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Safety, Risks and Outcomes from the Use of Injecting Paraphernalia

Crime and Justice



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**SAFETY, RISKS AND OUTCOMES FROM THE
USE OF INJECTING PARAPHERNALIA**

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Scottish Government Social Research
2008

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Acknowledgements:

Without the support and co-operation of Drugs Action in Aberdeen and The Harm Reduction Centre in Dundee this study would not have been possible. Sincere gratitude is expressed to both staff teams and managers who supported this work, sometimes through difficult times. The support of Dundee Drug and AIDS Project is also very much valued. The participation of the service users was of course essential and is very much valued.

Sincere thanks go to the researchers who were employed on stage two of this study. Phillipa Blake (Jan 2006 to October 2006) and Denise Thompson (Jan 2005 to November 2005) worked in Aberdeen. Erja Aalto (November 2005 to October 2006) and Sheila Paterson (March 2006 to October 2006) were based in Dundee. Their enthusiasm and ability to drive the study forward when based remotely from Bath are much appreciated.

Statistical analysis for stage two was performed by Dr G Taylor, Medical Statistician, Bath Research & Development Support Unit. Assistance with quantitative data entry and cross checking was given by Ms Kath Hood and Mr Chris Carey, University of Bath. Some transcribing assistance was obtained from Ms Laura Hiscox and Mrs Amanda Lester, University of Bath. Sincere thanks to them all.

Thanks are also expressed to those who assisted with stage one: Dr Rhys Ponton, formerly University of Bath, Mrs Jo Carter and Dr Ursula Potter, University of Bath, Avon & Somerset Constabulary Forensic Science Dept, Prof Avril Taylor, Jeanne Rutherford and Alex Fleming from University of Paisley, Mr R Reid, The Robert Gordon University and Mr R Headford, Royal United Hospital.

Those who contributed at various points to the advisory panel are also thanked: Dr A Baldaccino, Prof C Bond, Dr C Ford, Mr A Preston, Mr S Pringle, Mrs D K Roberts, Prof G Sewell, Dr G Taylor and Prof R Velleman.

EXECUTIVE SUMMARY

1. Increasing scientific evidence suggests that sharing injecting paraphernalia by injecting drug users (IDUs) could transmit hepatitis C infection (Mathei et al, 2006). Since its legalisation in the UK in 2003 with subsequent additions in 2005, the supply of paraphernalia to IDUs from needle exchanges has been given increasing attention by commissioners and service providers. Approximately 80% of needle exchange agencies in Scotland (Griesbach et al, 2006) and England (Abdulrahim, 2006) recently reported supplying citric acid sachets. Other items were supplied to relatively lesser extents, with some geographical coverage noted as patchy. There is an increasing range of paraphernalia being marketed for needle exchange supply. Additionally, some services are known to supply makeshift items (e.g. hand rolling cigarette filters and packed down citric acid in non sterile bags). Paraphernalia items are not classed as 'medical devices' therefore not subject to devices testing requirements. So although there are several types of item for needle exchange providers to choose from, there is little information to inform their choice.

2. Paraphernalia is supplied for three reasons: (1) to discourage sharing and hence prevent blood borne virus transmission, (2) to prevent skin and soft tissue infections by facilitating the use of sterile equipment, and (3) to attract injecting drug users (IDUs) into needle exchange services. The latter has been demonstrated by Garden et al (2003), who showed citric acid sachet supply increased the numbers of injectors accessing services. Griesbach et al (2006) also note citric acid sachet supply influenced needle exchange visits at the Glasgow Drug Crisis Centre. The first two factors have not been previously studied.

3. This study had two aims, which required two distinct pieces of work:

- a) To test paraphernalia items and injection preparation methods in the laboratory to quantify the theoretical benefits and/or risks that they present to health, thereby identifying from those tested the items of paraphernalia and preparation methods that present the least theoretical risk to individual health.
- b) To conduct an investigation into the impact that paraphernalia supply is making on sharing and health in the practice setting and compare this with non-supply.

4. The first aim was set in order to subject paraphernalia to some controlled testing similar to medical devices testing. Work was based in the laboratory. A controllable experimental method was developed that replicated the injection preparation practices of IDUs. Stages in the injection preparation process studied were hand washing, use of cookers, use of acids and use of filters. The results were also informed by the qualitative field work conducted for stage two. Results suggested, in addition to needles and syringes, the least theoretical health risks would result from the following:

- Encouraging hand cleansing before injecting
- Promoting the use of single use cookers but this must be accompanied with equipment and advice to avoid or reduce the risks from batch preparation (e.g. adequate needles and syringes, small volumes of sterile water, sterile acid).
- Sterile citric or ascorbic acid sachets accompanied by a strong message to add small amounts stepwise
- Filters that remove particles, do not shed fibres or retain drug. In this work the Sterifilt performed best out of the filters tested.

5. The second aim was studied by undertaking a comparison study, examining the health and sharing practices of IDUs in Dundee, where paraphernalia (except water) was supplied with Aberdeen, where only swabs were supplied. Levels of ever sharing of paraphernalia items were statistically higher in Aberdeen, except for cookers which were similarly high in both areas due to batch preparation. Sharing of paraphernalia in the past month was reported to a lesser extent in both areas compared to 'ever' and there were no statistical differences between the two locations, although sharing in the past month was lower in Dundee. Sharing of needles and syringes was relatively low in both locations, but saving own needles and syringes for reuse was very common.

6. Qualitative interviews showed this was because insufficient quantities of needles and syringes were available when needed. Some injectors reported using multiple sets to facilitate a single intravenous access. They also distributed them to peers when they were in need of clean equipment. This suggests that strategies to increase convenient access need to be developed. There was no statistical difference between the number of participants with non infected complications or skin and soft tissue infections in each location, although numbers were lower in Dundee and the infections seen in Aberdeen may have been more severe. The level of skin and soft tissue infection seen in Aberdeen was lower than that predicted at study design based on the literature.

7. Data collection had to be modified following the pilot stage due to low recruitment rates at both sites. The restriction on information obtained was with hindsight too limited. Lack of collection of data on paraphernalia use for every injecting episode or frequency of use of needle exchanges makes it impossible to conclude whether paraphernalia impacts on sharing and injecting site complications or not. Several suggestions for improved future quantitative work have been made in chapter 5.

8. Qualitative interviews with participants found that the term 'paraphernalia' was not always understood. Risks of Hepatitis C Virus (HCV) transmission through paraphernalia sharing were not often explicitly mentioned without prompt. The Dundee participants were more aware of the need to avoid paraphernalia sharing. Most said they attempted to do so, although they did not always do this in practice. Reasons for continued sharing and use of makeshift paraphernalia in Dundee centred on lack of convenient access at the time of need. Lack of planning for future injecting, peer distribution and the priority of obtaining drugs over equipment all influenced paraphernalia use. Convenience, including distance from the exchange, has previously been identified as a factor in needle and syringe sharing in Glasgow (Hutchinson et al, 2000) and was also found here.

9. Support for water supply was expressed by some in Dundee. In Aberdeen access to makeshift paraphernalia, particularly citric acid causes difficulties. Limited outlets, refusal of sales, over-inflated prices for suspected IDUs and concerns about quality were described. Some participants perceived there to be a culture of sharing of paraphernalia, promoted by lack of availability and desperation to obtain items, especially citric acid when 'strung out'. Interviewees expressed fear, distress and anger from lack of access to paraphernalia and voiced strong support for it. Sharing was seen by some in Aberdeen as inevitable. Participants in both locations suggested HCV was not as 'important' as HIV as it had not been subject to mass media public health campaigns. Participants raised several ideas on ways to promote awareness of HCV, which mainly focused on mass media campaigns, more information from exchanges and many suggestions on how to attract new and younger IDUs into services. These are detailed in chapter 5.

10. In summary, the lab based information offers performance data for certain commercially available paraphernalia items. The quantitative field work data was insufficiently sensitive to give support to the supply or non supply of paraphernalia but the qualitative data gave strong support. Several suggestions for future research and twelve recommendations for practice have been made. These are summarised in chapter 5.

CHAPTER ONE: INTRODUCTION

Purpose

1.1 This is the fourth report from the project '*Study of the Safety, Risks and Outcomes from the use of Injecting Paraphernalia*'. The first was the *Inception Report* (December 2003); the second was the '*One year interim report*' (December 2004), which gave the results from the laboratory study (stage one) and the third was '*Stage two interim report*' (November 2005), which was a progress report on the field study (stage two). This final report collates the findings from both stage one and stage two and presents the overall conclusions from this work.

1.2 This research was originally commissioned by the Effective Interventions Unit (EIU) of the Scottish Executive. This body has now been replaced by the Drug Misuse Research Team of the Scottish Government.

Structure

1.3 This report begins with an introduction to the study and the relevant background. Subsequently it is divided into two parts. The first part, presented in chapter two, gives an overview of the laboratory based work. Here theoretical health benefits and risks within the injection preparation process were explored, with a focus on the use of makeshift and commercially produced injecting paraphernalia. The laboratory section is presented with a non laboratory science readership in mind. Therefore full technical and scientific detail is not included, but can be obtained by contacting the author j.a.scott@bath.ac.uk.

1.4 The second part of this report presents the field based study in chapters three (methods) and four (results). This work compared self reported injection preparation and sharing practices and injecting related health. This was done by studying injecting drug users (IDUs) in Aberdeen, where only swabs were supplied, and comparing them with IDUs in Dundee, where swabs, citric acid, spoons and filters were supplied. The report ends with a discussion (chapter 5) which draws the findings from both stages together and gives overall conclusions. Here recommendations for service providers and commissioners are made.

Introduction to the study

Injecting paraphernalia used by IDUs

1.5 'Injecting paraphernalia' is a collective term used to describe equipment used by IDUs in the preparation and administration of drugs for injection. This equipment may include mixing vessels –which are commonly spoons, water, acids such as citric and ascorbic acid, heat sources, filters, tourniquets and swabs. Previous research examining injection preparation practices has identified and described the equipment used (Ponton & Scott, 2004; Taylor et al, 2004). Spoons and other mixing vessels are used to prepare the injections in and water acts as a vehicle for the drug(s). The purpose of the acid addition is to make soluble illicit drugs that are in the chemical form described as 'base'. In Europe brown heroin and crack cocaine are commonly in the base form (King, 1997), which although suitable for inhaling, e.g. via foil or a crack pipe, they do not readily dissolve. Hence, when these drugs are prepared for injection, IDUs add acid and heat the solution to speed up the chemical reaction. Filtering removes insoluble particles from the solution, to prevent needle blockage on administration. Tourniquets are used to raise veins and swabs are used to cleanse injecting sites, during the injection administration process.

Health concerns relating to paraphernalia use

1.6 Intravenous injecting, whether of a medicine or an illicit drug, carries risk from the method of delivery because it directly enters the blood stream. This means the substance injected bypasses the body's natural defences against harm from potentially infectious or irritant agents contained within the injection. For medicines, strict manufacturing and administration guidelines are followed in order to minimise these risks. Clearly for illicit drug injecting no such safeguards are present. The injecting paraphernalia used by IDUs is often not 'fit for purpose'. For example cigarette filters are used by IDUs, but these are designed to remove large particles (>20 microns) from smoke when it is drawn through the filter using air. They are not designed to remove smaller particles from solutions. There are several health concerns relating to the use, reuse and sharing of paraphernalia by IDUs, some of which are documented in the literature.

Hepatitis C Virus

1.7 International concern at the high levels of hepatitis C virus (HCV) antibody positive IDUs led to suggestions at the end of the 1990's that sharing paraphernalia may transmit HCV (Crofts, 1997, Denis, 2000, Hahn, 2001). Crofts et al, 2000 detected HCV virus (by measuring RNA) on 70% of syringes, 67% of swabs, 40% of filters, 25% of spoons, and 33% of water samples. This method cannot tell if the virus is viable but still is of concern. An increasing body of international literature has found correlations between self-reported paraphernalia sharing and HCV antibody status (Hagan et al, 2001, Thorpe, 2002, Lucidarme, 2004). Mathei et al (2006) calculated an odds ratio of 2.44:1 of being positive for HCV antibodies if ever having shared paraphernalia, but never having shared needles and syringes. Thiede et al (2007) showed that newer injectors tend to share paraphernalia more. Ethnographic research conducted in Glasgow by Taylor et al (2004) described the sharing of paraphernalia as a common occurrence when injectors prepare and administer drugs together. Scottish Drug Misuse Database statistics suggest that paraphernalia sharing remains common

amongst IDUs, but there has been some decrease over recent years. In 2001/02 50% of injectors in new contact with services reported having shared spoons, water or filters in the past month. The 2005/6 report showed this figure had reduced to 42% (DMIS, 2006).

Bacterial infections

1.8 Where possible medical injections are manufactured in a sterile environment and/or sterilised before use. Otherwise they are made from sterilised materials e.g. sterile granules reconstituted with sterile water. Illicit drug injections do not of course under go such procedures, making IDUs particularly vulnerable to the risks of bacterial infections from non-sterile injecting. Skin and soft tissue infections are some of the most common infections in IDUs (Gordon and Lowy, 2005). They are well documented in the literature (e.g. Haverkos and Lange, 1990, Stein, 1990, Levine, 1991). Sources of bacterial contamination could be the skin of the IDU themselves, especially if hands and injecting sites are not washed prior to use. A study of 1057 IDUs in the USA suggested that IDUs who always clean their skin before injecting were 50% less likely to suffer from abscesses than those who never cleaned their skin (Vlahov et al, 1992). Other sources of bacterial contamination could be the drugs, the paraphernalia or the injecting environment (Gordon and Lowry, 2005). These authors also suggest that ‘flushing’, where blood is repeatedly drawn back into the syringe after injection administration may also increase the risks of abscess. Co-existing HIV infection increases susceptibility to infections.

1.9 The Health Protection Agency (HPA) report a growing number of acute bacterial infections seen in IDUs (HPA, 2006). They note concern about infections with *Staphylococcus aureus* (both methicillin sensitive and methicillin resistant), *Group A streptococci*, both of which may come from the IDU’s skin and through shared paraphernalia, and clostridia bacteria including *Clostridium botulinum* and *clostridium tetani*, which will come from contaminated drugs. These organisms are also noted as those commonly causing infections in IDUs by Gordon and Lowry (2005). *Clostridium novyi* and *Clostridium perfringens* were isolated in many of the cases of severe skin and soft tissue infection that lead to the deaths of drug users in Scotland and elsewhere in 2000, with contaminated drugs being the source (Gruer and Ahmed, 2001). Such bacteria cause a range of clinical symptoms from minor abscesses and soft tissue infection, to widespread soft tissue infection such as cellulitis, major systemic infections and complications such as endocarditis.

1.10 The paraphernalia used by IDUs is often ‘makeshift’, utilising household items such as cigarette butts as filter material, tea spoons as preparation vessels and water from taps or bottles. Acid sources can include domestic items such as citric acid from home brew and catering packs, vitamin C tablets (ascorbic acid), bottled and fresh lemon juice (citric and ascorbic acid) and vinegar (acetic acid). Clearly such items are not sterile and could potentially be a source of contamination. It is unknown what effect the heating process used in injection preparation has in terms of killing viable organisms. However an outbreak of *Pseudomonas aeruginosa* in IDUs in Chicago in the late 1970’s was linked to the lack of heating (Shekar et al, 1985). The injections concerned were made using non sterile water and soluble tablets. Saving paraphernalia for later use could exacerbate risks, particularly if stored damp and dirty. Filters of natural origin such as cotton wool may potentially be more contaminated. The practice of saving filters for times when no drugs are available and ‘bashing down’ several to extract trapped drug is noted (Taylor et al, 2004). These authors also observed that homeless IDUs may prepare injections in particularly unclean

environments. Additionally, sharing paraphernalia means handling of items by more than one IDU, so potentially could increase cross contamination. Administering injections to others could also increase infection risks through skin contact. There is very little in the literature detailing these risks or consequences, although they can be derived through association from work such as that of Vlahov et al (1992).

Fungal infections

1.11 *Candida albicans* has been isolated as a causative organism of fungal infections in IDUs. Immunocompromised status e.g. caused by HIV infection, increases the likelihood of *Candida* infection taking hold. The skin and pith of lemons contains *Candida*. In the mid 1980's an outbreak of *Candida endophthalmitis*, a fungal eye infection, amongst IDUs in Glasgow was attributed to the widespread use of lemon juice as an acidifier. Chignell (1992) in reviewing these and other cases notes reduced incidence since this time attributed to increased harm reduction interventions.

Vascular damage

1.12 Progressive loss of peripheral vascular access and indicators of peripheral vascular damage, such as swollen digits, are known complications of long terms injecting drug use (Gordon and Lowry, 2005). However, there is little scientific study of factors that worsen IDU vascular health in the literature. It is thought that length of time injecting is key and that over time many IDUs progress to using deeper veins in order to gain vascular access (Darke et al, 2001, Maliphant and Scott, 2005). However rate of deterioration of vascular access varies and a minority of IDUs appear to maintain peripheral access long term (Maliphant and Scott, 2005). The factors that contribute to the extent of this damage and the rate of decline are not clear. Using too much acid to prepare injections and inflaming veins through repeated use of the same vein without rest is considered by to contribute to vascular damage (Derricott et al, 1999). The injection of insoluble materials contained within the injection are linked to vascular inflammation, cardiac valve damage and the formation of hard lumps known as granulomas (Stein, 1990). These form under the skin and in systemic organs e.g. the lungs. The source of insoluble materials could be the drug substance or the preparation process, potentially from paraphernalia items themselves, e.g. fibres from makeshift filters. Talc retinopathy and the identification of cotton fibres in the eye of IDUs have been reported (O'Brien and Schroedl, 1991). The source of fibres is attributed to filters. The source of talc is reported to be adulterants in street drugs and fillers from tablets that have been injected.

The supply of paraphernalia to IDUs through needle exchange schemes

Support for the provision of paraphernalia to IDUs

1.13 Concerns around the health risks from sharing paraphernalia and using 'makeshift' paraphernalia have prompted drugs services, commissioners and policy makers to consider whether IDUs should be supplied with paraphernalia via needle exchange schemes.

1.14 The basis of the argument for supply is that the provision of adequate quantities of paraphernalia could prevent sharing and prevent the need for reuse, hence reducing HCV

transmission and bacterial infections. Research has shown that the response to HIV in the UK (1987-1993) was successful in avoiding an epidemic because it combined information not to share with the means to follow this advice i.e. access to new sterile injecting equipment (Stimson, 1995, Stimson et al, 1998). Countries where information only was given were less successful in curbing the HIV spread amongst IDUs (Stimson et al, 1998). Therefore, it may be suggested that the supply of paraphernalia equipment *and* accompanying advice on its use, could reduce sharing and other risks.

1.15 Garden et al (2003) showed that supplying citric acid sachets attracted IDUs into needle exchange services. A vignette relating to the Glasgow Drug Crisis Centre reported by Griesbach et al (2006) also shows that citric acid availability influences IDU use of services. Attracting IDUs to services gives the opportunity to provide appropriate safer injecting interventions and signpost to treatment services. Unless drawn into services, IDUs can be a difficult to reach group. Hence this gives an additional argument made for supplying paraphernalia.

1.16 The supply of paraphernalia in the UK is governed by legislation, which was largely prohibitive until recent years.

The UK legal situation

1.17 Until August 2003 it was against the Misuse of Drugs Act (section 9A) to supply any paraphernalia to IDUs. Paraphernalia was defined legally as ‘equipment that facilitated the illegal administration of a controlled drug’. Needles and syringes were exempt to prevent HIV transmission. The ‘paraphernalia laws’ were introduced as part of the Misuse of Drugs Regulations (1985) to stop drug dealers selling consumption kits, it was never intended to prevent harm reduction. It is known anecdotally that some needle exchange services supplied paraphernalia prior to 2003, often under local agreements with police and drug action teams (DATs). In response to concerns about HCV transmission through paraphernalia sharing, the law was amended in August 2003 with further additions in 2005. Those who engage in drug treatment are now lawfully permitted to supply swabs, spoons/cups, filters, citric acid, ascorbic acid and sterile water in volumes less than 2ml in order to prevent harm.

Availability of paraphernalia to IDUs following the law change

1.18 The law change has given commercial impetus for companies to develop paraphernalia products. An increasing range has become available from several companies. Examples include single use sachets of acids, single use spoons and some types of filter. It is also known that following the law change, some needle exchanges continue to supply makeshift items similar to those already used by IDUs e.g. hand rolling cigarette filters. In Scotland, the 2006 national needle exchange survey showed that availability of paraphernalia from Scottish services is variable (Griesbach et al, 2006). Although in some areas coverage was good, services were found overall to be less likely to supply paraphernalia than services in England.

The need for research to underpin the supply of paraphernalia to IDUs

1.19 Increasingly it is expected by the public, commissioners and policy makers that healthcare interventions are supported by evidence to qualify their use. There is little research in the literature focusing on paraphernalia. There could be several reasons for this: Firstly, UK based research may have been inhibited by the legal restrictions on supply, as it could be difficult to attract research funding. However there is also little European work, despite paraphernalia being used and supplied there with no history of legal restrictions. Secondly, most injecting paraphernalia items are not classed as medical devices or medicines (except water for injection). This means there are no requirements for evidence of safety or effectiveness for marketing approval purposes. Hence there is little data on performance.

1.20 As said, what is known is that sharing paraphernalia is implicated in HCV transmission (1.7). Makeshift paraphernalia contributes to bacterial (1.8) and fungal (1.11) infections and may worsen vascular damage (1.12). Providing paraphernalia attracts IDUs into services (1.15). These factors advocate the supply of effective paraphernalia to IDUs. What has not been studied is whether supplying paraphernalia reduces sharing and consequently HCV transmission, or other injecting risks such as skin and soft tissue infections and vascular complications (Wright and Tompkins, 2006). This requires field based study. The theoretical efficacy and safety of different items of paraphernalia is also not established. For example to what extent does a purpose-made filter reduce insoluble particle contamination in injections and how does this compare to makeshift filters like cigarette filters? Laboratory study is necessary to establish such data. Such information is important to guide policy makers, commissioners and service providers on implementation of the paraphernalia law changes. This is particularly pertinent as the cost implications from supplying, or not supplying, depending on the impact, may be large. Such information could also inform IDU's choices and equipment selection.

1.21 This report presents both laboratory and field based work to offer an introduction to establishing an evidence base to guide paraphernalia supply decisions.

Aims of the study

1.22 To test paraphernalia items and injection preparation methods in the laboratory to quantify the theoretical benefits and/or risks that they present to health, thereby identifying from those tested the items of paraphernalia and preparation methods that present the least theoretical risk to individual health.

1.23 To conduct an investigation into the impact that paraphernalia supply is making on sharing and health in the practice setting and compare this with non-supply.

CHAPTER TWO: OVERVIEW OF THE LABORATORY STUDIES

2.1 This chapter is concerned with the first aim of the study:

To test paraphernalia items and injection preparation methods in the laboratory to quantify the theoretical benefits and/or risks that they present to health, thereby identifying from those tested the items of paraphernalia and preparation methods that present the least theoretical risks to individual health.

2.2 Several objectives were set in order to fulfil this aim. These were to:

- a) Develop experimental methods for use in the laboratory that replicate the injection preparation practices of IDUs, based on the ethnographic work of Taylor et al (2004) and previous work.
- b) Identify the key equipment variables and method variables in the preparation process to be investigated in the laboratory experiments.
- c) Prepare injections using the developed method. Control all the variables in the preparation process (equipment and method) to allow the study of the impact of each variable.
- d) Study the impact of each variable by performing scientific experiments on injections prepared in different ways using different equipment.
- e) Where possible, benchmark the prepared injection results against standards used within the pharmaceutical industry for small volume injections and other relevant aspects of aseptic ('sterile') manufacturing. This will allow comparison of the preparation method and paraphernalia against theoretical standards that present minimal risk.
- f) Establish the contents of a safer injection 'kit' and preparation method which presents the lowest theoretical risks to health based on the laboratory results.

Development of the standardised injection preparation process

2.2 Objectives covered in this section:

- a) Develop experimental methods for use in the laboratory that replicate the injection preparation practices of IDUs.
- b) Identify the key equipment variables and method variables in the preparation process to be investigated in the laboratory experiments.

Background and summary of method

2.3 Scientific experimentation requires all the variables that impact on a process to be controllable. This allows for the effects of a change in one to be studied. In the study of pharmaceutical injections this is simple as the manufacturing process is standardised and can therefore be easily controlled. One of the first challenges for this study was the need to develop a method of preparing injections that copies what IDUs do as closely as possible, but is controllable so it can be used in the laboratory.

2.4 Prior to this study, Professor Avril Taylor, University of Paisley, was commissioned by the Scottish Executive to undertake an ethnographic study of injecting practices. Her study (Taylor et al, 2004), focused on a sample of injectors from Glasgow and data was recorded using video. This provided a rich source of information on blood borne virus risk taking behaviours and also clear illustration of how those involved prepared and administered their injections. This information was systematically gathered for the study here by completion of a questionnaire by Taylor's researchers, while replaying each filmed injecting episode. Sixty questionnaires were completed. The data was analysed to establish a common preparation method used for a single person injection and practices that deviated from this. The results informed the development of a standardised injection preparation process that was copied in the laboratory. This process reflected as closely as was scientifically possible the 'typical' preparation method used by IDUs, balancing the scientific need for accuracy and reproducibility. Where a choice in the process had to be made, advice given in training information for needle exchange workers such as the Safer Injecting Briefing (Derricott et al, 1999) was used. It was considered better practice to investigate the potentially safer methods of preparation which are likely to be advocated by needle exchange staff. Full detail of the method used to develop the standardised injection preparation process is available from the author j.a.scott@bath.ac.uk.

The findings and how they informed the laboratory work

Drugs used by injection

2.5 As expected, heroin was the most common drug injected in the work of Taylor et al. It is also the most common drug injected in Scotland (Parry et al, 2004). The laboratory work investigated the preparation of heroin injections. Future work could examine other common drugs such as crack cocaine and amphetamines.

2.6 It was chosen to investigate preparation of injections for use by one person as sharing should be discouraged. However, it should be noted that 42% (n=25) of the preparation episodes documented were for batch preparation (i.e. for injections that were subsequently divided amongst injectors).

Drug quantities

2.7 Heroin quantities were described by those in the video study by their value in pounds sterling. A 'ten pound bag' was the most common quantity used when preparing injections for one person. This was therefore chosen for the laboratory method, but first, the corresponding average weight had to be estimated. This was done based on several sources of information: (i) advice from Avon and Somerset Constabulary (ii) advice from the Independent Drug Monitoring Unit (IDMU) in Edinburgh, (iii) previous work with IDUs that measured fake powders (Ponton & Scott, 2004). A full description of what was done can be provided. The resulting weight of street heroin corresponding to a 'ten pound bag' used in the laboratory was 130mg.

Preparation of injections

Hand washing

2.8 Only one person was noted on Taylor's videos washing their hands prior to preparation, even though 83% (n=50) of injections were prepared in a building considered likely to have access to washing facilities. The Health Protection Agency 'Shooting Up' update report (2006) expresses concern about the increase in bacterial infections seen in IDUs. Unclean hands and skin could be a source of such bacteria. No research could be found examining the extent of microbial contamination on IDUs hands or the impact of hand washing in IDUs. Common sense and the application of knowledge from surgical and food hygiene suggests that hand washing prior to injection preparation should be encouraged. The lack of hand washing in the data from Taylor et al suggests it may not be seen as important by IDUs. The extent of contamination of IDUs hands, along with barriers to hand washing were further investigated in the 'Hand washing study' (section 2.2). A comparison of hand washing with a quicker and potentially more convenient source of hand cleansing using alcohol hand rub (alone without water) was also undertaken.

Order of preparation steps

2.9 Most IDUs in the videos used six steps in the preparation of heroin. The order of these steps varied with some, but the majority used the process summarised in figure one:

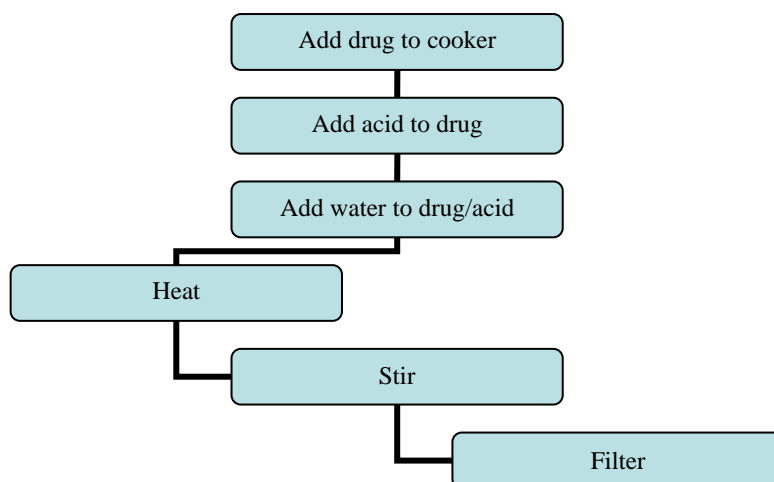


Figure 1: heroin injection preparation process most commonly used for single and multiple person injections

2.10 All heroin injectors added an acid and heated the injection. All but one used a filter. This was consistent with previous work with IDUs in the South West (Ponton & Scott, 2004). Detail of each step was required from the video data, in order to inform the laboratory standard method.

STEP ONE: Add drug to cooker:

2.11 The most common cooker in the videos was the teaspoon. The alternative used was the bottom of a drinks can. In Europe, and in some needle exchanges in the UK, the supply of commercially produced cookers is undertaken. When this work began, the Stericup® was the only one available. This is a thin aluminium bowl with a handle. A plastic cover placed over the handle protects the fingers from heat transfer. The Stericup is intended for disposal after use. It becomes more fragile after use due to the heat contorting the aluminium. The Stericup is sterile so should not contribute bacterial, fungal or viral contamination to the injection. For more information see:

<http://www.apothicom.org/index.php> (English language version available).

2.12 There is a need to investigate the use of the Stericups as an alternative to injectors using their own spoons or drinks cans. Specific questions are:

- Do Stericups prevent IDUs sharing cookers?
- Do Stericups discourage reuse?
- Does the Stericup leak any aluminium into the injection and if so, are levels safe?

2.13 The first two questions are discussed in the qualitative section of the practice based study; the last question (3) was investigated in the laboratory, in the ‘Stericup tests’ (section 2.3).

