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# **Knowledge & Library Services (KLS) Evidence Briefing**

**What are the facilitators and barriers to the uptake of low dead  
space injecting equipment for people who inject drugs?**

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## What are the facilitators and barriers to the uptake of low dead space injecting equipment for people who inject drugs?

### Question

This briefing summarises the evidence on the facilitators and barriers to the uptake of low dead space injecting equipment from 1<sup>st</sup> January 2000 to 31<sup>st</sup> May 2021.

### Key messages

The main facilitators to the uptake of low dead space (LDS) injecting equipment for people who inject drugs (PWID) are:

- Provide accessible information about the beneficial features of LDS injecting equipment, such as less wasted drug and lower risk of transferring infections. Encourage PWID to use new equipment for every injection, but supplement this with instructions for proper rinsing and disinfection of equipment.
- Ensure LDS injecting equipment is available for PWID to try alongside their current equipment. Gradual transition – make LDS equipment available and over time reduce the availability of high dead space equipment.
- Place PWID at the heart of any further research into implementation of new equipment.
- Make use of peer networks to share information among PWID, particularly positive experiences.
- Train staff involved in the provision of needle and syringe programmes (NSP) in the benefits of LDS equipment, as well as how to respond to any safety, health or practical problems.
- Any intervention should be viewed as a component of comprehensive harm reduction policies, not as a lone intervention.

The main barriers to the uptake of LDS injecting equipment for PWID are:

- Many PWID are happy with their current equipment and have not reported problems with injecting, so do not feel it is necessary to change.
- Familiarity with current equipment and its place in the routine of injecting; length of time injecting.
- The need to learn how to use new equipment.
- Potential lack of availability of comparable equipment, such as size of barrel or length of needle.
- Getting a 'hit' can sometimes be viewed as more important than harm prevention.

Evidence briefings are a summary of the best available evidence that has been selected from research using a systematic and transparent method in order to answer a specific question.

#### What doesn't this briefing do?

The findings from research papers summarised here have **not** been quality assessed or critically appraised. This briefing is a neutral presentation of the evidence and does **not** seek to make any recommendations.

#### Who is this briefing for?

This briefing is for a Consultant in Health Protection for the purpose of objective setting and policy development.

#### Information about this evidence briefing

This briefing draws upon a literature search of the sources Embase, Ovid Medline, APA PsycInfo, Ovid Emcare, and the website IDPC.NET from 1<sup>st</sup> January 2000 to 31<sup>st</sup> May 2021.

#### 23 highly relevant citations were used to produce this evidence briefing.

17 additional papers were considered to be 'of interest' and details can be obtained on request.

You may request any publications referred to in this briefing from [libraries@phe.gov.uk](mailto:libraries@phe.gov.uk)

#### Disclaimer

The information in this report summarises evidence from a literature search - it may not be representative of the whole body of evidence available. Although every effort is made to ensure that the information presented is accurate, articles and internet resources may contain errors or out of date information. No critical appraisal or quality assessment of individual articles has been performed. No responsibility can be accepted for any action taken on the basis of this information.

## What are the facilitators and barriers to the uptake of low dead space injecting equipment for people who inject drugs?

- Lower risk of infection transmission may encourage sharing or reuse of equipment.

### Background

'Dead space' is the space between the needle and the plunger that still has liquid in it following an injection; injecting equipment contains either low or high amounts of 'dead space'. There is a growing body of evidence that suggests **low dead space (LDS) injecting equipment** may reduce the risk of bloodborne viruses and infections, such as HIV and hepatitis C, that are associated with sharing equipment (1). LDS injecting equipment includes low dead space syringes (LDSS), reduced dead space modified syringes and more recently developed, detachable low dead space needles.

When **people who inject drugs (PWID)** share needles and syringes, the volume of dead space is an important determinant of the volume of blood that is transferred from one PWID to another (2). *"The 'dead space' in syringes is a significant factor in both the dose of blood left in used syringes (less dead space = less virus), and the viral survival time (lower dead space = reduced viral survival)"* (3) (p8). Traditional syringes with detachable needles are known as high dead space syringes (HDSS) and these transfer more blood if reused (4).

