in prison, inmates have higher mortality rates by suicide [9], but lower overall mortality [10], which is likely to reflect decreases in behavioral and social risk factors such as injection drug use and violence, or better access to healthcare than in the community [2].

THE PRISON ENVIRONMENT

The primary purpose of imprisonment is to punish the individual by deprivation of liberty, and thereby remove criminals from mainstream society. It is clear, however, that imprisonment is effectively “double punishment” in that it not only deprives offenders of their liberty, but also causes significant risk of psychological and physical harm [11]. Individual prisons and jurisdictions vary enormously in terms of architecture and ethos, and their resident populations are also heterogeneous in demographic characteristics, security status, and length of stay. Nevertheless, prisons generally feature overcrowding, exposure to violence and illicit drugs, lack of purposeful activity, separation from family networks, and emotional deprivation.

Although the prevailing notion in the general community is that prisoners are generally incarcerated for long periods, the average length of stay across all prison types is typically only weeks to months [2, 12].

As prison populations have continued to grow, prison healthcare services have become increasingly complex. The United Nations Basic Principles for the Treatment of Prisoners states that prisoners “shall have access to the health services available in the country without discrimination on the grounds of their legal situation” [13]. Despite this mandate, the scope and quality of healthcare delivery within prisons varies substantially by region. Jurisdictions in which healthcare is delivered under the auspices of correctional authorities face the essentially intrinsic conflict between custodial and healthcare priorities, whereas settings where healthcare is delivered by separate health agencies face the challenge of dealing with dual bureaucracies [2]. In some prison systems, academic medical centers play an important role in healthcare delivery, with evidence of improved outcomes [14].

HEPATITIS C IN PRISONS

Hepatitis C (HCV) infection is arguably the premier communicable disease priority in correctional settings [15], due to the close nexus between illicit drug use, HCV infection, and imprisonment. Injection drug users (IDUs) have high rates of imprisonment predominantly due to the criminal nature of illicit drug use and the tendency to fund drug use through crime. Accordingly, imprisonment is an independent risk factor for HCV infection in community-based IDUs [16].

The prevalence of HCV infection among prison inmates is generally 30%–40% [2], which is much higher than that in the general population. A meta-analysis of 30 studies in different countries showed a clear association between the prevalence of HCV infection in prisoners and the history of injection drug use, and also with female sex and tattooing [17].

Prospective studies of incident HCV infection among continuously incarcerated IDUs have generally been limited in follow-up [18–20]. However, a Scottish prison study identified 5 incident cases among 302 inmates, which gave rise to a transmission estimate of 11.9 per 100 person years among IDU inmates [21]. An Australian study of 253 HCV seronegative IDU inmates, of whom 120 were continuously imprisoned, revealed that although the frequency of injection drug use was reduced upon imprisonment, one-third continued to inject drugs, 90% of whom reported sharing injecting equipment. In this study, there were 16 individuals who acquired HCV infection indicating an incidence of 34.2 per 100 person-years, with comparable rates in those continuously incarcerated and those released and reimprisoned [22, 23].

HEPATITIS C SCREENING AND ASSESSMENT

The key milestones in the clinical pathway to successful delivery of antiviral therapy for chronic HCV include (1) screening for HCV antibodies and viremia to detect cases; (2) clinical and laboratory assessments with a view to therapy; (3) specialist assessment and prescription of antiviral medications; (4) initiation of treatment and monitoring for response and adverse effects on treatment; and (5) monitoring posttreatment for sustained virologic response (SVR). Achievement of each of these milestones in the prison setting is associated with both significant challenges and potential solutions (Supplementary Table 1).

Several surveys to assess the availability and uptake of prison-based screening and treatment services for HCV have been completed, including in the United States, Europe, and Australia [24–29]. These studies report that screening is generally available, treatment is offered to a small minority, and standardized protocols are rare. For instance, US data indicate that 49 states have at least 1 prison that tests inmates, whereas only 10 states offered routine testing in all facilities [24]. A 2008 Swiss study with a response rate of 41% among the custodial institutions surveyed revealed that almost all offered serological testing, predominantly at the request of the inmate, and the majority (85%) also offered antiviral therapy [26]. Targeted screening of IDUs on reception into prison has been shown to be a cost-effective surveillance strategy [30].