STEP TWO: Add acid to cooker:

2.14 Acids are a necessary part of the injection preparation process. They have potential however to irritate veins, especially if too much is used. Most street heroin in the UK is in the chemical form called 'base' (King, 1997). Crack cocaine is also in base form. Bases are poorly soluble in small volumes of water, such as those used to prepare injections. They vaporise on heating so suitable for smoking. The acid converts the base drug into a soluble form by a process called 'protonation', which makes the drug dissolve in water. The heroin still exerts the same psychoactive effect.

2.15 Various amounts of acid were observed to be added on the videos. For the laboratory method a standard amount of 70mg, calculated as representing a 'pinch' of citric acid was chosen, with ascorbic acid and various amounts of both acids also investigated. The laboratory experiments were done to predict how much acid is needed, so the minimum amount can be advised, to reduce vein risks.

2.16 Citric acid sachets were supplied in Glasgow when the video work of Taylor et al was done. They were used in 41% (n=20) of heroin injection preparations recorded. Citric acid from other sources e.g. cooking grade citric and lemon juice were also observed. No ascorbic acid (vitamin C) was used. The use of various other household acids has been reported elsewhere (Ponton & Scott, 2004). The provision of acid of high quality (British Pharmacopoeial -BP grade) to IDUs, in sterile sachets has the potential to bring several benefits:

- a) to ensure that the acid does not contribute contaminants or bacteria to the injections. This would allow needle exchanges to be reassured of the quality of the product supplied.
- b) to perform favourably for clients so attract them into service, thus allowing the opportunity to deliver harm reduction messages and signpost into treatment services.
- c) to minimise the risks to health, if the least risky BP grade acid and quantity can be established.

2.17 The BP grade and sterile nature of the acids assures that the first benefit is met. BP limits mean the acid has passed quality control tests e.g. for fungal contamination which can occur naturally in citric acid. The second benefit has been demonstrated by Garden et al (2003). However the third benefit has not been shown. Hence the question 'Which acid is least risky?' was studied in the laboratory. Both ascorbic acid BP (vitamin C) and citric acid BP are available in sterile sachets and both are permitted within the legislation. 'The acid tests' in laboratory section 2.4, address this.

STEP THREE: Add water to cooker:

2.18 For most of the injections videoed tap water was used. Bottled water tended to be used when preparation occurred outside. The most common volume used to prepare a £10 bag of heroin was 0.7ml, so this was taken as quantity used in the standard laboratory preparation method. This is similar to previous findings of 0.8ml (Scott, 2000, Ponton and Scott, 2004).

2.19 Sterile Water for Injection (BP) (WFI) is water that has been prepared to injectable pharmaceutical standards. It is sterilised, so is free of microbiological contamination and also has limited quantities of particles in it. This means there is minimal risk of this water

contributing to any infection or damage to the vascular system. Since water can be a source of bacteria and shared contaminated water may transmit blood borne viruses (BBVs), sterile water, in single use ampoules small enough to prevent sharing could have advantages. The supply of Sterile Water would also allow needle exchanges to be reassured that the water they were supplying was 'fit for purpose'. The advantages of single use sterile water ampoules prepared to pharmaceutical standards of sterility and particle content, over a cup of boiled and cooled tap water are evident, so laboratory experiments to further verify this were considered unnecessary.

STEP FOUR: Heating

2.20 In the videos all injections were heated as part of the preparation process. Therefore heat was used in the laboratory. The length of time of heating on the videos was variable. Several factors could influence this including volume and temperature of the water, thickness and type of spoon metal, the source of the heat and distance from the spoon. From previous work (Scott, 2000) and the videos, the established heating end point was when the injection 'bubbled and went clear'. Hence it was chosen to use this as the end point of heating in the laboratory. Figure 2 gives an illustration of a prepared injection after the endpoint.



Figure 2: clear heroin solution after heating with acid

STEP FIVE: Stirring

2.21 Stirring was used during the preparation of the majority of injections that were videoed, so it was used in the standard laboratory method. The end of the needle cap was used to do this. A new syringe was used each time and stirring undertaken until most powder was seen to dissolve.

STEP SIX: Filtering

2.22 Makeshift filters are used by IDUs to prevent the needle blocking during injection administration. It is believed that filters remove insoluble materials. The use of filters is advocated in harm reduction leaflets, as it is perceived that they reduce the risks of thrombus and granulomas. These can be caused by the injection of insoluble particles. However makeshift filters are not fit for purpose and needle exchange suppliers need to consider the performance and requirements of a filter when selecting one to supply.

2.23 A $\frac{1}{4}$ piece of cigarette filter was most commonly used as a filter in the videos. Cotton wool and hand rolling filter were also sometimes used. These are all 'makeshift' items and may not be fit for purpose. The laboratory experiments aimed to investigate whether these filters could potentially reduce risks and compare them with commercially available ones.

Commercial manufacturers are starting to produce filters for use by IDUs. At the start of this work the Sterifilt[®] had recently been produced by Association Apothicom in France. It is a polypropylene filter which fits over the needle and grips the sides of the syringe tip. It is designed to remove particles over 10 microns from solutions. It is illustrated in figure 3.

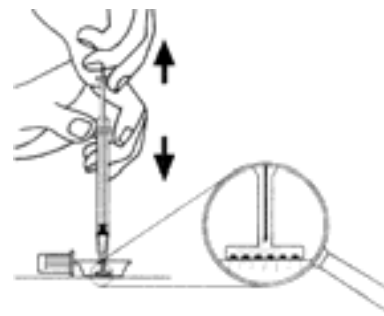


Figure 3: Sterifilt in use and close up of the filter.
© Association Apothicom [used with permission]

2.24 The advantage of the Sterifilt is it is sterile and therefore new ones will not contribute microbiological contaminants into the injection. This has advantages in reassuring needle exchanges. The Sterifilt also has minimal absorption capacity so should not retain much drug. The Sterifilt has therefore less potential in theory of being kept for future reuse or sharing. Other commercially made filters were available at the start of this work. The Stericup filter was a small cellulose acetate filter supplied with Stericup cookers. ‘Wheel filters’ of the type used in medical and laboratory research were known to be supplied in Australia to IDUs. This raises the question of how the commercially available filters compare against each other and with makeshift filters.

2.25 The video data showed that filters were sometimes saved for later reuse or ‘bashing down’ to release trapped drug. Hence if filters were found to retain drug it was considered that they would likely be saved. Hence drug retention capacity was an important aspect of all filters to study. The filter experiments are summarised in section 2.5 ‘The filter tests’.

Development of the standardised injection preparation method

2.26 Based on the video data from Taylor et al and previous work, the standard method of injection preparation used in the laboratory was as shown in figure 4:

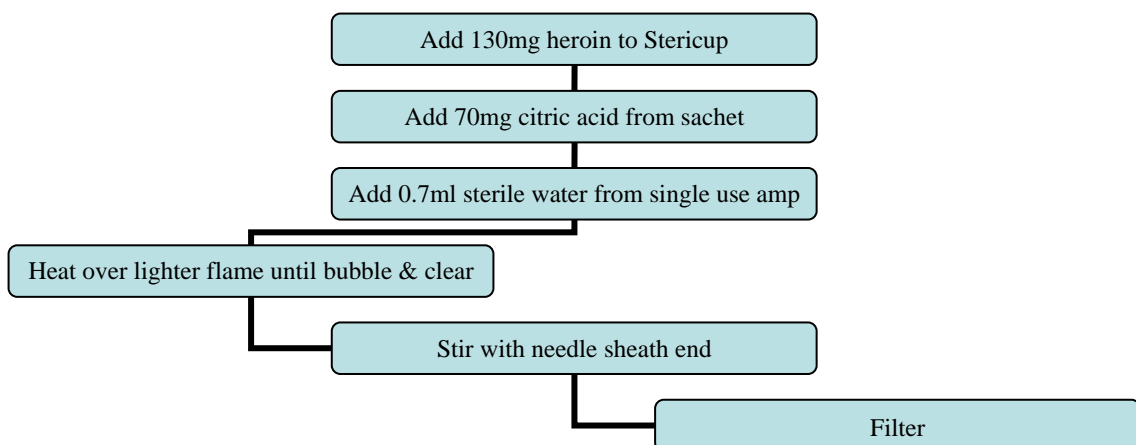


Figure 4: the basic preparation method for use in the laboratory.

2.27 In summary, the questions to be investigated were:

- How extensively microbiologically contaminated are IDUs hands?
- What barriers prevent IDUs from washing their hands prior to injecting?
- Is alcohol hand rub (a quicker and more convenient hand sanitiser) as good as soap and water?
- Do Stericup leak aluminium to the injection solutions and if so, are the levels safe?
- Which sterile acid presents the least theoretical risk to veins?
- What minimum quantities of acid dissolve heroin?
- How do commercially available filters (e.g. Sterifilt, Stericup filter and 'wheel' filters) compare against each other and with 'makeshift' filters used by IDUs (e.g. cigarette filters, hand rolling cigarette filters and cotton bud tips)
- To what extent do various filters retain drug and hence are likely to promote their retention for reuse or sharing?

Materials and methods

2.28 It is convention in scientific research to give full detail of the materials and experimental methods. This includes listing manufacturers of materials and describing equipment test conditions and settings. As this report is for a multidisciplinary audience, such detail has not been reproduced here. Instead, brief information has been given. Full detail can be obtained from the author j.a.scott@bath.ac.uk. The heroin samples were obtained from Avon & Somerset Constabulary Forensic Science Dept. A controlled drugs licence is held by the researcher and all storage, documentation and destruction have been verified by the police.

The Hand Washing Study

2.29 The hand washing study was designed to answer the questions:

- How extensively microbiologically contaminated are IDUs hands?
- What barriers prevent IDUs from washing their hands prior to injecting?
- Is alcohol hand rub as good a sanitiser as soap and water?

Method

Collection of the data

2.30 A study was designed to investigate the extent of contamination on IDUs hands and to compare the effectiveness of two different hand cleansing methods, which were:

- (i) washing with Simple® soap and water and drying with a paper towel (a two step process that requires access to a sink)
- (ii) rubbing with Spiri-Gel® 70% denatured ethanol hand rub until hands felt dry (a one step process that can be undertaken conveniently if gel carried e.g. belt clip packs as used by nurses)

2.31 The study was undertaken in association with Bristol Drugs Project (BDP). Participants were recruited from IDUs attending three outreach mobile harm reduction services and the city centre needle exchange service. After consent was obtained,

participants were asked to press all fingers of their dominant hand, defined as the hand they most commonly used to write with, into a tryptone soya agar plate. The dominant hand was chosen as this was the hand considered to be most involved in the preparation and administration of injections. This provided information on the contamination of IDUs hands. Participants were then randomised to one of the two cleansing methods. No instruction on how to cleanse the hands was given in order to gain insight into results from ‘natural’ practice. Participants then pressed their dominant hand fingers again onto another agar plate. Participants also completed a short questionnaire with the needle exchange worker, to describe their living arrangements and explore their views on hand cleansing.

Analysis of data

2.32 Plates were stored in a fridge until they were returned to the University where they were incubated at 37 degrees C for 48 hours. The number of colony forming units (CFU), indicating microbiological contamination, were counted on each finger dab and an average for all visible dabs taken. Not all IDUs showed 5 finger dabs. ‘Before’ and ‘after’ plates were studied and compared. These and questionnaire data were analysed using Excel and SPSS. Data was compared using t-tests. The study was not designed to identify specific organisms.

Ethical approval

2.33 NHS Research Ethics Committee approval was sought as the needle exchange service received NHS funding. The study was given approval by Swindon Local Research Ethics Committee, ref: 04/Q2004/29.

Results

2.34 The target number of 50 participants completed the study. Twenty three from the city centre needle exchange and 27 from the mobile harm reduction service.

What is the extent of bacterial contamination on IDUs hands?

2.35 It should be noted that for some dabs the count was approximate as the close growth of the CFUs made the exact count impossible to determine. Table 1 shows the results prior to hand cleansing, grouped into bands. As can be seen, the majority of IDUs had between 20 and 50 CFUs per finger dab.

Band in which the average number of colony forming units (CFU) per finger dab fell	Number of IDUs from whom this result was obtained (n=50)
0-5	2
6-10	2
11-15	5
16-20	5
20-50	30
Over 50	6

Table 1: Contamination of injecting drug users hands before cleansing, shown as band within which the average number of colony forming units per finger on the dominant hand fell.

Homeless vs. housed

2.36 Thirty four (68%) people said they lived in housing –either their own house or flat, with a parent or in shared accommodation with friends. Sixteen people (32%) termed themselves homeless, ten of these slept rough, for example in car parks, five slept in a hostel or shelter and one lived in a squat with other injectors. Homeless and housed IDUs showed no significant difference in the extent of the contamination on their dominant hand ($p=0.104$).

What is the impact of hand cleansing before preparing injections?

2.37 Figure 5 shows the ‘Before’ and ‘After’ results for the entire study group, not broken down according to hand cleansing method. Note that there are 48 ‘After’ results because two plates could not be read due to ‘spreaders’. This is where the finger must have been wet, resulting in extensive spread of the contamination across the plate. This gives a difficult to interpret, so unreliable result, so it was discounted. Hand cleansing significantly reduced microbial contamination ($p=0.015$).

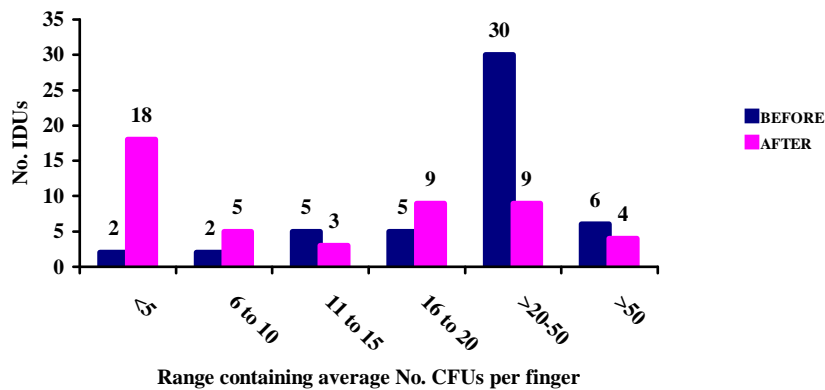


Figure 5: Contamination before and after hand cleansing shown as the number of injecting drug users with CFU average count within the stated band.

Figure 6 shows one set of agar plates to illustrate the effect of hand cleansing. This has subsequently been used in an in-house BDP leaflet to highlight the importance of hand cleansing to IDUs.



*'BEFORE' illustrating heavy contamination
(over 50 CFU average per finger)*

*'AFTER' illustrating one colony forming unit per
finger but with some 'spreader' effect.*

Figure 6: 'Before' (top) and 'After' (bottom) plates for participant H3, illustrating the reduction in the number of colony forming units due to hand cleansing.

Comparison between alcohol hand rub and soap and water

2.38 Comparison between alcohol hand rub and soap and water: which is better for IDUs? Table 2 shows the impact of both types of hand cleansing, with the number of CFUs grouped into bands. Both methods of hand cleansing reduced contamination and when data was compared statistically, alcohol hand rub was not significantly better than soap and water ($p=0.093$).

	Number of participants who's average finger dab CFU count fell within the stated band			
	HAND RUB group		SOAP group	
Avg CFUs per finger dab bands	BEFORE (n=25)	AFTER (n=25)	BEFORE (n=25)	AFTER (n=23)
0 to 5	1	16	1	2
6 to 10	1	4	1	2
11 to 15	4	1	1	2
16 to 20	3	3	2	6
>20-50	12	1	17	7
>50	4	0	3	4

Table 2: Comparison between average number of colony forming units before and after hand cleansing with the specified method, with counts in the stated bands.

How can hand cleansing be promoted to IDUs?

Participants' views of hand cleansing:

2.39 The questionnaire, which was administered by the needle exchange worker, asked participants whether they usually washed their hands before injection preparation. They were given a choice of 'YES -all the time or most of the time', 'YES -but only sometimes', 'NO - never or rarely' or 'Not Applicable, does not prepare own injections'. All participants prepared their own injections so the last option was not selected. Results are shown in figure 7:

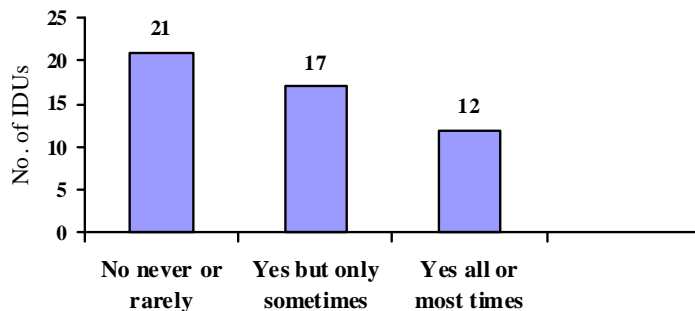


Figure 7: Participants self-reported hand washing practices prior to injecting (n=50)

2.40 This shows that amongst the participants only 24% (n=12) said they always or mostly washed their hands before injecting. The majority either never or rarely washed their hands (42%, n=21), or reported doing this only sometimes (34%, n=17).

2.41 The questionnaire also asked 'What are the main reasons the client thinks prevent hand washing?' A choice of the following options were given 'Lack of access to soap and water at the time', 'In too much of a hurry to get hit', 'No one else does it' or 'Client does not think there is a need to wash hands before injecting'. The option of 'other' and specifying a different reason was also given. Although the question was intended only for those who reported never or rarely hand washing, responses were recorded for 41 participants indicating that the needle exchange workers collecting the data asked this question to most. However since the question asked for a general opinion, data is considered meaningful from all who responded.

2.42 The most popular answer to this question was 'in too much of a hurry to get a hit', selected by 18 respondents (44%). Eleven participants (27%) said they thought there was no need to wash hands, highlighting a need for education around hand washing. Nine (22%) said 'lack of access to soap and water' was an issue and all of these nine were homeless. Two people gave other reasons: one said it depends on the circumstances around the injecting and the other said they had not thought about doing it. One person said 'no one else does it', which may mean it was not a learned part of the process or may mean they are deterred from doing it as no one else does.

Conclusions from the hand cleansing study

How extensively microbiologically contaminated are IDUs hands?

2.43 60% of IDUs produced average finger dab counts between 20 and 50 CFUs. There was no difference between homeless and housed IDUs contamination levels, which suggests that attempts to promote hand cleansing should be targeted at all IDUs not just homeless ones.

What barriers prevent IDUs from washing their hands prior to injecting?

2.44 Only 25% of participants reported cleansing their hands 'all or most of the time' prior to injecting. The main factors that prevented them from washing their hands were the hurry to get a 'hit' and the lack of perceived need. It should be noted that those who said lack of access to soap and water was the main barrier were all homeless.

Is alcohol hand rub as good as soap and water?

2.45 Hand cleansing by either soap and water or alcohol hand rub prior to injecting could be of benefit for IDUs, as both reduced the amount of contamination on their finger tips. This study showed alcohol hand rub reduced contamination on IDUs fingers in 23 out of 25 cases. The 70% alcohol hand rub gave a greater reduction overall in number of colony forming units than the soap and water, but this was not statistically different with the numbers in this study. It also did not on any occasion cause an increase in contamination. Hand rub may potentially be more convenient as it does not require access to a sink. This leads on to the question as to whether alcohol hand rub should be supplied to IDUs.

2.46 Alcohol hand rub within medical practice is promoted for use in addition to washing hands with soap and water. Hand rub use is endorsed by the US Centre for Disease Control (Dix, 2002) as its convenience has been demonstrated to promote compliance (Pittet, 2000). It is used in Scottish hospitals and in England, following a successful pilot study by the National Patient Safety Agency (see: www.npsa.nhs.uk/cleanyourhands). Alcohol hand rub has also been studied as an alternative to soap and water elsewhere and produced favourable results (Hernandes et al, 2004). Hand rub provides the convenience of a cleansing method that can be used without the need to access a sink or towel. It may be more likely to be used by IDUs as it is quicker to use, hence more possible when in a hurry to inject. However this would require supply in convenient containers, such as belt clipped small bottles or sachets and an accompanying education campaign to promote this practice. 27% of participants did not think hand cleansing was necessary. This belief was also identified in the field study reported later.

Aluminium cooker tests

2.47 The Stericup tests were designed to answer the question:

- Do Stericups add aluminium to the injection solutions and if so, are the levels safe?

Method

The injections that were prepared and tested

2.48 A series of injections were prepared, using the basic preparation method that was developed (figure 4). Both citric and ascorbic acids were tested, as both are supplied to IDUs. Various quantities of these were tested as it was thought that the acidity may make a difference to the results. ‘Controls’ prepared without acid or drug were tested too. Heat was used for approx 30 seconds. Controls with acid were also prepared in spoons instead of Stericups. The spoons were made of stainless steel, so did not contain aluminium. The individual injections tested are detailed in table 3 with the results.

The analysis technique

2.49 Aluminium levels were measured using a technique known as Atomic Absorption Spectrophotometry. This can detect levels of aluminium down to a concentration of 0.2 parts per million. A full description of the analysis method can be provided (j.a.scott@bath.ac.uk).

Results

2.50 The results from the aluminium detection tests are shown in table 3:

Injection under investigation	Average aluminium level detected (ppm) (n=2)	
	Stericup	Spoon
Water stirred in cooker no heat	0	-
Water stirred in cooker + heat	0	-
Water + 70mg citric acid + heat	1.9	0
Water + 140mg citric acid + heat	1.2	0
Water + 175mg ascorbic acid + heat	0.5	0
Water + 330mg ascorbic acid + heat	0.3	0
Water + 130mg heroin + 70mg citric + heat	3.0	-
Water + 130mg heroin + 175mg ascorbic + heat	2.8	-

Table 3: Aluminium detection test results.

What do the results show?

2.51 Water without acid or drug in the Stericup, did not yield any detectable aluminium levels. This was found both with and without the use of heat. When acid was used with water and heat in Stericups, aluminium was detected. This was found both with citric and ascorbic acids in various quantities. When injections were prepared using heroin, with citric or

ascorbic acid and heat, aluminium was again detected. The concentration of aluminium detected when heroin was used was higher. All solutions with acid prepared on the stainless steel spoon did not yield any detectable aluminium levels. So some aluminium is deposited from the Stericup into the solution during preparation, although in all cases the quantity did not exceed 3.0ppm. Although not tested, other aluminium preparation cookers for IDUs, like Danicup, are likely to also exhibit this effect.

Why does this happen?

2.52 Ascorbic acid and citric acid are reported in the literature to increase aluminium absorption from the stomach (Fairweather-Tait et al, 1994). The authors suggest this may be due to the ascorbic and citric acids forming what is termed a 'soluble chemical complex' with the aluminium. This means the aluminium, which is not normally soluble, can dissolve in liquid because it reacts with the acid. The same mechanism may be occurring with the Stericup, since water and heat alone did not increase aluminium levels (i.e. water and heat did not dissolve any aluminium from the Stericup).

2.53 The injections that contained heroin had more aluminium in them. No control was performed with heroin on a spoon as drug supplies were limited. This means it cannot be established whether the higher level of aluminium is due to the heroin reacting with the acid and aluminium, or whether there is also aluminium in the street heroin as a contaminant. The former is considered most probable.

Are Stericups and other aluminium cookers safe for IDUs?

2.54 This leads to the question of whether the level of aluminium in injections contributed from the Stericup can be considered safe. Concerns in the literature around aluminium consumption relate to aluminium build up in bone, brain tissue and internal organs. However, much of the work is animal based (e.g. Fulton and Jeffery, 1990). Human studies are difficult as the effects take a long time to be seen, and it is impossible to control for all possible causes over a lifetime. Neither the British Pharmacopoeia, European Pharmacopoeia nor United States Pharmacopoeia specify a limit for aluminium in injectable medicinal preparations. This is likely to be because of the difficulty in establishing a safe limit. Aluminium is present in foods and drinking water sometimes in reasonably high quantities. Data from Wessex Water (Water Supply Zone Summary, Zone 59, ref: 44000059, 21/02/03) showed that analysis of 20 drinking water samples in Bath gave an average aluminium concentration of 21.6 micrograms per litre, which is equivalent to 0.02 micrograms per ml or 0.02 ppm. However aluminium is poorly absorbed from the gastrointestinal tract, therefore oral ingestion data does little to guide on safe limits for intravenous use.

2.55 Taking the highest experimental result which was 3 ppm (3 micrograms per ml), an injection of volume of 0.5ml would contain 1.5 micrograms. On this basis, an IDU who injected five times a day could be estimated to inject 7.5 micrograms of aluminium daily. Concern in the literature is largely around build up of aluminium in the body over time, so the real question is whether use of aluminium cookers by IDUs over several years could present any risks. This cannot be answered from this work. The potential advantages of single use sterile cookers in preventing sharing and BBV transmission need to be remembered when considering speculated longer term risks.

2.56 Future manufacturers of cookers may want to investigate other metals that do not react with acid or drug, but also do not withstand multiple use. One of the advantages of the Stericup is its fragile nature. It was found in the laboratory that the Stericup becomes flimsy when reheated, especially around the handle, which bent. This was also reported by some of the interviewees in the field study detailed later. This may prevent it being used by IDUs multiple times. Stronger metals and materials such as stainless steel are likely to be more durable, so potentially not be as 'single use' in nature. Their cost is likely to also make their supply prohibitive.

Conclusions from the aluminium cooker tests

Do Stericup add aluminium to the injection solutions and if so, are the levels safe?

2.57 Small amounts of aluminium were shown to be detectable in solutions made with acids in Stericups. The significance of this, if any, cannot be assessed at this point based on the limited literature on aluminium accumulation effects. Therefore it is unknown whether there is any cause for concern from aluminium deposits in injections. The Stericups were found to be 'single use' in nature. Reheating tended to make them bend at the handle and hence run the risk of spilling the contents. This was also noted by IDUs who were interviewed for the field study. The benefits of supplying single use cookers in potentially reducing the transmission of BBVs and in improve the cleanliness of injection preparation methods need to be remembered when considering supply.

The acid tests

The acid tests were designed to answer the questions:

- a) Which sterile acid presents the least theoretical risk to veins?
- b) What minimum quantities of acid dissolve heroin?

Method

2.58 Although a range of acidic substances have been noted to be used by IDUs e.g. lemon juice, vinegar, vitamin C tablets, it reasonable to propose that in order to reduce risks, the acid used should be in a 'pure' form, defined as of appropriate pharmaceutical grade. The British Pharmacopoeial (BP) standard is recommended, as this means that the acid has passed all the necessary quality control tests stipulated, such as purity and limit tests for oxalic acid. Sterility is important as it can assure the needle exchange supplier that the acid they are distributing will not contribute towards microbiological risks in the injection preparation process. This laboratory work focused on citric acid BP grade sterile acid sachets and ascorbic acid (vitamin C) BP grade sterile acid sachets, as they present the less theoretical risks for IDUs.

2.59 The experiments performed investigated relative irritancy of prepared injections by measuring osmolality and pH. These terms are both explained below. The pH data can be used to predict the minimum amount of acid needed.

Osmolality measurements

2.60 Osmotic pressure (tonicity) is commonly described as *osmolality*. In the context of this study, this is the pressure that the injection may place on the blood and vein tissues when

injected, due to a difference between the tonicity (amount of particles in the solution) of the injection and those in the blood/tissue cells. Hypotonic injections are ones where the tonicity of the solution is less than that of the blood/tissue cells. When this occurs, water from the injection may enter into the blood/tissue cells causing them to swell and possibly burst. Hypertonic injections are where the tonicity of the injection is greater than that of the blood/tissue and these cells may again attempt to redress this difference by leaking water, which may burst or dishevel them, possibly causing pain and reducing tissue function. Isotonic solutions are ones where the osmotic pressure of the injection is equal to the tissue or blood. Isotonic solutions cause no swelling or contraction of the tissues with which they come in contact. In the case of eye and nose drops isotonicity is essential to avoid pain on administration. However with injections, as the rapid moving blood quickly dilutes the injection, isotonicity is not essential.

2.61 Osmotic pressure is measured in units of milli-osmoles per litre (mOsmol/l). The osmotic pressure of plasma is 291 mOsmo/l. It is recommended that any fluid with an osmotic pressure above 550 mOsmo/l should not be injected rapidly as this would increase vein damage and ideally injections and infusions should be between 300-500 mOsmo/l (Florence and Attwood, 1998). Injections with a higher osmolality could be administered if this was done so very slowly, to allow adequate time for dilution in blood. Hence rate of administration is also an important factor in avoiding vein damage.

2.62 For this study, a series of heroin injections were prepared using the standard method (figure 4) and various quantities of either citric acid or ascorbic acid BP from sterile sachets were used, as described in table 4:

Heroin quantity	Water volume	Acid added	Acid quantity
130mg	0.7ml	Citric acid BP	70mg (one pinch/half sachet)
130mg	0.7ml	Citric acid BP	140mg (whole sachet)
130mg	0.7ml	Citric acid BP	50mg* (small pinch)
130mg	0.7ml	Ascorbic acid BP	330mg (whole sachet)
130mg	0.7ml	Ascorbic acid BP	175mg (one pinch/half sachet)
130mg	0.7ml	Ascorbic acid BP	135mg* (small pinch)

Table 4: samples prepared for osmolality measurement. *originally the equivalents of half a pinch were used but this was found not to be enough to dissolve all that was visible so these were increased to the stated amounts.

2.63 Injections were prepared in duplicate then combined as the minimum volume that the equipment could analyse was 1.0ml. Osmolality measurement was performed.

pH measurement

2.64 pH is an indicator of the concentration of hydrogen ions (charged molecules) (H⁺) in a solution. pH values are described as *acidic* (pH <7) or *alkaline* (pH >7) or *neutral* (pH = 7) on a scale of 0-14. Water has a pH of around 7. A high concentration of hydrogen ions gives a low pH (acid) and may be irritant to tissues and vein walls on injections. As said in 2.14,

the acid dissolves the base heroin by a process called ‘protonation’. The pH at which 99.9% of heroin molecules are ‘protonated’ is pH 4 (Florence & Attwood, 1998). In theory, adding additional acid will reduce the pH but have practically no effect on increasing the amount of dissolved heroin (i.e. be more irritant for no more drug gain). The pH of two of each injection described in table 4 was measured and the average calculated.

2.65 It was originally planned to also measure the amount of drug in resulting injections made with various quantities of acid to confirm concentration, but due to major equipment failure this was not possible.