The World Health Organization (WHO) recommends that: *"needle and syringe programs [...] provide low dead-space syringes for distribution to people who inject drugs"* (5) (p8). For the UK, the National Institute for Health and Care Excellence (NICE) recommend that needle and syringe programme providers should, *"make needles available in a range of lengths and gauges, provide syringes in a range of sizes and offer low dead-space equipment"* (6).

**Needle and syringe programmes (NSPs)** act as sites to supply sterile equipment to PWID with the aim of reducing the need to share or reuse injecting equipment. Sometimes equipment will still be reused or shared, so WHO's and NICE's recommendations to provide LDSS are intended to protect people from infection.

### Facilitators to the uptake of low dead space injecting equipment

*"Informing people who inject drugs (PWID) about the beneficial features of less wasted drug and the lower risk of transferring infections is likely to support the acceptability of detachable LDSS as it recognises their priorities in regards to the properties of injecting equipment as well as the health benefits"* (7) (p142).

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Research undertaken at a needle and syringe service in Bristol (England) aimed to explore whether PWID were willing to switch to LDSS (1). Interviews were conducted with 23 PWID (15 men and 8 women) and 13 NSP volunteers and professionals (6 men and 7 women) who work with them to gather views and insights into how to ensure the successful implementation of providing LDSS. PWID were invited to be on the project steering group, which was vital as they brought valuable insight and engagement.

The research found support among PWID for LDSS. The most valuable benefit was, *"less wasted drug, as there is less left in the syringe after injecting,"* as well as, *"the lower risk of transferring infections"* (1). Based on the findings of the research, the following recommendations have been made for introducing LDSS:

- training staff involved in the provision of NSP on the benefits of LDSS and how to encourage behaviour change in PWID
- education for PWID on the benefits of switching from HDSS
- providing information both verbally and in written format
- ensuring LDSS are available to try alongside usual equipment – gradual introduction of new equipment (1).

It is suggested that these would be most effective during a targeted intervention in NSPs that incorporates training, education, persuasion and eventual restriction of HDSS to smooth the transition to LDSS. The authors also note that: *"in staff members' view, focusing on the benefits of equipment change in relation to drug use, rather than on the prevention of potential health risks was more likely to be effective"* (8) (p103).

Another project in Bristol found that, *"people who inject drugs would be willing to switch to this safer equipment"* (9). The project aimed to encourage the use of LDSS in NSPs and involved service users in co-designing materials including posters, a booklet and an animation. The researchers ran a consultation process with eight NSPs across the UK, *"to understand barriers to the uptake of LDSS, and how different programmes operate and share harm reduction messages"* (10) (p3). Workshops were run with 5 service users (3 men and 2 women) from a range of ages, with different experiences of injecting and equipment preferences. The audience for promoting the benefits of LDSS and broader harm reduction messages, was: PWID, NSPs (and their staff), and policymakers.

The authors found that placing PWID at the heart of the research implementation project was shown to be essential, as it ensured the materials produced were appropriate and engaging. It was also important not to stigmatise or alienate the intended audience; PWID selected the design style and informed the language, messages and overall look of the designs. This meant that the designs *"avoided images and language with negative connotations"* and comments on the overall look

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and feel of the designs were taken into account before they were finalised (10) (p1). The materials were launched at a public event in January 2019 and outcomes of this work are being monitored by the project team.

Further work from this research team that was informed by behaviour change theory recommends that interventions should focus on increasing capability, opportunity and motivation of PWID to change to LDSS. Staff involved in the provision of NSP are advised to take 5 key actions:

1. Undertake training about the benefits of low dead space syringes, how to identify barriers to change and ways to support changes in behaviour
2. Provide accessible information and education to people who inject drugs to raise awareness of the benefits of low dead space syringes
3. Use peer networks to spread information
4. Make detachable low dead space syringes available, and over time reduce the availability of high dead space syringes
5. Monitor and respond to any safety, health or practical problems which service users have using the new equipment (11) (p3).

In 2015 Glasgow (Scotland) experienced an outbreak of HIV infection amongst PWID. 47 new diagnoses were recorded, compared to an annual average of around 10 in PWID (12). Response to the outbreak was multi-agency and a key aspect was increasing availability of Injecting Equipment Provision (IEP) services and introducing detachable LDSS to PWID. It was identified that fixed-needle 1ml LDSS were available, but the majority of cases had recently accessed 2ml syringes from the IEP service. The standard design of these 2ml syringes was found to be incompatible with lower dead space needles, which necessitated a new design. A new LDSS was designed to fit all separate needles, which was *"lab tested and shown to reduce 'post injection' blood and fluid content by 70%"* (p140).

