

Needle stick injuries in the community



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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. The present document 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.

INTRODUCTION

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. Although the actual risk of infection from such an injury is very low, the perception of risk by parents results in much anxiety. Evaluation and counselling are needed. The present document updates the Canadian Paediatric Society's position statement published in 1999 (1).

The important pathogens to be considered in this situation are hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV (2,3). It is essential that the health care provider be knowledgeable about the risks of acquisition of these viruses following needle stick injuries, and the recommendations for management and follow-up. The prevalence of HBV, HCV and HIV among injection drug users varies in different 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.

There have been single case reports of HBV (4) and HCV (5) transmission and no reported transmission of HIV following injuries by needles discarded in the community. A review of the literature (6-17) up until September 2007 yielded 12 case series from areas of high prevalence of blood-borne viruses. These involved a total of 483 children with follow-up for HIV, 452 for HBV and 265 for HCV. There were no infections. The majority of children received HBV

prophylaxis, if it was indicated, but only 130 children received antiretroviral prophylaxis.

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, and that appropriate arrangements are made. Parents sometimes assume that if blood tests that are performed at the time of injury are negative, then there is no possibility of infection and no need for further testing.

Needle stick injuries may 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. Children need to be made aware at an early age. In the studies of injuries from discarded needles referred to above, the mean ages of the injured children were five to eight years. In one study (8), 15% of injuries occurred in children pretending to use drugs. There is a community responsibility to provide adequate cleanup of parks and schoolyards. In addition, community commitment is necessary to support addiction treatment and infection prevention programs for injection drug users.

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 level of viremia (2). HBV can survive for up to one week under optimal conditions, and has been detected in discarded needles (6,18). A case of HBV acquired 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 target children who are older than the usual age at which they sustain accidental needle stick injuries (19). Thus, the majority of injured children are likely to be susceptible to HBV infection. Postexposure prophylaxis with anti-HBV immunoglobulin and HBV vaccine is effective if provided promptly (20).

HCV

The risk of acquiring HCV as a result of an occupational needle stick injury when the source was infected varies from 3% to 10% (2). HCV is thought to be a fragile virus which would be unlikely to survive in the environment, but there are little data at this time. There has been a case report (5) of HCV acquisition after an injury from a discarded needle.

Unfortunately, there is no effective postexposure prophylaxis at present. Alpha-interferon and ribavirin are used in therapy of chronic HCV infection (21), but their benefit for prophylaxis is not known. It is important to determine whether a potential exposure results in transmission of HCV because 50% to 60% of infected children will have persistent, asymptomatic infection for which follow-up by a specialist is indicated. Chronic hepatitis will eventually develop in some of these cases, and antiviral treatment may be required (22).

HIV

The risk of acquisition of HIV from a hollow-bore needle with blood from a known HIV seropositive source is between 0.2% and 0.5%, based on prospective studies (2,23) of occupational needle stick injuries. The risk is increased with higher viral inoculum, which is related to the amount of blood introduced and the concentration of virus in that blood. The size of the needle, the depth of penetration and whether blood was injected are also important considerations. 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 is 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 (24). One study (25) found no traces of HIV proviral DNA in syringes discarded by intravenous drug users, while another study (26) 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, infection is theoretically possible and prophylaxis is indicated. In occupational needle stick exposures, zidovudine prophylaxis was shown to reduce the risk of HIV transmission from a positive source by 80% (23). Prophylaxis with combination antiretroviral therapy is presumed to be even more effective. Whether two or three drugs should be used is controversial. The use of three drugs is based on

observations in treatment of HIV infection and the assumption that maximum suppression will be most effective in preventing infection. On the other hand, two drug regimens are better tolerated and adherence may be better with two than with three drugs (27,28).