Results

2.66 The pH and osmolality measurements are given in table 5.

Acid type	Acid wt (mg)	Avg pH	Average mOsmo/Kg
Citric (small pinch)	50	2.96	492
Citric (half sachet)	70	2.62	529
Citric (whole sachet)	140	1.84	1006
Ascorbic (small pinch)	135	3.26	1279
ascorbic (half sachet)	175	2.95	1591
ascorbic (whole sachet)	330	2.38	Would not freeze

Table 5: Average pH and osmolality measurement (n=2). Note the unit of measure mOsmo/Kg is approximately equivalent to mOsmo/l

2.67 The injections prepared with citric acid had a lower osmotic pressure, but also a lower pH. This indicates that although they may cause less cell bursting if injected rapidly, they may cause more vein lining irritation due to higher hydrogen ion content. The ascorbic acid injections had a higher osmolality, but higher pH, suggesting that if injected slowly to compensate for osmolality, they may be less irritant (Kuwahara et al. 1998). Citric acid is anecdotally reported by IDUs to cause more pain on injection than ascorbic acid, suggesting that irritation of the vein due to the hydrogen ion content is more significant than cell bursting, in causing pain. The results support the advice that small quantities of acid should be used and injections should be administered slowly.

2.68 The 330mg of ascorbic acid precipitated out of solution and would not freeze despite many attempts. This may possibly be due to the large quantity of ascorbic acid having an antifreeze type action or interaction with other materials present, causing precipitation. Dissolution occurred, then some minutes later the precipitate appeared.

2.69 When smaller quantities of citric and ascorbic acid (35mg and 70mg respectively) were added, not all the drug was seen to dissolve. Hence the minimum quantities used were increased to 50mg and 135mg, which were deemed approximately to be ‘small pinches’. As said, in theory 99.99% of heroin base will dissolve at pH 4, at which the solubility is 120mg/ml (Florence and Attwood, 1998). However, this data relates to pure heroin base and the effects of other compounds present in street heroin cannot be accounted for. For example, other materials may ‘use’ some citric molecules (protons) to dissolve.

Conclusions from the acid tests

Which sterile acid presents the least theoretical risk to veins?

2.70 The results show advantages and disadvantages for both citric and ascorbic (vit C) acids and favour small quantities added stepwise. The results suggested ascorbic acid may be less irritant to vein lining due the injections being less acidic. However, they need to be administered slowly to avoid any osmotic effects. Citric acid produced theoretically more ‘osmotically compatible’ injections but it was shown that small amounts in excess of what is needed reduce pH a lot and hence it may be easier to cause burning, pain and irritation. Citric acid allows less ‘margin for error’ as smaller amounts compared to ascorbic acid produce similar pH changes. This concurs with anecdotal reports from IDUs.

What minimum quantities of acid dissolve heroin?

2.71 Less than half a sachet of either acid was sufficient for a £10 bag equivalent of the heroin used in these experiments. The results suggest that compared with the laboratory results, injectors may be using too large quantities of acid. This is based on data reported by Garden et al (2003) where whole sachets were common and the videos of Taylor et al (2004) where 8 out of 9 who used sachets to prepare £10 bags used one or more whole sachets. As well as using small quantities of acid, the results show the importance of administering injections slowly. As said, the diluting effects of blood are important to reduce irritation by the acid. Citric acid is cheaper than ascorbic acid, and for this reason services may be more able to fund citric acid supply.

2.72 Further work would be needed to measure the amount of resulting opiate in injections. Although all those prepared in the lab were observed visually to fully dissolve.

The filter tests

2.73 The filter tests were designed to answer the questions:

- How do commercially available filters (e.g. Sterifilt, Stericup filter and ‘wheel’ filters) compare against each other and with ‘makeshift’ filters used by IDUs (e.g. cigarette filters, hand rolling cigarette filters and cotton bud tips)
- To what extent do various filters retain drug and hence are likely to promote their retention for reuse or sharing?

Method

2.74 The first question was addressed by measuring particle content of prepared injections and comparing them when different filters were used. Injections were also studied under a powerful microscope technique called SEM to look for fibres from filters. The second question was answered by measuring the amount of drug retained in the filters after use.

Particle content analysis method

2.75 The particle content was measured using the British Pharmacopoeial standard method of particle size analysis for injections. The machine used was an LS-200 PMT particle sizer. It counts particles within specified size ranges, rather than reporting the exact size of each

particle, which would be inaccurate. Each experiment was performed in triplicate and the average calculated. 'Controls' were performed. These were experiments that did not use drug to show the effects of filtering in itself. The particle content of various water sources was established. Then the amount of particles shed by the filters when used was also established. Finally injections prepared with heroin were prepared and filtered by different means and the results were compared. The SEM was used to examine and take pictures of prepared injections to look for shed fibres.

Analysis of used filters for retained drug

2.76 Capillary Zone Electrophoresis was used to measure opiate content, performed in conjunction with R Reid, The Robert Gordon University. The drug retained in the filters was 'bashed down' copying the methods of IDUs using 1.0ml of methanol, which was then diluted and analysed. The wheel filters were flushed with 1.0ml methanol, which was then diluted in the same way. Each one was tested twice and the average taken.

The filters that were used in the experiments

2.77 The filters analysed were cigarette filters (split into ¼), hand rolling cigarette filters (Rizla, split into ¼), cotton buds (removed from the plastic stalk and used whole), Sartorius syringe ('wheel') filter (0.2 microns), Stericup filter and Sterifilt.

Microbiology of used filters

2.78 In the video work of Taylor et al, the practice of retaining filters for future use was observed. This could potentially present risks from infection if the filters harbour microbes. Demonstration of contamination of used filters could be used to convey harm reduction messages to IDUs to discourage reuse and sharing. An initial exploratory study would also be useful to indicate if further more detailed microbiological investigation is worthwhile. Participants in the hand washing study previously described (2.29-2.46) were invited to donate used filters for this study. Willing participants either donated filters they had on their person at the time of request or were issued with a sterile sample pot, marked with their study code, and asked to return it on their next visit to the needle exchange. As filters appear to have a value, as seen in the work of Taylor et al, it was anticipated that response may be quite low. LREC approval covered this aspect of the study. Returned filters were dropped using tweezers to avoid touching them, into 1ml of diluent nutrient broth and incubated for 48 hours. Where two or more filters were supplied by an IDU, two were chosen for analysis in duplicate. 100 microlitres of the resulting broth was plated onto a tryptone soya agar plate and growth counted after 24 hours as the number of colony forming units. The purpose was to conduct initial investigation into extent of contamination and speculate on likely species. No attempt was planned to identify the specific organisms. A microbiologist (JC) assisted with classification.

Results and their significance

Particle content analysis & SEM: water only

Figure 8 shows the results of the tests on water samples. WFI =water for injection; Exchange water =water from Exchange Supplies plastic ampoules. Tap waters as described. A 3-D format has been chosen to illustrate them more clearly.

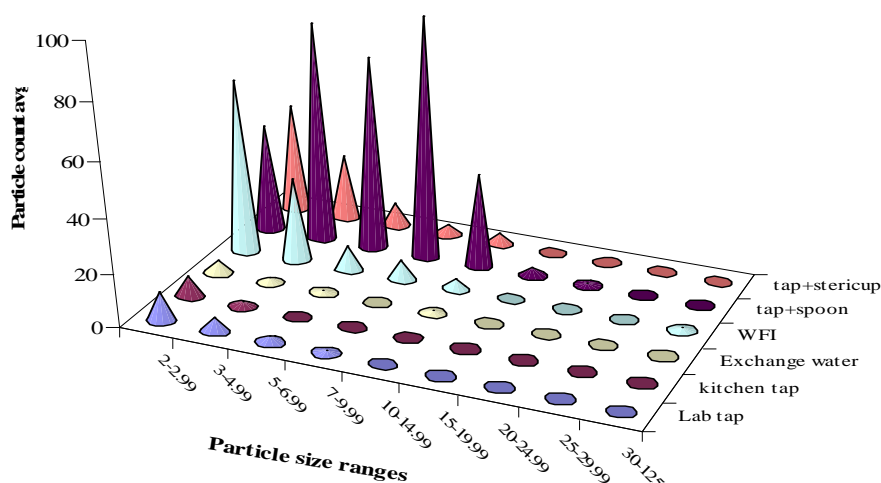


Figure 8: Average number of particles per size range for each water sample (n=3)

2.79 The tap waters were relatively low in particles, with the kitchen cold tap giving slightly less particles than the lab cold tap. The sterile water BP in plastic ampoules performed favourably, giving a lower count than tap water. This would be expected as it is prepared to BP standard. The WFI was taken from glass ampoules and was more heavily contaminated. This may seem surprising at first, as it is prepared to the same BP standard the sterile water. However both waters were sampled straight from the packaging ampoule. The WFI ampoule was glass and it is likely that the increased particle load is due to glass particles that contaminate the water when the ampoule is snapped open. This is a known feature within the pharmaceutical industry. The tap water added to the Stericup was more contaminated than tap water alone. It is to be expected that some particles would be added from the atmosphere, the preparer and the Stericup. However the Stericup gave much less particle load than the spoon. This is likely to be because the spoon was cleaned prior to use and dried, whereas the new Stericup was removed directly from its packaging.

2.80 Particles detected were mainly less than 10 microns. The injection of small particles of this size is not without risk, for example they may cause granulomas. However, it is the injection of larger particles that may cause blood capillary blockage or the formation of clots

that are of greatest concern. Overall the water control results support the use of the Stericup and support the use of sterile water BP, ideally taken from plastic not glass ampoules.

Filter controls

2.81 Figure 9 shows the results for control tests on the filters without drug. These were done to show the contribution to particle content from filters only. In all cases 0.7ml of sterile water from plastic ampoules was heated in a Stericup with 70mg citric acid, then filtered using one of the test filters.

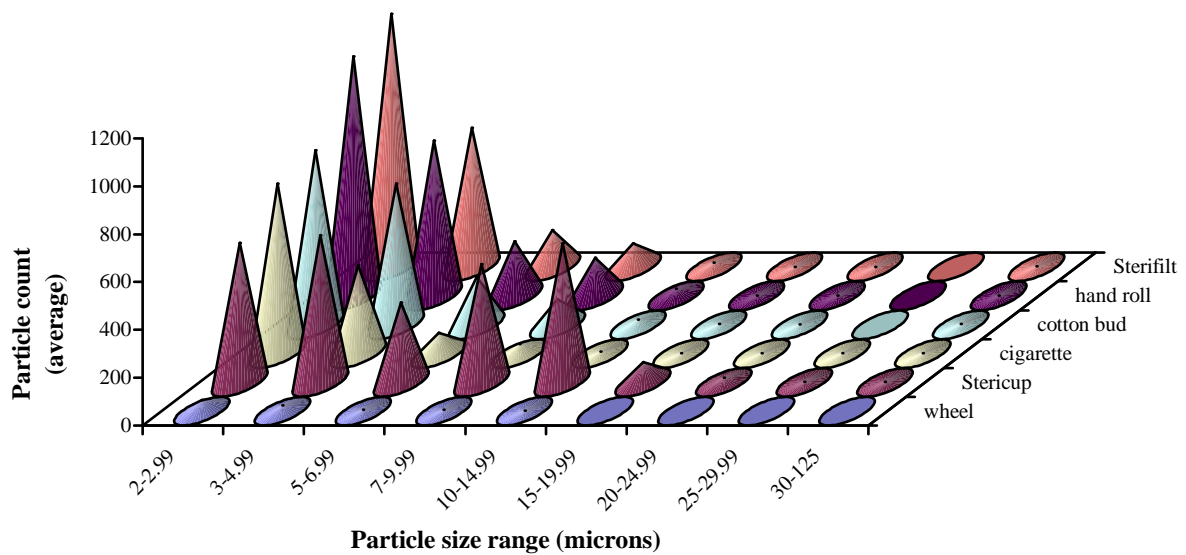


Figure 9: Average number of particles per size range for each filter control (n=3)

2.82 The filter controls show that all filters add particles to the injection. The majority were below 10 microns. The Stericup filter added more large particles than the others, although overall few large particles were detected in any of the solutions. The Sterifilt added a lot of very small particles, but fewer larger ones. As particles would be generated in the manufacturing process of all filters (e.g. dust), the presence of particles was not a surprise.

Heroin injections

2.83 Figure 10 shows the results for heroin injections filtered by the stated means. The unfiltered injections ('no filter') contained the largest particles. All methods of filtration reduced the size distribution of particles towards the smaller end, to a greater or lesser extent. The makeshift filters performed less well than the commercially produced ones. The Sterifilt performed similarly to the wheel filter at the larger end of the particle size range. As may be expected, due to the difference in pore size, the wheel filter injections contained less of the very small particles.

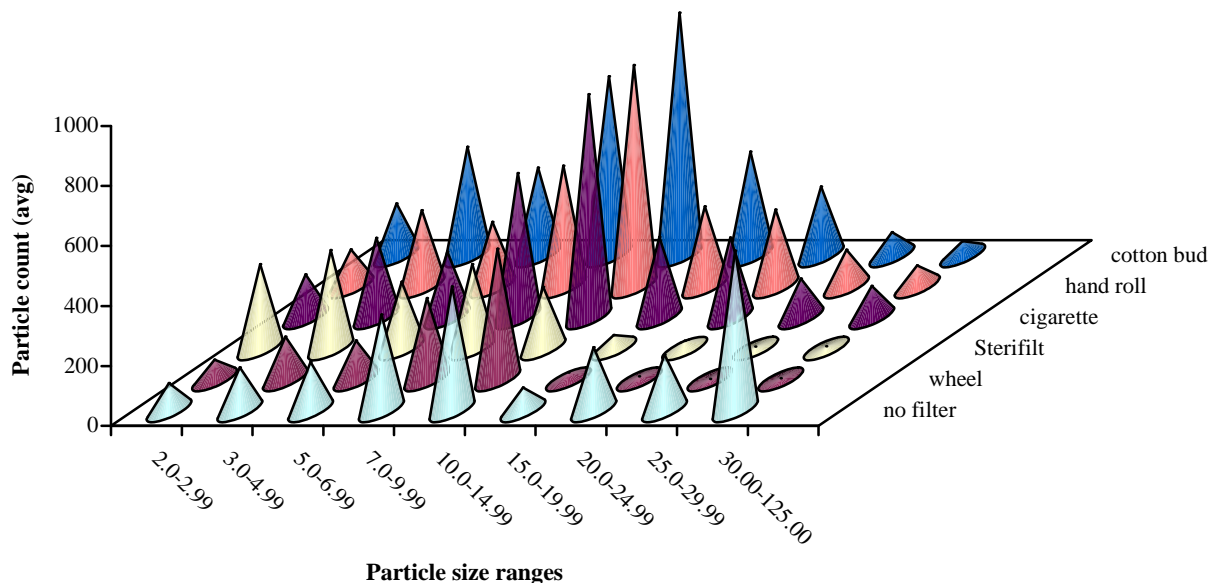


Figure 10: Average number of particles per size range for each heroin injection filtered by the stated means ($n=3$).

2.84 At the small particle size range (up to 5 microns), the unfiltered heroin contained less particles than the filtered injections, with the exception of those filtered through the wheel filter. This shows that the filters or the act of filtration adds small particles to the injection. This was also shown by the filter controls, when compared to the sterile water ampoule water controls. However this does not mean that filtration should be discouraged, as when the larger particle data is studied the benefits of filtration, especially using the Sterifilt and wheel filter, are seen. It can be seen from fig 10 how the makeshift filters (cigarette, hand rolling and cotton bud) shed more particles especially in the 5 to 15 micron range. Since the smallest capillaries in the body are approximately 5 to 8 microns, these makeshift filters therefore have the potential to block these small vessels.

2.85 The Scanning Electron Microscope showed long thin fibres in the injections filtered with the cotton bud. Some of these images are given in figures 11 and 12.

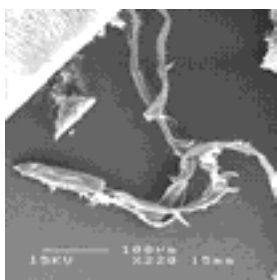


Figure 11: SEM image of cotton bud fibre found in heroin injection

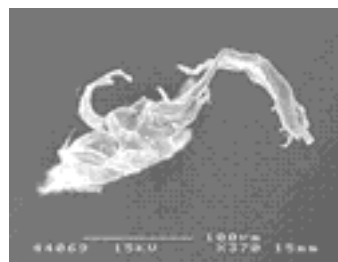


Figure 12: SEM image of cotton bud fibre found in heroin injection

Comparison with British Pharmacopoeial limits

2.86 The smallest capillaries in the body are approximately 5 to 8 microns, so particles smaller than this present less theoretical risk of capillary blockage but could however still form granulomas. The British Pharmacopoeia (BP) (2004) states limits for the particle content of small volume injectables. These are defined as solutions of less than 100ml intended for injection. The BP limits require each container to have no more than 6000 particles equal to or greater than 10 microns. Of these, no more than 600 must be bigger than 25 microns. Table 6 summarises the filter heroin injection data according to BP limit sizes.

Heroin sample	Total No. >10um BP limit =6000 Suggested limit =300*	Total No.>25um BP limit =600 Suggested limit =30
Sterifilt	289	13
Wheel filter	476	7
Unfiltered heroin	1419	719
Hand roll filter	1454	193
Cigarette filter	1516	235
Cotton bud	1511	126

Table 6: Average total number of particles in injections up to 10 microns and up to 25 microns (n=3). *For definition of suggested limit see text.

2.87 Applying the BP limits finds all injections within limits except the unfiltered heroin. Clearly it would be preferable to promote use of the filters that gave the smallest number of particles, especially >25 microns (i.e.) the Sterifilt and the wheel filter. This is because the frequent and chronic use of street drugs by injection is in contrast to medicines, which are used by injection for the shortest, clinically appropriate time. Hence to minimise accumulative risks, minimal particle injection would be advocated.

2.88 Although the BP limit applies per container up to 100mls, clearly container volume can vary greatly. The BP limit allows small injections e.g. 0.5ml comparable to the size of an IDU injection to contain as many particles as a 100ml infusion. If the BP limit is taken to apply to 100ml containers only and a proportional calculation is made for 0.5ml volume (i.e. 1/20th) this would limit the IDU injection more strictly to 300 particles of 10 microns or greater with no more than 30 of these being greater than 25 microns. Referring to table 6, it can be seen that the Sterifilt would be within limits.

Drug retained in filters

The average amount of drug extracted from the filters is shown in figure 13.

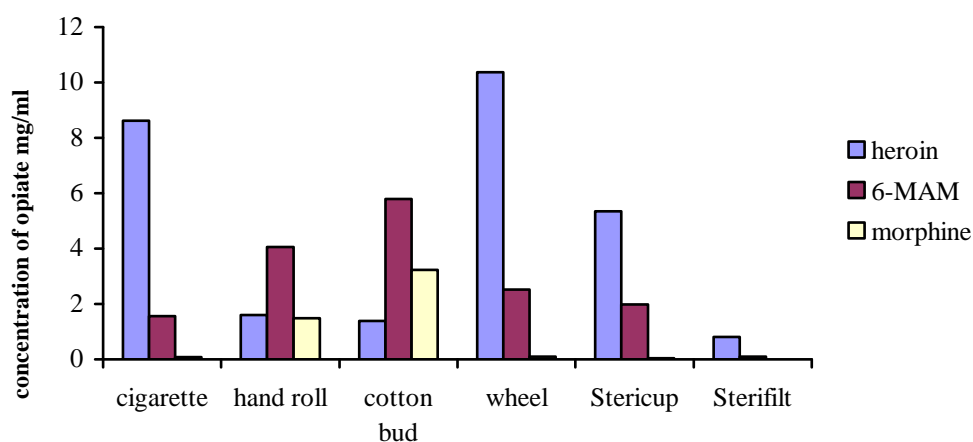


Figure 13: Average amount of drug removed from used filters, shown in mg/ml of methanol which was used as the solvent for extraction.

2.89 The cotton bud and hand rolling filters had been stored for some time. As can be seen the heroin content had converted somewhat to 6-monoacetylmorphine (6-MAM) and morphine. The Sterifilt retained significantly less heroin ($p < 0.001$), 6MAM ($p = 0.001$) and morphine ($p = 0.03$). The incentive to retain makeshift filters for future use is illustrated by the opiates retained. The Stericup filter retained less than the makeshift filters, but as shown the qualitative interviews later, were still retained by some IDUs for future use. As the Sterifilt retained less drug it is less likely to be saved for reuse and future 'trading' or donation to IDUs. This was also reported in the qualitative interviews and was given as a reason by some for disliking the Sterifilt. The wheel filter retained much more drug because it retained a greater fluid volume. When the volume of water retained by filters was established, taking an average of 3 measures, the Sterifilt was found to retain 0.02ml. The wheel filter retained 0.3ml and the cigarette and hand rolling filters that both retained an average of 0.13ml. Therefore the wheel filter is unlikely to be acceptable to IDUs. It was found that the volume of retained injection can be reduced by pre-wetting the filters. However this would add another step and potential risk, if water was shared. The wheel filters are also expensive, being manufactured for hospital and laboratory use.

Microbiology of used filters

2.90 Table 7 gives the results of this work. JC judged the microbes to be largely a mixture of skin microflora, presumably transferred from the IDUs hands during preparation. No faecal contamination was evident. The filter itself may act as a filter for microbes in that the broth may not draw all the microbes off the filter. The results show that filters are contaminated with microbes, during reuse or sharing these could potentially cause infections. Dominant microbes can mask less dominant microbes in work such as this.

<i>Reference</i>	<i>Filter A: No. CFUs per 100 microlitres</i>	<i>Filter B: No. CFUs per 100 microlitres</i>
	Notes on identity	Notes on identity
<i>C2</i>	2; <i>Gm+rods; oval yeasts</i>	2; <i>Gm+rods; oval yeasts</i>
<i>C6</i>	1; <i>Gm+ cocci</i>	1; <i>Fungi Aspergillus sp.</i>
<i>K4*</i>	0	-
<i>B11</i>	5; <i>Gm + rods; White spreader chain rods</i>	5; <i>Gm + cocci</i>
<i>B15</i>	1	0
<i>B17</i>	68	50; <i>Mixed culture; Gm + rods; White dominant spreader</i>
<i>B18</i>	0	0
<i>B23</i>	1	4
<i>H2</i>	54; <i>Gm+ rods; Dry uneven edge</i>	0
<i>H3</i>	0	1
<i>H13</i>	2	1
<i>U1</i>	1; <i>Gm+ cocci</i>	1; <i>Fungi</i>
<i>U2*</i>	>100; <i>Mixed culture</i>	-

*Table 7: microbiology of used filters donated by IDUs. * K4 and U2 only donated one filter.*

2.91 The results support the need for a more detailed study to identify specific named organism (rather than type). Similarly, future work would attempt to collect detailed history of obtained filters, although reliability of such data would have to be considered carefully, as such information may not readily be known. Preliminary discussions with IDUs and drugs workers when designing this study suggested obtaining a detailed and reliable history on a specific filter could be difficult. It may be expected that those who willingly donated filters may have less of a tendency to store or reuse them as they were willing to donate them for no return. Only 12 of 50 IDUs donated filters for this work, despite a voucher incentive being offered.

2.92 The information from this study supports the harm reduction message that filters should not be stored for future use. It emphasises the need to address the culture of filter retention and to supply a filter that does not retain drug. The qualitative interviews showed there are several challenges in addressing such behaviour.

Conclusions from the filter tests

How do commercially available filters (e.g. Sterifilt, Stericup filter and ‘wheel’ filters) compare against each other and with ‘makeshift’ filters used by IDUs (e.g. cigarette filters, hand rolling cigarette filters and cotton bud tips)

2.93 The Sterifilt and wheel filter gave better performance in reducing the amount of particles in the heroin injections, compared to the makeshift filters. The Sterifilt passed the suggested stricter limit for 0.5ml injections that was based on the British Pharmacopoeial standard. The Sterifilt retained very little drug, giving evidence as to why it is unlikely to be retained for ‘bashing down’ (drug removal). Although the wheel filter performed well in the

particle tests, it retained a lot of drug and is also expensive, which does not support its widespread use.

To what extent do various filters retain drug and hence are likely to promote their retention for reuse or sharing?

2.94 The Sterifilt retained significantly less opiates. Hence may be less likely to be stored for later use or shared. As discussed later, strategies should aim to discourage filter reuse, although this is difficult due to the perceived benefits of saving makeshift filters to save drug 'for a rainy day'.

2.95 Used filters were shown to be contaminated with a range of microbes, which may be capable of causing infections. This exploratory data supported the need for further work to perform a more detailed study to identify specific named organism.

CHAPTER THREE: THE FIELD-BASED STUDY METHODS

3.1 As said previously, this second stage aimed to conduct an investigation into the impact that paraphernalia supply makes on sharing and health in the practice setting and compare this with non-supply. A number of objectives were set for this:

Objectives of the study

- a) Perform a study comparing health and sharing practices of IDUs in a location where needle and syringe exchange plus paraphernalia is supplied, with the same measures taken in a location providing needle and syringe exchange only. Establish whether there are any differences and if so, whether these can be attributed to paraphernalia supply.
- b) In the location where paraphernalia is supplied, establish participants' views on the paraphernalia supplied, including ease of use, self-reported nature of use, compatibility with the injection preparation process and its perceived impact on health and sharing.
- c) In the location where paraphernalia is not supplied, establish participants' experiences of access to paraphernalia items needed, the items they use and perceptions on their impact on health and sharing.
- d) Identify participants' suggestions and ideas for promotion of use of appropriate paraphernalia and ways to discourage sharing.

Design

3.2 A comparative cohort study with baseline and six month follow up comprising two groups of participants recruited from two needle exchange services in geographically distinct areas was planned, but due to difficulties in follow up, this became a cross sectional comparison study (i.e. no follow up). One group were receiving the intervention, which was the supply of injecting paraphernalia and the other received 'standard needle exchange care', which was no paraphernalia except swabs. The locations were separated by a distance of approximately 70 miles. This was to minimise the chance of those in the standard needle exchange group encountering IDUs in the intervention group and potentially obtaining paraphernalia.

3.3 This design method was chosen for pragmatic reasons after other possibilities were explored but deemed unsuitable, as discussed below.

3.4 Consideration was given as to whether it would be possible to use a randomised controlled design. The options were: to conduct the study at one location and randomise participants to intervention or no intervention; or, to conduct the study at many sites and randomise the sites to supply paraphernalia or not.

3.5 Randomisation at individual person level was considered inappropriate as injectors often present to needle exchanges with partners and peers. Cluster randomisation of social groups was considered. However, it was felt that in both designs it would not be possible to prevent 'contamination'. What is meant by this is that due to drug users often knowing other drug users and sometimes injecting in different groups, it would be impossible to prevent

those receiving the paraphernalia (the intervention group) from passing it on to others who may be in the control group (i.e. no paraphernalia).

3.6 The possibility of cluster randomisation using a number of sites in different geographical regions was ruled out for two reasons: Firstly, lack of suitable areas. Most services in Scotland large enough to potentially provide the required number of participants had already begun supplying paraphernalia. It was a request of the funder that the study be performed in Scotland. Asking services to withdraw supply was considered inappropriate and initial discussions with providers confirmed that this would not be supported. In Dundee, the Harm Reduction Centre (HRC) had been supplying paraphernalia for many years, with makeshift filter and tourniquet supply being available in the 1990's under local agreement. Further paraphernalia supply e.g. Stericups, was introduced by HRC subsequently, initially as part of a pilot trial. Distribution of paraphernalia became Tayside wide in 2003, and tourniquet supply stopped. Secondly, such a study design would have been very costly.

3.7 It was also recognised that the paraphernalia used by IDUs in either location could not be controlled. It could not be guaranteed that in the intervention location that participants would not on occasions use items other than those supplied. No accurate way of measuring paraphernalia used for every injecting episode could be identified, after the pilot phase (see later) attempted this but found reliability and recall to be problematic.

3.8 Hence the decision was taken to use a pragmatic study using distance as the main means of contamination prevention. Demographic data was collected from participants to allow the two groups to be assessed for comparability.

The intervention being studied

Original planned intervention

3.9 At study inception it was proposed to compare the supply of a safer injecting kit with non supply. However due to circumstances explained below this was adapted to become a comparison between paraphernalia already received with receiving only swabs. The supply of information and advice to needle exchange clients was unaltered from normal practice in both locations.

Changes to the original planned intervention

3.10 Ethical Approval of the study (3.26) was subject to the requirement that normal care was not withheld or any intervention was not withdrawn at the end of the study. On this basis, the study had to be 'naturalistic'. This meant that it had to compare practice in two locations and not seek to reduce supply in the control group or temporarily increase supply in the intervention group.

3.11 Aberdeen was identified as the only major Scottish city (i.e. large enough to potentially have enough injectors to undertake the study) where paraphernalia was not already being supplied, with the exception of swabs. Dundee was identified as a major Scottish city already supplying paraphernalia, having done so in some form since the 1990's.

3.12 It would have been preferred to have compared needles and syringe supply only with the supply of all items recommended from stage one, introduced into a population of drug users who had previously received no paraphernalia. However this was not possible. The study had to be more pragmatic in its design and measures for the following reasons:

3.13 Two appropriately sized geographically distinct Scottish sites not supplying any paraphernalia could not be found.

3.14 In the time between the protocol being first devised and stage two beginning (3 years), HRC in Dundee stopped supplying tourniquets (and later vitamin C) and were unable to introduce sterile water (see below). As said, Ethical Approval required that no change in 'normal' service was brought by the study.

3.15 Similarly the Aberdeen needle exchange providers could not be asked to stop supplying swabs. Therefore this meant that the non intervention group could access needles, syringes *and swabs* through the exchange scheme.

3.16 At the start of stage two, appropriate sterile water could not be sourced for supply in Dundee as they had planned. Although sterile water had been included in the paraphernalia laws of August 2003, it was still a prescription only medicine in January 2005 (stage 2 start). Steps had begun to agree a Patient Group Directive to allow supply, but an appropriate product was not available on the UK market at the time stage 2 began. In order to prevent sharing the ampoule had to be of small volume (and by law less than 2mls). It also had preferably to be plastic as opposed to glass to avoid the risk of cuts and blood spills from IDUs. Although an earlier agreement had been made with Exchange Supplies to donate their 1.4ml plastic ampoules of sterile water for the study, this could not be achieved as MHRA licensing issues meant they had to withdraw their plastic ampoules from the market¹. No appropriate alternative could be found. 5ml plastic ampoules could be sourced but this volume could promote sharing, was not legal and cost was prohibitive. Note 2ml glass ampoules are now marketed with syringe snappers, aimed at needle exchanges.

3.17 The launch of the Sterifilt prototype that had been used in the laboratory work onto the UK market was delayed. Therefore supply only began in Dundee once data collection had begun.

3.18 Vitamin C sachets were withdrawn from Dundee due to funding issues. The funding for this study was not sufficient to permit continued supply and this would have been against the ethical approval.