Due to the considerable risk of further transmission during the outbreak, these new LDSS were introduced without training or promotion for PWID. Staff were briefed with information so that they could answer any questions that arose, but at the time of publication, the authors reported that no issues were identified by clients or staff in relation to the distribution or use of LDSS. A national procurement contract in Scotland for IEP equipment meant that the new LDSS were then rolled out across the country. This shows that when faced with a rapidly transmitting outbreak among PWID, replacing existing stock with new LDSS can be successful with minimal disruption to supply.

A pilot study in Tajikistan across NSPs in two cities in 2015 aimed to assess:

- the feasibility of NSPs distributing LDSS
- whether LDSS was acceptable to the clients
- any barriers to PWID using the needles

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- which features of the LDSS might affect uptake ([13](#)).

The research team identified that NSPs in Tajikistan were very busy and only had access to limited resources. To mitigate the need for extensive staff training, the authors of the study created a one-page flyer that promoted the benefits of LDSS (specifically detachable needles) for staff involved in the provision of NSP to distribute alongside the equipment. Distributing a flyer was considered to be a low-intensity intervention.

The flyer emphasised several advantages of LDS detachable needles, which were informed by previous research into the values and beliefs of PWID in Tajikistan:

1. LDS detachable needles reduce the amount of drug that is retained and wasted in the dead space
2. LDS detachable needles facilitate accurate division of drug solution between two PWID
3. LDS detachable needles reduce the volume of blood retained in a needle and syringe after use, which may decrease the risk of HIV and HCV transmission if they are shared ([13](#)) (p4).

Both NSP locations distributed the flyer and needles without difficulty, in place of the usual HDS needles. Findings from the study suggested that at follow-up, almost all use of HDS needles were because participants were unable to obtain LDS detachable needles. The findings also highlight the importance of selecting interventions that are compatible with the beliefs of both PWID and staff involved in the provision of NSP. Acceptability is the most important factor with the intended recipients, and not the implementation of a solution that strives to be perfect.

A study that considered how to reduce the burden of exposure to infections through sharing needles recommended that the distribution of LDS syringes and needles is accompanied by instructions for proper rinsing and disinfection of equipment. This is not to encourage sharing of equipment, but to reduce transmission of viral or infectious loads and chances of the needles clogging ([14](#)).

A social marketing intervention took place as a pilot programme over 1 year in Vietnam ([15](#)). This involved distributing LDSS through both pharmacies as well as non-pharmacy outlets. If LDSS were already available at pharmacies, the project focused on improving late-night access to LDSS by establishing new non-pharmacy outlets. Results showed a positive association between LDSS use and exposure to social marketing activities. The programme used print materials, community events and face-to-face communication tools to promote the benefits of LDSS, particularly emphasising less pain and scarring due to high quality of the needle, and less drug loss due to LDS. Distribution channels included tea stalls, coffee shops, truck stations, motorcycle taxi drivers, and pharmacies near shooting galleries. The



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authors also found that, *"LDSS use had a stronger association with perceptions of LDSS product quality than with perceptions regarding LDSS potential to reduce HIV transmission risk and use"* (p1).

Participants in another study in Tajikistan (6 focus groups with a total of 100 participants) reiterated the importance of having good quality needles, particularly needles that are sharp and securely attached to the plastic hub (16). Sharp needles are less painful, and do less damage to veins. If the quality of LDSS is assured, this may mean that PWID are more likely to use them.

An economic analysis that modelled the use of detachable LDSS over 10 years showed potential increased costs (£0.008) per syringe and increased yearly staff training costs (£536) but an estimated decreased risk (by 47.5%) of hepatitis C virus (HCV) transmission compared with HDSS, which would result in considerable savings in HCV-related treatment and care costs. *"Overall cost savings were £4,116,401 over 50 years and [quality-adjusted life year] gains were 1000, with an estimated 30% reduction in new infections over the 10-year intervention period"* (17) (p702). The study was based on an NSP in Bristol, England and found that a gradual transition towards detachable LDSS would enhance acceptability in PWID, supported by providing information about the reasons for the introduction of the equipment.