RECOMMENDATIONS

Prevention

- Parents, educators and health care providers should be made aware of the problem of discarded needles.
- Children should be educated about the potential dangers of injection drug use.
- Children should be taught not to handle needles and syringes, and to report finding them to an appropriate, responsible adult (parent, school teacher, police officer, etc), 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, where children generally play, free of discarded needles (29).
- 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

- After the injury, the wound should be cleaned thoroughly with soap and water as soon as possible. It should not be squeezed to induce bleeding.
- The extent of the wound, if any, or the probability of exposure of open skin lesions or mucous membranes to blood should be assessed.
- The child's immunization status for tetanus and HBV should be determined.
- Tetanus vaccine, with or without tetanus immunoglobulin, should be given if indicated (30).
- The circumstances of the injury should be documented (the date and time of injury or exposure, where the needle was found, circumstances of the injury, type of needle, whether there was a syringe attached, whether visible blood was present in or on the needle or syringe, whether the injury caused bleeding and whether the previous user of the needle is known).
- Blood should be obtained from the child for:
 - Baseline HBV, HIV and HCV status (may be stored for later testing).
 - If antiretrovirals are being considered: complete blood count, differential, aspartate aminotransferase,

TABLE 1
Hepatitis B virus (HBV) prophylaxis

Child known to be HBV antibody- or HBsAg-positive	No action required.
Child has not been fully vaccinated against HBV	<p>Test for anti-HBs antibody and HBsAg. If results are not available in 48 h:</p> <ul style="list-style-type: none"> • Give HBIG immediately (ideally within 48 h of injury; efficacy unknown if >7 days after injury). Dose=0.06 mL/kg intramuscularly. • Give HBV vaccine (as soon as possible, and at latest within 7 days of injury). <p>If anti-HBs antibody- and HBsAg-negative, complete vaccine series.</p> <p>If anti-HBs- or HBsAg-positive, discontinue vaccine series. Arrange appropriate follow-up if HBsAg-positive.</p>
Child has been fully vaccinated against HBV	<p>Test for anti-HBs antibody. If results are not available in 48 h, give dose of HBV vaccine.</p> <p>If anti-HBs antibody-positive, no further action required.</p> <p>If anti-HBs antibody-negative, test for HBsAg:</p> <ul style="list-style-type: none"> • 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

Table 2
Risk assessment for HIV transmission

Source	Device	Injury
Source unknown but known or presumed high prevalence of HIV in injection drug users in the region, or if source known to have HIV, consider high risk.	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. Large lumen devices with visible blood are highest risk.	Consider depth and extent of trauma (scratch or deep cut, injection of blood and bleeding at the site). Injuries with actual blood injection are high risk. Superficial scratches are low risk. 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.

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.
- If 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

- Risk of HIV transmission (Table 2), and risks and benefits of antiretroviral prophylaxis should be assessed on a case-by-case basis, taking into consideration the ability of the child to tolerate and adhere to an antiretroviral regimen for four weeks. The potential benefits, adverse effects and costs of antiretroviral prophylaxis should be discussed and decisions should be made in conjunction with the parents, and with the child if age appropriate.
 - Antiretroviral prophylaxis should be recommended only in cases of high risk, in which the source is considered likely to have HIV, the incident involved

Table 3
Antiretroviral agents recommended for postexposure prophylaxis

Agent	Dosage	Comments
Nucleoside reverse transcriptase inhibitors*		
Zidovudine (ZDV)	6 weeks to 12 years: 160 mg/m ² /dose tid or 240 mg/m ² /dose bid ≥12 years: 300 mg/dose bid	Available in oral solution 10 mg/mL; 100 mg capsules; 300 mg tablets. Can be taken with or without food; may be better tolerated with food
Lamivudine (3TC)	1 month to 16 years: 4 mg/kg/dose bid (maximum 150 mg/dose) ≥16 years and ≥50 kg: 300 mg once daily	Available in oral solution 10 mg/mL; 150 mg capsules. Can be taken with or without food; may be better tolerated with food
ZDV + 3TC (Combivir) [†]	13 years and >37 kg: One tablet bid	Tablet contains 300 mg ZDV plus 150 mg 3TC
Protease inhibitor [‡]		
Lopinavir/ritonavir (LPV/RTV)	6 months to 12 years [§] : (230 mg LPV/57.5 mg RTV)/m ² /dose bid (maximum 400 mg LPV/100 mg RTV)/dose >12 years: (400 mg LPV/100 mg RTV)/dose bid	Available as oral solution (80 mg LPV/20 mg RTV)/mL; 200 mg LPV/50 mg RTV tablets. Should be taken with a high-fat meal

