

REVIEW

# Preventing and curtailing injecting drug use: a review of opportunities for developing and delivering ‘route transition interventions’

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## Abstract

**Injecting is an important cause of viral and bacterial infection among drug users and is also associated with increased risk of overdose and severe dependence. Even when aggregate numbers of illicit drug users remain constant, significant health and social benefits may be achieved by a reduction in the prevalence and/or frequency of injecting. Yet, to date, little attention has been paid to reducing injecting (rather than drug use) as a policy objective. This paper reviews a range of ‘route transition interventions’ (RTIs) that can be used to reduce injecting and its associated harms. Two points for intervention are distinguished: preventing injecting among existing non-injecting drug users and promoting the transition away from injecting among current injectors. Targets for basic research and programme evaluation are discussed. In particular, it is argued that the time is now right for regional or national case studies that investigate how injecting can be reduced.** [Hunt N, Griffiths P, Southwell M, Stillwell G, Strang J. Preventing and curtailing injecting drug use: a review of opportunities for developing and delivering ‘route transition interventions’. *Drug Alcohol Rev* 1999;18:441–451]

**Key words:** injecting, transitions, harm reduction, route transition interventions (RTIs), prevention.

## Introduction

Since the mid-1980s the HIV epidemic has led to intensive activity to reduce the risks of viral transmission between injecting drug users. During this period, harm reduction interventions that reduce the pro-

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density of injected drug use to transmit viral infections have become a central part of the provision of drug services in much of the developed world [1,2].

Despite the development of harm reduction services, new infections with blood-borne viruses continue. There is evidence that the rate of new HIV infections is generally falling where such services are in place; however, their effects on other problems, notably HCV infection which continues to have a high prevalence and incidence [3–6], is less obvious. As yet, it is uncertain to what extent harm reduction services can be enhanced to reduce the prevalence of HCV infection among injecting drug users.

Although syringe exchange services and injecting hygiene training (e.g. the North American ‘bleach and teach’ approach) seem almost certain to have reduced transmission rates of HIV [7], their potential effect on other problems associated with injecting seems likely to be smaller. For example, injecting is associated with greater dependence [8], increased levels of paranoia, hallucinations and violent behaviour among amphetamine users [9] and a greatly heightened risk of overdose [10]. The various health and social consequences are not necessarily addressed by services which have a primary goal of limiting the rates of viral transmission.

Drug prevention remains high on the international policy agenda [11, 12] despite the paucity of evidence that it can be effectively accomplished. However, this focus largely fails to consider the differential harm that can arise from administering the same drug by different routes. Even within a constant rate of drug use, it is entirely possible for the associated harm to vary, depending on the route of administration. Reducing the proportion of people who inject has the potential to reduce harms at the individual, community and societal level, even when the aggregate number of drug users remains constant. At present, it would be possible for a considerable policy success of a reduction in the rate of injecting to go largely unacknowledged, if the crude levels of drug use remained unchanged.

Nevertheless, awareness of the opportunities and value of achieving a reduction in rates of injecting is growing. ‘Transitions’ research has identified the need for interventions that reduce the number of people who progress from non-injecting drug use towards injecting [13–15]. Furthermore, Strang and colleagues [13] noted the existence of ‘reverse transitions’ in which the change of route of use was away from the more harm-laden injecting. Recently, a growing

number of researchers have identified the potential benefits of such a change and proposed that closer attention be paid to the ways that this can be achieved. Wodak [16] coined the acronym NIROA (non-injecting routes of administration) and has suggested that switching people towards these ‘should be the major focus of national efforts to control hepatitis C and overdose deaths in Australia’. Stimson [17] has raised the question of whether we should be making greater efforts to discourage injecting. Strang and colleagues [18] and Strang & King [19] have presented arguments for the manipulation of drug markets to this end. Loxley & Davidson [20] have recommended the development of a user-led campaign to encourage smoking heroin as an alternative to injecting in order to reduce overdose rates.

There are two main points for intervening in drug careers to reduce the prevalence of injecting: one seeks to influence the incidence rate and primarily involves preventing the initiation of non-injected drug users into injecting; the second seeks to accelerate the ‘exit rate’ from the injecting population—the ‘outcidence’ rate, as it has been termed [21]—by encouraging current injectors to change from injecting to an alternative, less dangerous, route. Some strategies, such as selective interdiction in drug markets, have the potential to bridge these functions as they may act on both incidence and ‘outcidence’. This paper reviews a range of relevant interventions to reduce the levels of injecting and discusses an agenda for the development of work in this field.