In respect to this analysis, another factor to consider regarding uptake of LDSS is how to ensure that PWID have a sufficient supply of sterile equipment. Some data illustrates that three or more attempts can sometimes be necessary to obtain an injection, which means that multiple LDSS would need to be provided for each injection (18).

A response from the authors of the economic analysis suggests that: *"a complete switch in equipment available across all NSP providers would reach all PWID, including the most marginalised, who may not access services directly (i.e. rely upon secondary distribution from peers)"* (19).

It is noted that encouraging PWID to use LDSS should be viewed as a component of comprehensive harm reduction policies, and not as a lone intervention (4).

*"The provision of LDSS needs to occur alongside innovation within needle and syringe programmes (NSP) to ensure that unrestricted provision of injecting equipment and safe injecting advice reach underserved populations and those disengaged from services. LDSS must therefore be considered part of an integrated approach to alleviate social exclusion and reduce health inequalities faced by PWID"* (18) (p714).

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## Barriers to the uptake of low dead space injecting equipment

There are several barriers that arise in the literature when considering how to encourage PWID to change from HDSS to LDSS.

In interviews with 23 PWID (15 men and 8 women) in Bath and Bristol, England, respondents indicated that they put trust in their friends or acquaintances, so early experiences of injecting often influences their current practice (8). A person who has witnessed their peers successfully using HDSS and gone on to do the same in their own practices may show some reluctance to change.

Further reluctance to change has been cited as a factor if a person has not had any problems with their current practice, as there is no impetus to change (8). The length of time a person has been injecting also affects willingness to change.

Most people interviewed found it difficult to change injecting equipment (1). Reasons for this included continuity and familiarity as being an important part of their routine. Some referred to their injecting practice as a 'ritual' that provided a sense of control. One interviewee suggested that there was some fear and wariness about the unknown of new equipment, and whether they would be able to successfully inject with different equipment. This is related to the potential loss or waste of drug, as well as potential for causing harm or pain with unknown equipment.

*"The prioritisation of getting a hit quickly over the prevention of future problems was identified explicitly by staff and more implicitly by PWID as an important barrier to change" (8) (p103).* Familiarity with current equipment may mean that it can be used more quickly and effectively, and thus discourage PWID from changing equipment.

Geographical differences in injecting practices have been highlighted as a barrier to change, as any interventions would need to be highly tailored to local drug types and injecting practices (20). For example, techniques such as frontloading, backloading, using the storage syringe or sharing the load require a syringe with a high volume and a detachable needle (21). In addition, in some parts of the world HDSS are the only option available (22).

Several articles discuss the availability and type of low dead space equipment that is available. One research project found that LDSS would not be acceptable to PWID who need larger syringes and longer and thicker needles that are detachable (13).

Some PWID indicated a preference for their usual HDSS because they allow replacement of needles during an injection episode, which is sometimes necessary if a needle becomes blocked or blunt from repeated attempts to find a vein (16). Some PWID 'back-fill' syringes with heroin by removing the plunger and adding dry powder



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directly into an empty barrel, which was difficult for those who had previously used 3 ml or 5 ml syringes (20). These perceptions highlight incomplete knowledge about the availability of different LDS injecting equipment, including detachable needles (4).

Injecting location is raised as another potential barrier. Examples include:

- PWID that had injected into their groin were less likely to use LDSS
- Those who had injected crack were less likely to use LDSS
- Polydrug use was negatively associated with LDSS use (23).

During the research project in Bristol mentioned previously, visits to NSPs revealed that not all NSPs are operated by dedicated workers. This highlights the need for updated standardised training to ensure that there is an awareness of the benefits of encouraging PWID to use LDSS where they are available (19). The authors also noted that in the Bristol NSP all injecting equipment is delivered through a single contract, so impact of any changes to provision is easier to assess.

Lack of awareness of alternatives to HDSS has also been presented as an issue in encouraging uptake of LDSS. *"The provision of LDSS needs to occur alongside innovation within needle and syringe programmes (NSP) to ensure that unrestricted provision of injecting equipment and safe injecting advice reach underserved populations and those disengaged from services"* (18) (p714).

