Position Statement

Needle stick injuries in the community

Dorothy L. Moore

Canadian Paediatric Society, Infectious Diseases and Immunization Committee, Ottawa, Ontario

Correspondence: Canadian Paediatric Society, 100–2305 St Laurent Blvd, Ottawa, Ontario K1G 4J8. E-mail info@cps.ca, website www.cps.ca

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Abstract

When children sustain injuries from needles discarded in public places, concerns arise about possible exposure to blood-borne viruses. The risk of infection is low, but assessment, counselling, and follow-up of the injured child are needed. This statement reviews the literature concerning blood-borne viral infections after injuries from needles discarded in the community, and provides recommendations for the prevention and management of such incidents.

Keywords: Antiretrovirals; Blood-borne infections; Children; Needle-stick injuries

Injury from used needles and syringes found in community settings arouses much concern, especially when children find discarded needles and injure themselves while playing with them. The user is generally unknown, and parents and health care providers fear that the needle may have been discarded by an injection drug user with a blood-borne infection. Although the actual risk of infection from such an injury is extremely low, the perception of risk by parents results in much anxiety. Evaluation, counselling, and follow-up with parents and the child are needed. This statement updates a Canadian Paediatric Society document published in 2008 (1).

The important pathogens to be considered in this situation are hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) (2,3). It is essential that health care providers know about the risks of acquiring these viruses following needle stick injuries as well as current recommendations for management and follow-up. The prevalence of HBV, HCV, and HIV among injection drug users varies among regions in Canada and may change rapidly. In the absence of up-to-date local data, it is prudent to assume that the needle may have been contaminated with one or more of these viruses.

To date, there have been two case reports of HBV (4,5) and three of HCV (6,7) transmission and no reported transmission of HIV following injuries by needles discarded in the community. A review of the literature (8–21) up to July 2018 yielded 14 case series from areas of high prevalence for blood-borne viruses. These studies involved a total of 613 children with follow-up for HIV, 575 for HBV, and 394 for HCV. There were no transmissions. Most children received HBV prophylaxis, if it was indicated, but only 181 children received antiretroviral (ART) prophylaxis. In an additional report that included needle stick, other percutaneous and mucosal exposures in community and other settings, there were no infections among 39, 33, and 37 children with follow-up for HIV, HBV, and HCV, respectively (22).

Needle stick injuries can be prevented by educating children, parents, educators, and health care providers about the dangers of handling used needles, syringes, and other objects contaminated with blood, including sharps containers designed for used needle disposal in public places. Children need to be made aware of these rules at an early age. In the studies of injuries from discarded needles referred to above, the mean ages of children injured ranged between 5 and 8 years. In one study (10), 15% of injuries occurred in children pretending to use drugs. Communities are responsible for providing adequate cleanup of parks and schoolyards. Also, communities must commit to and support addiction treatment and infection prevention programs for injection drug users.
The risk of infection from exposure to blood by a needle stick injury depends on the size of the needle, the depth of penetration, and whether blood was injected. Risk is increased with the amount of blood introduced and the concentration of virus in that blood. Follow-up after any significant needle stick injury is essential. The clinician dealing with the initial incident should ensure that the parents and child understand the importance of follow-up testing, and that appropriate arrangements are made. Parents sometimes assume that if blood tests that are performed at the time of injury are negative, there is no possibility of infection and no need for further testing.

**HBV**

HBV is the most stable of the blood-borne viruses and can be transmitted by a minute amount of blood. The risk of acquiring HBV from an occupational needle stick injury when the source is hepatitis B surface antigen (HBsAg)-positive ranges from 2% to 40%, depending on the source’s viremia level (2). HBV can survive for up to 1 week under optimal conditions, and has been detected in discarded needles (8,23). A case of HBV acquired in the community from a discarded needle used by a known HBV carrier has been reported (4).

Although HBV vaccine is now recommended for all children in Canada, most programs have targeted children who are older than the usual age at which they sustain accidental needle stick injuries (24). Thus, most children injured by needle sticks are likely to be susceptible to HBV infection. Recently introduced programs in some provinces provide HBV vaccine to infants, which will protect the age group at highest risk of needle stick injuries. However, children not vaccinated in infancy because of jurisdictional policies or age when infant HBV vaccination was introduced locally remain at risk. For children who have not yet received HBV vaccine, postexposure prophylaxis with anti-HBV immunoglobulin and HBV vaccine is advised, and is effective when provided promptly (Table 1) (25).