#### *Preventing the commencement of injecting (preventing)*

Approaches that have been developed to prevent injecting among non-injecting drug users operate in two ways. One is to identify non-injecting drug users—‘at-risk’ users—and intervene with them to reduce their propensity to adopt injecting [22,23]. The second focuses on the gatekeeper role that current injectors play and seeks to reduce their influence on non-injecting drug users [24].

#### *Working with ‘at-risk’ users*

Work by Casriel and colleagues provides an example of the first type of intervention. During the mid-1980s, the growing population of young heroin sniffers in New York was seen as a population at risk of making the transition to injected drug use [25]. In this

case, the researchers' initial suspicions that heroin sniffing was being adopted as a strategy to avoid AIDS infection were not supported and consequently led to increased concern about the risk of transitions to injecting. In response, a four-part psycho-educational prevention programme (based on social learning theory and Botvin's Lifeskills Training Programme) was developed and evaluated in order to determine whether transitions to injecting could be prevented [22,23]. Elsewhere, heroin 'chasers', oral/intranasal amphetamine users and cocaine smokers/sniffers might similarly be seen as 'at-risk' populations of drug users.

The intervention aimed to inhibit heroin sniffers' transition to injecting by heightening their awareness of the risks, outlining ways that people make the transition into injecting, and by encouraging the development of anti-injecting rationales and resistance skills. A researcher acted as group leader and tried to engender 'a support group atmosphere' within the groups.

The inclusion criteria were that subjects were HIV negative and had either never injected, or had injected less than 60 times in the previous 2 years and had then returned to sniffing heroin exclusively. After screening, 104 subjects were recruited into the study. Fifty subjects were assigned to a four-session intervention, with the remaining subjects acting as controls. Payments were made at intake for each session and on completion of the programme. Follow-up interviews were conducted with 83 subjects. After an average of 8 months, 14/43 (33%) of the control subjects had injected whereas only 6/40 (15%) experimental subjects had done so ( $\bar{X}^2 = 3.5, p < 0.05$ , one-tailed testing).

Although a multi-faceted recruitment strategy was employed, the most successful method was through newspaper advertisements. The experience in the groups suggests that some sniffers may not volunteer into such programmes as they do not perceive themselves to be at risk from beginning to inject and acquiring AIDS. Payments were helpful for initial recruitment, but after concerns about mistrust and confidentiality had been addressed it appeared that the payment was not the primary motivation for completing the programme.

#### *Working with current injectors*

Within the UK, Hunt and colleagues have developed and evaluated a brief intervention for use with current

injectors. Their study largely recruited people from drug services, and used a panel design with follow-up at 3 months [24].

The intervention was premised on insights from ethnographic work [26]. This indicated that requests for initiation were generally unwelcome, potential initiators could be very persistent in their efforts to obtain initiation and that IDUs often failed to anticipate how injecting in front of non-injectors could lead to initiation requests. The intervention sought to increase contemplation about injecting; reduce injecting in front of non-injecting drug users (NIDUs) and discussing injecting with NIDUs (behaviours hypothesized to promote injecting and encourage initiation requests); increase disapproval of initiating others and increase competence in managing requests for initiation.

Follow-up data were available from 73 of an original sample of 86 participants. Comparing the 3-month periods before and after delivery of the intervention, significant changes in the desired direction were found in injecting in front of NIDUs (from 97 NIDUs down to 49;  $p < 0.05$ ), the number of requests for initiation from NIDUs over a 3-month period (from 36 to 15;  $p < 0.05$ ) and unwillingness to initiate others—measured using a 12-item attitude scale ( $p < 0.001$ ). The number of new injectors initiated by the participants fell from six to two. The number of non-injectors with whom injecting was discussed did not fall significantly but attitude items showed significantly greater disapproval of discussing the 'rush' from injecting with non-injectors at follow-up.

The advantage of working with current injectors is that they are a more available population to drug services than 'at-risk' users. The intervention is given in a single session and is consequently cheap and simple to deliver. It was acceptable to users and drug workers. The intervention was largely delivered to long-term users and it remains to be seen how it can best be implemented with people who have begun injecting more recently. The authors suggest a simple assessment that can be used to target the intervention, as well as other ways in which the principles of the intervention can be applied. Despite encouraging short-term results, it remains unclear what impact such an approach can have on longer-term injecting prevalence. It is also uncertain how the intervention will work in other cultural contexts outside of Southeast England.