The factors under investigation

3.19 At project inception consideration was given to whether hepatitis C virus antibody presence should be measured. It was not considered possible to attribute HCV antibody status to paraphernalia access. HCV negative status would need to be confirmed prior to inclusion and followed up over time. It was considered that the size, duration and level of control necessary to draw any conclusions far exceeded a study of this size or funds. Instead self reported needle and syringe and paraphernalia sharing were investigated as an indicator of HCV risk taking behaviours.

¹ See: http://www.exchangesupplies.org/needle_exchange_supplies/water/water_intro.html

3.20 Skin and soft tissue infections are associated with the sharing of equipment as discussed previously (1.8-1.10). Vascular complications may be aggravated by the use of harsh acids and the injection of particles, potentially due to lack of or ineffective filtering (1.12). The presence of skin and soft tissue infections and vascular complications in participants was recorded. This was based on self reporting and verified wherever possible by inspection by the researcher, who had received prior training in doing this. Sharing practices were also recorded. To add further understanding to the self reported use of paraphernalia and risk taking behaviours a sub group of participants took part in qualitative interviews to explore the use of paraphernalia in more depth. Data collection is described in 3.29.

Participant access to needle exchange supplies in both locations

3.21 Needle and syringe supply in both locations followed the Lord Advocate's Guidance for Scotland. This guidance does not specify *paraphernalia* quantities. In Dundee paraphernalia quantities supplied were as requested by the client.

3.22 Participants may have been users of several needle exchange outlets in their area (i.e. pharmacy based and agency based). In Dundee the pharmacies supplied paraphernalia, following the same Tayside-wide needle exchange protocol as the agencies. In Aberdeen the pharmacies supplied needle exchange packs that contained needles and syringes and swabs but no other paraphernalia items were supplied at this time.

Control of paraphernalia used

3.23 The paraphernalia used by the participants could not be controlled, in that it would not be possible to stop a participant from using something other than what was being studied. For example, in Dundee it would not be possible to prevent a participant who had access to sterile citric acid sachets from using lemon juice. The study collected data on all paraphernalia recently used by participants to try to capture information on actual items used.

The researchers and base locations

3.24 Data was collected by two part time (0.5 FTE) research officers. One was based at Drugs Action (DA) in Aberdeen and the other was at The Harm Reduction Centre (HRC) in Dundee. Data collection ran for 18 months. The researchers recruited participants mainly at the agency base locations. Participants were also recruited from outreach locations, and in Dundee from the Dundee Drug and AIDS Project, another agency in the Tayside needle exchange scheme. Attempts to recruit participants through pharmacy based exchanges were not very fruitful.

Procedures

3.25 Full details of the study procedures are given in the protocol. This and other study paperwork such as the Participant Information Sheet and Data Collection Tools can be provided from j.a.scott@bath.ac.uk A summary of the protocol is given below.

Ethical approval

3.26 Approval of the protocol was given by Tayside NHS Research Ethics Committee (reference 04/S1401/138). Site Specific Assessment (SSA) approval was given by Grampian NHS Research Ethics Committee. Subsequent substantial amendments were given approval by the appropriate committee e.g. change of researcher.

Recruitment

Inclusion criteria

3.27 Mentally capacitated adults (16 years and over) who were current injecting drug users, willing to participate in the study.

Exclusion criteria

- Under 16 years of age
- Mental incapacity from known history or judgement of researcher/needle exchange staff
- Non injectors e.g. smokers of heroin

Publicity, approach and information for potential participants

3.28 Posters and leaflets, approved by the Ethics Committee, were used to raise awareness of the study to potential volunteers locally. Needle exchange workers in both agencies were briefed on the study by the principle investigator, who ran information sessions in both locations prior to agreement from the agencies to participate. Needle exchange workers highlighted the study to potential volunteers, which were all users of the needle exchanges that were considered to meet the inclusion criteria and not meet the exclusion criteria (this was further verified by the researchers). The needle exchange workers gave those who expressed an interest the leaflet which contains the participant information sheet (PIS). The researchers also distributed the PIS and posters to pharmacies, homeless hostels, drop in centres and community centres. Potential volunteers were given time to consider participation then consent was sought by the researcher. Those who agreed gave written consent, except for the questionnaire where participation was deemed to indicate consent (see *Measurements* below).

Data collection

The study used three mixed methods of data collection as follows:

3.29 Quantitative information was collected on vascular health, presence and nature of injecting site injuries and self reported involvement in paraphernalia sharing. This was achieved using the following tools:

(1) Needle Exchange Short Questionnaire (NESQ)

This was a brief questionnaire administered in both sites. It was completed with the participant by the researcher where possible or in some cases when the researcher was not available, by available needle exchange staff who had been trained by the researcher.

(2) Health assessment

This was always undertaken by the researcher, who received prior training. The participant was scheduled an appointment within the agency so objective health measures could be taken including blood pressure, measurement of extremities, heart rate, respiration rate and weight. Reminders were sent where possible by text message prior to the appointment.

(3) Semi-structured interview

Qualitative data was collected to facilitate understanding of the issues relating to paraphernalia from the participant's perspective. This was done using the third data collection tool. This interview gathered information on self reported injection preparation and administration practices, views on paraphernalia available and sharing practices. Ideas on how to reduce sharing amongst injectors were also sought. The researcher always undertook the interview. After consent was obtained, the interview was micro-tape recorded. The interview schedules asked participants to describe how they prepare and inject. Areas of risk were explored when highlighted. The schedules then varied between Aberdeen and Dundee. In Dundee views on the equipment supplied were sought, whereas in Aberdeen views were gathered on equipment used and thoughts on supply.

Study method and follow-up revisions

Original plan and post pilot modifications

3.30 During the pilot it was attempted to capture information on all injecting equipment used for every injection and detail each episode of sharing since the participant's previous visit to the needle exchange, by administering the NESQ (pilot version) at every visit. However it became obvious that this level of intensity would require greater researcher capacity than was available. The extent of time needed to collect the data at every visit and to contact and arrange follow ups detracted significantly from initial recruitment. Furthermore it would require significant incentives to retain participants. It was also initially planned to use all three data collection tools with every participant. However the pilot phase showed some potential volunteers were comfortable to complete the questionnaire but did not wish to undergo a health check or interview. Reasons given included lack of time and personal discomfort with this level of involvement. Therefore, since study funding was fixed, data collection was modified as described below to increase participation and make best use of available researcher time. The consequences of these modifications are discussed later.

Post pilot questionnaire and recruitment revisions

3.31 The questionnaire was revised to include collection of information on self reported injecting site injuries. Wherever possible these were verified by inspection by the researcher administering the questionnaire. Consent was separated into three distinct phases: Consent to take part in the questionnaire (verbal), consent to the health check (written) and lastly consent to the interview (written). This gave participants the option to take part in the questionnaire only, which collected core data required for quantitative analysis. This meant the health check became optional, which was not as originally desired, but it aided recruitment significantly. It was considered more important to gather in depth information in the

interviews than interview every participant, so a sub-group of willing participants was considered appropriate.

3.32 The revised design utilised data collection twice (baseline and 6 months) instead of at every visit. An intensive follow up strategy was devised. Contact details were given by willing participants, including mobile telephone numbers and home phone numbers, or their address/place of residence in the absence of contact numbers. They were also asked to nominate as many 'stable contact points' as they wish, to aid follow up (Pickering, 2003), for example a non-drug using relative. Not all were able or willing to do this. Their needle exchange record was annotated to indicate recruitment and follow up dates flagged to needle exchange workers.

3.33 Supermarket vouchers (Dundee) or household items and toiletries (Aberdeen) to the value of £2 (per visit) were offered, following the pilot, as a small incentive and to thank participants for their involvement in each stage (Pickering, 2003 and Taylor (personal communication)). Incentives were guided by local preference expressed to the researcher. This value was considered low enough not be coercive but a small token to recognise involvement. It was also affordable within the budget, as incentives were not initially included. Consent was taken again at follow-up to check that the person has not changed their mind about participation.

Confidentiality and anonymity of data collected

3.34 The researchers signed up to and worked under the confidentiality policies of the host agencies. Only participant initials and date of birth were known to researchers and recorded on the questionnaires to code them. A participant study number was assigned and this was used to distinguish participants in the study database and on the tapes. Nominated contact phone numbers for follow-up were stored in a mobile phone under participant study number only (i.e. separate from initials and date of birth). Completed paper-based data was stored by the researchers in locked cabinets within the agencies. Data was transferred to Bath via recorded delivery mail and stored by the principle investigator in locked cabinets, as per ethical approval requirements. Data was entered in the database and tapes transcribed in Bath. All data was coded and password protected.

Data analysis

Quantitative data

3.35 Ten percent of the data entered was cross checked for quality assurance purposes. The pilot stage of the NESQ included validation of data gathered against data held in needle exchange records (n=20) and showed the reporting in the NESQ to be accurate. Quantitative results for the Dundee and Aberdeen groups were compared statistically (SPSS v 14). Statistical guidance and analysis support was given by Dr G Taylor (medical statistician), Research & Development Support Unit, University of Bath. All data was assessed for normality and where appropriate was transformed. Otherwise it was analysed using non-parametric methods. The primary data set was formed from the initial collection data (baseline). Due to reduced follow up data, this was analysed where possible, including all available information. Analysis used a logistic regression model to analyse the prevalence rates adjusting for predicted confounding factors. Where appropriate Chi-squared tests were used. T tests were used if data was found to be normally distributed.

Qualitative data

3.36 The qualitative data was transcribed by the principle investigator and administrative staff at the University of Bath. Transcription checks were performed by the principle investigator. Transcripts were subject to grounded theory thematic analysis to identify key themes that emerged in response to each area of investigation. Progressive focusing was then used in order to group themes. This allowed key questions raised by the quantitative data to be answered, as well as providing additional understanding and information. Quotes given under the results section have been selected from interviewees where it is felt that they captured the meaning of the theme well or they provided particularly vivid insight.

Researcher competence assurance

3.37 Competence assessment of the researchers was undertaken, mapped against the identified competencies for the post listed in the job description. Training gaps were identified and addressed prior to data collection and if any new gaps were identified as part of the ongoing study governance process.

Summary of study method

Figure 14 below summarises the study process and methods used diagrammatically.

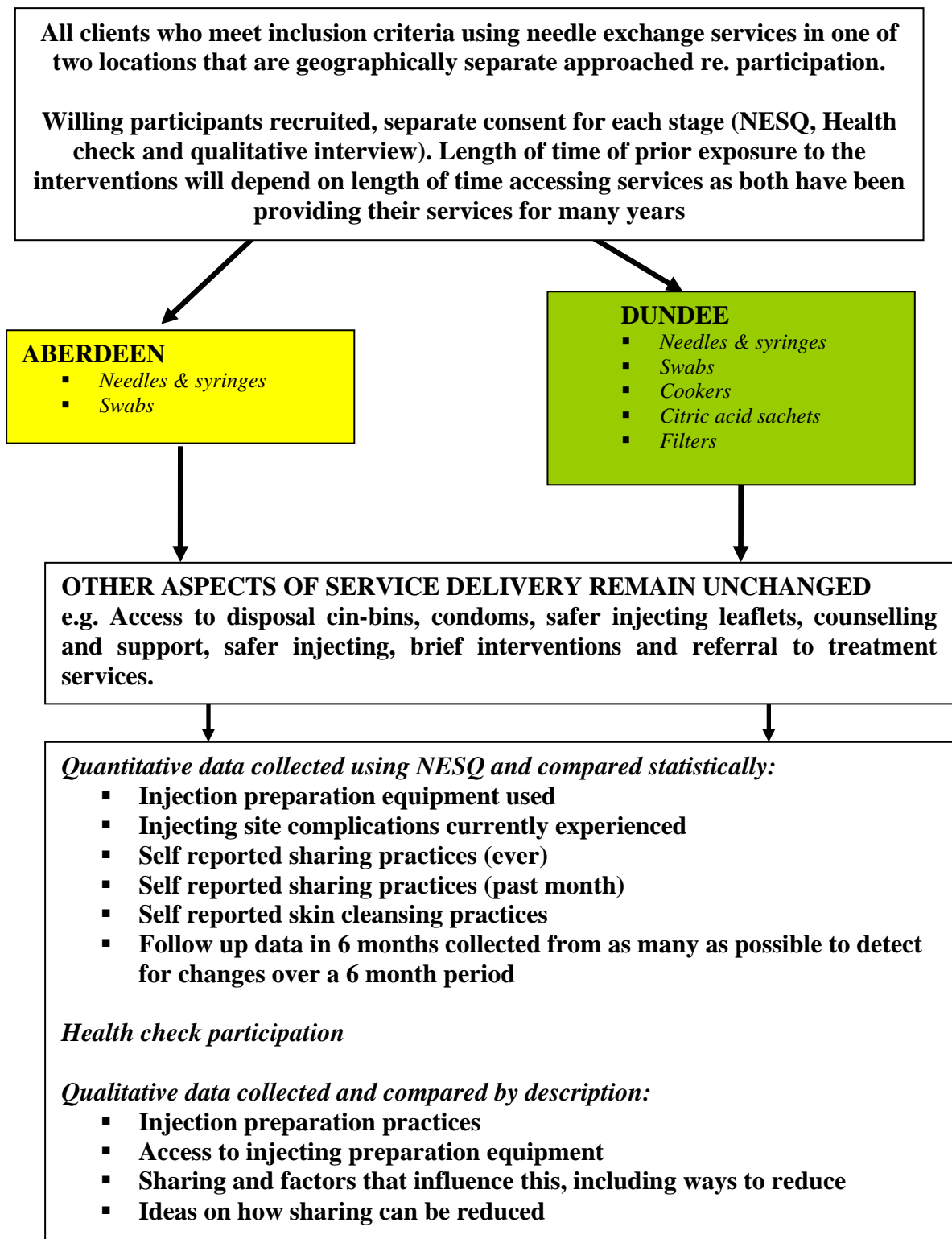


Figure 14: Summary of the methods used in stage two of the study

CHAPTER FOUR: THE FIELD BASED STUDY FINDINGS

The Participants

4.1 A total of 359 participants were recruited to the study and completed the needle exchange short questionnaire (NESQ) to provide the core quantitative data. Of these, 189 participants were recruited in Aberdeen and 170 in Dundee. The total number approached or number who refused was not recorded.

Demographics and injecting history

4.2 All quantitative data that was found to be normally distributed was compared using t-tests, otherwise a Chi squared test was used. P values of ≤ 0.05 indicate a significant difference. A summary of the two groups and comparisons is shown in table 8.

	ABERDEEN (n=189)	<i>Missing data</i>	DUNDEE (n=170)	<i>Missing data</i>	<i>p value</i>
Gender		n=3			
Female	55 (29.4%)		52 (30.6%)		0.809
Male	132 (70.6%)		118 (69.4%)		
Ratio M:F	2.4:1		2.3:1		
Age (mean)	30.4 yr (SD =7.1)	n =2	28.2 yr (SD = 6.5)		0.001
Age when first injected (mean)	21.6 (SD = 6.4)		22.3 (SD = 5.9)		0.772
Length of time since first injection	8.8 yr (SD =6.6)		5.9 yr (SD = 6.3)		< 0.001
Currently roofless?	13 (6.9%)		22 (12.9%)	n =1	0.053
Ever roofless since injecting?	100 (52.9%)		85 (50.6%)	n =2	0.662

Table 8: Demographic data for Aberdeen and Dundee cohorts and t-test p values

Patterns of drug use

4.3 The main drug used by injection by all but a few in each cohort was heroin (table 9, overleaf). Forty (21.1%) of the Aberdeen cohort *sometimes* injected a second drug. In 31 cases this was crack cocaine, for 5 this was speed (amphetamine), 3 cocaine powder and one 'other'. Thirty three (19.4%) of the Dundee cohort sometimes injected a second drug. In 13 cases this was speed (amphetamine), for 10 this was 'pills' of various types, 3 crack cocaine, 3 cocaine powder and 2 'other'. Speed and 'pills' were more commonly reported in Dundee while crack cocaine was more commonly reported in Aberdeen. Small numbers in both groups injected a third and sometimes a fourth drug.

	ABERDEEN (n=189) (missing =2)	DUNDEE (n=170)
<i>heroin</i>	184	166
<i>heroin + cyclizine</i>	0	1
<i>speedball (heroin + crack)</i>	0	2
<i>speed (amphetamine)</i>	1	1
<i>other</i>	2	0

Table 9: Main drug used by injection for Aberdeen and Dundee cohorts

4.4 In Aberdeen 155 people (82%) were classed as ‘regular users’, which was defined as those injecting one or more times every day. In Dundee this figure was 125 (74%). It was not established whether participants were receiving any form of drug treatment at the time of participation (e.g. methadone), which could influence the frequency of injecting.

4.5 *Daily amount* of heroin used was calculated by multiplying the amount of heroin per injection (which was reported in or converted to monetary value) by the number of injections per day. For example, a person who usually injected a ‘£10 bag’ three times a day had a ‘daily amount’ value of £30. Table 10 shows this data rounded to the nearest ‘£5 bag’ in order to make the values meaningful. When compared statistically, actual figures were used, not the rounded figures. There was no significant difference between the groups in the average daily amount of heroin used by regular users ($p=0.603$). It should be highlighted that many people commented that actual amount used varied depending on finances and availability. Therefore these figures will be approximations.

	ABERDEEN	DUNDEE
<i>Average daily amount of heroin in £ (rounded to the nearest £5)</i>	50 (SD =30)	50 (SD = 30)
<i>Minimum daily amount £</i>	10	10
<i>Maximum daily amount £</i>	160	160

Table 10: Amount of heroin used per day by Aberdeen and Dundee cohorts

Injection sites and administration methods

4.6 Participants were asked in the NESQ to describe their **main** injecting site, which was defined as the one that they currently most often injected into. The researcher marked this on a diagram on the questionnaire. Table 11 lists the results.

4.7 There were more injectors using their groin (femoral vein) as their main site in Aberdeen (31.2%, $n = 59$) compared to Dundee (10.5%, $n = 18$). Amongst groin injectors, time since first injection was 10.8 years in Aberdeen ($SD = 6.8$) and 6.9 years ($SD = 5.5$) in Dundee. Classifying injecting sites together, 125 (66.9%) of Aberdeen participants stated their main injecting site was a peripheral vein (all arm, hand, leg and feet sites) and 60 (32.1%) said it was a deep vein (groin or neck). Two (1.1%) said another site (buttock or

genitals). In Dundee 149 (87.7%) used a peripheral site as their main site and 20 (11.8%) used a deep vein (groin, neck or clavicle). The proportion of participants using a deep vein as their main site was significantly greater in Aberdeen compared to Dundee ($p < 0.001$).

<i>Main site of injecting currently</i>	ABERDEEN (missing = 2)	DUNDEE
<i>Cubital Fossa</i>	66 (34.9%)	83 (48.5%)
<i>Upper Arm</i>	12 (6.3%)	7 (4.1%)
<i>Lower Arm</i>	25 (13.3%)	35 (20.5%)
<i>Groin (femoral)</i>	59 (31.2%)	18 (10.5%)
<i>Hands</i>	9 (4.8%)	15 (8.9%)
<i>Legs & feet</i>	13 (6.9%)	9 (5.3%)
<i>Buttocks</i>	1 (0.5%)	0
<i>Clavicle</i>	0	1 (0.6%)
<i>Genitals</i>	1 (0.5%)	0
<i>Neck (jugular)</i>	1 (0.5%)	1 (0.6%)

Table 11: Main site of injection administration currently being used

4.8 As well as their main site, participants were asked to describe all additional sites they regularly used at the moment. The mean number of sites used by the Aberdeen cohort was 4.1 (SD = 2.8). For Dundee the mean number of sites was 4.0 (SD = 2.6). There was no significant difference in this ($p = 0.535$).

Breaks in injecting

4.9 This question was considered important in relation to vascular health. It was hypothesised that those who had had breaks from injecting may have had better vascular health than those who had injected continuously. In the Aberdeen group, 161 (85.6%, 1 missing) participants said they had had a break from injecting at some point. In Dundee this figure was 138 (81.2%). There was no significant difference for this between the groups ($p = 0.256$). However it became clear from the researcher annotations on the questionnaires and through the qualitative interviews that there are complications with this term. The descriptions of breaks varied considerably both in frequency and duration. For example some people mentioned breaks in terms of years and others did so in days. One person reported that they take planned two week breaks four times a year in order to 'let veins recover'. A further person said they often 'stopped for a few days' with no definite pattern. Imprisonment sometimes forced breaks. Although breaks in injecting may be a factor in limiting the extent of vein damage, the significance in this study cannot be confirmed and would be difficult to do so in future work of this kind due to the high number of variables and reliance on recall.

Who prepares the participant's injections?

4.10 In the Aberdeen cohort, 171 (91.0%, 1 missing) participants prepared their own injections. In Dundee this figure was 154 (91.1%, 1 missing) which is not significantly different ($p = 0.956$). In the case of people who did not prepare their own, all but two said the preparer was their partner. In one case it was a brother and one person, who was a new injector, said their preparer varies. There was no relationship between age and whether the person prepared their own injections, but those who prepared their own had been injecting longer than those who did not. Looking at the participants as a whole, 19% of women ($n=20$, total number of women = 107) did NOT prepare their own injections. For men this figure was 5% ($n= 12$, total number of men = 248). Women were significantly less likely to prepare their own injections than men ($p = <0.001$).

Participant Summary

Both groups were predominantly made up of primary heroin users, most of who injected regularly. The Aberdeen group contained more 'regular' injectors defined as injecting one or more times a day (82% vs 74%), although this was not significantly different. The two groups contained similar proportions of men and women and began injecting at similar ages. About half of each group had been roofless, and more of the Dundee group were currently roofless although this was just short of significance. The Aberdeen group were older than the Dundee group, by on average approximately two years and had a significantly longer average time since first injection (8.8 years compared to 5.9 years), which means they may have been exposed to injecting related risks for longer. This is confounded by the very varied frequency of and duration of breaks in injecting identified in both groups. Both groups injected the same average amounts and range of amounts of heroin. 21.1% of the Aberdeen group sometimes injected a second drug, most commonly crack and in Dundee 19.4% sometimes injected a second drug, most commonly speed or pills. Significantly more of the Aberdeen group used a deep vein (femoral and jugular veins) as their main site compared to the Dundee group, a greater proportion of whom used peripheral veins (arms and legs). It is not known how many were receiving drug treatment such as methadone.

Injection preparation equipment used

4.11 Participants in the NESQ were asked to select from lists read out to them, all the injecting equipment that they were *currently* using. If they said something not on the list, the researcher could select 'other' and describe the item(s).

Needles and syringes

Table 12 (overleaf) shows the syringes that participants reported using. All syringes currently used could be selected, hence the totals exceed 100%.

<i>Injecting equipment</i>	Aberdeen	Dundee
<i>1ml insulin syringes</i>	156 (82.5%)	145 (85.3%)
<i>0.5ml insulin syringes</i>	2 (1.1%)	29 (17.0%)
<i>1ml detachable barrels</i>	56 (29.6%)	18 (10.6%)
<i>2ml detachable barrels</i>	22 (11.6%)	23 (13.5%)
<i>5ml detachable barrels</i>	4 (2.1%)	3 (1.8%)
<i>10ml detachable barrels</i>	0	0

Table 12: Syringes that participants reported using (NB Some participants used more than one type).

4.12 Regarding detachable needles, the most commonly used type was ‘Blue spikes’ used by 56 (29.6%) of the Aberdeen group and 18 (10.6%) of the Dundee group. This corresponds with the greater use of detachable barrels in Aberdeen. Blue spike users were significantly more likely to be main site groin injectors ($p < 0.001$). The type of injecting equipment used to access each site was not specifically asked. Drugs worker advice may be an influencing factor in equipment use. In the qualitative interviews it was noted that those who used insulin syringes for peripheral sites, if also using the groin site, reported selecting larger needles and detachable barrels for this site. It is suggested that the difference in use of the 0.5ml insulin syringes is due to variations in drug worker promotion and availability from pharmacy exchanges in Dundee.

Paraphernalia

4.13 Table 13 summarises the paraphernalia *currently* used by the two cohorts. All items currently used could be selected hence the totals exceed 100%. Examples of ‘*other*’ filter materials were all reported in Aberdeen. These included nappy linings, duvet or pillow fillers, sanitary towel material, socks, sponge, swabs and tampons. Participants could again report more than one of each type of item. ‘*Currently*’ was not defined to participants.

4.14 Only one participant in Dundee did not use *any* of the paraphernalia items supplied. This person was a heroin injector and reported using their own makeshift items instead. This participant was a 35 year old female who had just begun injecting. She did not participate in an interview, so no further information is available on why this was so, but it may be that she was a new contact to the service. 169 (99.4%) of the Dundee cohort reported using one or more of the paraphernalia items supplied by the exchange. The data above shows that in Dundee where paraphernalia was supplied it was used predominantly. However, it also shows that it was not used exclusively. The qualitative interviews provided greater insight and it is discussed later why this was so.

4.15 In Aberdeen a small number had obtained some of the exchange paraphernalia from needle exchanges outside of Aberdeen. However they did not use this exclusively. In both Aberdeen and Dundee a small number described using water ampoules. One participant who took part in an interview described a source of medical supplies. It is unknown what the other sources were.

4.16 As water was not supplied in Dundee it is not surprising to see that the range of different types reported is large and similar to that of Aberdeen. Kitchen tap was the most popular source in both cohorts. The researchers frequently annotated this ‘boiled’. This is advocated in safer injecting leaflets in the absence of access to sterile ampoules. The use of bottled water could potentially be of concern, especially if this bottle had also been drunk out of, due to bacterial and fungal infection risks from the mouth. Qualitative data on the sharing of water is further discussed later.

	ABERDEEN (n=189)	DUNDEE (n=170)
COOKERS		
<i>Tea spoon</i>	175 (92.6%)	40 (23.4%)
<i>Stericup</i>	4 (2.1%)	161 (94.2%)
<i>Drinks can</i>	19 (10.1%)	7 (4.1%)
<i>Other</i>	3 (1.6%)	1 (0.6%)
FILTERS		
<i>Cigarette</i>	169 (89.4%)	59 (34.5%)
<i>Hand roll</i>	67 (35.4%)	21 (12.3%)
<i>Cotton wool</i>	76 (40.2%)	19 (11.1%)
<i>Stericup/Sterifilt</i>	12 (6.3%)	143 (84.1%)
<i>Tissue paper</i>	13 (6.9%)	1 (0.6%)
<i>Other (see below)</i>	18 (9.5%)	1 (11.8%)
WATER		
<i>Kitchen tap</i>	164 (86.8%)	152 (88.9%)
<i>Bathroom tap</i>	51 (27.0%)	46 (26.9%)
<i>Bottles (e.g. Volvic®)</i>	50 (26.5%)	66 (38.6%)
<i>Public toilet source</i>	26 (13.8%)	24 (14.0%)
<i>Outside (e.g. puddle)</i>	4 (2.1%)	3 (1.8%)
<i>Ampoules</i>	3 (1.6%)	2 (1.2%)
ACIDS		
<i>Citric sachet</i>	28 (14.8%)	168 (98.2%)
<i>Citric powder</i>	166 (87.8%)	23 (13.5%)
<i>Vitamin C sachet</i>	12 (6.3%)	2 (1.2%)
<i>Vitamin C powder</i>	17 (9.0%)	2 (1.2%)
<i>Vitamin C tablets</i>	6 (3.2%)	0
<i>Kettle descaler</i>	2 (1.1%)	2 (1.2%)
<i>Fresh lemon squeezed</i>	19 (10.1%)	17 (9.9%)
<i>Bottled lemon juice</i>	59 (31.2%)	27 (15.8%)
<i>Vinegar</i>	19 (10.1%)	8 (4.7%)
<i>Other (not specified)</i>	0	1 (0.6%)

Table 13: Paraphernalia ‘currently used’ by participants in Aberdeen and Dundee

Injecting equipment summary

In both groups the majority used 1ml insulin syringes. In Aberdeen detachable 1ml syringes and blue needles were more common, probably because of the greater prevalence of groin injecting. A few Aberdeen participants did access supplied paraphernalia elsewhere, but most used makeshift. In Dundee, the supplied paraphernalia was used by all but one participant. The filters supplied in Dundee (Stericup/Sterifilt) were used by less people than the other items supplied (citric acid sachets and cookers). Supplied paraphernalia was not used exclusively in Dundee, makeshift items were still reported. The qualitative interviews gave greater insight into understanding this (see later).

Injecting site complications currently experienced

Data gathered using the NESQ from all participants

4.17 Participants in the NESQ were asked to report any injecting site complications that they had on the day of participation. These were verified by inspection by the researchers wherever possible. Tables 14 and 15 present the data.

Non infected complications

4.18 In Aberdeen the number of sterile abscesses per person ranged from one to 10, with the most common number being one. In Dundee the range was one to 20 with again the most common number being one. Grouping the data together for '*non-infected complications*', 142 (75.1%) of the Aberdeen cohort presented with one or more, in Dundee this figure was 123 (71.9%) which was not significantly less ($p = 0.491$). Using a logistic regression model to adjust for time since first injection (injecting time), also showed no significant difference between the groups ($p=0.806$).

	ABERDEEN (n=189)	DUNDEE (n=170)	<i>p value</i>
<i>One or more sterile abscesses</i>	60 (31.8%)	58 (34.1%)	0.152
<i>Visible track marks</i>	118 (62.4%)	103 (60.2%)	0.669
<i>Nerve tingling and burning sensations</i>	81 (42.9%)	59 (34.5%)	0.104

Table 14: Number of participants experiencing non-infected complications from injecting on day of baseline participation

Skin and soft tissue infections

4.19 In Aberdeen, the number of infected abscesses ranged from one to eight, with one being the most common. In Dundee, again one abscess was the most common but the range went up to 22 (which was annotated as an estimate). In Aberdeen, 14 people had one ulcer and the range went up to five. In Dundee, seven people had one ulcer and the range went up to 30, which was estimated.

4.20 Grouping the data together for '*skin & soft tissue infection*', 40 (21.2%) of the Aberdeen cohort and 30 (17.5%) of the Dundee cohort had a current complication within this category, which was not significantly less ($p = 0.386$). Again, using a logistic regression

model to adjust for time since first injection (injecting time), also showed no significant difference between the groups (p=0.454).

