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Effectiveness of low dead space syringes for reducing the risk of HCV acquisition among PWID

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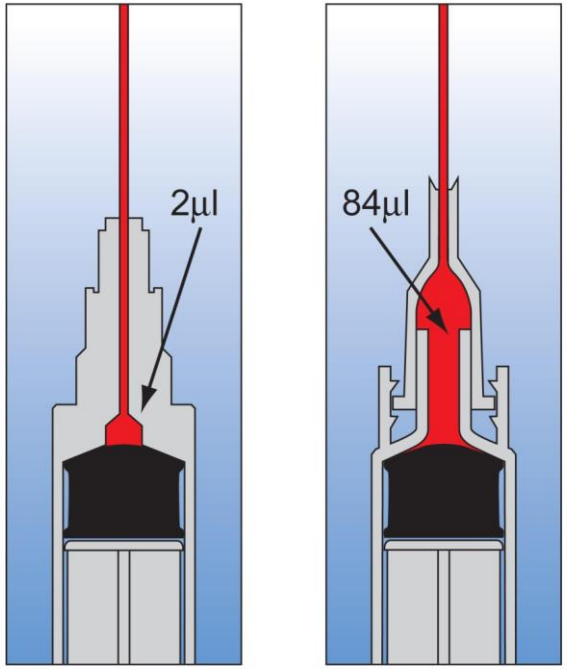
Background and aims

- PWID use two styles of syringe
  - Syringes with detachable and attached needles
  - Syringes with attached needles have less dead space – **Fixed low dead space syringes (fixed LDSS)**
  - Carry less blood after injection, so likely less infectious
- WHO and NICE recommend their use to reduce HIV and HCV transmission:
  - Supported by lab experiments[1,2] and
  - HIV or HCV prevalence studies[3,4],
  - BUT no evidence that reduces incidence
- We tested the hypothesis that using LDSS reduces the risk of HCV acquisition.

Difference between low and high dead space syringes



Low dead-space syringe

High dead-space syringe

1. Paintsil J Infect Dis. 2010; 2. Binka Plose one 2015;
3. Trickey DAD 2018; 4. Zule DAD 2009 & SoSci med 2002

Data

Unlinked Anonymous Monitoring (UAM) Survey from England, Wales, and Northern Ireland

- Annual bio-behavioural survey of PWID recruited from drug treatment services, NSP, and outreach
- Sample size about 1800 per year
- Short questionnaire about drug use behaviours and demographics
  - For 2016, 18 and 19, survey asked about obtaining **syringes with attached needles**
- Dried blood spot (DBS) sample tested for HCV antibodies (anti-HCV)
  - From 2016, **if anti-HCV negative then also tested for HCV RNA → recent primary HCV infection**
- **Unable to determine reinfections** so analysis considers just primary incident infections.

Inclusion criteria for analysis

- Only 2016, 2018 and 2019 surveys used
- Include participant if
  - Report recent injecting, and
  - Have HCV Ab and RNA test result – retain if test antibody negative
- Calculate % of syringes used in past month that had detachable or attached/fixed needles using questions:
  - "How many individual needles (including ones attached to syringes) did you get from Needle Exchanges during the last month (28 days)?" and
  - "How many of these needles were already attached to syringes (barrels)?"
- Syringes with detachable needles will include some new detachable LDSS

Statistical Methods

- **Binary variable** created for PWID that either:
  - 100% fixed LDSS - Received ONLY syringes with fixed needles
  - 0-99% fixed LDSS - Received ANY syringes with detachable needles.
- **Logistic regression** used to estimate:
  - Association of 100% fixed LDSS VS 0-99% LDSS use with recent HCV infection (RNA+ and AB-)
- **Adjusted** for many things:
  - **Demographics**: Sex, region, year, duration of injection,
  - **Injecting risks** last month: groin injecting, injecting crack, injecting heroin, equipment or syringe sharing, injection frequency
  - **Intervention access**: NSP coverage (100% syringe coverage or not), current OST
  - **Structural factors**: Ever been in prison, current homelessness.
- **Multiple imputation** to account for missing data in covariates

