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History of detention and the risk of hepatitis C among people who inject drugs in Germany

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ABSTRACT

Objectives: The aim of this study was to investigate the association between detention experience and hepatitis C virus (HCV) status, the role of duration and frequency of detention, and whether risk behaviours practiced in detention could explain an observed increase in risk.
Methods: Current drug injectors (injecting in the last 12 months) were recruited to participate in a sero-behavioural, cross-sectional survey using respondent-driven sampling in eight German cities during the years 2011–2014. Using multivariable logistic regression, the association between HCV status and reported detention experience was investigated.
Results: A total of 1998 participants were included in the analysis. Of these, 19.9% reported no detention experience, 28.6% short and rare experience (≤3.5 years in total, ≤3 times), 12.1% short but frequent experience, 7.1% long but rare experience, and 32.4% long and frequent experience. After correcting for HCV risk factors, the association between detention experience and HCV status remained statistically significant. By adjusting the model for intramural risk behaviours, the odds ratios of detention experience were reduced but remained significant.
Conclusions: The proportion of people who inject drugs positive for HCV increased with both frequency and duration of their detention experience. As intramural risk behaviours could not fully explain this increase, it appears that transfers between community and custody may confer additional risks.

Introduction

Hepatitis C (HCV) is a viral, blood-borne infection that becomes chronic in eight out of 10 cases, with the development of liver cirrhosis or liver cancer as possible long-term consequences (Te and Jensen, 2010). The use of contaminated injection equipment is an important mode of transmission, making the group of people who inject drugs (PWID) particularly vulnerable to HCV. In most countries, this group is disproportionately affected by the infection, and the global HCV prevalence among PWID has recently been estimated to be 52% (Degenhardt et al., 2016).

Prison experience is common among PWID, due to both drug-related crime and to acquisitive offending (Pierce et al., 2017). Individuals with a history of injecting drug use are overrepresented in prison populations across Europe and other developed countries (EMCDDA, 2012; Australian Institute of Health and Welfare, 2013). In Germany, it is estimated that 22–30% of sentenced inmates have a history of injecting drug use (Schulte et al., 2009; Eckert, 2008).

Despite prisons being highly controlled settings, drugs frequently find their way inside, making it possible for incarcerated PWID to continue their drug use. In the only existing, representative study of the German prison population from 2007, 33% of PWID reported injecting in prison (Eckert, 2008). Similar rates have been found in countries like Australia, Denmark, and Greece;

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however, the lifetime prevalence of injecting in prison has been reported at significantly higher rates (Dolan et al., 2010; Snow et al., 2014; Luciani et al., 2014; Christensen et al., 2000; Malliori et al., 1998). To a certain extent, prisons also serve as a place where injecting drug use is initiated (Eckert, 2008; Taylor et al., 1995; Butler et al., 2004).

Access to sterile injecting equipment, on the other hand, is very limited, as clean needles, syringes, and other injecting paraphernalia are rarely available. Despite the recommendations of the United Nations Office on Drugs and Crime and the World Health Organization to provide needle exchange programmes (NSP) for inmates, merely eight countries worldwide offered NSP in at least one prison in 2016 (Harm Reduction International, 2016; UNODC/ILO/UNDP/WHO/UNAIDS, 2013). To date, NSP is available in only one (female) prison in Germany. Difficulties accessing sterile injecting equipment lead to increased unsafe use, as the equipment must frequently be shared between inmates (Dolan et al., 2010; Luciani et al., 2014; Malliori et al., 1998; Taylor et al., 1995; Schäffler, 2012; O'Sullivan et al., 2003; Haber et al., 1999). In a paper on behavioural change amongst drug injectors in Scottish prisons, Shewan et al. described how the number of PWID sharing injecting equipment went up from 24% prior to imprisonment to 76% during imprisonment (Shewan et al., 1994).