*ZDV and 3TC are well tolerated. Occasionally children have 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; [†]GlaxoSmithKline Inc, Canada; [‡]LPV/RTV may cause nausea, vomiting, diarrhea or abdominal discomfort; [§]Alternative dosing – <15 kg: (12 mg/kg LPV/3 mg/kg RTV)/dose twice a day (bid); 15–40 kg: (10 mg/kg LPV/2.5 mg/kg RTV)/dose bid. tid Three times a day. Data from references 27,28 and 32

- a needle and syringe with visible blood and blood may have been injected.
- In situations of low risk (source unlikely to have HIV, no visible blood in the device or superficial injury), prophylaxis should not be recommended but should be considered. Parents should be reassured of the low probability of their child acquiring HIV as a result of the incident.
- If the decision is made to begin antiretroviral prophylaxis:
 - Antiretrovirals should be started as soon as possible, ideally within 1 h to 4 h of the injury (27,31). Prophylaxis is not recommended if it cannot be initiated within 72 h of the injury (27,31).
 - If parents considering prophylaxis are undecided, they should be advised that it is preferable to start prophylaxis immediately and then discontinue if they wish because starting later may be of no benefit.
 - The antiretroviral agents used should be those currently recommended for occupational and nonoccupational exposures (27,28,32):
 - For low-risk situations, zidovudine plus lamivudine.
 - For high-risk situations, add lopinavir/ritonavir.
 - The duration of prophylaxis is 28 days. For dosing and other details, refer to Table 3.
- If alternative antiretrovirals are needed, consult a specialist involved in the care of children with HIV.
- Recommendations may change as new antiretrovirals become available. For up-to-date information and information on alternative antiretrovirals, visit <<http://www.aidsinfo.nih.gov/guidelines>> (click on Pediatric Guidelines).
- Antiretrovirals, especially protease inhibitors, may interfere with other medications. Check whether the child is taking other medications, and assess for possible interactions.
- Adverse effects: There are no data to suggest that a four-week course of antiretrovirals will have serious or long-term detrimental effects (listed in Table 3 footnote). 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 so that, if indicated, prophylaxis can begin with the least delay.
- On the initial visit, drugs should be provided for two to three days and arrangements made for reassessment after that time to review adherence, assess 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 for it (eg, monitoring of side-effects if on antiretroviral prophylaxis, testing for acquisition of infection and completion of HBV vaccination).
- If receiving antiretroviral prophylaxis:
 - Reassess at two to three days, by phone or visit.
 - Follow-up at two, four and six weeks for complete blood count, differential, aspartate aminotransferase, alanine aminotransferase, blood urea nitrogen and creatinine.
- At four weeks, give second HBV vaccine dose if only one previous dose received (consult Table 1) or if no antibody or antigen detected on initial testing.
- At six weeks, test for anti-HIV antibody.
- At three months, test for anti-HIV antibody (unless previously positive) and anti-HCV antibody.
- At six months, test for anti-HIV, anti-HCV and anti-HBsAg antibody (unless previously positive). Give third HBV vaccine dose if only two previous doses received.
- If anti-HBs antibody negative at six months, test again one to two 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 one to two months later. If still negative, refer to an appropriate specialist.
- If HIV, HCV or HBV infection occurs, test the stored baseline sera (unless already done) to determine whether infection was subsequent to the injury, and arrange for appropriate follow-up.

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