## Promoting transitions away from injecting ('switching')

### *Methadone maintenance*

Methadone maintenance is often described as being a pharmacological treatment for opiate dependence [27,28] or as being a pharmaco-social-psychological intervention that helps to neutralize some of the damaging effects of the opiate dependence while enabling the opiate addict to tackle other areas of disadvantage in his or her life [29–31]. However, one of the enormously important benefits that can result from methadone maintenance is the cessation of injecting. Hence it is reasonable to consider methadone maintenance treatment programmes as being interventions designed to help the injecting opiate addict move to a non-injectable route of opiate administration. As illustration, of the 111 opiate addicts interviewed at 1 month into a methadone treatment programme (from a cohort of 119) in a South London treatment programme, the proportion that had injected in the last month had reduced by a quarter (from 97 to 72). Furthermore, 49 of the 72 continuing injectors had reduced their injecting frequency. While 67 had been injecting at least once per day prior to commencing methadone treatment, only 17 were still doing so at 1 month into treatment [32]. Capelhorn and colleagues [33] have also reported a dose-response relationship to this benefit, with methadone maintenance at higher daily doses being associated with a greater likelihood of cessation of injecting. This benefit is also associated with the nature and intensity of other non-pharmacological treatment factors. Ball & Ross [29] found major variation between different methadone maintenance clinics in the extent to which they were successful in reaching a variety of objectives including reduction in illicit drug use and, of particular relevance for this discussion, reductions in injecting.

Even though the benefit from ancillary counselling in methadone programmes has been questioned [34], subsequent randomized treatment studies comparing methadone alone and methadone with low intensity and high intensity support [35] have found both low intensity and high intensity support to be associated with substantially better outcomes (and with the greatest benefit being seen with the high intensity support). Furthermore, McLellan [35] has also explored the extent to which this is associated with individual counsellors and their particular aptitudes and has found that the style of the individual therapists

within methadone maintenance programmes is, itself, a significant influence on the extent to which they are effective. This suggests that there is scope to further develop targeted counselling interventions that increase the effectiveness of practitioners who are supporting the injecting opiate addict in making a transition to oral drug use.

Methadone maintenance is primarily regarded as a treatment for injecting opiate users; however, it has also been argued that this treatment could be used to assist non-injecting opiate users from progressing to injecting [36]. Although injecting is a common criterion for entry into methadone maintenance programmes, Gossop and Colleagues [8] have shown that severity of dependence is often high among non-injecting users. Although methadone maintenance is mainly used to encourage 'switching' from injecting, it may also have potential for preventing dependent non-injectors from beginning to inject.

### *Amphetamine prescribing*

Amphetamine injectors comprise a sizeable part of the overall population of IDUs for whom methadone services are unsuitable. The prescribing of oral dexamphetamine is increasingly discussed as a treatment option that may enable a proportion of amphetamine users to stop or diminish their injecting [37–39]. In some countries such as Sweden, the UK and Australia, a substantial proportion of the injecting population [40–42] injects amphetamine.

Whereas methadone prescribing has been extensively researched, this is not the case for amphetamine substitution. In the UK, the Advisory Council on the Misuse of Drugs [43] have drawn attention to the lack of research on oral substitution programmes for people who inject cocaine, amphetamines and benzodiazepines. They concluded that publicity, outreach, syringe exchange and advice and counselling services are the best means of influencing this group. The risk of amphetamine psychosis, particularly when the stronger methylamphetamine is used, gives reason for caution in the use of prescribed amphetamine [44]. Nevertheless, some dexamphetamine prescribing does occur and there is evidence that carefully targeted programmes can be delivered [37,38]. Recent research [45] has further clarified the subset of amphetamine users who may most benefit from targeted interventions and there is increasing evidence that treatment can reduce amphetamine injecting [39].