At the same time, prison populations, especially those with a history of injecting drug use, often have a high prevalence of HCV. A meta-analysis of detained populations from 2013 estimated that two-thirds of detainees with a history of drug injection were positive for HCV antibodies (Larney et al., 2013). High HCV prevalence and multiple sharing among prisoners thus result in a high risk of infection. The same meta-analysis estimated the incidence rate among prisoners with a history of drug injection to be 16.4 per 100 person-years (Larney et al., 2013). The results of another meta-analysis by Stone et al. also suggest that recent incarceration among PWID is associated with a substantial increase in HCV acquisition risk (Stone et al., 2018).

Studies of PWID in the community have found previous imprisonment, multiple imprisonments, and the duration of imprisonment all to be associated with HCV infection; however, only one of these aspects is usually considered at a time (Macalino et al., 2016). Less is known about how the frequency and the duration of imprisonment each affect the risk of HCV. Thus, using data from a large sero-behavioural survey of PWID in Germany, this analysis was performed with the aim of investigating (1) the association between detention experience and HCV status, (2) the role of the duration and frequency of detention, and (3) whether risk behaviour practiced in detention could explain the observed increase in risk.

Methods

Participants and methods

A multicenter sero-behavioural survey was conducted in eight German cities between 2011 and 2014. Participants were recruited using respondent-driven sampling over a period of 8–10 weeks in each city. Study participation was reimbursed with €10 and another €5 for each successful peer-recruitment, with a maximum of three recruitments. Eligibility criteria for study inclusion were injecting drug use in the past 12 months, drug consumption in the surveyed city, and a minimum age of 16 years. All participants were asked to provide informed consent before being enrolled into the study.

Enrolled participants were interviewed face-to-face about their demographic characteristics, drugs used, injecting behaviour, sexual behaviour, detention experience, history of HIV, hepatitis B virus (HBV), and HCV testing, health status, and knowledge related to HIV, hepatitis B, and hepatitis C. An interview typically lasted 30–45 minutes. Each participant was also asked to provide a capillary blood sample on filter paper (i.e., dried blood spots), which was sent to the laboratory for analysis of serological and molecular markers for HBV, HCV, and HIV. If desired, participants could later pick up their test results. Ethical approval for the study was granted by the ethics committee of the Charité University of Medicine, Berlin.

A detailed description of the study protocol has been published elsewhere (Zimmermann et al., 2014).

Measures

The outcome variable used in this analysis was HCV status (negative/positive). A positive HCV status was defined as testing positive for antibodies, RNA, or both. Subsequently a negative HCV status was defined as having a negative result with both tests. Test results for both HCV antibodies and HCV RNA were available for all participants. The variable of interest in this analysis was detention experience. Having detention experience was defined as having ever been at least once in any of the following: juvenile arrest/prison, pre-trial custody, prison, forensic commitment (i.e., detention in a clinic for forensic psychiatric care, following a criminal conviction). Due to the way the data were collected, it was not possible to consider the various forms of detention separately. The variable was divided into five categories: none, short and rare, short but frequent, long but rare, and long and frequent. The duration (short vs. long) contained in the variable of interest was defined as the total duration of all detentions, where short was up to 42 months (3.5 years) and long was 43 months or longer. The frequency (rare vs. frequent) contained in the variable of interest was defined as the sum of all detentions, where rare was three times or less and frequent was four times or more. The two cut-off values were based on the median total detention duration and median detention frequency.

Risk factors for HCV previously described in the literature were identified in the dataset and those considered as possible confounders of the relationship between detention experience and HCV status were selected for analysis. The following variables were selected: age (<25 years, 25–39 years, ≥40 years), sex (male, female), region of birth (Germany, Western Europe, Central Europe, Former Soviet Union, Middle East, other), ever having been homeless (no, yes), duration of injecting drug use (≤2 years, 3–10 years, >10 years), typical number of injections on an average injection day (1, 2–4, ≥5), and ever had a non-professional tattoo/piercing while not in detention (no, yes). Known in-detention risk behaviours for HCV infection were also identified and those for which data were available were selected for the last step of the analysis: ever injected drugs in detention (no, yes), ever had a non-professional tattoo/piercing while in detention (no, yes).