	ABERDEEN (n=189)	DUNDEE (n=170)	<i>p value</i>
<i>Infected abscesses</i>	25 (13.2%)	23 (13.5%)	0.777
<i>Ulcers</i>	19 (10.0%)	14 (8.2%)	0.054
<i>Cellulitis</i>	13 (6.9%)	6 (3.5%)	0.153

Table 15: Number of participants experiencing non-infected complications from injecting on day of baseline participation

Swelling at injecting sites and puffy limbs

4.21 In Aberdeen, 77 (40.7%) participants had swelling at their injecting sites on the day of baseline participation, in Dundee this figure was 53 (31.0%) (p =0.093). Fifty (26.5%) in Aberdeen had puffy limbs or digits compared to 30 (17.5%) in Dundee, which was a significant difference (p = 0.027). When length of time injecting was adjusted for the difference was not significant (p=0.139).

Data on injecting site complications established at the health check

The number of participants who took part in the health check is shown in table 16.

	ABERDEEN (n=189)	DUNDEE (n=170)
<i>Baseline health check</i>	106	37
<i>(% of total number of participants)</i>	(56.1%)	(21.8%)
<i>6 month follow up health check</i>	51	13
<i>(% of total number of participants)</i>	(27.0%)	(7.7%)
<i>% of baseline health check participants who were followed up at 6 months</i>	48.1%	35.1%

Table 16: Number of participants who took part in the health check

4.22 Injecting complications that they had on the day of the health check were assessed by the researcher using the *Injecting Site Injury Rating Scale*. This scale gave sizes and descriptive information for each grade of severity for each type of complication to attempt to standardise researcher assessment. A copy can be provided from j.a.scott@bath.ac.uk Where more than one of the same type of injury was seen (e.g. abscess) the researcher was asked to rate the most severe. Data is shown in table 17 combining both injuries seen at baseline and 6 month follow up. The numbers represent the number of participants assessed who had a complication at this grade. The percentage data shows the proportion of participants who's complication was assessed at the stated grade compared to the total number of participants who had this complication. Percentages have been calculated because of the large difference in numbers of participants. However the small number of participants in Dundee also means caution is needed. Data should be interpreted by considering the *trends* in severity. The data suggests a tendency towards more severe complications in Aberdeen. Caution is needed as interpretation could have varied between the researchers, despite the criteria given on the

rating scale. Validation of this rating scale would be necessary in subsequent work to increase robustness of using this tool.

SEVERITY GRADE OF WORST COMPLICATION					
	Very Mild	Mild	Moderate	Severe	Very Severe
<i>Sterile Abscess</i>					
Aberdeen (n=28)	8 (28.6%)	8 (28.6%)	9 (32.1%)	3 (10.7%)	0
Dundee (n=16)	7 (43.4%)	8 (50.0%)	1 (6.3%)	0	0
<i>Track marks</i>					
Aberdeen (n=107)	16 (15.0%)	38 (35.5%)	43 (40.2%)	5 (4.7%)	5 (4.7%)
Dundee (n=28)	10 (35.7%)	16 (57.1%)	2 (7.1%)	0	0
<i>Nerve tingling and burning</i>					
Aberdeen (n=42)	16 (38.1%)	18 (42.9%)	2 (4.8%)	4 (9.5%)	2 (4.8%)
Dundee (n=3)	2 (66.7%)	1 (33.3%)	0	0	0
<i>Infected abscesses</i>					
Aberdeen (n=25)	3 (12.0%)	6 (24.0%)	8 (32.0%)	7 (28.0%)	0
Dundee (n=12)	3 (25.0%)	4 (33.3%)	4 (33.3%)	1 (8.3%)	0
<i>Ulcers</i>					
Aberdeen (n=18)	5 (27.7%)	0	3 (16.7%)	9 (50.0%)	1 (5.6%)
Dundee (n=3)	1 (33.3%)	1 (33.3%)	1 (33.3%)	0	0
<i>Cellulitis</i>					
Aberdeen* (n=8)	4 (50.0%)	2 (25.0%)	1 (12.5%)	0	1 (12.5%)
Dundee (n=0)	0	0	0	0	0
<i>Injecting site swelling</i>					
Aberdeen (n=42)	21 (50.0%)	10 (23.8%)	5 (11.9%)	4 (9.5%)	2 (4.8%)
Dundee (n=5)	0	2 (40.0%)	1 (20.0%)	0	2 (40.0%)
<i>Limb and digit puffiness</i>					
Aberdeen (n=25)	8 (32.0%)	5 (20.0%)	5 (20.0%)	4 (16.0%)	3 (12.0%)
Dundee (n=6)	4 (66.7%)	0	1 (16.6%)	1 (16.6%)	0

Table 17: Researcher assessed severity of injecting complications seen.

Injecting site complications summary:

‘Track marks’ were the most common non-infected complication reported by participants on the day of participation in the NESQ. This was also true for those who participated in the health check. ‘Track marks’ is the common name given to phlebitis, which is inflammation of the veins. Phlebitis is a sign of vein irritation and can lead to peripheral vascular damage such as vein collapse. This prompts IDUs to search for other accessible veins and ultimately the use of deep veins such as the femoral vein (‘groin’). Track marks will be worsened by frequent venous access and venous irritation e.g. from the use of too much or harsh acid. Nerve tingling and burning sensations were commonly reported at the NESQ in both groups. These may be caused by the injection of irritant solutions or nerve damage from missing veins with needles. Sterile abscesses are the common name for ‘granuloma’, which are hard lumps that form around foreign bodies when injected, such as insoluble particles. 142 (75.1%) of the Aberdeen cohort presented with one or more ‘*non infected complication*’, in Dundee this figure was 123 (71.9%). Overall there was no statistical difference between participants in the two locations experiencing non-sterile complications on the day of NESQ participation.

Skin and soft tissue infections were less common in both groups than non-infected complications, with 40 (21.2%) of the Aberdeen cohort and 30 (17.5%) of the Dundee cohort being affected on day of participation. There was no significant difference. The number of ulcers, which is associated with poor vascular supply, was close to significance in Aberdeen. Puffy limbs or digits were significantly more common in Aberdeen (n=50, 26.5%) compared to Dundee (n=30, 17.5%), again a sign of poor vascular function, but significance between the results disappeared when length of time injecting was controlled for. The researcher assessment of severity suggests that the complications seen in Aberdeen were worse than those seen in Dundee, although caution is needed due to the number of cases in Dundee and the methodology as discussed.

General health measures established at the baseline health check

4.23 Blood pressure, heart rate, respiration function and limb measurements were taken at the health check and Body Mass Index was calculated. This was done to allow some general health parameters of the two groups to be reported and compared. Table 18 shows the results.

4.24 Two-tailed t-tests found no significant difference in the means for any of the health measures between the two groups. The faster heart rates detected could be due to withdrawal symptoms or anxiety at being assessed. Average respiration rates in both groups were close to normal (15 per min) but the range varied greatly in Aberdeen. Again this could be due to withdrawal. Some low peak flows were identified, although the group averages of around 450 l/min were good. The researchers annotated ‘smoker’ against the majority of the participants, which may worsen peak flow. The Aberdeen group had slightly larger hands and ankle average circumferences and the presence of limb and digit swelling was shown in the NESQ data to be higher in this group. Prior validation of the technique ensured that the researchers in both sites were making these measures at the same points. Hand measures were taken just below the fingers and ankles were just on the ankle bone. The researcher in Aberdeen made two GP referrals due to health measure concerns. In Dundee no GP referrals were made, but an on site doctor was consulted when required.

	ABERDEEN (n=106)	DUNDEE (n = 37)	Reference value
<i>Body Mass Index (kg/m²)</i>	22.3 (18 to 33)	23.4 (17 to 36)	20 to 25
<i>Systolic blood pressure average (mmHg) (range)</i>	122 (88 to 158)	124 (104 to 151)	120 (approx)
<i>Diastolic blood pressure average (mmHg) (range)</i>	76.2 (50 to 117)	76.3 (55 to 103)	80 (approx)
<i>Heart rate average (bpm) (range)</i>	78.2 (44 to 129)	83.9 (60 to 115)	70
<i>Respiration rate (per min) average (range)</i>	17.4 (8 to 48)	15.9 (12 to 21)	15 to 20 (resting)
<i>Peak flow rate (l/min) average (range)</i>	441 (180 to 800)	456 (180 to 700)	N/A
<i>Ankle circumference (cm) average (range)</i>	22.4 (17 to 27)	22.0 (18 to 26)	N/A
<i>Hand circumference (cm) average (range)</i>	21.1 (14.5 to 26)	20.8 (15 to 24)	N/A

Table 18: general health measures established at baseline health checks

General health measures summary:

The two groups had average similar general health status, with average values within normal parameters. Values at either end of the range of results were extreme in some cases, particularly heart rate, respiration rate and obesity.

Self reported injecting equipment sharing practices

4.25 Self reported sharing practices undertaken ‘ever’ and ‘in the past month’ were explored in the NESQ. Sharing was first defined to participants before these questions were asked. Sharing was described as ‘*Pass on after you used or borrow after someone else has used it*’. It is therefore thought unlikely that the Dundee participants defined passing on new sterile equipment obtained from the exchange to others as ‘sharing’ (for example providing another injector with an unopened citric acid sachet).

Sharing practices that have ever been undertaken

Table 19 illustrates the extent of sharing of **needles and syringes ever**.

	ABERDEEN (n=182) (missing =7)	DUNDEE (n=159) (missing =11)	p value
<i>Yes has shared N&S</i>	93 (51.1%)	60 (37.7%)	0.013
<i>Never shared N&S</i>	89 (48.9%)	99 (62.3%)	

Table 19: self reported sharing of needles and syringes EVER

Table 20 shows the extent of sharing of **paraphernalia items ever**.

	ABERDEEN (missing =7)	DUNDEE (missing =11)	p value
<i>Yes has shared acid</i>	149 (81.9%)	101 (63.5%)	<0.001
<i>Never shared acid</i>	33 (18.1%)	58 (36.5%)	
<i>Yes has shared water</i>	146 (80.2%)	107 (67.3%)	0.007
<i>Never shared water</i>	36 (19.8%)	52 (32.7%)	
<i>Yes has shared cooker</i>	139 (76.4%)	110 (69.2%)	0.136
<i>Never shared cooker</i>	43 (23.6%)	49 (30.8%)	
<i>Yes has shared filter</i>	148 (81.3%)	104 (65.4%)	0.001
<i>Never shared filter</i>	34 (18.7%)	55 (34.6%)	

Table 20: self reported sharing of paraphernalia EVER

4.26 In the NESQ participants were specifically asked if they had *ever* used any injecting equipment (needles, syringes or paraphernalia) after someone else had used it. This was to tease out this behaviour from the definition of sharing detailed above. Of the Aberdeen participants, responses were noted for 180 (9 missing). Of these, 142 (78.9%) said they had used injecting equipment after someone else had used it. In Dundee 156 responses were noted (14 missing) and of these 75 (48.1%) said they had, which was significantly lower ($p < 0.001$). The lack of difference in the sharing of cookers was explained in the qualitative interviews, where batch preparation of drugs and subsequent division of this amongst IDUs was identified as a common practice. This is discussed more later.

Sharing practices that have been undertaken in the past month

Participants' sharing practices in the past month only are shown in table 21.

		ABERDEEN	DUNDEE	
		(n= 189)	(n =170)	p value
<i>I have kept my own needles and syringes for reuse by me</i>	Yes	123 (65.1%)	119 (70.0%)	0.321
	No	66 (34.9%)	51 (30.0%)	
<i>I have kept needles and syringes for reuse by others</i>	Yes	23 (12.2%)	13 (7.6%)	0.154
	No	166 (87.8%)	157 (92.4%)	
<i>I have used needles and syringes that someone else may have previously used</i>	Yes	23 (12.2%)	18 10.6%	0.638
	No	166 (87.8%)	152 89.4%	
<i>I have kept my filters for later use by me</i>	Yes	124 (65.6%)	95 (55.9%)	0.059
	No	65 (34.4%)	75 (44.1%)	
<i>I have used the same acid pot/bag/box as someone else</i>	Yes	117 (61.9%)	94 (55.3%)	0.204
	No	72 (38.1%)	76 (44.7%)	
<i>I have given someone else one of my used filters</i>	Yes	80 (42.3%)	57 (33.5%)	0.087
	No	109 (57.7%)	113 (66.5%)	
<i>I have used the same water container/cup/jug as other people</i>	Yes	106 (56.1%)	93 (54.7%)	0.793
	No	83 (43.9%)	77 (45.3%)	
<i>I have injected someone else</i>	Yes	77 (40.7%)	85 (50.0%)	0.078
	No	112 (59.3%)	85 (50.0%)	
<i>Someone else has injected me</i>	Yes	74 (39.2%)	83 (48.8%)	0.065
	No	115 (60.8%)	87 (51.2%)	

Table 21: Self reported risky sharing practices in the past month only

4.28 Participants were also asked to respond to the statement '*In the past month I have always put my used needles and syringes in a cin-bin (disposal bin)*'. In Aberdeen 134 (70.9%) agreed with this statement, in Dundee this figure was 118 (69.4%), with no significant difference ($p= 0.758$). It is not known if this was interpreted as *immediately after use* or *eventually* and could be better explored in future work.

4.29 As said in 3.6, paraphernalia supply began in Dundee in a staged manner. In the 1990's makeshift paraphernalia items such as cigarette filters were supplied from the HRC under local agreement. The HRC also undertook pilot work around the supply of the first commercially available items from Exchange Supplies in the early 2000's. Following the law change in 2003, paraphernalia supply extended across Tayside needle exchange schemes. This means that Dundee participants who had been injecting for longer time periods may have had access to varying levels of paraphernalia availability. Therefore, data on 'past month' sharing was analysed for those who had begun injecting from 2003 onwards, in both Aberdeen and Dundee. This was done to identify if those in Dundee who had *always* potentially had access to the *widest availability of paraphernalia* reported lower levels of recent paraphernalia sharing than those in Aberdeen.

4.30 There were 47 in the Aberdeen group who began injecting since 2003 and 96 in the Dundee group. There was no significant difference found between them for the following paraphernalia sharing and risk taking behaviours: '*Has kept needles & syringes for use by others in past month*' (12.8% in Aberdeen vs 8.3% in Dundee, $p=0.402$), '*Has used someone else's needles & syringes in past month*' (8.5% in Aberdeen vs 8.3% in Dundee, $p=0.971$), '*Has kept own filters for use by me in past month*' (57.5% in Aberdeen vs. 57.3% in Dundee, $p=0.986$), '*Has given someone else a used filter in past month*' (25.5% in Aberdeen vs. 31.3% in Dundee, $p=0.481$), '*Has used same acid as someone else in past month*' (46.8% in Aberdeen vs. 55.2% in Dundee, $p=0.345$), '*Has used same water as someone else in past month*' 48.9% in Aberdeen vs. 55.2% in Dundee, $p=0.480$).

4.31 It should be noted that when it came to injecting someone else and being injected by someone else, the differences became significant when analysis was restricted to those who had begun injecting since 2003. Significantly *more* Dundee newer injectors had engaged in these behaviours in the past month than those in Aberdeen: '*In the past month I have injected someone else*' (25.5% in Aberdeen vs. 45.8% in Dundee, $p=0.019$) and '*Someone else has injected me in the past month*' 38.3% in Aberdeen vs. 56.3% in Dundee, $p=0.044$).

4.32 As shown in tables 18 and 19, the majority of Dundee participants used Sterifilt/Stericup filters and the sachets of acid supplied, although the qualitative interviews showed this not to be on every occasion. Data was extracted to compare filter reuse and sharing and acid sharing between those in Dundee who used both these supplied items with those in Aberdeen who did not. It was hypothesised that use of these supplied items might show a difference in sharing of these items in the past month. However no significant differences in reported behaviour were found: '*I have kept my filters for later use by me*' (64.5% Aberdeen vs. 58.9% Dundee; $p=0.285$), '*I have given someone else one of my used filters*' (43.3% Aberdeen vs. 37.0% Dundee, $p=0.233$) or '*I have used the same acid pot/bag/box as someone else*' (67.5% Aberdeen vs. 60.3% Dundee; $p=0.165$). When this was restricted to those who begun injecting from 2003, again no significant differences were seen: '*I have kept my filters for later use by me*' (51.4% Aberdeen vs. 57.9% Dundee; $p=0.510$), '*I have given someone else one of my used filters*' (31.4% Aberdeen vs. 31.6% Dundee, $p=0.987$) or '*I have used the same acid pot/bag/box as someone else*' (51.4% Aberdeen vs. 55.8% Dundee; $p=0.685$). It should be noted that this data indicates a reduction in the proportions of newer injectors in Aberdeen taking these risks compared to the Aberdeen cohort overall.

Injecting equipment sharing practices summary:

A greater proportion of participants in Aberdeen (51.1%) had *ever* shared needles and syringes compared to Dundee (37.7%), which was significant ($p=0.013$). Sharing of needles and syringes in the past month was broken down into two practices: (1) *keeping needles and syringes for reuse by others*, and (2) *using needles and syringes that someone else may have previously used*. In both cases, these practices were reported to a greater extent in Aberdeen (12.2% of participants reported each practice) compared to Dundee (7.6% and 10.6%), although overall the numbers were relatively small and not significantly different. In both locations a large majority (around 90%) had not kept needles and syringes for reuse by others or used someone else's needles and syringes in the past month. This is encouraging and suggests the embracing of harm reduction messages in both locations. Less encouraging is the high levels of reuse of own equipment identified in both locations, suggesting levels of equipment supply reaching IDUs in both locations are not adequate. This was further demonstrated in the qualitative interviews (see later).

Sharing of all paraphernalia items *ever*, was higher in Aberdeen. Participants in Aberdeen were statistically more likely to have *ever* shared acids, water and filters than those in Dundee. Although not significantly different, the Aberdeen participants reported greater levels of cooker sharing than those in Dundee. Batch preparation, which involves cooker sharing, was shown in the qualitative interviews to be common practice in both areas as a means of pooling resources.

In the past month, in Dundee more participants had kept their own needles and syringes for reuse (70.0% vs 65.1%), injected someone else (50.0% vs 40.7%) or been injected by another (48.8% vs 39.2%), but none were significantly higher. Amongst those who had begun injecting since 2003, significantly more in Dundee had injected others or been injected by another in the past month, which suggests a need to focus on these risk practices with newer injectors.

In the past month, a greater percentage of Aberdeen participants had used the same acid container compared to those in Dundee (61.9% versus 55.3%), given someone a used filter (42.3% versus 33.5%) or kept their own filters for reuse (65.6% versus 55.9%). None of these practices tested significantly different, but the latter was close to significance. A similar percentage in Aberdeen (56.1%) and Dundee (54.7%) had shared water containers in the past month. Overall, levels of sharing in the past month were less than sharing 'ever', suggesting participants were taking on board harm reduction messages, but they were not significantly different between the two locations.

There were no significant differences in paraphernalia sharing or filter reuse in the past month amongst those who had begun injecting since 2003, although those in Dundee potentially had access to paraphernalia supply. Similarly the extent of past month filter reuse and passing on or past month acid sharing were not significantly different between those in Dundee who used the supplied acids and filters compared to those in Aberdeen who did not use supplied paraphernalia.

Self reported skin cleansing practices

Participants' hand washing practices prior to preparation of injections are shown in table 22. This data compares with the findings in Bristol in stage one (Chapter 2).

	ABERDEEN (n=189)	DUNDEE (n=170)
<i>No never</i>	35 (19.0%)	31 (18.2%)
<i>Not apply not prepare own</i>	12 (6.3%)	2 1.2%
<i>Yes always</i>	30 15.9%	43 25.1%
<i>Yes most of the time</i>	52 27.5%	42 24.6%
<i>Yes but only sometimes</i>	60 (31.7%)	52 (30.6%)

Table 22: Self reported hand washing prior to preparing

4.33 When data was grouped together to test for differences in whether participants 'always or mostly' washed their hands, there was no significant difference between Dundee (n=85) and Aberdeen (n=82) ($p=0.425$).

Participants' practice relating to washing/wiping injecting sites before injecting, responses are shown in table 23. (Pre-injection swabs were supplied in both locations.)

	ABERDEEN (missing = 3)	DUNDEE (missing = 1)
<i>No never</i>	29 (15.3%)	20 (11.7%)
<i>Yes always</i>	59 (31.2%)	79 (46.2%)
<i>Yes most of the time</i>	40 (21.2%)	36 (21.1%)
<i>Yes but only sometimes</i>	58 (30.7%)	34 (19.9%)

Table 23: Self reported site cleaning prior to injecting

4.34 When data was grouped together to test for differences in whether participants 'always or mostly' wiped their injecting sites prior to injecting, significantly more participants in Dundee (n=115) than Aberdeen (n=99) reported site wiping ($p=0.004$).

4.35 Combining data for both cohorts, those who 'always or mostly' wiped their sites before injecting were significantly less likely to have a skin or soft tissue infection on the day of data collection ($p=0.05$).

Skin cleansing practices summary:

Hand washing and skin cleansing prior to injecting were reported to be undertaken by the majority, but only on some occasions. There were no statistical differences found in the number in each location who said they 'always or mostly washed their hands prior to injecting. However significantly more participants in Dundee wiped their sites prior to injecting compared to Aberdeen participants. Combining participants from both groups showed that those who always or mostly wiped their sites prior to injecting were statistically less likely to have a skin or soft tissue infection on the day of participation. This concurs with the findings of Vlahov et al (1992) in the USA.

Follow up health check data collected at 6 months

4.36 As shown in table 16 (4.21), in Aberdeen 27.0% (n=51) of participants who underwent a baseline health check were followed up in 6 months. However in Dundee this figure was 7.7% (n=13) and the total number of baseline participants was much less (37 in Dundee versus 106 in Aberdeen). This gave too small a dataset to make meaningful comparisons between the Dundee and Aberdeen participants at 6 months. When those in the Aberdeen group who were followed up at 6 months (n=51), had their baseline and follow up data compared, there was no significant change in the number with skin and soft tissue infections (9 vs 11, $p = 0.652$). Similarly there was no significant difference in the number with non-infected complications (37 vs 34, $p = 0.316$). No change in care was made in this time. Blood pressure, heart rate, respiration rate and peak flow averages also showed no significant change.

Findings from the qualitative data

4.37 In depth qualitative interviews were undertaken to provide an understanding of participant's views on and experiences of using paraphernalia. They were also undertaken to better understand risk taking behaviours. The findings gave a deeper understanding of the quantitative results of the NESQ. Fifty four in depth interviews provided this data. Of these, 34 were with Aberdeen participants and 20 with Dundee participants. The key findings are reported and illustrated with quotes. The codes used after the quotes relate to Gender (M=male, F = female), Age, location (A = Aberdeen, D = Dundee) and length of time since first injection. So for example, M46D(25) was male, 46 years old, part of the Dundee cohort and had been injecting for 25 years.

4.38 Those who took part in the NESQ but were unwilling to be interviewed were given the opportunity to provide brief qualitative data, on which the researcher made notes. They were asked to describe '*Problems obtaining paraphernalia*', '*Problems using paraphernalia*', '*Items you would like to have supplied*' and to give their thoughts on '*How to reduce sharing, lending and borrowing*'. The researcher notes were subject to thematic analysis. In Aberdeen, 39 participants in the NESQ gave additional comments and in Dundee this figure was 99. Findings were largely similar to the interviews, but where additional points were made they have been noted in this section.

Injection preparation and administration practices

The preparation steps used

4.39 Those who participated in the interviews, both in Aberdeen and Dundee, described using a similar heroin injection preparation process. The method reported concurs with the steps identified from analysis of the transcripts of Taylor et al (stage one) and from work in Bristol and Hereford (Ponton & Scott, 2004). The order in which components were added to the spoon did vary occasionally, for example if preparing outside liquid may be added first to avoid powder blowing away. The need for spoons, water, the addition of acid and the use of a filter was considered essential by most interviewees in both locations. Some did report unsuccessfully attempting to prepare injections in the past without some of these items, particularly acid. A few said they could manage without filters or chose not to use them. For most interviewees the use of a tourniquet was also considered necessary, although not all required this.

4.40 Variation was found in the quantity of citric acid reported to be used. This was found both in Dundee and Aberdeen. Some interviewees reported adding citric acid stepwise, checking to see if the liquid went clear (the end point indicator) with each small sprinkle. However, more commonly interviewees reported using the same quantities of acid every time they prepared a set amount of heroin. In Dundee quantities were described in sachet proportions, for example 'half a sachet', 'whole sachet'. Some interviewees reported using excessive amounts when compared with the laboratory findings from part one. For example adding one whole sachet to a £10 bag. Some reported using two whole sachets. Only one Dundee interviewee mentioned that not everything in the drug should be dissolved with citric acid and that he expected some residue in the cooker. In Aberdeen because citric acid sachets were not supplied, it was harder to judge the reported quantities the interviewees used, as these were usually described in 'pinches'. In both locations, visual judgement was the only means reported of determining how satisfied the interviewee was with the resulting prepared injection. Visual judgement also informed whether a filter was believed to retain drug or not, as discussed later.

How did people learn to prepare and inject?

4.41 All interviewees had learned how to prepare injections by watching someone else. Most described having their first injection prepared for them by another, who often also administered their first injection to them. In some cases this was a particularly trusted person such as a brother or sexual partner. However for others there was no particular trust relationship. Instead, the circumstances had encouraged them to inject and the person who facilitated this was someone present at the time when the opportunity or necessity arose:

'[I learned to inject]...in the homeless unit. I used to do foil...I was on foil for 5 years... in there [the homeless unit] it'd have to go in the pot so if you don't inject you don't get, so I just started injecting...The choice between injecting and rattling -you're gonna inject' M33D(new injector)

4.42 This interviewee was referring to residents pooling finances to buy drugs that are then prepared in a batch and divided. Because he had to pool finances with the others to obtain enough heroin, he was unable to remove his share of powder for smoking, prior to it being made into solution. His first injection was prepared and administered by another hostel resident with whom he subsequently said he was not familiar.

4.43 Many participants reported refining their preparation and injecting technique through a subsequent process of ‘trial and error’ in the time after initial injecting. Some described selectively following the advice or actions of others and choosing to disregard practices they considered to be unsafe or ineffective. Commonly interviewees who had been injecting for some time considered that their current injection preparation and administration methods were either ‘better’ or less risky than their early techniques. This is reflected in the data on ever sharing and sharing in the past month, reported in tables 20 and 21, where sharing in the past month was undertaken by less people compared to the proportion who had ‘ever’ shared the items. Some interviewees spoke of past practices and risks taken with regret:

‘Yes I’ve done that quite often [used someone else’s needles and syringes]...when I haven’t had a needle....so I’ve had to or I’ve been rattling....It was a while ago’ M37D(9)

4.44 Supplementary sources of information which were said to have informed injecting practices at a time after first injection, were other IDUs, needle exchange staff and safer injecting leaflets. Some interviewees reported that it was some time, typically several months after beginning injecting, before they accessed a needle exchange for the first time. Lack of awareness of services was given as a reason for this by some. Others expressed initial concerns and fears about accessing services, including confidentiality worries. They reported relying on others for information, advice and equipment early in their injecting careers.

Control over the injection preparation process

4.45 It was previously thought that if a person prepared their own injections they would be in control over their paraphernalia use and risk taking. However the qualitative interviews showed this to be more complicated. When asked about injection preparation, several interviewees who prepared their own injections described situations where the circumstances forced them to take risks that they did not perceive able to control, as illustrate in this quote:

‘You want to boil your water but there is not always the means....if you are injecting in the house where you are getting your drugs, you can’t always use their kettle to boil the water...’ M32A(12)

4.46 Many people described the use of communal water provided by the host in the facility where they were injecting. Reasons given for sharing water despite perceiving it to be a risk, included fear of offending or being disrespectful to the host, cultural ‘norms’ and the urgency with which the person needed to inject. Many people described worrying about risks after they had taken them. However, others described high levels of control over their preparation environment and consequent practices. For example, always having their own water which they did not allow others to use, e.g. by carrying it in a medicine bottle or bottled drinking water. Some interviewees appeared to be much more assertive than others in dictating injecting circumstances to their peer groups.

4.47 Just as preparation of ones own injections can not assume perceived control over the process, similarly, there were interviewees who did not prepare their own injections who described high levels of control over the process. These were female participants who, despite not preparing their own injections, described observing preparation and dictating the standards of hygiene and choice of equipment used by their preparer, who was their partner. However, there were other participants who did not prepare their own injections who described little control over the preparation of their injections.

Administering injections

4.48 Interviewees in both locations gave many reports of difficulties accessing peripheral veins. Similar difficulties were well illustrated in Glasgow by Taylor et al (2004). The use of tourniquets to raise peripheral veins was common, with most interviewees describing the use of a belt or shoe lace for this purpose. In Dundee the lack of supply of tourniquets from needle exchanges was specifically mentioned. These had been supplied in the past. Some indicated it would make the injecting process more convenient if tourniquets were supplied, describing their ease of use compared to makeshift tourniquets. Others wanted them to be supplied in order to facilitate the use of 'clean' equipment. Some interviewees in both locations reported no need for tourniquets.

4.49 Careful administration techniques tended to be described in both Aberdeen and Dundee. For example participants often described taking some time to raise a vein and injecting slowly in the direction of blood flow. Some reported that a considerable number of attempts were needed to access veins, sometimes taking several hours. This was also noted by Taylor et al (2004). Many reported that peripheral vascular access had become increasingly difficult over time, now requiring several attempts with several new (sharp) needles for each injection.

'Sometimes I can go through 10 sets trying to get in' M25D(9)

4.50 The need for several sets of needles to deliver one injection was given by some as a reason for running out of clean sets of needles and syringes. Safer injecting information encourages injectors to replace the needle after one unsuccessful attempt to access a vein. However it is sometimes assumed that the number of sets of injecting equipment supplied equates to the number of injections delivered. These interviewees reported that this was not the case. In such circumstances the number of needles and syringes needed to facilitate delivery of every injection with sterile equipment would far exceed the number of daily injections. Many described reusing their own equipment several times. This was also evident from the NESQ data where 65% (n=123) of Aberdeen participants and 70.0% (n=119) of Dundee participants had kept a needle and syringe for reuse in the past month.

4.51 Those who reported using the groin acknowledged that it was particularly risky and many expressed reluctance in having to do so.

'I do find it is actually slightly easier [comparing groin injecting with previously described difficulties with peripheral access] but I think there is a lot mair to worry about ...it's quite dangerous and I have always been warned about how dangerous it is to inject there....but I don't have much choice..' M32A(12)

4.52 A minority of injectors who used peripheral veins above the waist said they would not inject into their groin indicating that they would prefer to stop injecting than do so. Whether this would be the case if they had no peripheral access is of course not known.