*Promoting heroin smoking as an alternative to injecting*

From the early 1980s the use of heroin by 'chasing the dragon' (inhaling the sublimate of heroin base from heated aluminum foil) became increasingly popular in many countries in Europe (for a historical review of this spread see Strang and colleagues [18]). This has prompted some commentators to suggest that encouraging injectors to move to smoking heroin may represent a way of encouraging the non-injecting use of opiates. Little empirical evidence exists to inform a debate on the likely efficacy of interventions in this area, though the findings of studies of the spontaneous transition of injectors to non-injecting routes [14,15] are not encouraging. Spontaneous behavioural shifts from injecting to smoking appear rare, often unstable, and may be found most often among individuals with severe venous damage. Changes in route of administration that have been observed at the population level are best explained by new users taking up heroin chasing, rather than injectors moving to chasing as a safer method of drug administration [14].

It should also be noted that although there are some experimental data, the pharmacology of such non-injecting drug delivery systems is poorly understood. Heroin users often report that smoking heroin is a less 'effective' mode of administration than injection. Why this should be remains unclear, but is somewhat surprising given the efficiency of the respiratory system in delivering drugs to the brain. Experimental work on heroin sublimation conducted by Huizer raises serious questions about the effectiveness of using diamorphine hydrochloride in reefers. Heroin salts perform poorly in smoking simulations compared to the base form of the drug [46]; for further consideration of this area see Strang & King [19].

Although the risks are undoubtedly fewer than with injecting, heroin smoking itself is not free of risk [47]. Indeed, encouraging transitions to heroin smoking may be counter-productive if it were to lead to a greater number of new recruits into heroin use. Some evidence suggests that about 10% of heroin chasers will move to injecting per year of use [14]. It is unclear how sensitive such rates are to socio-cultural factors such as peer approval of injecting, or how amenable these may be to influence through targeted interventions. A larger smoking population may in time give rise to an increased number of drug injectors. Nevertheless, the morbidity associated with heroin smoking is far lower than that associated with opiate injection, and encouraging drug injectors to

adopt chasing does not necessarily imply that this behaviour is promoted among non-injectors. Targeted interventions that encourage drug injectors to move to smoking or that inhibit drug smokers from adopting drug injection are clearly worthy of greater consideration. Two main types of intervention can be considered: the prescribing of smokeable heroin (reefers) by clinicians and the social marketing [48] of heroin chasing through targeted campaigns.

*Prescribing heroin reefers*

Heroin reefers have occasionally been prescribed to drug users in the UK [49]. Reefers are prepared by dissolving a specified dose of diamorphine hydrochloride in chloroform and impregnating cigarettes with this solution. The drug users usually supply cigarettes and licensed pharmacists conduct the preparation. Reefers have on occasion also been used for the delivery of other drugs such as methadone hydrochloride, cocaine hydrochloride and amphetamines, the method of preparation being similar for all [50]. The reefers are usually stained as a result of their impregnation with heroin. This ensures that they are easily identified and cannot be confused with ordinary cigarettes. A protocol for reefer preparation and distribution has been drawn up by the British Pharmaceutical Society [50].

While generating considerable publicity, the prescribing of heroin reefers has remained a relatively rare and controversial practice. There have been no data published that allow this technique to be assessed adequately. The efficacy of prescribing heroin reefers in promoting route transitions and the costs and benefits of this mode of drug provision is therefore unknown. Consequently there is no clear consensus on when the provision of drugs in this form could be appropriate. Investigation through carefully designed and targeted trials is necessary to understand whether this approach is warranted.

*The 'chasing' campaign*

A campaign has been developed by the Healthy Options Team, London, in partnership with the Respect Users Union to promote heroin chasing as an alternative route of drug administration for people who inject [51]. This reflects the popularity of chasing among many English drug users as an alternative to injecting. The campaign originates from dissatisfaction expressed locally among a proportion of injecting drug

users with methadone maintenance as a treatment option; indications that some injectors were unfamiliar with the benefits and technique of chasing and increased awareness of transitions that have occurred within drug using communities such as within the Netherlands.

A social marketing approach has been incorporated within the campaign, in order to present arguments concerning the relative benefits of chasing (such as reduced overdose risk, increased control and sociability), along with detailed technical guidance targeted at injecting drug users who lack the skills or inclination to use the technique. The campaign uses a combination of posters for display within syringe exchange services, alongside a handbook that is targeted at injectors. Campaign materials have been developed and piloted. The campaign has not yet been evaluated, which will be necessary to enable the benefits and risks of such work to be fully assessed.