**HCV**

The risk of acquiring HCV from an occupational needle stick injury when the source was infected varies from 3% to 10% (2). HCV is thought to be a fragile virus and therefore less likely to survive in the environment, but there have been case reports (6,7) of HCV acquisition after an injury from discarded needles.

Unfortunately, there is no effective postexposure prophylaxis at present. Many drugs are now available for therapy of chronic HCV infection, but their benefit for prophylaxis is not known. It is important to determine whether a potential exposure results in transmission of HCV because 75% of infected children will develop chronic infection, which is usually asymptomatic. Children with chronic infection require referral to a specialist and antiviral treatment may be required (26).

<table>
<thead>
<tr>
<th>Table 1. HBV prophylaxis</th>
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<tbody>
<tr>
<td><strong>Child known to be anti-HBsAg antibody or HBsAg-positive</strong></td>
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<tr>
<td><strong>Child has not been fully vaccinated against HBV</strong></td>
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| **Child has been fully vaccinated against HBV** | Test for anti-HBsAg antibody. If results are not available in 48 h, give one dose of HBV vaccine. If anti-HBsAg antibody-positive, no further action is required. If anti-HBsAg antibody-negative, test for HBsAg: |
| | • If HBsAg-negative, give HBIG and dose of HBV vaccine. |
| | • If HBsAg-positive, arrange appropriate follow-up. |

*HBIG* HBV immunoglobulin; *HBsAg* Hepatitis B surface antigen; *HBV* Hepatitis B virus.
HIV
The risk of acquiring HIV from a hollow-bore needle with blood from a known HIV-seropositive source as a result of occupational needle stick injury is between 0.2% and 0.5%, based on prospective studies (2,27). In most reported instances involving transmission of HIV, the needle stick injury occurred within seconds or minutes after the needle was withdrawn from the source patient.

In contrast to the situation with health care workers, the source of blood in discarded needles is usually unknown, injury does not occur immediately after needle use, the needle rarely contains fresh blood, any virus present has been exposed to drying and environmental temperatures, and injuries are usually superficial. HIV is a relatively fragile virus and susceptible to drying. However, survival of HIV for up to 42 days in syringes inoculated with the virus has been demonstrated, with duration of survival dependant on ambient temperature (28). One study (29) found no traces of HIV proviral DNA in syringes discarded by intravenous drug users, while another study (30) found HIV DNA in visibly contaminated needles and syringes from shooting galleries.

It is extremely unlikely that HIV infection would occur following an injury from a needle discarded in a public place. However, if the incident involved a needle and syringe with fresh blood, and if some of the blood was injected into the child, infection is theoretically possible and prophylaxis is indicated. In early studies of occupational needle stick exposures, zidovudine prophylaxis alone was shown to reduce the risk of HIV transmission from a positive source by 80% (27). Prophylaxis with combination ART therapy is presumed to be more effective, but has not been studied. Two-drug regimens have been used for low-risk exposures in the past, but currently three drugs are recommended for all prophylaxis, based on observations in treatment of HIV infection and the assumption that maximum suppression will be most effective in preventing infection (31,32).

Other potential exposures
Although this document addresses potential exposures of children or youth to blood-borne viruses from injuries with discarded needles, the principles presented here could be extended to other potential exposures (e.g., injuries from other sharp objects contaminated with blood, sharing equipment for injection drug use, mucous membrane or nonintact skin exposure to used condoms or tampons, sexual exposure, etc.).

RECOMMENDATIONS
In the absence of specific studies, all recommendations are based on expert opinion and extrapolations from other scientific data, with a level of evidence rating of B-III.

Prevention
- Parents, educators, and health care providers should be made aware of the problem of discarded needles.
- Children and youth should receive age-appropriate education about the potential dangers of injection drug use.
- Children should be taught not to touch or handle needles and syringes, and to report finding them to a responsible adult (a parent, teacher, or police officer), who should then arrange for the safe disposal of the needle in a puncture-proof, closed container.
- Community programs should be in place to keep parks and public places, and other public areas where children generally play, free of discarded needles (33).
- Programs should be in place for the treatment and control of injection drug addiction, and to adequately support HIV prevention, HBV vaccination, and needle exchange programs for injection drug users.