'...Once these veins are done it is game over...' M46D(25)

Injection preparation and administration summary:

Participants in both locations used very similar heroin preparation steps. They emphasised the need for acid in the process. Participants had learned how to prepare and inject from other IDUs, often having had their first injection prepared and administered by another. Risk taking and vulnerability surrounding the injection preparation process was particularly high when people were early in their injecting careers and when in other people's homes. Knowledge on safer injecting was accumulated and applied over time. Many had not accessed a needle exchange service until they had been injecting for several months, so had previously relied on other injectors for information and equipment. Strategies to draw newer injectors into needle exchanges and more rapidly expose them to safer injecting advice should be explored and evaluated. The level of control felt over preparation circumstances varied, for example some felt unable to refuse to use communal water. Others were more assertive. Many experienced difficulties accessing peripheral veins and reported using several sets of injecting equipment to deliver one injection. Therefore it cannot be assumed that the number of sets of needles and syringes supplied equates to the number of injections administered. The high level of reported saving of needles and syringes for reuse illustrates the need to increase the availability of clean needles and syringes.

Access to injecting preparation equipment in Dundee

4.53 Tables 13 (page 52) shows that in Dundee the majority of participants reported currently using the paraphernalia that was supplied from the exchanges. In Aberdeen, almost all used makeshift paraphernalia. However, table 13 shows that makeshift paraphernalia was also used in Dundee. Table 21 (page 59) shows that many participants in both locations had undertaken risky injecting equipment practices in the past month. This raises questions which the qualitative interviews helped answer.

Views of Dundee participants on the supplied paraphernalia

4.54 Dundee interviewees all emphasised that the paraphernalia supplied by the exchanges was their preferred choice, with the exception of mixed views on filters. There were three reasons identified as to why the supplied paraphernalia was preferred:

(i) Cleanliness and safety

Supplied paraphernalia was seen as '*clean*' and described by many as '*safer*'. This was equated with reducing the risks to one's own self such as vein damage and loss of peripheral access to veins, or HIV prevention. Less explicit emphasis was given to HCV prevention. All interviewees in Dundee had experience of using some form of makeshift equipment. Comparison with the perceived risks from makeshift items was commonly made, for example citric in sachets was often described as being '*gentler*' than citric bought from a food shop. The risks of ophthalmic infection from the use of lemon juice were cited by many as a reason why supplied citric acid was '*safer*'. Some favoured vitamin C over citric acid, considering it to be less irritant. Many participants also attributed reusing makeshift paraphernalia, especially filters, to experiencing a '*dirty hit*'. The use of the supplied paraphernalia was reported to prevent this as it enabled '*fresh*' items to be used each time. Some interviewees considered that use of clean paraphernalia prevented skin and soft tissue infections. Cellulitis infections were mentioned by a couple of interviewees who attributed past infections to makeshift paraphernalia reuse. Many interviewees believed that the supply of paraphernalia

reduced sharing of paraphernalia. This was equated by many with preventing HIV. As said, only a minority of interviewees specifically mentioned HCV prevention unprompted.

'I've been in the company of people with HIV [referring to injecting groups] so I know the importance of not sharing it [paraphernalia]' M33D(new injector)

Some interviewees described the nature of single use items as 'forcing' them not to share, for example, by encouraging each person to have their own 'kit'. However others also described sharing supplied items, especially cookers, during batch preparation of drugs.

(ii) *Quality*

Paraphernalia quality was a common theme, with the supplied items considered to be more reliable and of better quality than makeshift items. This was equated by some with increased safety. Others equated quality with better reliability and less risk of losing the 'hit', for example through product failure and spillage.

'Yes, it [paraphernalia supplied] is definitely [better for me]...when I used to work in [name of place].I stayed down there and it was a wee village, so I used to have to travel to score and plus to get works. They weren't giving out citrics at that [needle exchange] office, so it was like vinegar and lemon juice that you're using and it doesn't break down the heroin as well plus somebody said if you use lemon juice repeatedly it ...damages your eyesight'. M29D(5)

(iii) *Convenience*

Readily available supplied paraphernalia was also a recognised as being convenient and this was linked explicitly with prevention of risky behaviours. For example, some who lived close to needle exchanges or received outreach reported that the supply of paraphernalia with needles and syringes made it unnecessary to use makeshift items, and easier to follow safer injecting advice about not sharing.

Mixed views on the filters supplied in Dundee

4.55 Some interviewees in Dundee spoke favourably about the Stericup filter and Sterifilt. Others had unfavourable opinions. When this study began, the supplied filter in Dundee was the one contained within the Stericup. Later in this study the Sterifilt was also supplied. Many interviewees had experience of using both.

4.56 Some interviewees spoke strongly in favour of the Stericup filter, reporting that it was easy to use and they thought it made the injection safer. Some reported retaining it to 'bash down' with others in times of drug drought. However a common theme identified in those who disliked the Stericup filter was that it was 'too big'. Further exploration identified that what participants meant was it was visibly seen to retain an unacceptable quantity of drug. This was attributed not so much to the physical size of the filter but to the density of the material that it was made from. The visible colour of the used filter and reduced volume of the resulting injection were seen as signs that significant heroin was retained. Some reported ripping it into smaller pieces before use. Hence, although retention of drug was seen as important for reuse, retention of too much drug due to too absorbent a filter was undesirable and deterred use.

4.57 The Sterifilt was shown in the laboratory to retain minimum amounts of drug. Some in Dundee recognised this and expressed a liking for it. The fact it was seen not to visibly retain drug was welcomed. Lack of drug retention was considered by these interviewees as a reason to discard the Sterifilt after first use, which was linked to cleanliness and less risk of 'dirty hits'. Some did retain it for future filtration purposes if they thought they were running short of filters. Others did not like the Sterifilt for this same reason, as it did not give them anything to save 'for a rainy day'. Some also reported that the Sterifilt was difficult to use. However some who spoke in favour of the Sterifilt said that it had taken some practice to get used to it and suggested training on use to be important for injectors.

'The Sterifilts are good but people will need shown how to use them' M35D(3)

4.58 The dislike of the Stericup and Sterifilt helps explain why 34.5% of participants in Dundee reported using cigarette filters, coupled with the issues on access and convenience that have been discussed. Those interviewed in Dundee who disliked the supplied filters reported using pieces of cigarette or hand rolling filters. Many reported past problems with the Stericup bending on heating, but this had now been resolved with a new style handle.

Why did the Dundee participants still sometimes use makeshift paraphernalia?

4.59 It is important to understand why, if most supplied paraphernalia was favoured over makeshift items, use of makeshift items and risky paraphernalia practices were still identified in Dundee.

4.60 For some in Dundee the supplied paraphernalia was used for every injection and they described having no access problems. However, for most it was not exclusively used. Interviewees reported that makeshift paraphernalia was used when they had run out of needle exchange supplies. Reasons for running out of supplied paraphernalia were thinking they'd need less than they did when they went to the exchange, or thinking they'd be back to the exchange in a shorter time span, reluctance to carry large quantities, not being close geographically to a supplying needle exchange prior to injecting and donating paraphernalia to others who did not access the exchange or had run out. Many said the amount of paraphernalia needed cannot be easily predicted. 'Convenience' was a factor, which was related to makeshift paraphernalia use. Some interviewees described difficulties with the distance between where they lived and needle exchanges where they could access injecting paraphernalia. Many said paraphernalia was easy to access in the city but more problematic for those based out of town. Some interviewees used pharmacies that did not provide paraphernalia and some rural areas did not have a needle exchange. Occasionally pharmacies ran out of supplies. This caused access difficulties. In addition, many comments were made expressing difficulty accessing paraphernalia at weekends and at night. Those who described not having access to paraphernalia at the time it was needed, often described the time between obtaining and using drugs as very short. Essentially, obtaining more paraphernalia from the exchange was often less of a priority than injecting, when faced with the possibility of withdrawal effects.

Access to makeshift paraphernalia in Aberdeen

4.61 All Aberdeen interviewees described using makeshift items. A few had obtained supplied paraphernalia from needle exchanges in other cities and all spoke very favourably of this, emphasising a strong preference compared to makeshift items. A range of household items were used as paraphernalia in Aberdeen. Interviewees expressed preferences for particular items, for example citric acid in preference to lemon juice. Reasons given included less perceived health risks and more satisfactory performance.

General comments on paraphernalia access in Aberdeen

4.62 It may be assumed that since makeshift paraphernalia items usually come from household items such as cooking grade citric acid and cigarette filters that they could easily be obtained. The qualitative interviews showed this not to be the case. Significant problems in obtaining some makeshift paraphernalia were identified, particularly citric acid in Aberdeen. Less difficulty was identified in Dundee, where distance from shops that sold citric acid was the main issue mentioned.

4.63 Some Aberdeen interviewees reported little difficulty in accessing makeshift paraphernalia. For a minority this was because their drug preparation appeared to be forward planned for and organised. For example some reported having their own assembled preparation kits that they carried around for use when needed or they only injected in their homes. In some cases these items were shared with others, for example a partner, but care was expressed not to share this with others. It is not known if these interviewees were also on a methadone prescription, hence may have less pressing urgency around their injecting. These interviewees tended to be able to purchase paraphernalia easily. In the case of citric acid they commonly lived or worked close to an outlet selling it, found the vendor willing to sell it to them and did not consider the cost to present a difficulty for them. For many, being a cigarette smoker meant ready access to cigarette or hand rolling filters. However, others who did not perceive they had any problems accessing paraphernalia said this was because there was always someone around them from whom they could borrow or share. Some did not explicitly recognise this as an aspect for concern, although others did.

‘When I am out of citric...you have tae’ share it, there is nae’ choice you just share it’
M32A(12)

‘When I am strung out I am not going to travel to buy citric when I could use lemon juice...’
M28A(7). This interviewee later acknowledged he thought lemon juice could make you blind adding *‘but this hasn’t happened to me’*.

4.64 However, the *majority* of interviewees in Aberdeen reported they had *difficulty* accessing makeshift paraphernalia. Commonly this related to accessing citric acid.

‘I am surprised there is not more sharing in Aberdeen...citric is a nightmare to get hold of...’
M31A(6).

This person went on to describe times when he had traded some of his prepared ‘hit’ for citric in order to prepare it. The liquid was removed from his spoon by the citric donor, using the donor’s needle and syringe.

Difficulties reported in obtaining citric acid in Aberdeen

4.65 The interviewees issues relating to the difficulty in obtaining citric acid in Aberdeen.

(i) Availability of citric acid

Few shops sold citric acid and some who did, refused to sell it to IDUs. This included both pharmacies and food shops. Many interviewees reported that food shop keepers had informed them that the police had instructed them not to sell citric acid to injectors.

'I have never been refused...but I have to go in for a number of my friends to get theirs [citric acid] for some reason they will sell it to me but won't give it to them' M40A(27)

Two food shops in the city and one on the outskirts were repeatedly mentioned by interviewees as sources of citric acid. Few knew of more than two or three outlets. Access to these shops was difficult for some due to their location, the need to spend money on transport and reported erratic opening hours.

(ii) Cost of citric acid

Cost of citric acid from those shops willing to sell was also reported to be a problem by many. Escalation of the reported price over the course of this study was identified from several sources. Early interviewees reported the cost of £2 per bag. This cost was reported as consistently increasing throughout the study for the same product. Later many interviewees reported a cost of £4 for 100 grams. Some also said this was packed down into unmarked half bag quantities (50g) aimed at injectors, still at a cost of £4.

'When I first started [injecting] it was £1 a bag, now it's £4...' M33A(12)

'The boss told them [the shop staff] that they had to put the prices up because I actually spoke to him one day and he goes 'well you boys need it so I can charge whatever I like' that was his exact words' M33A(17)

Some said they were unable to afford citric acid or other paraphernalia. Lack of money was a barrier to obtaining it reported by many.

'I haven't got any money to get it [paraphernalia]' Interviewer: 'what happens if you don't have the money?' 'Basically I have to go borrowing to people or sharing it you know' M24A(5)

'It costs me £7.60 to get citric including the bus fares' F29A(8)

'Every penny I don't need for my habit goes on my daughter' F19A(new injector).

This woman did not include paraphernalia items in the expense of her habit.

'Junkies are poor people, you need a way to fund it [drug use]...prostitution, theft, dealing....those that don't do that use their social money, their housekeeping'. F44A(3)

This woman, her sister, her son and her cousin were all injectors. They prepared communal batches divided between them. She described how her cousin had obtained injecting kits in London and brought them to Aberdeen. She considered their injecting practices were safer

and 'cleaner' during the short time when they had access to the kits and described preparing single injections for their own use. However, others said they were willing to buy paraphernalia, including a small number who said they would buy it from exchanges. One cited employment as facilitating his ability to pay. However those willing to pay identified that many others wouldn't be so able or willing and considered that charging for paraphernalia would limit uptake or increase crime to fund it.

(iii) Quality issues regarding citric acid

Quality concerns were raised by some. The use of citric acid intended as a food ingredient was expressed as a concern. Trust in the supplier was mentioned by some who considered citric acid products supplied from needle exchanges would be safer to use and of guaranteed content. Variation in perceived strength of shop bought citric acid was reported by several. Many mentioned they had no way of knowing if what they bought was citric acid as it was sometimes packed down and sold unmarked. One person had been sold a packet of powder from an Aberdeen food shop believing it was citric acid. On using it he found the heroin did not dissolve and he was unable to inject it. Subsequently he said he had identified this powder to be Monosodium Glutamate.

(iv) Distress

Distress caused by difficulties in obtaining citric acid was reported by many. For some they described this largely in terms of inconvenience. They reported time and cost of travel as a deterrent from attempting to purchase citric acid, but expressed worries about using other acids. Others described lack of citric acid as pushing them to take risks in order to avoid withdrawal. Some said it created a 'borrowing frenzy', when people were desperate to inject, often in withdrawal, but did not have paraphernalia. They described situations where they had been pestered by injectors to lend items such as citric acid. Others described observing people desperate for an injection putting themselves at risk. This was also noted in Dundee when lack of paraphernalia when needed was discussed.

'I have even had people coming to my door at 2 and 3 O'clock in the morning...[looking for citric]' M31A(new injector)

Some said shop owners had threatened to stop selling them citric acid and this was causing distress.

(v) Reluctance and anger towards spending money on paraphernalia

These were expressed by some, sometimes questioning why needles and syringes were distributed for free, but nothing else.

'Some people just won't spend any money at all on anything other than drugs, they will never have any money for food or cigarettes. They will use cigarette filters from cigarettes that have been smoked...or other people's filters' M40A(27)

Some expressed bitterness that paraphernalia was not supplied in Aberdeen, often aware that it is supplied in other cities.

'People from other areas must be laughing at us we are so far back in time....it is the addict again thrown on the heap, people don't want to bother with us....I'd like to come in here and get all the stuff and cut out all the side roads so I wouldn't have to share....it is bad enough I have to inject' M33A(12)

'I have lived in Edinburgh....and they were giving out citric..they have like such a good centre.....you come up to Aberdeen and it is like the bloody dark ages...nothing has changed from 5 years ago...because of your postcode, that matters whether you get drug equipment or not, whether you get hep C or not, whether you get HIV or not, whether you are going to die or not....they should try and make it as equal as possible for everybody' F26A(8).

Lack of availability of citric acid was emphasised by most interviewees as a significant problem in Aberdeen. Other items such as spoons and filters could more easily be improvised. However, this was not without risk, although these were not always recognised when described by the interviewees.

Access to clean makeshift filters in Aberdeen

4.66 The main barrier to accessing clean filters in Aberdeen was having no money to buy cigarettes. The majority reported that this was overcome by obtaining cigarettes or hand rolling filters from others. Clearly these would be non-sterile and run the risk of being handled by contaminated hands. Some reported borrowing used filters.

What do injectors do if they do not have access to the paraphernalia they need?

4.67 Interviewees were asked what they did when they could not obtain the paraphernalia they wanted or did not have enough of it. There were several different themes in response:

Unlikely to run out

4.68 In both Dundee and Aberdeen a small number always planned ahead, so said it was unlikely that they would not have access to their own preferred equipment. They described a high level of organisation in their drug use, making plans to ensure they always had the equipment they needed. It is unknown if they were on any substitution therapy. In Aberdeen this high level of organisation related to undertaking the sometimes costly and time consuming task of purchasing citric acid before they ran out of their current supply. Access to cigarette filters and spoons was less problematic and some carried their own bottled water with them or only injected at home. In Dundee this related to visiting the exchanges or requesting outreach service home visits ahead of the time when they expected to run out of equipment. Several outreach clients in Dundee who said they lived remotely from a static exchange, attributed the 'home delivery' nature of the service as being key to ensuring they had access to equipment ahead of need.

4.69 For both the Aberdeen and Dundee interviewees who can be categorised into this group, a sense of pride in their level of cleanliness and organisation was clearly expressed. They often considered themselves different in this respect from most other injectors they knew. Most could however recall a time in the past where they had not been as organised and had improvised or shared equipment. The sense of improved injecting practices over time described earlier was reflected strongly in many of this group.

Improvise

4.70 Another group reported improvising on the equipment used when they did not have access to their preferred equipment. The ‘improvisers’ used items that they perceived to be less effective or less safe, but perceived improvisation to be safer than borrowing or sharing. For example risks were perceived to be less from reusing their own filters as opposed to using filters previous used by others. Using lemon juice instead of borrowing someone else’s citric acid was also mentioned. The ‘improvisers’ included people who reported batch preparation and sharing with a sexual partner. Injection preparation practices were described that were thought to keep the couple as a unit safe as opposed to each person safe as an individual.

4.71 The range of household items used to improvise was much wider amongst the Aberdeen interviewees than the Dundee interviewees. Items used as filters when improvising included cotton buds (reported in both Aberdeen and Dundee); pieces of clothing or tissue, nappies and sanitary materials (Aberdeen only). The use of acidic household items in the absence of access to citric acid was commonly reported, although often described as unsatisfactory. Dissatisfaction included the perceived extent to which the heroin had dissolved and the perceived risks that use of the household items presented, including damage to veins and risks to eyes. However most chose to take these risks describing the need to inject as unavoidable. Bottled lemon juice and fresh lemon was reported in both Aberdeen and Dundee. Vinegar, Lemsip® preparations, vitamin C tablets, alcohol squeezed from swabs and sterilising preparations were mentioned in Aberdeen.

Borrow from and share with others

4.72 In Aberdeen many considered running out of paraphernalia to be unlikely, but when probed this was because there was always someone to borrow from, indicating that they considered ‘running out’ to mean no one in the injecting group had the necessary item available. Borrowing was seen as an entrenched part of drug use culture by these people. Some of whom did not describe blood borne virus transmission risks.

‘...but you cannae’ get AIDS from sharing it [citric]...can ye?’ F42A(10)

4.73 Some mentioned an expectation amongst injectors that someone else will have paraphernalia they can borrow and that these people do not bother to get their own.

4.74 However others did acknowledge risks from borrowing, but saw it as inevitable. They described borrowing as a preference to improvising, only doing the latter if no one else could lend them paraphernalia. For example they would rather use someone else’s citric acid than use lemon juice as they perceived citric acid to perform better and to be safer than lemon juice, often mentioning ophthalmic risks from using lemon. Some said if they had difficulties finding someone to borrow from they would then make do with other things. Some did not consider sharing citric acid to present any risks.

4.75 There seemed to be more explicit recognition in Dundee that running out of paraphernalia meant running out of your own equipment – in all cases this was referred to as equipment supplied by the exchanges. Borrowing exchange supplies from others was usually undertaken in such circumstances, but this also depended on how accessible a supplying exchange service was at the time.

'If I've not got I'll go down town to see if I can get off them [exchange service], but 9 times out of 10 cause I am living with 3 or 4 users I can borrow off one of them....but it's always clean' M33D(0).

4.76 New sterile exchange supplies could easily be identified because it was still in the packaging. Such loans were sometimes repaid by supplying others with sterile equipment when obtained from the exchange at a later date. Interviewees did not consider there to be any risks from lending and borrowing sterile new equipment that was sealed in the packaging, which will be the case if hands that pass the items are not contaminated.

4.77 Others in Dundee reported saving their last set of supplied paraphernalia until they could get more. For example, saving Stericups[®] and cleaning them for reuse. It was noted that this practice tended to be reported by interviewees who injected alone or in couples.

'If it is the last cooker I'll clean it with boiling hot water and lemon or lime' M46D(25)

Use alternative administration routes

4.78 A couple of interviewees said they would not inject if they could not get all their own new equipment. It is unknown whether they were in drug treatment such as a methadone programme, which may have influenced their need to inject. These interviewees described being unwilling to take the risks from sharing or improvising and expressed a greater level of control in choosing when to inject compared to the majority of interviewees.

'If I dinnae hae the stuff I winnae be havin' a hit ...I'll find a bit o' tin foil and smoke it' M43D(24)

Access to injecting preparation equipment summary:

All the Dundee interviewees had experience of using makeshift paraphernalia. They expressed a strong preference for the paraphernalia supplied by the exchanges, perceiving it to be safer and of better quality. The exception was the Sterifilt and Stericup filters, where mixed opinions were expressed. Those who did not rely on retaining used filters to prepare injections at times of drug drought tended to favour the Sterifilt. However, those who relied on keeping used filters for later use did not like the Sterifilt because they do not retain drug. Some disliked the Stericup filters because they retained too much drug and reported reducing their size before use or using alternative makeshift filters. The need for IDU training when introducing new items of paraphernalia was highlighted.

Despite a preference for the supplied equipment, makeshift paraphernalia was still also used in Dundee. It was used when supplied paraphernalia was not available at the time when needed. Dundee interviewees did not convey any major difficulties obtaining makeshift paraphernalia *per se*, in that they knew where and how to obtain paraphernalia. However various reasons were identified for lack of supplied paraphernalia when needed, which are discussed in the next section. These included lack of forward planning and prioritisation -it was clear that priority was given to obtaining drugs and preventing withdrawal. Also many reported donating supplied paraphernalia to others in need, if injecting in their company. This meant the amount of paraphernalia needed by individual IDUs between exchange visits could not easily be predicted. Convenience in accessing paraphernalia was also a factor, with exchange opening times and distance from location when needed being a factor.

A spectrum of responses to lack of access to preferred paraphernalia was identified in both Dundee and Aberdeen. These ranged from risk avoidance strategies such as smoking heroin instead of injecting if they had no equipment, but for many identified risks were taken in order to facilitate an injection, including sharing used paraphernalia. Because of the sterile sealed packaging, paraphernalia supplied from needle exchanges can easily be identified as unused. This was noted by Dundee participants, although not always a factor that influenced the decision to borrow or share. In Aberdeen, lent equipment had inevitably been handled by others even if it was unused. Borrowing and sharing appeared to be more common in Aberdeen and some described a 'culture of sharing'. In Aberdeen, major difficulties in accessing citric acid were reported. A lot of distress due to this was expressed, particularly around fear of withdrawal effects if drugs could not be quickly administered. This was identified as promoting risk taking. A 'borrowing frenzy' was described by some.

Promoting factors such as forward planning when collecting exchange equipment and increasing risk avoidance strategies are challenges for needle exchange staff. The data here suggests a need to further develop and deliver education interventions. Many in Dundee recognised the difference between borrowing and passing on sterile unused paraphernalia and borrowing or passing on used paraphernalia in terms of risk. Therefore, in areas where paraphernalia is supplied, this could form part of education strategies, coupled with encouraging IDUs to collect increased amounts of equipment.

Sharing and risk taking behaviours

Why do injectors share needles and syringes despite accessing needle exchange services?

4.79 Sharing needles and syringes was something that most who took part in the interviews had engaged in at some point. At the time of this 'direct sharing', they did not possess a new set of injecting equipment and the need to inject overrode immediate concerns. For some, needle sharing had been some time ago and they reported no longer doing it. However for others it was something that had done in recent times. As said, the majority of interviewees who had been injecting for some time considered that their current injection preparation and administration methods were either 'better' or less risky than their early techniques and spoke

with regret about past sharing. This is reflected in the data on ever and past month sharing. Many said, on reflection, direct sharing was something that they had not planned to do or necessarily wanted to do. Most talked about being 'forced' to borrow used needles and syringes in order to have a 'hit' because of the pressing immediate need to inject.

'Some people aren't willing to wait...when they get to a dealers house they are so overwhelmed and glad to get their bit and they would be prepared to use whatever was there to have it' F26D(4)

'I know about the concept of it [sharing] but whether it is always practical [to use clean needles] is another matter..there is no choice you have to take it, it is nae' practical in the world we live in'. M33A(12)

'Not many places in Aberdeen do needle exchange, so if you can't come into town or it's after 5pm you do get [needles] from someone else' F44A(3)

'.....they always say sort of have your own spoon and that, but it doesn't work like that.....it doesn't, it just doesn't go like that, I mean fair enough I try really hard to keep my own clean needles like but... umm... that doesn't happen all the time either.' F26A(8)

4.80 Many expressed worry and fear from a past incident, particularly with reference to HIV. Less overt concern was expressed about HCV. In cases where the interviewee expressed worry, the researcher encouraged them to talk with the blood borne virus specialist within the service and ensured they were aware of local testing services. A few people said that using someone else's needles and syringes was a normal part of their injecting practices which they routinely did and demonstrated a fatalistic approach towards blood borne virus risks. Risks were discussed with these participants and safer injecting information offered.

4.81 Some described having seen others empty cin bins in order to obtain injecting equipment. They emphasised a lack of self-respect or care held by these people, who were viewed as desperate. The fear of withdrawal in driving this desperation was acknowledged and empathised with by some. Others were scornful and saw it as something the person could avoid doing.

Why do injectors reuse their own needles and syringes despite accessing needle exchange services?

4.82 In Aberdeen 65.1% of participants in the NESQ had kept their own needles and syringes for reuse in the past month. In Dundee this figure was even higher at 70.0%. This practice is of concern for two main reasons. Firstly, if stored needles and syringes get mixed up with those of others there is a risk of blood borne virus transmission. Such risks are evident in the video work of Taylor et al (2004). Secondly, it means injecting with non-sterile and potentially blunt equipment. This can promote infections and exacerbate vein damage. In the interviews, the reason given for reuse of one's own needles and syringes was lack of sufficient quantities of clean equipment. On exploration three factors seemed to be important:

Many interviewees reported using more than one set of needles and syringes per injection

4.83 The reason for this was that each attempt to find a vein made the needle blunt and several attempts may be needed. It was said to be less painful if sharp equipment was used. It

was also advocated in safer injecting literature. Hence the assumption that one set of injecting equipment equates to administration of one injection cannot be made. Interviewees said it was not always possible to predict when visiting a needle exchange how many sets of equipment would be needed before the next visit. Some were reluctant to take more than the minimum amount they perceived necessary for fear of carrying large quantities on their person.

Some supplied others in need with equipment

4.84 Many conveyed a feeling of comradeship and duty to help out other drug users when they were in need, albeit of equipment or drugs. Some felt morally responsible to intervene if they saw someone about to share, so donated sterile equipment. Some reported doing this for people they did not know. Therefore own supplies may suffer unplanned depletion, through donations made to others.

Convenience of accessing needle exchanges

4.85 This was an important factor in influencing whether the person had enough sterile sets of equipment or not. Those who lived close to a needle exchange or were frequently in the city centre did not express the same difficulties with quantities of equipment as those who lived more remotely or relied on outreach. Similar findings were also shown by Hutchinson et al (2000) in Glasgow. The notion that injectors will make daily trips over longer distances to collect clean equipment prior to using drugs was not evident. This was often due to other challenges that arose daily regarding acquisition of money and drug, which gained priority in the face of addiction and the risks of withdrawal. Some cited 'laziness' as a factor.

4.86 Some interviewees expressed concern around vein damage from reusing needles. Others acknowledged the risk of blood borne virus transmission if their used equipment was accidentally taken by another or vice versa. Some reported marking their own equipment in some way to make it recognisable.

Why do injectors share and reuse paraphernalia?

4.87 For the majority, sharing paraphernalia appeared to be perceived as less of a risk than sharing needles and syringes. Sharing needles and syringes was clearly a big concern for many. For some, sharing paraphernalia was seen as inevitable, especially in Aberdeen.

'I'd say 8 out of 10 people would share –never a needle, but a spoon, filter...yes' M33A(15)

'Well I share spoons and filters and works...it is not easy [to obtain paraphernalia] as I haven't got any money for it....basically I have to go borrowing to people...' M24A(5)

4.88 The communal nature of injecting was seen to necessitate sharing. Those who avoided sharing in such situations described actively devising strategies to avoid this such as carrying self-prepared kits. In some cases strategies perceived to reduce risks were reported. For example, borrowing only from trusted people or attempting to clean equipment prior to use. Others described judging risk based on how they had seen the item handled.

'I wouldn't use someone else's needle but if there was only one cigarette filter, I would share it. One of us take one half and the other take the other. Or like the citric....as long as it has not been on somebody else's spoon or somebody else has touched it' F22A(2)

Keeping and sharing used filters

4.89 Keeping one's own filters for reuse was common; 65.6% of the Aberdeen cohort and 55.9% of the Dundee cohort reported doing this in the past month. However giving someone else a used filter was less common in the past month in both locations (Aberdeen = 42.3%; Dundee = 33.5%). Interviewees in both Aberdeen and Dundee said filters were kept for reuse because they retained some drug. This was verified and quantified in the laboratory investigations in stage one (figure 13). Retained filters were seen by some as an important 'back up'. Stored filters could be 'bashed down' to prepare an injection at times when no heroin was available, either due to lack of finance or lack of dealer supplies. This was seen as an important way to control withdrawal symptoms. Passing on used filters to others to help them prevent withdrawal was seen as part of the culture of 'looking out for' other drug users. This explains the saving of filters for own use reported by over half the group in Dundee despite availability of clean ones from the exchange.

4.90 However, some interviewees said 'bashing down' filters in this way presented the risk of a 'dirty hit'. This is an acute febrile reaction attributed to a response to contamination within the filter, possibly microbial grown on the filter material. For some this deterred them from this practice. They regarded the use of a new filter each time as 'clean' and 'safer', but most did not explicitly mention blood borne virus risks from sharing. For others, although they considered 'dirty hits' to be a risk from reuse, they still undertook this practice:

'I'll save my ones [filters] from the day...say I have five hits in a day...that's a decent hit, so I do that... but I do think in the back of my head that I could get a bad hit off it.' F26A(1)

'I know we shouldn't do it [save filters to bash down], I know they are breeding germs...but they tide you over' F26D(4)

Sharing water

4.91 80.2% of Aberdeen participants and 67.3% of Dundee participants reported having shared water at some point *ever*. In the past month, 56.1% of Aberdeen participants and 54.7% of Dundee participants had shared water.