#### *Other possibilities for discouraging injecting*

Alongside the 'chasing' campaign described above, another approach has been developed by the same partners. Specifically targeted at those chronic injectors with deteriorated veins (who nevertheless continue to inject into the femoral or carotid veins), 'Up Your Bum' is a campaign that promotes anal insertion of drugs using a syringe barrel [52]. Pilot work suggests that the very rapid absorption through the rectal mucosa provides an effect which is only marginally less intense than the intravenous route and, thus, provides an alternative for people whose injecting incurs the greatest level of risk. Campaign materials have been developed, although implementation has not yet begun. Equivalent work is also being considered to promote crack piping to crack cocaine injectors. It is also possible to imagine campaigns that attempt to promote heroin sniffing, rather than smoking, in areas such as New York, where this is the most common alternative to injecting.

Some obvious concerns arise with respect to such strategies. The harms from the alternative routes are not fully understood. It is unclear whether the campaigns can be constrained to the target population or whether leakage of campaign materials may unintentionally promote transitions from safer routes to ones that are more harmful if, for instance, oral users began anal use. Some would also argue that such strategies might sustain drug use when the accumulating problems could otherwise lead to complete

cessation of use. Should such campaigns be implemented, there is a need to evaluate them carefully in order to determine their effectiveness and answer questions about any associated risks.

## **Bridging approaches**

### *Manipulating drug markets*

Analyses of alcohol and tobacco policy have identified the profound influence of price and availability upon levels of consumption within a population and thence in the overall levels of harm that results [53,54]. Demand for tobacco and for alcohol have both been shown to be price-elastic with, for example, a 10% increase in the price of cigarettes consistently resulting in a reduction of about 4% in smoking prevalence—at least in countries such as the US and UK. Furthermore, this relationship has been found to hold not only for those who are drinking at lower levels, but also among those whose alcohol consumption is already problematic [54]. Some observers have proposed that increased controls could be used to create lower levels of harm [55,56], while others have argued that greater benefits would be seen with reduced involvement from drug control [16]. However, it is uncertain whether the illicit use of injected drugs is price-elastic in a similar way to alcohol and tobacco. More importantly, illicit drug markets are controlled by criminals and are not within the direct influence of governments. The only available mechanism for influencing price is through drug interdiction; yet it remains unclear whether drug law enforcement can be implemented in a way that has any consistent effect on street prices.

An alternative approach has recently been mooted [18,19] in which there might be the deliberate concentration of criminal justice efforts on sectors of the black market dealing with injectable drugs (white, injectable, hydrochloride forms of heroin), while paying less attention to those sectors of the black market dealing with smokeable forms (brown, base forms of heroin). The feasibility of such an approach is greater now that the close association between country of origin of the black market heroin and its suitability for use by either injecting or 'chasing the dragon' has been identified [18,57].

### *Community development, user-led initiatives, mass media campaigns and cultural change*

Possibilities may exist to increase cultural disapproval of injecting among relevant groups. It is known that