If a question was answered with either "I don't remember" or "I don't want to answer", the response was re-coded as missing. Participants with incomplete data on detention experience and those in the stage of seroconversion (HCV antibody-negative, HCV RNA-positive) with last detention experience more than 12 months ago were excluded from the analysis.

Data analysis

A descriptive analysis was performed, generating counts and frequencies for all variables, as well as calculating the HCV seroprevalence for each variable category. To investigate the univariable associations between HCV status and each of the variables, logistic regression was used, reporting the odds ratio (OR) and 95% confidence interval (CI). As a next step, a multivariable model was built using stepwise forward selection.

The initial model included detention experience (the variable of interest), as well as age, sex, and study site. These variables were locked into the model throughout the selection procedure, regardless of their significance. The remaining variables were added in order of significance from the univariable analysis ($p < 0.2$). The model improvement was tested using the likelihood ratio test ($p < 0.05$). A backward stepwise elimination was also performed with the same set of variables. The same variables were locked in as in the forward selection and the 'p-value to remove' was set at 0.2. Upon completing the variable selection for the multivariable model, interactions considered meaningful a priori between detention experience and selected confounders were examined. The interaction terms were added to the multivariable model one by one, checking for significant improvement using the likelihood ratio test ($p < 0.05$). As a final step, the in-detention risk behaviour variables were added to the model in order to examine how this affected the effect of detention experience.

Missing data were excluded when calculating percentages, and list-wise deletion was applied in all logistic regression analyses described. All statistical analyses were performed using Stata version 13.1 for Windows (StataCorp LP).

Results

A total of 2077 participants were recruited for the study. Of these, 63 (3.0%) had incomplete data on detention experience and 16 (0.8%) were in the stage of HCV seroconversion with last reported detention experience more than 12 months ago and were thus excluded, resulting in a study sample of 1998 participants. Data were missing for 0.10–1.05% of observations, with the exception of the variable 'typical number of injections on an average injection day' for which data were missing for 4.7%. Of the individuals included in the analysis, 6.6% were younger than 25 years of age, 76.3% were male, and 22.2% were born outside of Germany (Table 1). The most common substances consumed in the last 30 days were heroin (74.7%), benzodiazepines (49.4%), and cocaine (48.4%). The majority (70.9%) reported more than 10 years of injecting drug use, most commonly injecting 2–4 times on an average injecting day (55.6%).

One fifth (19.9%) of the participants reported not having any detention experience, while 32.4% reported long and frequent and 28.6% short and rare detention experience. Short but frequent and long but rare detention experience were less common (12.1% and 7.1%, respectively). Four hundred and seventy participants reported ever having injected drugs while in detention, corresponding to 23.6% of the entire sample and to 29.4% of those reporting detention experience. The proportion of participants who had ever had a non-professional tattoo/piercing while in detention corresponded to 26.5% of the entire sample and to 32.9% of those ever detained. The proportion of participants reporting these risk factors increased significantly with both total duration and frequency of detention (Table 2). The overall HCV seroprevalence in the sample was 64.7%.

HCV seroprevalence increased along with the duration and frequency of detention experience, from 48.6% among those with no experience to 79.1% among those with long and frequent experience (Table 3). In the univariable analysis, all types of detention experience were significantly associated with HCV seropositivity: OR 1.35 (95% CI 1.04–1.74) for short and rare experience, OR 2.09 (95% CI 1.50–2.91) for short but frequent experience, OR 3.36 (95% CI 2.18–5.18) for long but rare experience, and OR 4.01 (95% CI 3.05–5.27) for participants

Table 1
Distribution of characteristics and behaviours of the study population.