Characteristics by LDSS use category

- 4,473 PWID in 3 surveys:
  - 2,981 excluded because HCV Ab+
  - 27 excluded received no syringes
  - ➢ 1,465 included in analysis
- 63.8% PWID are 100% fixed LDSS users [25.5% used no fixed LDSS and 10.7% used both]
- 100% fixed LDSS users vs 0-99% fixed LDSS users:
  - Fewer ever incarcerated (54.8% vs 63.0%)
  - Fewer on OST (63.1% vs 76.2%)
  - Fewer inject in groin (13.5% vs 55.7%).

Variable	0-99% use of fixed LDSS*	100% use of fixed LDSS*†
Number (%)	530 (36.2%)	935 (63.8%)
Mean (95% confidence interval)		
Age (years)	37.5 (36.8-38.2)	37.1 (36.6-37.7)
Number of injections in last month	33.9 (31.7-36.0)	31.8 (30.0-33.5)
Percentage (95% confidence interval)		
Female	26.4% (22.8-30.2%)	26.1% (23.4-29.1%)
Injected heroin in last month	93.0% (90.6-94.9%)	92.2% (90.2-93.7%)
Injected crack in last month	51.3% (47.1-55.5%)	44.5% (41.3-47.7%)
Injected in groin in last month	55.7% (51.5-59.8%)	13.5% (11.4-15.9%)
Ever incarcerated	63.0% (58.9-67.0%)	54.8% (51.6-58.0%)
Currently homeless	29.1% (25.5-33.1%)	33.1% (30.1-36.2%)
Currently have 100% NSP coverage	61.0% (56.8-65.0%)	61.0% (57.8-64.2%)
Currently on OST	76.2% (72.4-79.6%)	63.1% (59.9-66.2%)
Shared any injecting equipment last month	16.1% (13.3-19.5%)	19.9% (17.5-22.6%)
Markers of recent infection (RNA-positive and antibody negative)	3.8% (2.5-5.8%)	1.3% (0.7-2.3%)

Association with recent HCV infection

- 33 recent infections among the 1465 HCV Ab-ve PWID
  - **1.3%** prevalence in 100% fixed LDSS users vs **3.8%** in 0-99% fixed LDSS users
- Univariable analysis – Odds ratios (OR) for recent HCV:
  - **100% use of fixed LDSS (vs 0-99%): OR 0.32 (0.14-0.74)**
  - Female (vs male): OR 2.11 (1.05-4.26)
  - Injecting crack (vs not): OR 3.09 (1.43-6.70)
  - No other variables associated
- Multivariable analyses (aOR):
  - **100% use of fixed LDSS (vs 0-99%): aOR 0.24 (0.08-0.67, p=0.007)**
  - Injecting crack (vs not): aOR 3.09 (1.24-7.69, p=0.016)

Limitations

- Observational data so could have unmeasured confounding
- Used marker of recent infection
  - Could be misclassification
  - Gold standard is longitudinal follow-up for identifying new infections
  - Only 33 incident infections so low power
- Relied on self-reported data for most factors:
  - May be biases in reporting or misreporting
- Used simple variable of using syringes with fixed or detachable needles
  - Could not assess use of new detachable LDSS
  - Some participants did not complete all questions for LDSS variable

Conclusions

- LDSS with attached needles may **reduce risk of HCV acquisition by 75%** compared to syringes with detachable needles
  - LDSS could be an important prevention technology for eliminating HCV
  - Likely to be cost-saving seeing small cost difference between syringes[1]
- However, further incidence studies are needed :
  - To confirm our findings
  - Assess if similar efficacy for HIV
  - Assess the efficacy of different syringe options, including detachable LDSS;
- Also important to increase NSP coverage, which is currently low globally

1. Hancock and Vickerman Addiction 2019