Multiple barriers in access and uptake of screening for HCV in prisoners have been identified. A qualitative study in the United Kingdom described several barriers to HCV screening, such as a lack of proactive approaches to offering testing, prisoner

fears and lack of knowledge about HCV infection, concerns about confidentiality and stigma, and lack of continuity of care in the event of transfer or release [31]. A survey of 946 prisoners in Western Australia revealed that completion of blood-borne virus screening was significantly associated with older age and male sex [27]. Another UK study from a single facility with a 12% routine screening uptake rate and a low yield of detection of chronic infection (7/1000 tested), led to recommendations for: a standard (targeted) HCV screening protocol across all prisons; building capacity to reduce waiting times so that inmates could be reviewed before transfer or release; and improved information systems to avoid repetition with community providers and to allow quality assurance and research [32].

One potential solution for improved screening rates via introduction of dried blood spot testing has been formally evaluated in a cluster randomized trial in 22 specialist drug clinics and 6 prisons in England and Wales [33]. Before the trial, 8% of subjects at control and intervention sites had been tested for HCV. During the trial, 791 subjects were tested for HCV including 529 (67%) using dried blood spot, which was an increase of 12.2% in those sites in comparison to the 6 months prior to the trial. By contrast, in the control sites, there was a small decline (−2.3%) in testing rates. The average difference in the proportion of patients tested between intervention and control sites (14.5%) was significant. Although point-of-care tests have not yet been evaluated in the prison setting for routine clinical use, they may be particularly useful in situations where the patient's prison sentence duration is unknown or prison transfers are frequent, as results with high sensitivity and specificity can be obtained rapidly [34].

The laboratory assessments with a view to antiviral therapy typically include multiple blood tests (eg, screening for HIV and hepatitis B virus coinfections, assessment of hepatic synthetic function with liver function tests, platelet count, and prothrombin time, HCV RNA and genotype, and testing for other causes of chronic liver disease) and hence the need for ready access to diagnostic pathology services. In addition, imaging (eg, via upper abdominal ultrasound) and/or fibro-elastography are typically undertaken, necessitating access to such specialized services. In the innovative nurse-led model of HCV assessment and treatment developed by the authors (A.R.L., J.J.P.) [35], the timelines for completion of this laboratory workup milestone in 217 subjects averaged 58 days, with a further mean of 67 days from workup completion to specialist review (largely by telemedicine), and a mean of 54 days from specialist review to antiviral treatment initiation. These data highlight the fact that even in a protocol-driven context, completion of the clinical pathway to treatment initiation typically spans 5–6 months, which is longer than the average length of imprisonment in many jurisdictions.

Given high incidence rates of HCV infection in the prison setting [21, 23], and the high response rates to early treatment [36],

a US-based team has evaluated strategies for identification of the often asymptomatic acute HCV infection among inmate IDUs based on risk factors [37]. Of 3470 inmates screened, 171 (4.9%) were classified as high risk, and 35 (20.5%) were ultimately diagnosed with acute HCV. This finding argues for targeted screening of high-risk individuals in the prison setting—for both acute and chronic HCV infection.

TREATMENT OF HCV

The outcomes of interferon (IFN)-based HCV treatment regimens for incarcerated populations are comparable to those in the community setting, with reported SVR rates ranging between 36% and 69% in studies with standard and pegylated (peg)-IFN in combination with ribavirin (RBV) [28, 35, 38–44]. These studies are mostly retrospective and typically include relatively small numbers of carefully selected patients, with detailed psychiatric screening and adequate sentence lengths to complete treatment while in prison. This careful selection may explain the excellent SVR rates in some studies.

By contrast, there are also some studies with lower documented SVR rates. For example, one study of peg-IFN and RBV treatment with a reported SVR rate of only 20.5% had a high dropout rate (18/39 patients) during the first 3 months associated with unseasonably hot weather (mean summer seasonal temperature of 26.2°C) and Christmas and Easter holiday periods with incomplete medical and nursing “coverage” [45]. A further likely factor was the high proportion of subjects (37%) undergoing retreatment after previous standard IFN and RBV treatment. Another study with a SVR rate of 28% had a substantial loss to follow up (5/33 patients), frequent inmate movements, and unforeseen release from custody [46]. In combination, these reports indicate that the outcomes of antiviral treatment of prisoners are comparable with community standards. However, the literature also illustrates the importance of close patient follow-up and support, as well as the need for improved systems to ensure continuity of care.