4.92 The use of a communal container of water for preparation was commonly described both in Aberdeen and Dundee interviews. Many described risky situations such as using communal water in the house of another. Some perceived they were in control of the risks around communal water, for example because the cup was in their home. They described only allowing 'clean tools' to be put into their cups and some explicitly stated that they required to see the needles and syringes being removed from their packaging. The cultural norm of supplying water for those who inject in your house was acknowledged as the reason for having only one water container. The single-use nature of small volume water ampoules may potentially break this cultural norm. However, batch preparing would also have to be discouraged, otherwise multiple numbers of single-use ampoules could be emptied into a communal cooker from which several injections may be drawn. If used needles and syringes

were used to draw out individual injections this could present both blood borne virus and bacterial risks and negate the benefits of single use ampoules.

4.93 Some interviewees stated they only shared water with certain people such as sexual partners. They used explicit strategies and applied definite rules to avoid sharing with anyone else. Those who shared with sexual partners did not explicitly acknowledge any risks from this practice.

4.94 However, others did describe avoiding communal water containers. Some had their own water which they did not allow others to use, for example by carrying it in a medicine bottle or having bottled drinking water. They expressed concerns about the risks of communal water and stated they always took water from the tap or kettle directly for their own use.

4.95 Many interviewees in Dundee said they would like to see water supplied. Some said this would complete the 'kit' to facilitate safer injecting, stating that they felt water was the 'missing link' at present. Some said they thought supply would prevent sharing of water. Some said they would like water supplied to prevent infections such as abscesses and cellulitis. Blood borne viruses were mentioned by fewer. This suggests that supply of water would have to be accompanied by education to prevent sharing and batch preparation, as discussed below. One person thought cost would prevent water being supplied. Some interviewees in both locations perceived bottled water to be better than tap water because it did not contain chlorine which was perceived to be harmful if injected. Chlorine content was judged by the smell of the water. Use of bottled water was also described as a way to protect ones self as it could be passed to others after use to remove water for their own use. This assumes others do not put used needles and syringes into the bottle which is subsequently kept for further use.

Sharing cookers

4.96 Cookers can be shared in one of two ways: They can be shared by means of *batch preparation*, as described by Taylor et al (2004). This is where drugs are prepared on one spoon then divided up amongst injectors. Risks present where one or more persons drawing up from the cooker is using a used and potentially contaminated needle and syringes, which contaminates the batch. Cookers can also be shared by being *used by an individual and then passed to another* for subsequent use. Both practices were reported by interviewees in both locations, although batch preparation appeared to be more common and a cultural norm. Interviewees in both locations described batch preparation as often related to times when money was pooled together to purchase drugs. Batch preparation was seen as a way of ensuring that the prepared quantity was shared fairly. Taylor et al (2004) noted this previously in Glasgow. Batch division described as each person drawing their entitled share of liquid into their syringe. This practice was also described by a few interviewees in Aberdeen as a way of 'paying' another for lending paraphernalia items. Some risk management strategies were described as being applied to batch preparation by some such as a hierarchy of removal of the solution:

'If there is 3 of us I make sure we have 3 clean needles, one clean pot. The hit gets drawn from the same pot. If somebody has not got a clean set of works it is up to them to go and get....either reuse their own set or come here [to needle exchange]... they get whatever is left

in the pot for them... Usually the one who is paying for it goes first and if someone's getting it for free he'll go last' M33D(new injector).

4.97 For some, they only undertook batch preparation with one injecting partner who was usually their sexual partner. They did not appear to consider this a risky practice. Batch preparation probably explains the sharing of cookers reported in Dundee (69.2% ever), despite their supply.

4.98 Passing on of Stericups in Dundee was seen as a risk in drug preparation, as the flimsy hot handle could bend and spill the contents on second use. This was also noted in the laboratory work. Some Dundee interviewees described this as a factor that stopped second use, so hence deterred sharing. Passing on of spoons was reported by interviewees in Aberdeen. Access to cookers was not identified as a problem in either location, although obviously makeshift items would be non-sterile. Tea spoons and drinks can bases were seen as suitable makeshift items, including by those in Dundee when they ran out of cookers. Some described cleaning cookers with swabs prior to sharing them and considered this to be adequate to reduce risks.

Perceptions on blood borne virus risks from sharing paraphernalia

4.99 Early in the study, the Aberdeen researcher noted that the term 'paraphernalia' appeared not to be one commonly used by or understood by interviewees. Therefore it was defined by both researchers as '*spoons, water, citric, filters and any other equipment you use to prepare*'. Many interviewees did recognise sharing to include paraphernalia items, although some needed prompting before they did so. Some did not consider borrowing or lending of paraphernalia to be 'sharing', equating this practice with needles and syringes only.

'I've nae shared nothing.....I have shared a touni' an cookers, but I winnae share needles or nothing' M43D(24)

'Is it just with needles?...umm...I don't know...I wouldn't use someone else's needle but if there was only one cigarette filter, I would share it...' F22A(2)

4.100 The majority of interviewees in both locations described having engaged in risky injecting practices at some point since they began injecting. In Dundee many interviewees described borrowing sterile packaged injecting paraphernalia or lending sterile packaged items to others when in need. This is unlikely to present risks as long as blood spillages do not contaminate packaging. However others in Dundee described borrowing used items. In Aberdeen some described borrowing only unused paraphernalia from others, such as cigarette filters from unsmoked 'new' cigarettes. However because sterile packaged paraphernalia is not supplied in Aberdeen, the items borrowed are likely to have been handled by others during the process of passing them on, even if they are perceived to be 'unused'. Citric acid packets would be used multiple times and hence if shared likely to have been handled by many. There was a suggestion from some that because citric was in powder form as opposed to a liquid that it was considered not to present a risk from sharing. There is a lack of reliable data on risks of HCV from sharing citric or any other individual items. Some US data is available suggesting that cooker sharing presents higher risks than other items (Thorpe et al, 2002). However, the reliability of being able to specify risks of one item over another, or separate out the risks from multiple used needles and batch preparation has been debated

(Koester et al, 2003). Because of differences in drug forms and preparation practices, there are difficulties in applying the US data to the UK. A reliable laboratory method to culture hepatitis C would enable comparisons of injection preparation practices, but such a method has not yet been developed.

4.101 Overall both groups perceived that the blood borne virus risks from needle and syringe sharing were greater than the risks from paraphernalia sharing. In most cases when asked to describe the concept of sharing and the risks it presented, interviewees unanimously described sharing used needles and syringes unprompted. Most made reference to HIV or AIDS as a risk. Awareness of this was considered to be high amongst the interviewees. Some indicated that they did not think HIV could transmit through paraphernalia sharing.

‘...well in fact, the more I think about it the more I must have done [shared needles] somewhere along the lines, because the likelihood of me catching HIV through a filter is quite slim. I know it is not through sex because I have had the same partner for six years and I was always going for regular check ups’ M33A(17)

4.102 However, when asked to define what they considered the risks of paraphernalia sharing to be, most commonly interviewees referred to ‘dirty hits’ or skin and soft tissue infections. Some made reference to HIV or AIDS but very few mentioned HCV without the interviewer prompting them.

‘Obviously if someone else was to use your needle....or water, or filter or cooker then there is a chance they’ll catch AIDS’ F23D(1).

4.103 Once prompted, many said they knew about the link between paraphernalia sharing and HCV transmission, both in Aberdeen and Dundee. Overall the sharing of needles and syringes seemed to be a greater concern than the sharing of paraphernalia. Fear of contracting HIV/AIDS appeared to be the factor that underpinned this perception of greater risk. Some interviewees identified HIV transmission as their main concern from sharing equipment, considering HCV to be less serious. Many interviewees reported having tested positive for HCV antibodies, although this was not explicitly asked.

4.104 Knowing others were HCV positive was a factor that deterred sharing in some but for others, being HCV positive was considered to be an inevitable consequence of being an injector. Others reported making a visual judgement based on someone’s appearance or the cleanliness of their house in order to inform their decision to share. Taylor et al (2004) also noted this in Glasgow.

4.105 Several interviewees were part of a sexual partnership where both persons were injectors. In such cases sharing with partners and batch preparation of injections was not explicitly recognised as being a risky behaviour. Interviewees talked about safer injecting in terms of keeping ‘us’ safe, or ‘our equipment’ compared to that of others outside of the partnership.

Thoughts on passing on used injecting equipment

4.106 As said, there was a sense of willingness to support other IDUs who were at risk of withdrawal symptoms, for example by donating used filters or lending used injecting equipment. However, there was a perception amongst most interviewees that if someone

wanted to borrow their used injecting equipment then it was a case of ‘on their own head be it’. Some, but not all, felt they had a responsibility to tell others if they were HCV positive. Interviewees tended not to see the responsibility for preventing sharing as being their own, even if they considered it a risky practice.

‘It is up to that person if they want to share a needle...up to the person if they want to gie you the needle...’ M43D(24)

‘...I have even had people coming up to me asking me for works...have I given works to other people?...yes’ M31A(new injector)

Thoughts on allowing someone else to inject you

4.107 Many said they had allowed others to inject them when they initially began injecting. Some interviewees still relied on others to inject them, commonly a sexual partner and this was perceived to be more convenient than self administration. Some described having given injections to others. For many the risks perceived from allowing others to administer injections related to levels of pain on administration and bruising. Blood borne viruses were not mentioned.

Sharing and risk taking summary:

HIV or AIDS was the main concern identified with needle and syringe sharing in both Aberdeen and Dundee. Less unprompted mention was made of HCV. Paraphernalia sharing and reuse tended to be linked with bacterial infection risks and skin damage. Less explicit mention of BBV risks was made.

Urgency to inject in the absence of clean or own equipment, led to sharing of needles and syringes. Concerns about risks often manifested after the risk taking event. Difficulties in predicting the number of sets of equipment needed in any period led to running out. Number of sets of needles and syringes was found not to equate with the number of injections delivered. Several sets are sometimes needed to deliver one injection, into an often damaged vein. Donation of clean equipment to others also cannot be pre-empted. Lack of new equipment promoted reuse of own equipment, which was seen by most as preferable to sharing.

There appeared to be more of desire to avoid sharing in Dundee, recognising that paraphernalia supply facilitated this. In Aberdeen paraphernalia sharing was often seen as unavoidable. However the quantitative data shows sharing still occurred in Dundee for various reasons. Filters were kept for own reuse or donated to others because of they retained some drug. This was seen by some as an insurance against withdrawal when drugs were scarce. The risk of ‘dirty hits’ from this practice were acknowledged. Communal water was considered ‘normal’ by many, although strategies to prevent contamination were reported by some. Water was not supplied in Dundee, which many saw as a gap. Cookers were commonly shared when drugs were prepared in batches then subdivided. This was done to make best use of financial resources. Reuse of spoons was normal in Aberdeen, but reuse of Stericups was reported as difficult by some in Dundee due to their fragility after first use. Hence Stericups deterred passing on and reuse but did not deter batch preparation.

Sharing within couples was not identified as a risk by those who took part in this.

Ideas on promoting use of appropriate paraphernalia and ways to discourage sharing

Thoughts on ways to prevent sharing of injecting equipment

4.108 The interviewer asked how the interviewee thought sharing of injecting equipment could be discouraged amongst injectors. The majority of interviewees immediately described strategies to prevent the sharing of needles and syringes. If specific mention of other paraphernalia sharing was not made the interviewer prompted on this matter. Several themes emerged from this part of the interview. Interviewees emphasised a need to increase the number of people who accessed services, stating they knew many injectors who did not use needle exchanges. This was also the most common suggestion added to the NESQ in Dundee. Increasing the quantity and range of equipment supplied was advocated as a means to do this, especially the supply of citric acid and safer injecting kits in Aberdeen. This was also noted as a comment on most NESQs. Provision of more education to discourage sharing practices, in particular to explicitly describe risks, was also mentioned by interviewees. However others considered nothing more could be done and that the solution was with injectors who had to change their practices. However it was also recognised that this could be difficult, as issues of self respect and self worth were important factors in how much care a person wanted to take. Laziness was also mentioned by some. These will now be discussed further:

Promote convenience: increase the number and geographical spread of needles exchange outlets

4.109 In both Aberdeen and Dundee, many suggested increasing the geographical distribution of needle exchange outlets. Particular emphasis was given to rural and outlying areas. Some who did not live in the city centres described difficulties obtaining enough equipment based on the frequency with which they visited the city and the quantities they could obtain. Outreach was spoken of very favourably in both terms of convenience and confidentiality. A mobile van and supervised injecting rooms were suggested by a few in both Dundee and Aberdeen.

4.110 Some specifically mentioned increasing the number of needle exchange pharmacies, recognising that pharmacies are already common and this may increase geographical spread. However others spoke against pharmacy needle exchange, describing concerns about confidentiality and attitude of staff putting them and their peers off from using pharmacy services.

'A lot of chemists make you feel like scum....that doesn't make it a pleasant thing to do'
F45A(3)

Supply all items of paraphernalia needed from exchanges

4.111 In Aberdeen there was overwhelming suggestion that paraphernalia should be supplied and belief that this would encourage people to access needle exchanges. Most who did not take part in the interviews made similar comments that were noted on the NESQ. Some only identified citric acid as required, stating that they could get other items easily, focusing on access and convenience issues. Others advocated the supply of complete kits. Some mentioned quality as a reason for citric acid supply.

'I think citric [from here] would make life a lot easier, a lot easier for drug users and safer as well...no dodgy citric. People stop me in the street and say 'you got citric?'' M33A(17)

'Lack of availability makes you share...acid is expensive' F32A(13)

4.112 Others emphasised the importance of sterility as well as quality. They advocated that all items of paraphernalia be supplied in a kit form. The packaging of items in 'one-hit-kits' was seen as promoting the single use message. Needle exchange supplies were seen as reliable.

'I would really like to see it coming all from the needle exchange or somewhere where we know it is sterile and it is safe to use' F22A(2)

'A single use pack...from the chemist then there would be no need for someone to go away and borrow off somebody else..' M31A(new injector)

'..like if we got packs I think we would...we would be a lot better because that'd encourage it [using all one's own equipment]. Because there will be spoon-things that are small...sort of individual, I think it would make you use individually' F26A(8)

4.113 Some specifically identified homeless drug users as a group they thought would benefit from paraphernalia supply, many of whom had been homeless themselves and described this as a time of particular risk taking.

'..in homeless hostels...you are not allowed to use....you have got to use outside and get everything [equipment] outside...you know some people if they can't get a spoon they use the top of a coke can' F26A(8)

4.114 Several considered that supplying paraphernalia would encourage more people to use needle exchanges in Aberdeen.

'I think you would get mair people in if you gave it [paraphernalia kits]' F26A(8)

'Supply citric -this would stop me sharing other equipment, as I'd come to the needle exchange more often' M30A(14)

4.115 In Dundee many advocated the supply of water, recognising that this was the one point in their preparation procedure where an item was missing. This was linked by most who suggested it with preventing infections rather than convenience, as water was considered to be readily available. A few specifically mentioned supplying 2ml volumes, as this was perceived to be enough to prepare an injection and clean injecting equipment for later reuse. Some interviewees in Dundee advocated the supply of tourniquets, as had been supplied in the past. This was also noted in many of the comments on the NESQ. Tin foil to encourage heroin smoking instead of injecting was advocated by one person. Recent pilot work on foil supply has suggested potential in discouraging injecting (Pizzey, 2007). There was some feeling that preventing batch preparation would be difficult, due to the practical benefits described. However, if all other items were new and sterile this was noted not to present risks.

Increase quantities allowed at each visit

4.116 Some interviewees advocated increasing the quantities of supplied items, most commonly referring to needles and syringes from pharmacy exchanges. Inadequate and limited supplies of needles and syringes were identified by most. This was found in both Dundee and Aberdeen. The need for multiple needles to gain peripheral access, especially in veins that are damaged was considered not to be recognised by service providers. Running out of needles and syringes was common and necessitated reuse. The need to retain needles for reuse prevented their return to exchanges.

'Sharp needles.....I might need 10 syringes per hit' M46D(25)

'I only get 5 at a time at the chemist but sometimes I can go through 10 sets trying to get in. If you have got clean stuff it is a lot easier on your mind' M25D(9).

'Make it easy to get [enough of all injecting equipment]...if it was there....Cause heroin is so addictive and the withdrawals are so bad....sometimes it is a full time job trying to get the money and get it [heroin]. Sometimes it [heroin] is not there and you have to drive about here there and everywhere to get it. You're just overwhelmed and you want it right then right now' F26D(4)

4.117 Peer distribution was also recognised by some as a way that they could give injecting equipment to others. Specifically mentioned was supply to people who they were using with, who did not have their own. Also supply to those who were too embarrassed to use a needle exchange or feared that this would not be kept confidential.

'If we get 200 [needles and syringes] it benefits more people [than us]. If they [other injectors] come here and don't have clean stuff we'll give them it, even if we don't know them, so you're helping more people than you know. I look like a drug dealer to my neighbours ... but I am a needle dealer!' M25D(9)

Increase awareness about services

4.118 Many interviewees advocated greater publicity of needle exchange services.

'I didn't learn about this place for a while and was struggling...the only needle-exchange I knew of was the once a week one, so if I missed that I'd had it, so information needs to be put about a bit more' F26A(1)

4.119 Many felt advertising did not need to be so discreet, stating they thought there would be public support for more high profile advertising. They suggested posters in prominent public places would be helpful. Examples included doctor's surgeries, post offices, job centres, community halls and adverts in local newspapers and free magazines. Local radio and television was also mentioned.

4.120 Some advocated the use of shock tactics. This included suggesting DVDs featuring people dying of blood borne viruses emphasising the risks. Pictures of injecting site wounds were also advocated.

'Show pictures of AIDS infected people....kits might help too' M37A(20)

Confidentiality

4.121 In Dundee confidentiality of services was mentioned as a factor why interviewees thought other injectors they knew did not use needle exchange services. The close proximity of a needle exchange services to a prescribing service was explicitly mentioned. Those who took part in the interviews were comfortable with the confidentiality of the needle exchange services in Dundee. They suggested increasing awareness of confidentiality policies to encourage others to use the service. Ideas on how to do this included a confidentiality statement on posters and on business cards that injectors could give to others. An example statement that was suggested was 'We won't tell your doctor if you get needles'. Publicising confidentiality was seen as necessary to encourage service use.

'A lot of people get prescriptions and think if they use a service it'll get back to their doctor' F26D(4)

'Promote confidentiality of the harm reduction services. I won't go in chemists -in a shop where there are other people and you're embarrassed to ask' F21D(3)

4.122 Confidentiality was not identified in Aberdeen as a specific issue of concern regarding Drugs Action. This may be because Drugs Action is physically not based near a prescribing service, or because it is not an NHS organisation. It could be that Drugs Action more explicitly describe their confidentiality policy, so clients are more aware and therefore feel more comfortable accessing the service. This was not explored.

4.123 Although some advocated expanding the number of pharmacy based exchanges, in both Dundee and Aberdeen, some concerns were expressed about lack of privacy and staff attitudes in pharmacy based needle exchanges, sometimes quoting bad experiences or others they knew who would not access such services.

Education and cultural change

4.124 In Aberdeen, many thought paraphernalia supply *per se* would prevent sharing, others recognised a need to change the culture of injecting and the behaviours of injectors alongside providing access to equipment. The communal nature of using paraphernalia items e.g. one cup of water and one bag of citric acid for all in the room, was recognised as a barrier to overcome.

'...whereas now it [sharing] is just a culture, that is just what people do.....I think the whole culture has to be changed....it is not going to be an easy job, it is going to take a lot of effort from all different sides...' F26A(8)

Examples of cultural sharing were given.

'There's a coke can on top of a tower block that everyone knows about and uses [as a cooker]' M35A(6)

Increasing education on safer injecting and the risks of sharing was highlighted by many.

I think it would be better to learn off someone who has medical training...who has knowledge of what is right and wrong ...than another smack head who maybe doesn't know properly' F26A(1)

'Information for people just starting out as they won't know all this' F21D(5)

4.125 Some older injectors made comparisons of the current level of information provided with the very visible public health anti-HIV campaigns of the 1980's and early 1990's. Memorable TV adverts were recalled and it was suggested that similar size and nature of campaigns were needed aimed at injectors to prevent HCV. HCV was suggested to be less of a health risk because it had not attracted the same level of publicity as HIV. These older injectors said that younger injectors would not remember these adverts, and they thought hence are not aware of risks. Information from needle exchanges was considered important but less prominent than mass media campaigns.

'When I was younger there was nothing....then for a while it [sharing] was a big issue, it was in the press and everybody knew the score...it is barely sensible but... young people now seem to have a totally different idea...[they think] you can get inoculations against the hepatitis, all the hepatitis versions, and they don't think this is a particularly big problem. A large part is it is not so much in the public eye any more...also people are not particularly interested in what happens to people who take drugs so...umm... I mean society at large...so they won't do very much about it' M40A(27).

4.126 Talking to injectors when they come into needle exchanges was recognised as important, as long as this was in privacy. Pharmacies were not seen as private places. Written information was seen as a good way to back this up and some injectors specifically mentioned safer injecting leaflets that they trusted and had learned from in the past.

Nothing more can be done

4.127 Some expressed concern that the supply of paraphernalia would not change cultures and took a fatalistic view that sharing was inevitable.

'It is pretty hard [to discourage sharing]...if they want a hit they'll take it....hand out one-hit sterile stuff?' M27A(8)

'...if somebody wants a hit they'll take it off somebody else even if they know he's dodgy. They'll do it and think of the consequences later. If you're rattling you'll do it, you're not going to pass it up even just cause someone's used it....you won't knock back a hit if you're rattling' M37D(9)

4.128 Some interviewees in Dundee considered that services were doing all they can and that it was up to injectors not to share. These tended to be interviewees who had described careful injection preparation and administration methods. Often they had been using for some time and considered that the current system enabled safer injecting.

'There is nothing more you can do –everyone knows what'll happen –you are doing all you can –it's up to us not to share....every injector knows not to share' F21D(5)

'You take this system away and you'll have more infections and it'll spread right through everything...Back then [early 1990's] we used to hurt ourselves, break our wrists and that, to get to A&E to steal syringes' M46D(25)

4.129 They also described several factors that they considered prevented injectors from following advice. Laziness was mentioned by some to be a factor.

'Make it more accessible for people...make citric available from here [the needle exchange]. Most drug addicts are lazy...' M25A(new injector)

4.130 Although some in Aberdeen specified laziness as applying to clean needles, they distinguished this from difficulties purchasing citric. Self respect and self worth were also mentioned as influencing sharing.

'When you inject heroin...well, the risks that you will take!...junkies are 'care-less'...when you're a junkie you reach the stage where you lose your sense of self-caring....we are taking massive risks all the time' F44A(3)

'When you're on drugs you just dinnae care about yourself or anything...' F21D(5)

4.131 In Aberdeen, every interviewee suggested supplying citric acid from needle exchanges, even in the absence of making any more of the above suggestions.

Ways to promote appropriate paraphernalia use and discourage sharing summary:

In Aberdeen supply of paraphernalia was seen as the solution to preventing sharing. In Dundee increasing the number and convenience of outlets was highlighted as important to access supplied and prevent running out. The number of sets of needles and syringes supplied did not equate to the number of injections the person gives themselves. Peer distribution, the need for multiple sets to enable a sharp needle to be used for every access attempt and breakage must be factored in. Lack of awareness of needle exchange facilities was identified as a barrier to access, especially early in an injecting career. Confidentiality of services was a concern in Dundee and close proximity with prescribing services was highlighted as an issue. In Aberdeen confidentiality about the agency based service was not expressed as a concern. Lack of privacy in pharmacy based exchanges was identified in both Aberdeen and Dundee as a factor linked to needle exchange use. Many did not mention blood borne virus risks of paraphernalia sharing, and when BBVs were mentioned it tended to be only HIV from needle and syringe sharing. Education and higher visibility of information on services were identified as important. The need to promote change in the current cultural of sharing was identified in Aberdeen. In Dundee there appeared to be more cultural awareness that injectors should not share, recognising that paraphernalia provision should prevent this. However, sharing did still occur when equipment ran out. This appeared to be due to difficulties predicting quantities, proximity to open services and the priority of getting and using drugs when in withdrawal.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Introduction to this chapter

5.1 The purpose of this chapter is to consider the results of this work and what they mean for practice. It is particularly important to discuss the limits of the methodology and their impact, as several changes had to be made to the original design for pragmatic and financial reasons. The methods used influence what can be deduced from the results and also the scope for future work.

5.2 Each aim and their corresponding objectives will be considered, highlighting results in the context of their meaning, limits and previous findings. The chapter ends with a summary of the recommendations that can be made for practice and future work that could be done.

The laboratory based work

5.3 The aims of this work was to test paraphernalia items and injection preparation methods in the laboratory to quantify the theoretical benefits and/or risks that they present to health, thereby identifying from those tested the items of paraphernalia and preparation methods that present the least theoretical risk to individual health.

Objectives 1 and 2

- *‘Develop experimental methods for use in the laboratory that replicate the injection preparation practices of IDUs, based on the ethnographic work of Taylor et al (2004) and previous work’*
- *‘Identify the key equipment variables and method variables in the preparation process to be investigated in the laboratory experiments’.*

5.4 Both these objectives were met using appropriate methodology. A questionnaire was designed to capture the necessary data from the videos made by Taylor et al and researchers in her team completed these. This provided a detailed dataset of injection preparation practices established from 60 episodes. Analysis produced a standardised preparation process (figure 4) which concurred with previous work conducted in different locations (Ponton & Scott, 2004) and anecdotal reports. The process was shown in validation work (not reported here) to be reproducible and reliable. The key variables to be studied in the laboratory were identified as effects of hand cleansing on skin contamination, consequences of using aluminium cookers on aluminium content of injections, effects of different types and amounts of acid on likelihood to damage veins and impact of various filters on particle content of injections and retention of drug. The methods used to in this part of the work were considered sound and reliable. The resulting process does not in itself have any application to harm reduction practice but it could be applied in future laboratory studies of paraphernalia e.g. with different quantities of heroin.

Objectives 3, 4 and 5

- *‘Prepare injections using the developed method. Control all the variables in the preparation process (equipment and method) to allow the study of the impact of each variable’.*

This was done, producing injections that represented as closely as possible the preparation of a single person injection of a £10 bag heroin equivalent. Most variables were controlled by measurement but length of time heating, height of spoon from the flame and use of stirring were based on visual replication of methods captured on Taylor’s videos.

- *‘Study the impact of each variable by performing scientific experiments on injections prepared in different ways using different equipment’.*
- *‘Where possible, benchmark the prepared injection results against standards used within the pharmaceutical industry for small volume injections and other relevant aspects of aseptic (‘sterile’) manufacturing. This will allow comparison of the preparation method and paraphernalia against theoretical standards that present minimal risk’.*

Both these objectives relate to the laboratory investigations which will now be considered in turn.

The hand cleansing study

5.5 This work combined practice based data collection with laboratory based analysis. The practice based data collection was successfully performed. The target of 50 participants were recruited and randomised to hand cleanse with one of the two comparative methods. Contamination levels were studied by identifying the number of ‘colony forming units’ (growth spots of microbes) produced from finger dabs on agar plates before and after hand cleansing with the allocated method. The results demonstrated the level of contamination prior to cleansing was reduced by either method of cleansing, Prior to hand cleansing the majority of participants had average finger dab levels of between 20-50 CFUs, this was reduced to less than 5 by cleansing. Both cleansing methods significantly reduced microbial contamination, and although the alcohol hand gel reduced contamination to a greater extent, it did not perform statistically better. No previous work examining microbial contamination of IDUs hands or the effects of skin cleansers could be found.

Methodological considerations and future work

5.6 The method used to quantify CFUs was considered appropriate. The hand cleansing study made no attempt to identify individual contaminating organisms. Future work could focus on doing so, in order to describe the range of contamination on IDUs hands, demonstrate any links with commonly seen skin and soft tissue infecting organisms and add further evidence of the effects of hand cleansing agents.

Implications for practice

5.7 The majority of participants did not regularly wash their hands before preparing injections. The main reason given was being *‘in too much of a hurry to get a hit’* (44%)

followed by 27% who said they thought there was no need to wash hands. Similar findings were found in the qualitative field work. This suggests a need for targeted campaigns to promote hand cleansing prior to injection preparation to IDUs.

5.8 When considering the potential supply of alcohol hand rub to IDUs, the lack of a statistically better performance compared to soap and water could be used as an argument against this expense. However, the utility of this intervention needs to be considered. Alcohol hand rub could be used in place of alcohol swabs to cleanse sites prior to injecting. In the field study 52.4% (n=99) of Aberdeen participants and 67.3% (n=115) of Dundee participants said they pre-cleaned their injecting sites 'always' or 'most of the time'. There is scope to improve this. Those who did '*always or mostly*' wipe their sites before injecting were significantly less likely to have a skin or soft tissue infection on their day of participation in the baseline data collection. Hence promotion of site cleansing has the potential to reduce skin and soft tissue infections.

5.9 The field study identified inappropriate use of alcohol swabs, previously known anecdotally. Some participants reported pressing swabs on sites *after* injecting. This is to be discouraged as the alcohol may inhibit blood clotting. Some interviewees and IDUs in the video work of Taylor et al (2004) and Jones et al (2006) used alcohol swabs as a flammable heat source to prepare injections. Replacing swabs with hand rub would provide a means of hand and injecting site cleansing and prevent inappropriate swab use. The health and economic outcomes from hand rub supply need to be considered in future work.

5.10 The results showed that roofless status made no difference to the level of 'before' contamination suggesting hand cleansing campaigns and strategies should be not limited to homeless IDUs. However access to hand cleansing materials was stated as a main reason for not washing hands by this group, suggesting that packs of alcohol hand gel may be particularly appropriate for them.

Recommendation: Needle exchange services should consider running campaigns to promote hand cleansing to IDUs prior to injection preparation. They should also consider providing alcohol hand rub in convenient to carry (e.g. belt clip) containers and promote their use for skin cleansing. The supply and use of hand rub should be evaluated on both a health and economic basis.

The aluminium cooker tests

5.11 In the lab, small amounts of aluminium were detected in solutions made with acids in Stericup cookers. The significance of this, if any, cannot be assessed based on limited literature on long term aluminium accumulation effects and the difference between absorption from the gastrointestinal tract and injecting. Length of time of use would likely be the most significant factor in determining risk. The benefits of single use cookers in potentially reducing the transmission of BBVs and in improve the cleanliness of injection preparation methods need to be remembered. No previous investigations of this type have been reported.