Characteristic or behaviour ($N = 1998$)		n (%)
Age (years)	<25	132 (6.6)
	25–39	986 (49.4)
	≥40	878 (44.0)
Sex	Male	1523 (76.3)
	Female	472 (23.7)
HCV status	Negative	705 (35.3)
	Positive	1293 (64.7)
Detention experience	None	397 (19.9)
	Short and rare	571 (28.6)
	Short but frequent	241 (12.1)
	Long but rare	142 (7.1)
	Long and frequent	647 (32.4)
Region of birth	Germany	1553 (77.9)
	Western Europe	67 (3.4)
	Central Europe	80 (4.0)
	Former Soviet Union	203 (10.2)
	Middle East	73 (3.7)
	Other	18 (0.9)
Ever homeless	No	682 (34.2)
	Yes	1310 (65.8)
Duration of injecting drug use (years)	≤2	112 (5.7)
	3–10	466 (23.5)
	>10	1405 (70.9)
Typical number of injections on an average injecting day	1	446 (23.4)
	2–4	1059 (55.6)
	≥5	399 (21.0)
Ever had non-professional tattoo/piercing while not in detention	No	1473 (74.5)
	Yes	504 (25.5)
In-detention risk behaviour ($N = 1998$)		
Ever injected drugs in detention	No[a]	1525 (76.4)
	Yes	470 (23.6)
Ever had non-professional tattoo/piercing while in detention	No[a]	1454 (73.6)
	Yes	523 (26.5)

HCV, hepatitis C virus.
[a] Category also includes never detained individuals.

Table 2
Frequency of in-detention risk behaviours by type of detention experience.

	Ever injected drugs in detention			Ever had non-professional tattoo/piercing while in detention		
	No, *n* (%)	Yes, *n* (%)	*p*-Value[a]	No, *n* (%)	Yes, *n* (%)	*p*-Value[a]
Detention experience						
Short and rare	507 (89.3)	61 (10.7)	0.000	501 (88.7)	64 (11.3)	0.000
Short but frequent	191 (79.3)	50 (20.8)		188 (78.3)	52 (21.7)	
Long but rare	92 (64.8)	50 (35.2)		87 (61.3)	55 (38.7)	
Long and frequent	338 (52.2)	309 (47.8)		292 (45.3)	352 (54.7)	

[a] Chi-square test.

Table 3
HCV seroprevalence by risk factor—univariable associations.

Characteristic or behaviour (*N* = 1998)		HCV seropositive *n* (%)	OR	95% CI
Detention experience	None	193 (48.6)	Reference	
	Short and rare	320 (56.0)	1.35	1.04–1.74
	Short but frequent	160 (66.4)	2.09	1.50–2.91
	Long but rare	108 (76.1)	3.36	2.18–5.18
	Long and frequent	512 (79.1)	4.01	3.05–5.27
Age (years)	<25	46 (34.9)	Reference	
	25–39	609 (61.8)	3.02	2.06–4.42
	≥40	637 (72.6)	4.94	3.35–7.28
Sex	Male	982 (64.5)	Reference	
	Female	309 (65.5)	1.04	0.84–1.30
Region of birth	Germany	1004 (64.7)	Reference	
	Western Europe	48 (71.6)	1.38	0.80–2.37
	Central Europe	42 (52.5)	0.60	0.38–0.95
	Former Soviet Union	150 (73.9)	1.55	1.11–2.15
	Middle East	41 (56.2)	0.70	0.44–1.13
	Other	7 (38.9)	0.35	0.13–0.90
Ever homeless	No	415 (60.9)	Reference	
	Yes	873 (66.6)	1.29	1.06–1.56
Duration of injecting drug use (years)	≤2	30 (26.8)	Reference	
	3–10	243 (52.2)	2.98	1.89–4.70
	>10	1015 (72.2)	7.11	4.61–10.98
Typical number of injections on an average injecting day	1	243 (54.5)	Reference	
	2–4	710 (67.0)	1.70	1.36–2.13
	≥5	290 (72.7)	2.22	1.67–2.97
Ever had non-professional tattoo/piercing while not in detention	No	941 (63.9)	Reference	
	Yes	342 (67.9)	1.19	0.96–1.48
In-detention risk behaviour (*N* = 1998)				
Ever injected drugs in detention	No[a]	905 (59.3)	Reference	
	Yes	387 (82.3)	3.19	2.47–4.14
Ever had non-professional tattoo/piercing while in detention	No[a]	885 (60.9)	Reference	
	Yes	398 (76.1)	2.05	1.63–2.57

