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Short communication

From initiating injecting drug use to regular injecting: Retrospective survival analysis of injecting progression within a sample of people who inject drugs regularly

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ABSTRACT

Background: The initiation of injecting drug use and the commencement of a pattern of regular injecting are key milestones in injecting careers. The progression from initiation to regular injecting is a poorly understood period in these careers.
Methods: Cross-sectional baseline data from a sample of people who inject drugs regularly ($N = 691$), recorded the age at which participants initiated injecting drug use and the age they became regular (at least once per month) injectors. Survival analysis compared the rapidity of progression to regular injecting across sub-groups within the sample using bivariate log-rank testing and multivariable Cox regression.
Results: Half of all participants progressed to regular injecting within 1 year of initiation and by the fourth year post-initiation, 91% had progressed. In bivariate analysis, there were significant differences in equality of hazards by sex ($X^2 = 7.75$, $p < 0.01$), from whom participants learnt to inject ($X^2 = 22.32$, $p < 0.01$) and the drug of injection initiation ($X^2 = 18.36$; $p < 0.01$). In the multivariable Cox model, only initiating injecting with heroin (HR = 1.28; 95% CI: 1.09–1.50) compared with other drugs (predominantly methamphetamine) showed a significantly greater hazard, suggesting a faster progression to regular injecting.
Conclusion: This study showed that among our sample of eventual regular injectors, progression from initiation to regular injecting was rapid. By gaining a greater understanding of the dynamics of this progression, the ability to appropriately target interventions and future research is subsequently informed.

1. Introduction

The natural history of the injecting careers of people who inject drugs (PWID) contains periods of heightened risk and harm (Huo et al., 2006). For example, the period following initiation of injecting drug use has been shown to be a period of heightened risk, with a substantial proportion of blood-borne virus (BBV) infections amongst PWID occurring within the first years after initiation (Bulled and Singer, 2011; Hagan et al., 2008; Maher et al., 2006; Miller et al., 2003; Stoove et al., 2008) As careers progress other risks are heightened, such as the risk of overdose, which has been shown to be highest amongst older, more experienced PWID (Dietze et al., 2006; McGregor et al., 2001). There are, however, considerable individual differences in natural histories; for example, although many PWID initiate injecting in late adolescence or early adulthood (Day et al., 2005; Huo et al., 2006), others initiate when substantially older (Carneiro et al., 1999).

The initiation of injecting drug use and the commencement of a pattern of regular injecting are milestones in injecting careers. Extensive literature examines both initiation (Day et al., 2005; Van Ameijden et al., 1994; Werb et al., 2013) and entrenched injecting drug use (Chitwood et al., 2001; Des Jarlais et al., 2007; Horyniak et al., 2013; Miller et al., 2003), but we could find no studies exploring the temporal characteristics of injecting progression. Lai et al. (2000) showed that the time from first use of heroin to first injection of heroin was a median 11 months for males and 22 months for females, whilst Lee et al. (2012) showed that the average time from first methamphetamine use to regular methamphetamine use was 2 years. However, neither of these studies analysed progression from injecting initiation through to regular injecting.

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Unlike other chronic health problems, the progression of injecting drug use is not well understood (Hickman et al., 2012). The gap highlighted here has implications for the targeting of public health interventions for newly initiated PWID. Improved knowledge of progression would allow risk reduction interventions to be tailored towards the transitional phase between initiation and regular injecting, just as interventions have been designed to prevent the transition from non-injecting to injecting drug use (Werb et al., 2013).

This paper presents an examination of cross-sectional data from a sample of people who inject drugs regularly, to retrospectively examine the rapidity of progression from initiation to regular injecting drug use and how this varies across different sub-groups. Evidence suggests that age (Miller et al., 2006), sex (Martin, 2010), ethnicity (Day et al., 2005), social networks (Day et al., 2005) and the influence of initiators (Bryant and Treloar, 2008) affect the dynamics of injecting initiation. We analysed these and other exposures and their influence upon the rapidity of progression from initiation to regular injecting drug use.

2. Methods

2.1. Recruitment

Baseline data were obtained from the Melbourne injecting drug user cohort study (MIX), which was designed to examine trajectories of injecting drug use. MIX began in Melbourne, Australia in 2008 and is described in detail elsewhere (Horyniak et al., 2013). Our analysis includes the original MIX participants ($N = 688$) along with an additional 69 participants enrolled into the study in 2011 via past involvement in the Networks II cohort (commenced in 2005; Sacks-Davis et al., 2012). Eligibility criteria for the original MIX cohort were being aged between 18 and 30 years and reported injecting of heroin and/or methamphetamine regularly (at least once a month in the previous 6 months). Networks II eligibility criteria were largely identical and both cohorts were similar across key characteristics such as sex (66% male in both samples), mean age (baseline age of 27 in both samples), mean age at first injection (18 in N2, 17 in MIX) and median past-week frequency of injecting (6 in N2, 5 in MIX). The Victorian Department of Health Human Research Ethics Committee and the Monash University Human Research Ethics Committee approved the study.