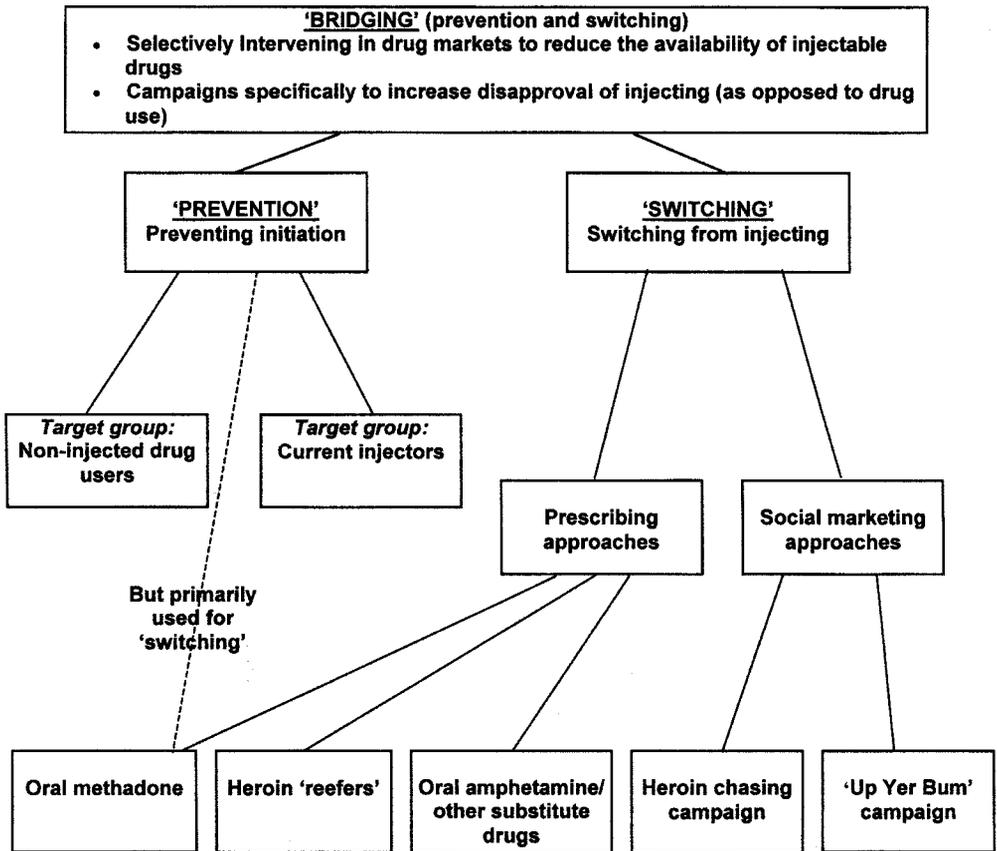


Figure 1. A schema for route transition interventions (RTIs).

disapproval of injecting is patterned. For example, it appears to be higher among Afro-Caribbeans in the UK [58], and gendered—with greater disapproval of women injectors [26]. Disapproval of injecting among people who primarily use 'dance drugs' in Britain is also considered to be widespread [59] and suggests that there may be opportunities to influence these taboos.

Some work geared towards producing cultural change away from injecting has emerged from agencies with strong traditions of community development such as Mainline in Amsterdam, or the Healthy Options Team (HOT) in East London, as well as drug-user organizations in Europe such as Respect Drug Users Union and, more recently, the Australian IV League. Cultural acceptability of injecting seems likely to be the product of a complex interplay between

these influences and a range of other factors such as the availability of injectable forms of drugs and the perceived benefits and risks of injecting. Documentary evidence of deliberate activity within the user-movement to promote transitions away from injecting is difficult to obtain. This makes it particularly hard to assess the contribution of drug users themselves, which may be greater than the published evidence would suggest.

We have identified no evaluated interventions with the explicit aim of increasing disapproval of injecting. Approaches targeted in this way nevertheless warrant consideration, although it would seem very wise to take account of Wodak's [16] cautionary words about the risks of further marginalizing an already marginalized group. Most of the interventions that have been described are either directly based on demand from

IDUs or have some potential to be 'socially marketed'. By contrast, approaches that deliberately increase stigma or taboos are qualitatively different. By making the practice of injecting even more unacceptable, greater stigma may have the adverse consequence of increasing harm for the minority of people who will continue to inject.

Although their effect is uncertain, there have been some mass media campaigns that attempt to discourage injecting such as the example from the UK of the poster campaign 'It only takes one prick to give you AIDS'. The campaign's effect on the rate of injecting is uncertain. It could further be argued that, by focusing on drugs that are widely injected, campaigns such as 'Heroin screws you up' in the UK also attempted to prevent injecting. However, many British heroin users smoke the drug as their preferred or exclusive route. Most drugs that are injected can also be swallowed, sniffed or smoked. For that reason mass media campaigns that are substance-specific rather than route-specific in their focus do not properly fall into the group of interventions being considered here. More clearly focused campaigns could be devised and, if implemented, should be evaluated for their effect on the attractiveness of injecting.

## Discussion

### *RTIs within a harm reduction approach*

Throughout this paper we have used the term 'route transition interventions' (RTIs) to focus attention upon a group of interventions for reducing harm by promoting transitions between different routes of drug administration (Figure 1). Wherever it is possible to identify a hierarchy of harms associated with different forms of administration of the same drug, it is worthwhile considering the possible RTIs. Although we have summarized these with reference to injecting, others examples exist or can be imagined, such as the use of nicotine patches, or the promotion of switching to oral ingestion of cannabis in order to eliminate damage to the respiratory system caused from smoking. The development of RTIs has implications for both basic research and programme evaluation.