HCV, hepatitis C virus; OR, odds ratio; CI, confidence interval.
[a] Category also includes never detained individuals.

with long and frequent detention experience, compared to those with none. Other factors significantly associated with a positive HCV status in the univariable analysis were age, region of birth, ever being homeless, duration of injecting drug use, number of injections on an average injecting day, and ever having had a non-professional tattoo/piercing while not in detention. The two risk behaviours specific to the detention setting were also significantly associated with a positive HCV status: ever injected drugs in detention with OR 3.19 (95% CI 2.47–4.14) and ever had a non-professional tattoo/piercing while in detention with OR 2.05 (95% CI 1.63–2.57).

In the multivariable analysis, both selection procedures rendered the same model. Variables included in the final model to correct for confounding effects on the association between detention experience and HCV status were age, sex, region of birth, duration of injecting drug use, typical number of injections on an average injecting day, and having ever had a non-professional tattoo/piercing while not in detention (see Table 4). None of the tested interaction terms improved the model significantly. Correcting for these variables and study site did not lead to a loss of significance of detention experience, which remained associated with an increased risk of HCV with the following odds ratios: OR 1.39 (95% CI 1.04–1.86) for short and rare experience, OR 2.08 (95% CI 1.43–3.02) for short but frequent experience, OR 3.32 (95% CI 2.04–5.37) for long but rare experience, and OR 3.80 (95% CI 2.73–5.28) for participants with long and frequent detention experience, compared to those with none.

Adding the in-detention risk behaviours to the model, which are known to mediate the relationship between detention experience and HCV status as they are part of the causal pathway, decreased the ORs of detention experience but did not lead to a loss of significance. The ORs of detention experience in the model including the in-detention risk behaviours were as follows: OR 1.31 (95% CI 0.97–1.76) for short and rare experience, OR 1.83 (95% CI 1.25–2.67) for short but frequent experience, OR 2.68 (95% CI 1.62–4.42) for long but rare experience, and OR 2.80 (95% CI 1.92–4.09) for long and frequent detention experience, compared to those with none.

Table 4
Multivariable models excluding and including variables of in-detention risk behaviours.

Characteristic or behaviour		Model excluding in-detention risk behaviours[a]		Model including in-detention risk behaviours[a]	
		OR	95% CI	OR	95% CI
Detention experience	None	Reference		Reference	
	Short and rare	1.39	1.04–1.86	1.31	0.97–1.76
	Short but frequent	2.08	1.43–3.02	1.83	1.25–2.67
	Long but rare	3.32	2.04–5.37	2.68	1.62–4.42
	Long and frequent	3.80	2.73–5.28	2.80	1.92–4.09
Age (years)	<25	Reference		Reference	
	25–39	1.48	0.94–2.34	1.54	0.97–2.45
	≥40	1.98	1.20–3.28	2.01	1.21–3.33
Sex	Male	Reference		Reference	
	Female	1.75	1.34–2.28	1.75	1.34–2.28
Region of birth	Germany	Reference		Reference	
	Western Europe	2.23	1.18–4.22	2.27	1.20–4.29
	Central Europe	0.84	0.50–1.40	0.81	0.48–1.35
	Former Soviet Union	2.69	1.82–3.98	2.77	1.86–4.13
	Middle East	0.85	0.49–1.45	0.88	0.51–1.51
	Other	0.31	0.11–0.91	0.31	0.10–0.90
Duration of injecting drug use (years)	≤2	Reference		Reference	
	3–10	3.34	2.00–5.55	3.31	1.99–5.52
	>10	5.01	3.04–8.27	4.76	2.88–7.85
Typical number of injections on an average injecting day	1	Reference		Reference	
	2–4	1.68	1.31–2.16	1.64	1.27–2.11
	≥5	2.36	1.70–3.27	2.25	1.62–3.12
Ever had non-professional tattoo/piercing while not in detention	No	Reference		Reference	
	Yes	1.38	1.07–1.77	1.39	1.08–1.79
In-detention risk behaviour					
Ever injected drugs in detention	No[b]			Reference	
	Yes			1.78	1.30–2.44
Ever had non-professional tattoo/piercing while in detention	No[b]			Reference	
	Yes			1.16	0.86–1.56