2.2. Measures

At baseline, participants were asked: "How old were you when you first injected a drug?" and "How old were you when you first started injecting drugs regularly (i.e. at least once a month)?" Responses to these questions were measured in years and recorded as discrete numbers. Though arbitrary, the recruitment criterion and the survey question specifying "at least once a month" align with other Australian research (Butler et al., 2015; Whittaker et al., 2015) that seeks to define an ongoing pattern of behaviour. Also, because MIX recruited "regular" injectors, all participants inherently met the criteria for our outcome of interest (regular injecting) by virtue of their involvement within the cohort.

A variable "time to regular injecting" was created by subtracting the age of initiation from the age of regular injecting. This meant that participants who responded with the same age for both questions received a value of zero for the time to regular injecting variable. In analysis, all time to regular injecting responses were increased by the value of one.

Time-invariant factors—that is, those occurring prior to initiation and could influence the progression to regular injecting—were identified and analysed. We examined sex (male female), country of birth (Australia, other), Indigenous status (Aboriginal & Torres-Strait Islander (ATSI), non-ATSI), age at initiation (<15 years, 15–18 years,>18 years), the drug used at initiation (coded as "heroin" (64%) vs. "other" (32% methamphetamine, 4% other drugs including ecstasy, pharmaceutical stimulants, cocaine, LSD or pharmaceutical opioids)) and non-injecting use of the drug of initiation prior to initiating (yes no).

We also analysed how or from whom participants learnt to inject (possible responses: "don't inject self", "self-taught", "close friends", "partner", "dealer", "acquaintances", "siblings", "parents", "Needles and Syringe Program (NSP) staff", "information pamphlet/other resource"). Due to very small response numbers, the categories of "dealer", "NSP staff" and "information pamphlet" were re-coded into a combined "other" variable ($n = 12$). Methods of learning to inject were not mutually exclusive (participants could choose more than one option). In order to achieve exclusive dichotomy in responses, participants who responded in more than one category ($n = 63$) were excluded from analysis. An additional three participants were excluded due to missing data for key variables, resulting in a final sample of 691 participants.

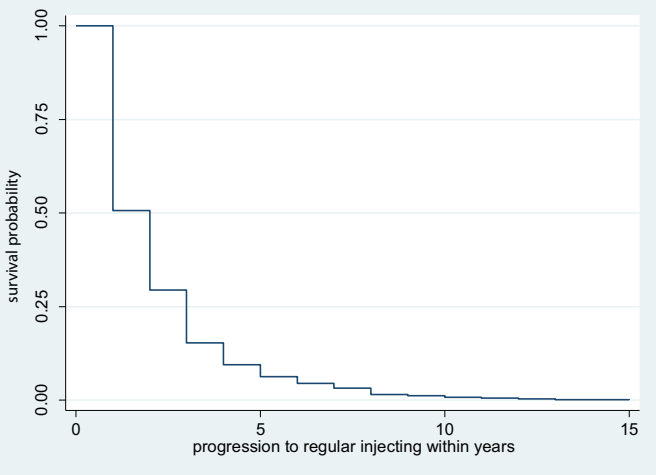

Fig. 1. Kaplan-Meier estimate of survival probability to regular injecting.

2.3. Analysis strategy

Log-rank testing compared bivariate proportional variance in the progression to regular injecting between specified covariates. Multivariable Cox regression was performed to explore the relationships between time to regular injecting and its covariates with sex, age at initiation and Indigenous status (selected due to the significantly younger mean age at initiation of Indigenous participants, t-value(689) = 3.17, $p < 0.01$) retained as potential confounders a priori. Aside from potential confounders, only those variables significant in log-rank testing were included within the multivariable model.

Statistical significance was set at $p < 0.05$. All analyses were carried out using Stata 13.1 for Windows (StataCorp LP, TX, USA).

3. Results

3.1. Demographics

Of the 691 participants included in analysis, 66% were male, 79% Australian-born and 6% identified as Indigenous. Mean age at baseline interview was 27 years.

3.2. Time to regular injecting

The range of reported ages at first injection was 8–30 years (median 17, IQR 15–19). The range of ages at commencement of regular injecting was 10–38 years (median 18, IQR 16–21). The range of time progression to regular injecting was 1–15 years. Half of all participants (49%) progressed to regular injecting within 1 year of initiation. A further 21% had progressed to regular injecting within 2 years of initiation. By the fourth year post-initiation, 91% of the sample reported progressing to regular injecting. Fig. 1 presents the Kaplan-Meier estimate of survival function (the progression to regular injecting) for the sample.

3.3. Survival analysis

In bivariate analysis, there were significant differences in equality of hazards by sex ($X^2 = 7.75$, $p < 0.01$), from whom participants learnt to inject ($X^2 = 22.32$, $p < 0.01$) and the drug of injection initiation ($X^2 = 18.36$; $p < 0.01$). There were no significant differences between age at initiation, country of birth, Indigenous status and the non-injecting use of the drug of initiation prior to initiating.

The variables excluded from the multivariable model due to non-significance in log-rank testing were country of birth and non-injecting drug use. In the final model, only initiating injecting with heroin (HR = 1.28; 95% CI: 1.09–1.50) compared with other drugs (predominantly methamphetamine) showed a significantly greater