5.12 The Stericups were found in the lab to be 'single use' in nature. Reheating tended to make them bend at the handle and hence run the risk of spilling the contents. This was also

noted by interviewees in the field study and reported to deter reuse of them, whereas conventional spoons are reusable.

5.13 The field study showed sharing of Stericup cookers to be common for batch preparation. This may increase BBV risks if any of the sharers uses a contaminated needle and syringe. The interviews identified strong economic arguments made by IDUs for batch preparation e.g. fair division of drugs purchased through pooled finances.

Methodological considerations and future work

5.14 The laboratory analysis detection method for aluminium content was validated and considered appropriate. A lack of information in the literature on risks from injecting aluminium makes it impossible to place the findings in any sort of context of risk. In the long term this should be remembered and studied. In the more immediate future, work could examine risks from other manufactured aluminium cookers. Future developers of paraphernalia should consider the use of other inert metals.

Implications for practice

5.15 The single-use nature of the aluminium cookers supports their use. However batch preparation is of concern. It is difficult to identify ways to deter this, so future work should seek to do this. However, if all involved in batch preparation used sterile needles and syringes and new containers of sterile water and acid are used in the preparation, then the risks are potentially removed. Therefore, the supply of cookers should be accompanied with strategies to reduce batch preparation risks (adequate quantities of sterile water, sterile acid and clean needles) and clear advice about the risks from batch preparation.

Recommendation: Strategies to prevent BBV risks from batch preparation should be considered by needle exchanges. Education campaigns should focus on the message to always use clean, sterile water and sterile acid to prepare the batch and new sterile needles by all who remove drugs from the batch. Manufacturers of paraphernalia should seek to identify other inert metals to produce affordable cookers.

The acid tests

5.16 The pH data shows that less than half a sachet of citric acid (50mg) achieved a pH of approximately 3 and was sufficient to dissolve the heroin in a '£10 bag' equivalent of drug used in this study. Less than half a sachet of ascorbic acid (135mg of vit C) produces a pH 3.3 and also dissolves the heroin. Heroin samples with different purities and compositions would require varying amounts, so this is a guide. The advice to add acid stepwise and use the minimum amount should be emphasised.

5.17 In the evaluation of the supply of citric acid sachets in Glasgow (Garden et al, 2003) most injectors used '£10 bags'. Sixty percent (n=203) of IDUs reported using a whole sachet during injection preparation, 16% (n=55) used three quarters of a sachet, 22% (n=74) used half a sachet and only 1% (n=3) used less than half a sachet. On weighing ten sachets, the average weight of the contents of a citric acid sachet from Exchange Supplies was found to be 148.6mg (range 131mg-162mg). This suggests that most of the participants in the

evaluation reported by Garden et al were using too much citric acid. This may be the reason why there are anecdotal reports that injections made with citric acid are painful on injection. Ascorbic acid allows more margin for error as greater quantities are needed to change pH.

5.18 The qualitative field work showed that lack of access to acid, as found in Aberdeen, is reported to cause considerable distress and promote the use of riskier substances. Some reported lack of acid promotes riskier behaviours, as the urgency to inject increases while the person attempts to source acid. This is discussed later.

Methodological considerations and future work

5.19 The acid experiments used validated methods to measure pH and osmolality. However, the lack of a reliable method to measure drug content meant that the impact of various acid quantities on opiate content could not be established. This should be done in future work as the data would be helpful to support the advice on acids to IDUs.

Implications for practice

5.20 The results do not strongly favour one acid over the other. The key message is that small quantities need to be added stepwise and injections administered slowly. Citric acid is cheaper than ascorbic acid, and for this reason services may be more able to fund citric acid supply. Garden et al also found the concept of single use (i.e. do not keep remainder for later and do not share) was not fully understood or followed, so sharing of sachets should also be discouraged.

***Recommendation:* IDUs should be encouraged to add small quantities of acid when preparing injections. Depending on purity, less than half of a citric acid or ascorbic acid sachet may be enough to prepare a £10 bag of heroin. Larger quantities of drug will require more acid. IDUs should be advised to inject slowly to reduce irritation by either acid, which may happen because of the low pH of citric acid and high tonicity of ascorbic acid injections.**

The filter tests

5.21 In the lab, the Sterifilt and wheel filter (Sartorius 0.2 um syringe filter) reduced the amount and size distribution of particles in the heroin injections better than the makeshift filters. The Sterifilt was considered to perform better overall as it passed a stricter limit that was derived from current British Pharmacopoeial standards. The Sterifilt retained statistically less drug than the others, giving evidence that it is unlikely to be retained for ‘bashing down’ (drug removal). Although the wheel filter performed well in the particle tests, it retained a lot of drug and is also expensive. These factors do not support its widespread use. There is little other previous work examining the performance of filters used by IDUs. Caflisch et al (1999) compared filters to investigate their ability to remove microbiological contamination, deducing that 0.2 micron syringe filters performed better than cigarette ones. However, no other work has studied particular contamination except Scott (2005), where the superior performance of 5 micron wheel filters compared to makeshift filters was demonstrated.

5.22 However this previous study used a larger pore size wheel filter and did not investigate purpose designed filters such as the Sterifilt.

5.23 Preliminary microbiological investigation of used filters collected from IDUs in the hand washing study showed them to be contaminated and a range of organisms were speculated, suggesting more detailed work in this area would be beneficial.

Methodological considerations and future work

5.24 The British Pharmacopoeial method for particle analysis was used and the standard used to derive the benchmark used. This method was considered appropriate. The microbiology work was only performed to undertake a preliminary investigation of used filters. However, on reflection this work should have attempted to have studied the donated filters in more depth, for example by isolating specific organisms. Discussion with needle exchange staff, raised concern that it would not be possible to collect each donated filter separately or establish a use-history on each one. Therefore, this was not attempted. On reflection this assumption should not have been made and pilot work could have investigated this. However, the number of filter donors was small (12/50) so asking for separately labelled donations may have reduced this further. It should also be remembered that due to limited heroin quantities, only £10 bag equivalents could be tested, therefore the applicability of the findings to other quantities has not been proven.

5.25 Future work could study filter contamination and relate this to history of filter use and storage. It could also collect other items of paraphernalia from IDUs to examine microbiological contamination. Work has been done with needles and syringes to test for HCV RNA, (Crofts et al, 2000) but no previous microbiological examination of used filters was found in the literature.

Implications for practice

5.26 The laboratory experiments support the supply of Sterifilt over other tested alternatives, suggesting it should be supplied. The field study showed some IDUs disliked Sterifilt as it did not retain drug, so gave nothing to save 'for a rainy day'. Others favoured it as they saw it as 'clean'. Many who favoured it identified that training on its use is essential to promote use to IDUs. This was also noted in the laboratory that it took several attempts to use them successfully. The field study also identified that used Sterifilt are still sometimes passed to others to use, this should be discouraged. Therefore supply should be accompanied by training on how to use them and advice that they do not retain drug. Advice should also emphasise that they should not be used by multiple persons.

Recommendation: Of the filters tested in the lab, the Sterifilt showed the most theoretical benefits to health. However the field study showed they are not universally liked. Supply is advocated and IDUs supplied them for the first time should receive education on the technique to use them correctly.

Objective 6

'Establish the contents of a safer injection 'kit' and preparation method which presents the lowest theoretical risks to health based on the laboratory results'

5.27 This objective brings together the findings described above. The laboratory work advocated hand cleansing and evidence from this and the field work suggested a need for targeted campaigns to promote hand cleansing to IDUs. Alcohol hand gel may be suitable for supply as it can also be used to clean sites and may be potentially more convenient. Work to evaluate such supply would be advocated. The use of aluminium cookers, sterile acid sachets (either citric or ascorbic) and Sterifilt is also suggested from the laboratory work. At all stages education on use and advice to discourage sharing is recognised as important. The supply of a 'kit' is however questionable as supplying one of every item may be wasteful of materials. The field work interviews showed that the single quantities do not equate to single injections. A 'pick and mix' supply method may be more cost favourable. This will be investigated in the current National Institute of Health and Clinical Excellence (NICE) evaluation of needle exchange (see: <http://www.nice.org.uk/guidance/index.jsp?action=folder&o=37994>).

The field based study

5.28 The aim of this aspect of the study was to conduct an investigation into the impact that paraphernalia supply is making on sharing and health in the practice setting and compare this with non-supply.

5.29 Findings, methodological considerations and future work are presented separately for the quantitative and qualitative objectives. Implications for practice and recommendations are considered together.

Objective 1

'Perform a study comparing health and sharing practices of IDUs in a location where needle and syringe exchange plus paraphernalia is supplied, with the same measures taken in a location providing needle and syringe exchange only. Establish whether there are any differences and if so, whether these can be attributed to paraphernalia supply'.

5.30 The first objective related to the quantitative aspects of the field based study. Data was collected on the health and sharing practices of two groups of IDUs, one in Aberdeen (n=189) and one in Dundee (n=170). Both were recruited via needle exchange services, Drugs Action (DA) in Aberdeen and the Harm Reduction Centre (HRC) in Dundee. In Aberdeen DA did not supply paraphernalia, in Dundee the HRC had been supplying paraphernalia in various forms for considerable time. Since around 2003 paraphernalia had been available across Tayside needle exchange outlets. The two cohorts were comparable except for age and length of time injecting, with the Aberdeen cohort being older and having begun injecting significantly longer ago. Age *per se* was not considered a factor likely to confound the findings, but length of time injecting may have, so it was controlled for.

Injecting related health complications and infections

5.31 75.1% of the Aberdeen cohort presented with one or more non infected complications of injecting, in Dundee this figure was 71.9%. In Aberdeen, 21.2% of the cohort presented with a skin or soft tissue infection and in Dundee this figure was 17.5%. There were no significant differences between these figures. In Aberdeen, 40.7% of participants had swelling at their injecting sites, in Dundee this figure was lower at 31.0%, but not statistically so. In Aberdeen 26.5% had puffy limbs or digits, compared to 17.5% in Dundee, which was significantly less. However, when length of time injecting was adjusted for the significance disappeared.

5.32 There were no statistical differences between the general health check measures taken for the two groups.

Needle and syringe sharing and risk taking behaviours

5.33 Although not directly the focus of this study, it was considered important to also examine needle and syringe risk taking behaviours. A significantly greater proportion of participants in Aberdeen (51.1%) had *ever* shared needles and syringes compared to Dundee (37.7%). *In the past month*, more Aberdeen participants had kept needles and syringes for reuse by others, and used needles and syringes that someone else may have previously used (12.2% in both cases), compared to 7.6% and 10.6% respectively in Dundee, but this was not significantly different. Approximately 90% in both locations were not taking these risks.

5.34 Less encouraging is the high levels of reuse of own needles and syringes in the past month identified in both locations (65.1% in Aberdeen and 70.0% in Dundee). This suggests that levels of equipment supply reaching IDUs in both locations are not adequate. This was further demonstrated in the qualitative interviews.

5.35 Significantly *more* Dundee participants who had begun injecting since 2003 had injected someone else (45.8%) or been injected by someone else (56.3%), in the past month compared to those in Aberdeen who had begun injecting since 2003 (25.5% and 38.3%). This suggests a need to focus on discussing these risk taking behaviours with newer injectors, especially in Dundee.

Paraphernalia sharing and risk taking behaviours

5.36 Sharing of all paraphernalia items *ever*, was higher in Aberdeen. Participants in Aberdeen reported statistically higher levels of ever sharing acids (81.9% vs 63.5%), water (80.2% vs 67.3%) and filters (81.3% vs 65.4%) than those in Dundee. Although not significantly different, the Aberdeen participants reported greater levels of cooker sharing than those in Dundee (76.4% vs 69.2%). Batch preparation, which involves cooker sharing, was shown in the qualitative interviews to be common practice in both areas as a means of pooling resources. This has been identified as a key factor promoting high levels of cooker sharing elsewhere (Koester et al, 2005).

5.37 *In the past month*, a greater percentage of Aberdeen participants had used the same acid container compared to those in Dundee (61.9% vs 55.3%), given someone a used filter (42.3% vs 33.5%) or kept their own filters for reuse (65.6% vs 55.9%). None of these tested significantly different, but the latter was close to significance. A similar percentage in

Aberdeen (56.1%) and Dundee (54.7%) had shared water containers in the past month. Overall, levels of sharing in the past month were less than sharing 'ever', suggesting participants were taking on board harm reduction messages. This was also reported in the qualitative interviews, with many reflecting that current injecting practices were safer than previous ones.

5.38 There were no significant differences in paraphernalia sharing in the past month amongst those who had begun injecting since 2003. In fact levels were slightly higher in Dundee despite participants potentially having access to a range of supplied paraphernalia from all Tayside needle exchanges (passing on filters: 31.4% Aberdeen vs. 31.6% Dundee; using same acid: 51.4% Aberdeen vs. 55.8% Dundee and filter reuse 51.4% Aberdeen vs. 57.9% Dundee). Similarly the extent of past month filter reuse and passing on or past month acid sharing were not significantly different between those in Dundee who used the supplied acids and filters compared to those in Aberdeen who did not use supplied paraphernalia, although levels were higher in Aberdeen (passing on filters: 43.3% Aberdeen vs. 37.0% Dundee; using same acid: 67.5% Aberdeen vs. 60.3% Dundee; filter reuse 64.5% Aberdeen vs. 58.9% Dundee). The NESQ was carefully worded to emphasise sharing of *used* items rather than passing on sterile packaged *unused* items, so it is thought unlikely that this was misunderstood. However when the qualitative interviews explored participants understanding of the term 'sharing', a focus on used needles and syringes was identified. In terms of paraphernalia, sharing was not immediately identified with its use and when it was, some appeared not to distinguish passing on new, sterile paraphernalia to others from passing on used paraphernalia. In terms of risk the differences should be highlighted when paraphernalia is supplied.

Methodological considerations

5.39 The first part of the objective was fulfilled in that the study collected data on the extent of injecting related health problems and injecting equipment risk taking behaviours of two cohorts on IDUs. The study found no significant differences in infected and non infected injecting complications or swollen puffy limbs when length of time injecting controlled for. It showed significantly higher numbers of participants in Aberdeen had ever shared needles and syringes and paraphernalia compared to participants in Dundee. It also showed lower, but not significantly different levels of sharing in the past month amongst the two groups. Newer injectors in Dundee showed slightly higher but not significantly different levels of past month sharing. Those who reported using supplied filters and acids in Dundee did not test for significantly lower levels of sharing or reuse of these items compared to those in Aberdeen without access. However, limits of the final revised pragmatic study design following the pilot suggest these results cannot be directly attributed to paraphernalia supply or lack of, i.e. the second part of the objective was *not* met by the quantitative data. The qualitative data however made a strong argument for paraphernalia supply, as discussed later. The following criticisms can be made of the quantitative data collection method, which influence interpretation.

5.40 The study was unable to collect sensitive enough data to describe the frequency of visits to all needle exchanges in both locations or use of supplied paraphernalia in Dundee versus use of makeshift. This makes it impossible to separate the effects of needle exchange service use, which is known to reduce HCV risks (Huo and Ouellet, 2007) and be a weak correlate with reduced paraphernalia sharing (Ksobiech K, 2006), from paraphernalia supply. Table 13 shows makeshift paraphernalia was still used in Dundee, but the frequency of this is

unknown. The qualitative interviews showed makeshift paraphernalia was still used in Dundee because IDUs did not always have enough supplied paraphernalia at the time of need. Lack of quantifiable information on supplied and makeshift paraphernalia used between each exchange visit and frequency of exchange visits therefore prevents the results being attributable to paraphernalia supply or lack of. The collection of such data was originally planned at each visit using a previous version of the NESQ. However the pilot work showed that the study did not have enough researcher resource to collect this data, due to the need to focus more efforts on recruitment. Although recruitment difficulties in needle exchange studies were identified from previous literature, the human resource needed to address these was underestimated when the design was revised.

5.41 Separating out each stage of consent aided recruitment for the NESQ but this meant researcher time appeared to be limited for health check data collection, and follow up data collection, especially in Dundee. This meant the study was also limited by lack of follow up data which would have provided more robust indicators of the impact of paraphernalia supply coupled with the more detailed data suggested. The advice on maximising follow up reported by Pickering (2003) was followed but was found at times not to be successful or usable for needle exchange clients. For example some were reluctant to nominate other contact points and many mobile phone numbers were no longer in use at follow up.

5.42 Lastly, the power of the study in relation to skin and soft tissue measures can be questioned. The prevalence of skin and soft tissue seen in Aberdeen (21.2%) was less than had been suggested in the literature. The literature data was used to calculate study numbers (see appendix 1). This suggests the study may have been underpowered for this outcome measure. The predicted level detailed in the protocol (33%), was based on previously published community based studies in the USA where the supply of paraphernalia is illegal (Spijkerman et al, 1996, Binswanger et al, 2000 and Bassetti & Battegay, 2004). US data was used due to lack of UK data at the time of design. When estimating the likely impact of paraphernalia, again lack of data meant a 'best guess' had to be made. Data from the Swiss heroin trials (Conrad et al, 2000), where sterile paraphernalia and pharmaceutical grade drugs were supplied, and expert opinion (Carnwarth, T. personal communication with J Scott, 2004), formed the basis of an estimate of 20%. These figures predicted that 180 per group were needed. However, the prevalence of skin and soft tissue infections in Aberdeen closer to that seen in the Swiss studies. Hence to be adequately powered, a greater number of participants per group would be needed. This also raises the question as to why the prevalence of skin and soft tissue infections seen in Aberdeen was less than predicted? It may suggest that despite lack of access to sterile paraphernalia, other factors promote skin hygiene, e.g. following safer injecting advice.

5.43 The qualitative data however did give strong support to the supply of paraphernalia to IDUs and this is considered in the next section.

Future work

5.44 It is unlikely, given the extensive supply of paraphernalia in the UK now (Abdulrahim et al, 2006, Griesbach, 2006) that true baseline data could be collected anywhere (i.e. needle exchanges not supplying any paraphernalia or swabs). Future studies should focus on collecting more sensitive data on frequency of visits to needle exchanges and paraphernalia use for every injection. Future work should also focus on collecting follow up data more successfully. The study showed that this would require considerably more researcher time. It

is suggested that each site would require two full time researchers, one to recruit participants and one to collect follow up data. This would also provide holiday cover. Ideally follow up data would be built into needle exchange data collection procedures, but since research ethics would suggest that this extra data should only be collected for consenting participants this may be difficult to implement in practice.

5.45 Future work could focus on why the prevalence of skin and soft tissue infections was lower than expected in Aberdeen to identify protective factors.

Objective 2

In the location where paraphernalia is supplied, establish participant's views on the paraphernalia supplied, including ease of use, self-reported nature of use, compatibility with the injection preparation process and its perceived impact on health and sharing.

5.46 The Dundee participants who took part in the interviews very much preferred to use the paraphernalia supplied by the exchanges compared to makeshift paraphernalia. There were three main factors that underpinned this: (1) Improved cleanliness and safety, which was found to equate to less injecting site complications and visible harms such as abscesses, as opposed to BBVs. (2) Quality –which was found to relate to less risk of losing the ‘hit’ e.g. through equipment failure. (3) Convenience –which related to comparative easier access and reduced risks from being desperate for a hit.

5.47 Supplied paraphernalia was seen as easy to use by most, although some disliked the Sterifilt as it did not retain drug and some disliked the Stericup filter as it retained too much liquid (i.e. reduced the volume of the hit visibly compared to other filters).

5.48 The supply of paraphernalia from exchanges was perceived to reduce sharing and improve injecting hygiene amongst the participants, but it was not used exclusively because it was not always in their possession when needed. This was due to a number of factors tied in with lack of ease of predicting required quantities, due to supplying others in need and lack of forward planning of visits to the exchange due to competing priorities such as obtaining drugs. Convenience was also a factor, such as the proximity to an open exchange immediately prior to need.

5.49 Dundee participants appeared to have more belief that they should attempt to always use clean equipment and that access to paraphernalia via exchanges facilitated this. A ‘no excuses’ sentiment was common, even amongst those who did not always use exchange supplied equipment. However this was in contrast to Aberdeen where a more resigned view of sharing was expressed and the reason for sharing usually being attributed to lack of supply of equipment.

Objective 3

In the location where paraphernalia is not supplied, establish participant's experiences of access to paraphernalia items needed, the items they use and perceptions on their impact on health and sharing.

5.50 The strongest views in Aberdeen from participants were around the difficulties experienced in accessing acids for injection preparation. Availability was the main factor that

prevented access, with cost also being a barrier. Quality concerns about shop bought citric acid were common. Distress and subsequent risky behaviours, induced by fear of withdrawal from lack of ability to prepare heroin injections were a common theme. Some were angry about lack of local availability. Other paraphernalia items were considered more readily available such as water from the tap and tea spoons.

5.51 The concept of risk from makeshift items such as cigarette filters was not always recognised and sharing of paraphernalia was not explicitly linked with HCV transmission by most interviewees until prompted. Sharing risks tended to be identified as HIV and applied to needles and syringes. A ‘culture of sharing’ was more evident from the Aberdeen interviewees with a resigned inevitability expressed by many. Paraphernalia sharing was not viewed in the same ‘league’ as needle and syringe sharing and for some it was an acceptable norm. As both services provided written and verbal advice on BBV risks, it may be that lack of supply of paraphernalia in Aberdeen is a barrier to emphasising the risks from paraphernalia sharing during the needle exchange transaction, or a barrier to facilitating change. This has been identified as key in the prevention of needle and syringe sharing (Stimson, 1998). Application of this theory to paraphernalia can be suggested but not proven from this work.

Objective 4

Identify participant’s suggestions and ideas for promotion of use of appropriate paraphernalia and ways to discourage sharing.

5.52 Several suggestions were made as to how to attract more IDUs into needle exchange services as participants recognised that increased distribution was key in increasing paraphernalia use. Ideas included increasing numbers of outlets, opening times and geographical spread, increasing publicity of services and promoting confidentiality policies. This was particularly highlighted in Dundee where the prescribing service was located in the same building as HRC. Outreach was also considered an important tool in facilitating convenient access to paraphernalia in Dundee. Peer distribution was also reported to contribute to existing supply networks, but also led to a lack of own equipment when needed. Negative attitude of staff was mentioned as a barrier and in all cases related to pharmacy staff. Similar factors were identified from IDU interviews by Neale et al (2007) and are highlighted elsewhere (e.g. Parsons et al, 2002, Griesbach, 2006, Abdulrahim et al, 2006).

5.53 The supply of all necessary items to facilitate safer injecting was considered by interviewees as an important strategy to reduce sharing and reuse. The supply of adequate quantities of equipment was also key –both needles and syringes and paraphernalia. Convenient access was mentioned commonly and the notion of several trips and investment of considerable time to access injecting equipment, and in particular paraphernalia, was not evident.

5.54 Sharing and reuse of equipment was usually attributed to lack of access to clean equipment when needed. It was very clear from the interviews that the ideal of one new set of injecting equipment for every injection is by no means able to be achieved, including paraphernalia supplies. Several needles and syringes were often used per injection and it was clear that supplies obtained do not match the needs of many. The limits of needle and syringe coverage have been previously highlighted e.g. Parsons et al (2002) suggested that on average there is one clean needle for every four injections administered in Scotland, and one

in two in England. Note that these suggestions were made before Lord Advocate's Guidance recent update in Scotland. This study showed that injecting equipment including paraphernalia is often donated to peers in need and that there are difficulties in predicting required quantities.

5.55 Sharing of Stericups in Dundee and spoons in Aberdeen for batch preparation was commonly described. The practice of batch preparation was reported to be often used to ensure drugs bought through pooled resource are fairly divided. This has been highlighted as a risk previously by many (e.g. Koester et al, 2005). If all other items used in the preparation are sterile and hands are cleaned, then the risks are effectively removed. Therefore, the economic benefits of batch preparation may be hard to address and efforts should therefore also focus on emphasising ways to make this practice safer. Stericups were shown to discourage reuse due to their fragile nature after heating. However, the interviews suggested that they appear not to reduce batch preparation.

5.56 The reuse of filters to remove trapped drug was common and again can be seen as a difficult practice to change in those who do it, due to the economic benefits. However some interviewees in both locations were against this practice, primarily because of the risk of 'dirty hits' and the perception of skin and soft tissue infection risks. Sharing filters was reported for similar reasons, e.g. to help someone in withdrawal or prevent own withdrawal. Explicit links with filter sharing and HCV risks were not mentioned unprompted by the majority again suggesting a need for more intensive education campaigns.

5.57 On the whole participants in both locations considered that risks tended to be mostly taken early in injecting careers and that attending needle exchanges improved their injecting practice. Many mentioned reluctance of new injectors to access services and highlighted a need for wider publicity of confidentiality policies and services available. In Aberdeen many thought paraphernalia supply would help draw in new injectors. The advice of workers at needle exchanges in both locations was valued and trusted. However the same value and trust was not expressed in relation to pharmacy exchanges.

5.58 Many of the cultural factors identified relating to sharing present challenges for needle exchange workers. For example, concerns about offending people by refusing to use communal water, cultural norms of lending and borrowing equipment, accepted sharing with sex partners and lack of concern for self and others. The desperate fear of drug withdrawal was also reported to increase risk taking leading to later regrets. Higher profile campaigns may empower people to address sharing risks, as suggested by some interviewees. Campaigns should also encourage forward planning. The need for major education campaigns were mentioned by some. In particular several people considered HCV was 'not as important' as HIV because it had not been subject to mass media prevention campaigns. Some mentioned memorable 'tomb stone adverts' and used in HIV prevention campaigns in the 1980's and the impact of shocking magazine adverts that used 'sufferers' to highlight risks. The use of such mass media campaigns raises many questions which warrant debate and discussion by those likely to make decisions on their use.

Methodological considerations and future work

5.59 The design of the qualitative work is considered appropriate. All participants were needle exchange clients therefore their views may not be the same as those not in contact

with other services. Future work could establish the views of those not in contact with services and also specifically focus on new injectors.

5.60 Future work could expand on some of the suggestions from participants on how to reduce sharing of paraphernalia. In particular the lack of or low level of awareness of HCV risks is of concern. Suggestions of a need for a high profile media campaign should be explored further. For example, future interviews could explore in more depth IDUs opinions on the advantages of such campaigns and why they think they advocate them. The limits of such campaigns could also be explored.

5.61 Future work should also seek to identify whether paraphernalia introduction in an area not previously supplying it, accompanied with advice, changes cultural 'norms' of sharing.

Implications for practice and recommendations

Several recommendations for practice can be made from the field based study, in particular from the qualitative work. The quantitative work suggests recommendations for future research, as previously discussed. The recommendations are as follows:

Recommendation 1: The term ‘paraphernalia’ needs to be clarified, as it appears not always to be used by IDUs.

Recommendation 2: Strategies to address the perception and practice of paraphernalia sharing should be implemented and evaluated. These may include the supply of paraphernalia, which is strongly advocated by IDUs.

Recommendation 3: Paraphernalia supply should be accompanied by strategies to encourage forward planning in IDUs, explicitly highlight risks of sharing, and discuss perceptions of HCV compared to HIV. The differences between HCV sexual risks and equipment sharing risks need to be highlighted.

Recommendation 4: The less public profile given to HCV compared to HIV should be discussed with IDUs. It should be explained that lack of mass media campaign does not mean IDUs are themselves at less risk.

Recommendation 5: More research into mass media campaigns on HCV prevention should be undertaken to further explore IDUs views. Subsequently, findings should be used to inform considerations on whether such mass media campaigns should be undertaken.

Recommendation 6: The supply of paraphernalia, if introduced in Aberdeen, should be evaluated to establish if it attracts more IDUs into services and if so, whether this includes newer injectors

Recommendation 7: Strategies are needed to increase needle and syringe distribution. Quantities given to IDUs need to be sufficient and access convenient enough to prevent sharing. This has been recommended by previous research also.

Recommendation 8: When supplying paraphernalia, convenience and accessibility need to be maximised, free distribution is advocated. Peer distribution exists and could be encouraged.

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Appendix: Power calculation to inform field based study (extracted from protocol)

Design and Power Calculation

This is a cohort study comparing two geographically distinct areas with similar population demographics. The design has been drafted in association with advice from our statistician Dr G Taylor. The project will comprise two groups of participants, the study group (Dundee) who will receive the paraphernalia with safer injecting information and the control group (Aberdeen) who will receive standard needle exchange care. As users of both services are similar it is envisaged that the composition of the two groups (age, gender, length of time injecting) will be similar. Ideally people will be in the study for **6 months** although it is anticipated that duration may be shorter for some. This will be accounted for in the statistical analysis.

Dr G Taylor's (medical statistician) assisted with the design and power calculations. As no previous work has been done to look at paraphernalia outcomes, a basis for guiding statistical calculation had to be constructed. The basis chosen was the incidence of abscess and/or soft tissue infections reported in IDUs in the literature, since it is hypothesised that the supply of sterile paraphernalia, accompanied with appropriate advice not to share, will reduce this incidence (more common and more studied than vascular problems). The prevalence of skin/soft tissue infection in IDUs in community based studies (comparable to the samples for this study), is reported as 33% [Spijkerman et al (1996). *J Clin Epidemiology*. 49(10):1149-54], 32% [Binswanger et al (2000) *Clin Infect Dis*. 30(3): 579-81] and 29% [Bassetti and Battegay. (2004). *Infection*. 32:163-169].

An approximate prediction of the expected outcome is needed to inform the power calculation. This is difficult due to lack of previous work. The closest comparison can be drawn from the Swiss heroin trials that supplied paraphernalia with pharmaceutical heroin (not street heroin as used by needle exchange clients). Conrad et al. (2000). *Schweiz Rundsch Med Prax*.89(46):1899-906 reports an incidence of 7% (cellulitis) and 5% (abscess), 18 months into treatment. An estimate from UK pharmaceutical heroin prescriber Dr Tom Carnwarth was given as 10% prevalence (Carnwarth,T. personal communication with J Scott, 2004). Pharmaceutical heroin will be 'cleaner' than street heroin which will be more bacteriologically contaminated so these may be underestimates of likely outcome. Therefore bearing these factors in mind, suggesting a 'best case' outcome of reduction in prevalence to approx. 10%, a more likely outcome of approx. 20% is estimated.

Based on 80% power and 95% confidence intervals:

A change from 33% prevalence to 10% prevalence would require 49 people per group.

A change from 33% prevalence to 20% prevalence would require 180 people per group.

To allow for drop outs this is rounded up to a target of 200 per group.

ISSN 0950 2254
ISBN 978 0 7559 7085 3
(Web only publication)

www.scotland.gov.uk/socialresearch

RR Donnelley B55369 03-08



ISBN 978-0-7559-7035-3