### Further considerations

At the time of writing in 2021, the availability and distribution of equipment in the UK differs from much of the literature included in this evidence briefing. More manufacturers have developed different products and access to detachable LDS equipment (in various forms) is much more widespread. Use of LDS equipment is likely to be more familiar to both service users and staff. The barrier for use of LDS relating to injecting practices requiring replaceable needles may no longer apply to users in the UK.

It is also noted that further research and epidemiological evidence would be beneficial to demonstrate the effectiveness of LDS equipment in reducing transmission of HCV and HIV at a population level (18).

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### Example search strategy

#### Embase (Ovid)

- 1 ("low dead space" or LDSS).tw.
- 2 "fixed needle and syringe".tw.
- 3 low dead space syringe/
- 4 1 or 2 or 3

Date limit: 2000 – current

### Inclusion/exclusion criteria

#### Inclusion criteria

- Low dead space injecting equipment
- People who inject drugs

#### Exclusion criteria

- Papers not in English
- Focused on healthcare use of low dead space injecting equipment
- Focused on high dead space equipment
- Commentaries and opinion pieces

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## References

1. National Institute for Health Research: Applied Research Collaboration West. Low versus high dead space syringes: user preferences and attitudes. 2017 (Date accessed: 14 May 2021). Available from: <https://arc-w.nihr.ac.uk/research/projects/low-versus-high-dead-space-syringes-user-preferences-and-attitudes>
2. Zule WA, Bobashev GV, Pande PG, Otiazhvili D, Friedman SR, Gyarmathy VA, et al. Options for reducing HIV transmission related to the dead space in needles and syringes. Harm Reduction Journal. 2018;15(1):3. Available from: <http://dx.doi.org/10.1186/s12954-017-0207-5>
3. Exchange Supplies. Maximising the effectiveness of needle exchange with low dead space syringes and prevention of accidental sharing. 2017 (Date accessed: 14 May 2021). Available from: [https://www.exchangesupplies.org/pdf/F722\\_LDS.pdf](https://www.exchangesupplies.org/pdf/F722_LDS.pdf)
4. Zule WA, Cross HE, Stover J, Pretorius C. Are major reductions in new HIV infections possible with people who inject drugs? The case for low dead-space syringes in highly affected countries. International Journal of Drug Policy. 2013;24(1):1-7. Available from: <http://dx.doi.org/10.1016/j.drugpo.2012.07.002>
5. World Health Organization. Guidance on prevention of viral Hepatitis B and C among people who inject drugs 2012 (Date accessed: 14 May 2021). Available from: [https://apps.who.int/iris/bitstream/handle/10665/75357/9789241504041\\_eng.pdf;jsessionid=7CB8B4E43C1DC5A4CB3EACC4F637C39D?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/75357/9789241504041_eng.pdf;jsessionid=7CB8B4E43C1DC5A4CB3EACC4F637C39D?sequence=1)
6. National Institute for Health and Care Excellence. Needle and syringe programmes: Public health guideline [PH52]. 2014. Available from: <https://www.nice.org.uk/guidance/ph52>
7. Kesten JM, Vickerman P, Hickman M, Redwood S, Ayres R, Neale J, et al. Rejoinder to: Implementation of low dead space syringes in response to an outbreak of HIV among people who inject drugs: A response to Kesten et al. International Journal of Drug Policy. 2017;43:142-3. Available from: <http://dx.doi.org/10.1016/j.drugpo.2017.01.017>
8. Kesten JM, Vickerman P, Hickman M, Redwood S, Ayres R, Neale J, et al. Acceptability of low dead space syringes and implications for their introduction: A qualitative study in the West of England. International Journal of Drug Policy. 2017;39:99-108. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6688102/pdf/nihms-1025639.pdf>
9. National Institute for Health Research: Applied Research Collaboration West. Driving the use of low dead space injecting equipment among people who inject drugs. 2019 (Date accessed: 14 May 2021). Available from: <https://arc-w.nihr.ac.uk/research/projects/driving-the-use-of-low-dead-space-injecting-equipment-among-people-who-inject-drugs/>
10. Hussey D, Dee C, Bagnall D, Bojangles T, Trinder-Widdess Z, Kesten JM. Co-design of harm reduction materials for people who inject drugs to implement research findings. Harm Reduction Journal. 2019;16(1):36. Available from: <http://dx.doi.org/10.1186/s12954-019-0300-z>
11. Bristol UoBP. Cost-effective tools to reduce the spread of the Hepatitis C Virus in people who inject drugs. 2020 (Accessed 14 May 2021). Available from: [http://fileserv.idpc.net/library/Cost\\_effective\\_tools\\_hepatitis\\_C.pdf](http://fileserv.idpc.net/library/Cost_effective_tools_hepatitis_C.pdf)
12. McAuley A, Goldberg DJ, Campbell J, Milosevic C, Hunter C. Implementation of low dead space syringes in response to an outbreak of HIV among people who