Management
- Clean the wound thoroughly with soap and water as soon as possible after the needle stick injury. Do not squeeze the area to induce bleeding.
- Assess the extent of the wound and the probability of exposure to blood through open skin lesions or mucous membranes.
- Determine the child’s immunization status for tetanus and HBV.
- Administer tetanus vaccine, with or without tetanus immunoglobulin, when indicated (34).
- Document the circumstances of the injury (date and time of injury or exposure, where the needle was found, whether a syringe was attached, whether bleeding was visible in or on the needle or syringe, whether the injury caused bleeding, and whether the previous user of the needle is known).
- Obtain a blood sample from the child for:
  - Baseline HBV, HIV, and HCV status.
  - In the rare instance where antiretrovirals are being started, complete blood count, differential, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, blood urea nitrogen, and creatinine.
- Testing needles and syringes for viruses is not indicated. Results are likely to be negative, but a negative result does not rule out possibility of infection.
- When the user of the needle is known, attempts should be made to assess for risk factors for blood-borne viruses and, if possible, to test for these viruses. Pending results, proceed as for an unknown source.
HBV prophylaxis

Refer to Table 1.

HIV prophylaxis

- Assess risk of HIV transmission (Table 2) and the risks and benefits of ART prophylaxis on a case-by-case basis, taking into consideration the ability of the child to tolerate and adhere to an ART regimen for 4 weeks. Discuss the potential benefits, adverse effects, and costs of ART prophylaxis with parents—and with the child if age-appropriate—with a view to shared decision-making.

  - Recommend ART prophylaxis only in cases of high risk, when the source is considered likely to have HIV, the incident involved a needle and syringe with visible blood, and blood may have been injected.

  - Discuss but do not recommend prophylaxis in situations of low risk (source unlikely to have HIV or no visible blood in the device or superficial injury). Reassure parents that the chance of their child acquiring HIV as a result of this type of injury is extremely low and has, so far, never been reported.

- If the decision is made to begin ART prophylaxis:

  - Start antiretrovirals as soon as possible, ideally within 1 hour to 4 hours of the injury. Prophylaxis is not indicated if it cannot be initiated within 72 hours of injury occurrence (31,32,35).

  - When parents considering prophylaxis are undecided, advise them that starting prophylaxis immediately is preferable. Prophylaxis is of no benefit after 72 hours, but treatment can be discontinued later, if they wish.

  - Paediatricians unfamiliar with ART drugs may wish to consult a specialist in the care of children with HIV but consultation should not delay start of prophylaxis, when indicated.

- The ART agents recommended are those currently used for occupational and nonoccupational exposures and for HIV therapy (31,32,36):

  - For young children: zidovudine plus lamivudine plus lopinavir/ritonavir.

  - For children at least 12 years old and weighing at least 35 kg: emtricitabine plus tenofovir plus raltegravir or dolutegravir. The latter three drugs are better tolerated than those recommended for younger children and are used by some experts in children less than 12 years old (see Table 3). For some drugs, a pharmacist may be able to prepare a suspension if the smaller tablets are not locally available.

  - If alternative ARTs are needed (e.g., because of contraindication, intolerance, or suspected drug resistance), consult a specialist in the care of children with HIV. Alternate regimens should include two nucleoside reverse-transcriptase inhibitors and one integrase strand transfer inhibitor or protease inhibitor (Table 3).

  - Other regimens may be preferred by local authorities in some jurisdictions.

  - Tenofovir is contraindicated if renal function is abnormal.

- The duration of prophylaxis is 28 days. For dosing and other details, refer to Table 3.

- Recommendations may change as new ARTs become available. For up-to-date information and information on alternative ARTs, visit: https://aidsinfo.nih.gov/guidelines/brief-html/2/pediatric-arv/444/regimens-recommended-for-initial-therapy-of-antiretroviral-naive-children.