There are very few health service evaluation studies specifically seeking to improve the management of HCV in prison. One such study is the Extension for Community Healthcare Outcomes model in which primary care providers in New Mexico (United States) and specialist hepatitis clinicians were connected by teleconferencing, videoconferencing, and e-mail communications. The protocol included frequent case conferences to enhance learning among the primary care clinicians. Although the predominant focus was primary care facilities in the community, the study included 5 prisons. The overall outcomes included similar treatment response rates to a comparator university clinic site [47]. This model demonstrated that the relative lack of specialist clinicians in settings such as prisons can be overcome by telemedicine.

The alternative nurse-led model of care model developed by the authors (A.R.L., J.J.P.) also aimed to overcome a relative lack of specialist providers in comparison to the large affected population in Australian prisons [35]. This model involves substantial task transfer from specialist physicians to trained nurses who assess the patients clinically by completion of a standardized proforma that includes a targeted medical history, as well as physical examination and mental health assessment, and also perform protocol-driven investigations and a fibro-elastography to stage hepatic fibrosis. After these assessments, the nurses triage the cases according to the anticipated risk of adverse events while on treatment. Low-risk subjects are discussed in teleconference with a specialist physician before treatment prescription without seeing the patient. Medium-risk cases participate in a telemedicine consultation with the physician, and high-risk cases (ie, significant medical or psychiatric comorbidities) are transferred for in-person assessment. In the 2-year study, 108 patients were treated, including 85 (79%) triaged for specialist review conducted by telemedicine only. Antiviral treatment delivery was demonstrated to be both safe (7% treatment discontinuations, 12% serious adverse events) and efficacious (69% SVR for those with completed datasets and 44% by intention-to-treat analysis).

In all reported studies, loss to follow-up upon release from custody is a significant barrier that needs to be overcome in the treatment of inmates with HCV infection. Former inmates report many challenges after release from custody that may reduce the likelihood of treatment continuation and success [48]. These include long waiting times to be screened for indigent care services, difficulty obtaining medications after being released, lack of health insurance, and lack of awareness as to where and how to access care. This study suggested that the creation of drug-free transitional environments and the provision of safe as well as drug- and alcohol-free housing may facilitate the transfer of care from prisons to community health settings.

In New York state, a program aiming to ensure continuity of care in HCV treatment for prisoners upon release to the community has been developed, although the outcomes have not yet been reported [49]. In New South Wales, Australia, the Connections Program allocates a case worker to inmates who are being released to freedom who have complex drug and alcohol and healthcare needs in order to support the transition into the community. A review of 941 participants in this program in 2009–2010 revealed that 74% of inmates needing ongoing medical treatment and 60% needing ongoing mental healthcare maintained uninterrupted treatment upon release [50].

Several groups have argued that correctional institutions are an important setting for clinical and public health interventions—both to improve the health of inmates, but also to benefit the community at large [2]. These include prevention of hepatitis B amongst IDUs via immunization while in prison [51], as well as

diagnosis and treatment of HCV infection [24, 52]. The ability to facilitate both screening and comprehensive assessment for treatment and to closely monitor adverse effects and adherence to treatment, as well as the availability of substance use treatment, are all improved in the prison setting. Improvements in the efficacy of direct-acting antiviral therapies [53], and the potential for reduced treatment duration, without the medical and psychiatric toxicities of IFN mean that prison-based treatment programs may offer substantial capacity for treatment of people with chronic HCV, as a period of incarceration may be the only time that many individuals intersect with the healthcare system.

Supplementary Data

Supplementary materials are available at *Clinical Infectious Diseases* online (<http://cid.oxfordjournals.org/>). Supplementary materials consist of data provided by the author that are published to benefit the reader. The posted materials are not copyedited. The contents of all supplementary data are the sole responsibility of the authors. Questions or messages regarding errors should be addressed to the author.

Notes

Financial support. A. R. L. is supported by a Practitioner Fellowship from the National Health and Medical Research Council of Australia (No. 1043067).

Supplement sponsorship. This article was published as part of a supplement entitled “Prevention and Management of Hepatitis C Virus Among People Who Inject Drugs: Moving the Agenda Forward,” sponsored by an unrestricted grant from the International Network on Hepatitis in Substance Users (INHSU), The Kirby Institute (University of New South Wales), Abbvie, Gilead Sciences, Janssen-Cilag, and Merck.

Potential conflicts of interest. All authors: No reported conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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