OR, odds ratio; CI, confidence interval.
[a] Model adjusted for study site.
[b] Category also includes never detained individuals.

Discussion

Main findings

This analysis found an association between detention experience and HCV exposure in a sample of active injecting drug users. Individuals with longer and more frequent detention experience were more likely to be positive for HCV, suggesting both the duration and the frequency of detention to be relevant aspects for the risk of acquiring this infection. Self-reported in-detention risk behaviours, such as injecting drug use and having a non-professional tattoo or piercing, could only partially explain the higher probability of positive HCV status among those with detention experience.

An important strength of this analysis is that it considered the duration and frequency of detention simultaneously, thus allowing the independent effects of both aspects to be observed. The total time spent in detention was clearly associated with the likelihood of being HCV-positive in this sample. As the time spent in detention increases, so does the probability of having injected drugs or having a non-professional tattoo or piercing done at some point during detention (Koulierakis et al., 2000). Both of these practices are known routes of HCV transmission, and injecting drug use in particular is thought to be the main driver of intramural spread of HCV (Butler et al., 2004; Vescio et al., 2008; Kinner et al., 2012).

Not all detained PWID inject drugs during their detention, but studies have shown that those who do are more likely to share injecting equipment than are PWID in the community (Dolan et al., 2010; Shewan et al., 1994), thereby increasing their risk of HCV infection. In the present study, it was found that the practice of either of these risk behaviours became more likely with increasing detention experience. It was also possible to show that these two behaviours partly explain the detention-associated risk of HCV, supporting the idea of intramural transmission. This finding, together with the increase in risk associated with detention frequency, also suggests that the increased risk of HCV among ever-detainees is not only caused by risk factors inside the detention facilities, but that further risks are contained in the broader process of detention.

This hypothesis is also proposed in a paper by Stone et al., based on a modelling exercise of the impact of incarceration on HCV transmission among PWID in Scotland (Stone et al., 2017). As each detention episode, regardless of duration, entails a transition of the individual from the community into custody and back again, the additional risk may arise from these transitions. A transition in either direction may lead to interruption of opioid substitution therapy (OST) for individuals in treatment, as specific arrangements for treatment continuation are often not in place and OST is not available in all detention facilities in Germany (Schulte et al., 2017). In detention facilities that do offer OST, a short sentence is sometimes applied as an exclusion criterion for OST access (Schulte et al., 2009). Both community- and prison-based OST have been shown to reduce injecting frequency and syringe sharing, whereas a cessation of OST results in relapse and risky behaviour being more likely (Platt et al., 2017; Hedrich et al., 2012). In an Australian prospective cohort study of male heroin users, Dolan et al. found that particularly those serving short prison sentences (<2 months) were likely to drop out of OST, which increased their risk of HCV seroconversion (Dolan et al.,

2005). Additionally, factors such as withdrawal, lack of a social network, and dealing with emotions regarding the recent detention may all possibly make unsafe use during the first period in detention more likely.

The first period upon release may also make risk-taking more likely, as this can be a particularly chaotic time for PWID, with housing and financial arrangements often lacking. In Germany, health care in prison is covered by a separate prison health system, and when released, the transfer of the detainee back into the regular health insurance system should occur seamlessly. However, due to bureaucratic barriers this transfer is often delayed, leaving the newly released individual uninsured and without access to OST and other health care services immediately upon release. In addition, there may also be an aspect of 'celebration' following release, which may include more risky behaviour. A Canadian study observed that individuals recently released from prison reported syringe sharing more frequently than those without recent prison experience (Milloy et al., 2009). Overall, cycling between community and custody may increase the risk of HCV infection through less continuity and more interruptions of OST and access to other harm reduction measures.