### *Basic research*

The basic research tasks are concerned with developing a better understanding of the impact of

using different drug delivery systems. For example, in the case of the 'Up Yer Bum' campaign, little is known about the behaviour or risks of street drugs when used rectally, or how social systems of drug users may adapt to such an innovation. This information is of importance for decisions about whether and how such campaigns should be adopted. We not only need to know more about the acute effects but also variations in their long-term effects. Although some important risks such as infection with blood-borne viruses resulting from sharing injecting equipment are specific to injecting, differences in rates of overdose and progression to dependence are less certain and some risks, such as respiratory damage, may increase. Similarly, although the balance of risks and benefits is already clear, it would be preferable to know more about the long-term effects of heroin chasing compared to injecting in order to fully understand the relative risk and benefits of different routes of administration.

Because they are susceptible to the influence of factors such as local tradition and the preconditions in an area [60], it is a mistake to view drug use as entirely the product of a rational decision-making process based on an assessment of the risks and benefits of different drug administration technologies. Nevertheless, the appeal or marketability of alternative non-injected routes will partly depend on their capacity to deliver equivalent sensations without the risks. Reducing the gaps in our understanding concerning factors such as the pyrolysis and absorption rate of different street drugs, and the efficacy of alternative delivery systems (i.e. the dose delivered into the bloodstream from a given quantity and the speed with which this reaches the brain), will help with a technical evaluation of alternative routes. In turn, this will help develop an understanding of the likely acceptability and risks of different routes and the advice that might accompany them.

The impact on social systems of drug users should also be considered. It is unclear to what extent targeted campaigns promoting safer routes of administration to segments of the drug-using population can be restricted to the target group. Some strategies may introduce a risk of the proliferation of 'safer' forms of drug use among a larger denominator population. Such effects are enormously difficult to evaluate. Nevertheless, the possibility of their occurrence must be acknowledged and effort should be made to assess such risks wherever possible.

*Programme evaluation*

Although a range of approaches has been discussed in this paper the literature is, as yet, short of detailed description of many such interventions. There is a need for careful process evaluations to establish: how individual approaches operate; whether there are particular groups with whom particular interventions can be targeted and within what existing service configurations RTIs can be integrated. These ingredients are neatly encapsulated within Pawson & Tilley's [61] recent appeal for careful attention to 'mechanism' and 'context' within a 'realist' approach to evaluation. Even within widely used treatments such as methadone maintenance there has been relatively little detailed consideration of the approaches specialist workers can use to minimize injecting. As Dorn & Murji [62] discuss, good process studies are necessary before outcome data can reasonably be sought.

As well as careful description of implemented programmes there is a corresponding need for people to continue to think creatively about ways that new RTIs can be developed. In particular, there is a pressing need to consider appropriate ways to discourage injecting in developing nations that cannot afford some of the more expensive options available in the industrialized world.

Outcome evaluation of RTIs is clearly important. In some cases, it will be possible to collect relevant outcome data from the people targeted by the interventions. Measures such as rate of injecting or number of people initiated by people receiving specific interventions will be important indicators. However, there are situations where case studies at the city, region or country-level are also necessary. For example, the effect of selective drug interdiction targeted at injectable forms of heroin require monitoring of outcomes, such as the availability of diamorphine hydrochloride within local drug markets, and any associated changes in the prevalence of injecting. It is also unclear how a constellation of interventions, each targeted at an objective of reducing injecting, can operate together. This requires a case-study approach although, to our knowledge, no country or region has yet adopted a reduction in injecting (as opposed to drug use) as a specific target within its drug strategy. Countries that eventually do so will have better prospects of mitigating some of the worst problems associated with illicit drug use, as to do so offers the prospect of considerable benefits in the reduction of viral and bacterial infection, overdose and dependent

drug use, along with improved community safety. The level of debate about NIROA in Australia and the UK suggests that faster progress towards such a policy is being made in these countries and that these may eventually provide useful 'natural experiments' that should not be missed.

**Conclusion**

We have described a range of ways by which the prevalence of injecting can be reduced through the use of RTIs. Despite the fact that harm is highly contingent on the means by which drugs are administered, there has been too little systematic consideration of interventions that influence the way drugs are used. A focus on drug prevention has deflected attention from approaches with the potential to deliver important health gains through a more deliberate focus on reducing the prevalence of injecting. By discussing these diverse interventions under a collective term we have tried to draw attention to under-exploited opportunities for reducing the harm related to drug use and to stimulate research and development work on such interventions. It is time for more finely focused policies that aim to reduce harm by reducing the level of injecting. The rewards for countries or regions that adopt this emphasis are likely to include improvements in the health of individual drug users, the public health and safer communities.

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