- ARTs, especially protease inhibitors, may interfere with other medications. Check whether the child

### Table 2. Risk assessment for HIV transmission

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<tr>
<th>Source</th>
<th>Device</th>
<th>Injury</th>
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<tbody>
<tr>
<td>Consider high risk if</td>
<td>• Consider the size of needle, whether it is hollow-bore, presence of visible blood in the needle or syringe, probability of exposure to drying, heat and freezing since use.</td>
<td>• Consider depth and extent of trauma (scratch or deep cut, injection of blood and bleeding at the site).</td>
</tr>
<tr>
<td>- Source known to have HIV</td>
<td>Large lumen devices with visible blood are highest risk.</td>
<td>• Injuries with actual blood injection are high risk. Superficial scratches are low risk.</td>
</tr>
<tr>
<td>- Source unknown but presumed or known high prevalence of HIV in local injection drug user population.</td>
<td>• Consider depth and extent of trauma (scratch or deep cut, injection of blood and bleeding at the site).</td>
<td>• If exposure limited to mucous membranes or nonintact skin, consider extent of exposure. For example, child put syringe with visible blood into mouth and possibly injected blood – high risk; suspected but unobserved splash onto eyes or lips – low risk. Splashes involving a large volume of blood (not just a few drops) coming into contact with extensive areas of nonintact skin – high risk.</td>
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</table>

**HIV** Human immunodeficiency virus.

>15% has been suggested (35).
### Table 3. Antiretroviral agents recommended for postexposure prophylaxis

<table>
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<tr>
<th>Agent</th>
<th>Dosage and age/weight criteria</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Zidovudine (ZDV) (^1^, (^3^) (NRTI))</td>
<td>4 weeks to 12 years: 240 mg/M(^2)/dose twice daily ≥12 years: 300 mg/dose twice daily</td>
<td>Available in oral solution 10 mg/mL; 100 mg capsules Can be taken with or without food; may be better tolerated with food.</td>
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<tr>
<td>Lamivudine (3TC) (^1^, (^3^) (NRTI))</td>
<td>1 month to &lt;3 months: 4 mg/kg / dose twice daily ≥3 months to 3 years: 5 mg/kg/dose (maximum 150 mg/dose) twice daily ≥3 years: 5 mg/kg/dose twice daily (maximum dose 150 mg) or 10 mg/kg (maximum dose 300 mg) once daily</td>
<td>Available in oral solution 10 mg/mL; 100 mg, 150 mg, 300 mg tablets Can be taken with or without food; may be better tolerated with food.</td>
</tr>
<tr>
<td>Lopinavir/ritonavir (LPV/r) (^2^, (^4^) (PI))</td>
<td>2 to 52 weeks: 300 mg LPV/75 mg r/M(^2)/dose twice daily 1 to 18 years: 230 mg LPV/57.5 mg r/M(^2)/dose twice daily (maximum 400 mg LPV/100 mg r/dose) &gt;35 kg: 400 mg LPV/100 mg r twice daily</td>
<td>Available in oral solution 80 mg LPV/20 mg r/mL; 100 mg LPV/25 mg r and 200 mg LPV/50 mg r tablets Should be taken with a high fat meal or snack.</td>
</tr>
<tr>
<td>Tenofovir (TDF) (^1^, (^6^) (NRTI))</td>
<td>2 to 12 years: 8 mg/kg/dose once daily (maximum 300 mg/dose) ≥12 years and ≥ 35 kg: 300 mg once daily</td>
<td>Available only as 300 mg tablet. Can be given with or without food.</td>
</tr>
<tr>
<td>Raltegravir (RAL) (^5^) (INSTI)</td>
<td>≥1 month and ≥ 3 kg: 6 mg/kg/dose twice daily (maximum 400 mg/dose) Tablets: ≥25 kg: 400 mg twice daily Chewable tablets: 11 to &lt;14 kg: 75 mg twice daily; 14 to &lt;20 kg: 100 mg twice daily; 20 to &lt;28 kg: 150 mg twice daily; 28 to &lt;40 kg: 200 mg twice daily; ≥40 kg: 300 mg twice daily</td>
<td>Available as 400 mg and 600 mg tablets and 25 mg and 100 mg chewable tablets. Can be given with or without food.</td>
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**Available for older children:**

| ZDV+3TC \(^1^, \(^3^\) | >30 kg: one tablet twice daily | Combination tablet contains 300 mg ZDV plus 150 mg 3TC |
| Dolutegravir (DTG) \(^4^\) \(INSTI\) | 30 to 40 kg: 35 mg once daily ≥40 kg: 50 mg once daily | Available as 10 mg, 25 mg and 50 mg tablets. Can be given with or without food. |
| FTC+TDF (Truvada) \(^6^\) \(NRTIs\) | ≥12 years and ≥35 kg: one tablet once daily | Tablet contains 200 mg FTC plus 300 mg TDF. |