Limitations

This study has several limitations. Due to the way the data were collected, it was not possible to analyse the different detention forms separately (juvenile arrest/prison, pre-trial custody, prison, forensic commitment). The effects of frequency and duration may vary between these forms, but it was not possible to account for this in the analysis. Data on access and utilization of OST and other harm reduction services during detention episodes and transition periods were not collected and it was therefore not possible to investigate the effect of these on the risk of acquiring HCV. Data on further intramural risk factors (e.g., sharing of snorting tubes, razors, bloody fights, etc.) were also not collected and could not be corrected for in the second multivariable model. It is also possible that not all participants answered the question on injecting drug use in prison truthfully due to social desirability. Finally, the possibility that individuals with a higher HCV risk behaviour in the community are also more likely to be detained could not be excluded; e.g. with an increasing severity of addiction, both the injection frequency and the likelihood of drug-related crime, in order to support the addiction, may increase.

Conclusions and recommendations

Efforts are needed to improve the prevention of HCV transmission occurring throughout the detention process. Prevention measures such as needle and syringe exchange programmes and evidence-based drug dependence treatment, including OST, are known to reduce the risk of transmission of blood-borne viruses and are broadly used in the community. On the basis of the equivalence of care principle, these effective measures of prevention should also be made available to PWID in all German detention facilities. Further research is needed, particularly in order to better understand the risk increase associated with the transitions between detention and the community. A cohort study of PWID entering a detention facility, including a follow-up period upon release, would improve our understanding of the risks of contracting HCV and other blood-borne viruses that PWID in Germany are potentially exposed to throughout the process of detention, including the period post release. It would also allow the impact of successfully maintained or interrupted OST on the risk of infection to be estimated.

Furthermore, considering the high HCV prevalence observed among the participants with detention experience, detention facilities offer an important opportunity to counsel, test, and treat PWID. Opt-out HCV screening should be offered upon entry and thereafter on a regular basis, with a positive test result leading to treatment while in detention. Appropriate linkage to care upon release must also be provided in order to make sure that the patients can progress through the continuum of care, regardless of whether they are in custody or in the community. Since the introduction of the directly acting antivirals, with their high clearance rates, limited side-effects, and reduced treatment times, this now appears more feasible than ever.

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Ethical approval and consent to participate

Ethical approval was received from the Ethics Committee at the Charité University of Medicine, Berlin (Germany) in May 2011 and with an amendment approved on November 19, 2012 (No EA4/036/11). Although all participants provided written informed consent, no personal data allowing identification of the study participants were collected. The Federal Commissioner for Data Protection and Freedom of Information approved the study protocol on November 29, 2012 (III-401/008#0035).

Conflict of interest

Prof. Dr N. Scherbaum has received honoraria for several activities (advisory boards, lectures, manuscripts) from Abbvie, Medice, Reckitt-Benckiser/Indivior, and Sanofi-Aventis. During the last 3 years he has participated in clinical trials financed by the pharmaceutical industry. Dr Bremer is an unpaid expert on the coordination committee for the implementation of the HIV/STI/hepatitis strategy of the German Government. The remaining authors declare no conflict of interest.

Author contributions

MG performed the analysis and drafted the manuscript. SN and RZ critically reviewed the manuscript draft. RZ and UM designed the study. BW, SN, and MG were scientific coordinators of the study. VB provided expertise and support throughout the study. SR validated laboratory procedures for dried blood spot testing and analysed the samples during the pilot phase of the study in 2011. CTB and NB validated and performed laboratory testing from 2012 onwards. All authors and the DRUCK Study Group approved the final manuscript.

Appendix A.

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