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- inject drugs: A response to Kesten et al. *International Journal of Drug Policy*. 2017;43:140-1. Available from: <http://dx.doi.org/10.1016/j.drugpo.2017.01.019>
13. Zule WA, Bobashev GV, Latypov A, Otiashvili D, Bangel S. Feasibility of needle and syringe programs in Tajikistan distributing low dead space needles. *Harm Reduction Journal*. 2018;15(1):44. Available from: <http://dx.doi.org/10.1186/s12954-018-0249-3>
14. Abdala N, Patel A, Heimer R. Recovering Infectious HIV from Novel Syringe-Needle Combinations with Low Dead Space Volumes. *AIDS Research and Human Retroviruses*. 2016;32(10-11):947-54. Available from: <http://dx.doi.org/10.1089/aid.2016.0023>
15. Huong NTT, Mundy G, Neukom J, Tuan NM, Zule W, Tam NM. Social marketing of low dead space syringes in Vietnam: Findings from a 1-year pilot program in Hanoi, Thai Nguyen, and Ho Chi Minh City. *Harm Reduction Journal*. 2015;12(1):15. Available from: <http://dx.doi.org/10.1186/s12954-015-0049-y>
16. Zule WA, Bobashev GV, Latypov A, Otiashvili D, Kirtadze I, Ibragimov U. Factors that influence the characteristics of needles and syringes used by people who inject drugs in Tajikistan. *Harm Reduction Journal*. 2015;12(1):37. Available from: <http://dx.doi.org/10.1186/s12954-015-0069-7>
17. Hancock E, Ward Z, Kesten JM, Hickman M, Vickerman P, Ayres R, et al. Detachable low dead space syringes for the prevention of hepatitis C among people who inject drugs in Bristol, UK: an economic evaluation. *Addiction (Abingdon, England)*. 2020;115(4):702-13. Available from: <http://dx.doi.org/10.1111/add.14849>
18. Platt L, Harris M, Sweeney S. Commentary on Hancock et al. (2020): Low dead space syringes are just one component of an integrated package of care needed to tackle HCV and social exclusion among people who inject drugs. *Addiction (Abingdon, England)*. 2020;115(4):714-5. Available from: <http://dx.doi.org/10.1111/add.14918>
19. Kesten J, Hickman M, Vickerman P, Ward Z, Hancock E, Ayres R, et al. Response to Commentary on Hancock et al. (2020): Low dead space syringes are just one component of an integrated package of care needed to tackle HCV and social exclusion among people who inject drugs. *Addiction (Abingdon, England)*. 2020;115(12):2407-8. Available from: <http://dx.doi.org/10.1111/add.15150>
20. Jacka D. How to encourage use of low dead space syringes? The Viet Nam experience. *International Journal of Drug Policy*. 2013;24(1):18-9. Available from: <http://dx.doi.org/10.1016/j.drugpo.2012.09.007>
21. Ambekar A, Pawar A. Low Dead-Space Syringes for HIV prevention among people who inject drugs: Interesting, but a much stronger case is required. *International Journal of Drug Policy*. 2013;24(1):16-8. Available from: <http://dx.doi.org/10.1016/j.drugpo.2012.09.009>
22. Ciccarone D. Saying goodbye to high-dead-space syringes. *International Journal of Drug Policy*. 2013;24(1):15-6. Available from: <http://dx.doi.org/10.1016/j.drugpo.2012.09.011>
23. Trickey A, Ward Z, Hickman M, Vickerman P, May MT, Hope V, et al. Usage of low dead space syringes and association with hepatitis C prevalence amongst people who inject drugs in the UK. *Drug and Alcohol Dependence*. 2018;192:118-24. Available from: <http://dx.doi.org/10.1016/j.drugalcdep.2018.07.041>