**INSTI Integrase strand transfer inhibitor; NRTI Nucleoside reverse-transcriptase inhibitors; PI Protease inhibitor.**

Data drawn from references \((31,36)\).

\(^{1}\)Dose adjustment required in cases of renal insufficiency.

\(^{2}\)Dose adjustment may be required in cases of hepatic insufficiency.

\(^{3}\)ZDV and 3TC are well tolerated. Occasionally, children experience anorexia, nausea, vomiting, diarrhea, abdominal pain, fatigue, and headache. Asymptomatic mild neutropenia, anemia, or elevation of liver enzymes may occur, which resolve after treatment is completed.

\(^{4}\)LPV/r may cause nausea, vomiting, diarrhea, or abdominal discomfort. Ritonavir component acts as a booster and is not counted as a separate antiretroviral agent.

\(^{5}\)FTC, RAL, and DTG are very well tolerated, with minimal adverse effects. RAL is licensed for age ≥2 years but chewable tablets may not be available in some locations. 600 mg tablets not used for prophylaxis. DTG licensed for ≥30 kg but 10 mg and 25 mg tablets may not be available in some locations.

\(^{6}\)TDF is well tolerated. Rarely, may cause headache, diarrhea, nausea, vomiting. Renal tubular dysfunction reported after more prolonged use. Monitor creatinine and urine protein. Contraindicated in renal dysfunction. Not licensed in Canada for children <12 years old.
is taking other medications and assess for possible interactions.

- Adverse effects: There are no data to suggest that a 4-week course of ARTs has serious or long-term detrimental effects (see Table 3, footnotes). Children with HIV infection have taken these drugs for years and serious side effects are rare.

- Emergency departments and clinics in which children with needle stick injuries are seen should arrange to have 'starter kits' available, such that prophylaxis can begin with the least delay, when indicated.

- At the initial visit, provide drugs for 2 to 3 days and schedule a reassessment immediately afterward to review adherence, check for adverse effects and arrange further follow-up.

- If the decision is made to continue prophylaxis, prescribe drugs to complete the 28-day course.

Follow-up

- Arrange follow-up and advise parents of the need to monitor side-effects (if on ART prophylaxis), test for acquisition of infection and complete the HBV vaccination schedule.

- If the child is receiving ART prophylaxis:
  - Reassess at 2 to 3 days, by phone or visit.
  - Follow-up at 2 and 4 weeks for assessment of adherence, tolerability, complete blood count, differential, aspartate aminotransferase, alanine aminotransferase, and creatinine.

- At 4 weeks, give a second HBV vaccine dose if only one previous dose was received (consult Table 1) or if no antibody or antigen was detected on initial testing.

- At 4 to 6 weeks, test for anti-HIV antibody.

- At 3 months, test for anti-HIV antibody (unless previously positive) and anti-HCV antibody.

- At 6 months, test for anti-HIV, anti-HCV, and anti-HBsAg antibody (unless previously positive). The test for HIV may be omitted if test is negative at 3 months using a fourth-generation combination HIV p24 antigen-HIV antibody test and the child does not have HCV infection (HCV delays HIV seroconversion). Give a third HBV vaccine dose if only two previous doses have been received.

- If anti-HBsAg antibody tests negative at 6 months, test again 1 to 2 months after the third dose of vaccine. If still negative, test for HBsAg. If negative for both, give a fourth dose of HBV vaccine and test again 1 to 2 months later. If still negative, refer to an appropriate specialist.

- If HIV, HCV, or HBV infection occurs, arrange for appropriate follow-up.

Acknowledgements

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References


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