Update Article

Post-exposure Prophylaxis : What Every Health Care Worker Should Know

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Most health care workers (HCW) working around patients or biological samples stand the risk of accidental exposure to blood and blood-borne pathogens [1-3].

An exposure to infected blood, tissue or other potentially infectious body fluids can occur by either cut/ needle-stick injury or contact with mucous membrane or damaged skin. The risk of infection after an exposure is dependent on a number of variables. After percutaneous injury, the risk of infection varies with the pathogen [1-3]. Dual infections are also known to occur [6]. If the source patient is positive for both HBsAg and HBeAg, the risk of Hepatitis B transmission is approximately 37-62%. If the source patient is positive for HBsAg but is HBeAg negative the risk of Hepatitis is lower- approximately 23-37% [2-4].

If the source patient has Hepatitis C infection the risk of transmission is approximately 1.8% (range 0-7%) [1-3,5,6]. The risk of HIV transmission is approximately 0.3% after a percutaneous exposure and 0.09% after a mucous membrane exposure if the source patient has HIV infection [1,7,8].

The risk of transmission of infection is higher with exposure to blood especially in advanced disease; prolonged exposure of even non-intact skin/ mucous membrane to blood or other infectious fluid; cut with a contaminated device drawing blood and injury with a hollow-bore, blood-filled needle.

The Primary Steps of Self-protection

Prevention of exposure in a workplace setting needs to be inculcated into every health care provider right from the time of recruitment. A few primary preventive aspects are washing hands thoroughly before and after patient care, after removing gloves for which commercially available antiseptic hand-gels can also be used; use of Personal Protective Equipment (PPE) such as gloves, gowns, boots, shoe-covers, eye-wear and masks as appropriate; wearing gloves whenever a blood vessel is being accessed through the skin route; exercise planning, meticulous care and proper disposal of all sharps in a puncture-proof container with 1% sodium hypochlorite solution. Do not try to recap needles. In case of an accidental spill of blood or body fluid, cover the spill with disinfectant (1% sodium hypochlorite), allow contact period of 30 minutes and then mop up the spill with gloved hands using absorbent material. Subsequently the mops and the gloves need to be discarded in 1% sodium hypochlorite and hands washed with soap and water.

All healthcare providers must be vaccinated against Hepatitis B (three doses) and the antibody levels checked after a month of completion of three doses (anti HBs). The protective antibody level is 10 IU/L or more [2].

Steps in the Event of Accidental Exposure

First Aid

Use soap and water to wash areas exposed. Do not scrub or suck on the wound. Encourage free bleeding. In exposure to mucous membrane (mouth, nose, eyes), flush exposed surface with plenty of water. There is no need of local antiseptic cream or disinfectant.

Reporting and Documentation

The exposed HCW should be aware of standard instructions for access to urgent advice about occupational exposure. Reporting is usually to the Authorised Medical Attendant (AMA) who will record the circumstances and details of injury, order baseline investigations of HCW and source and carry out counseling. He then starts post-exposure prophylaxis (PEP) in consultation with the physician. Details are endorsed in a separate register and also in the individual's Confidential Medical Record. An injury report is initiated

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thereafter. Details of baseline and follow-up tests also need to be endorsed in the laboratory. Copies of the completed format have to be dispatched as per laid down instructions on the subject (for the Armed Forces) or/ and as per the National Guidelines on the subject [3]. The following information should be documented; date, time and details of exposure; type and amount of biological material, severity of exposure and details about the exposure source.

In addition the following details about the exposed HCW should be made available: Hepatitis B vaccination status; if vaccinated against HBV, antibody status; other medical conditions/current medications if any and if a lady, pregnancy / breastfeeding status.

Evaluation of the Exposure

The HCW must be evaluated for potential to acquire HIV based on the type of biological material involved, route of injury and severity of exposure as shown in Fig.1 [2,3]. Susceptibility to Hepatitis B will be determined by vaccination status against HBV and antibody response. The baseline status of the HCW in terms of HBsAg, anti HCV and anti HIV should be carried out within 72 hours of injury [1,2,11].

Evaluating the Source of Exposure

The source status is determined by the algorithm as shown in Fig.2 [3] and baseline investigations asked for.

When source is HBsAg positive then HBe Ag is required, if anti HCV positive then HCV viral load and HCV genotyping are required . If HIV antibody positive then, absolute lymphocyte count/CD4 count, HIV-1 load, history of antiretroviral therapy (ART) and clinical stage of disease is to be assessed. In individuals where outcome of therapy is poor, drug resistance should be looked for, if feasible.

At times the source individual may not be available for testing or may refuse to be tested. In such circumstances, details of medical diagnosis, clinical symptoms and history of high risk behavior will determine administration of PEP to the exposed HCW.

When source is unknown a measured approach is taken considering the likelihood of high-risk exposure. Testing of discarded needles etc. should not be undertaken as these can give rise to inconclusive and unreliable answers [1]. The guidelines for HIV PEP [1,3,11] depend on the extent of exposure and the status of source (Table 1).

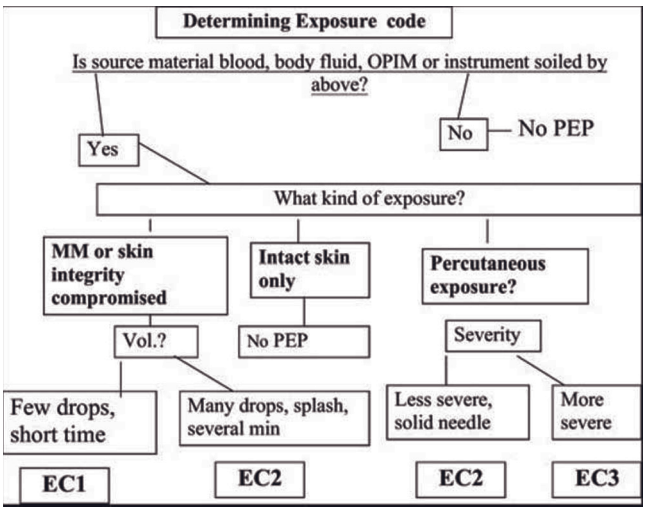

Fig 1 : Algorithm to determine exposure code (EC) of an injury (Source: NACO guidelines). Legend: OPIM-Other potentially infectious material. PEP-Post exposure prophylaxis. MM- mucous membrane. Vol-volume.

Specific Management by Post Exposure Prophylaxis

It is recommended that for optimal efficacy, PEP for HIV and HBV should be commenced as soon as possible after the incident and ideally within the next one to two hours [1,2]. It is appropriate that the exposed worker be offered initial dose pending more discussions and risk assessment. For HBV it will depend on the status of source and vaccination status of the HCW.

HBV exposure: PEP for HBV should be instituted immediately, preferably within 24 hours but definitely

Table 1

Recommendation of post exposure prophylaxis (PEP) regimens based on exposure and status of source* (Source : NACO guidelines)

a) If EC1 and SC1	PEP may not be required
b) If EC1 and SC2 or EC2 and SC1	Basic regimen required
c) If EC2 and SC2	Expanded regimen warranted
d) If EC3 and SC 1 or 2	Expanded regimen warranted
e) If both EC and SC are not known,or if EC2 or EC3 in the absence of SC	Basic regimen required

* For constituent drugs of Basic and Expanded regimens see Table 3

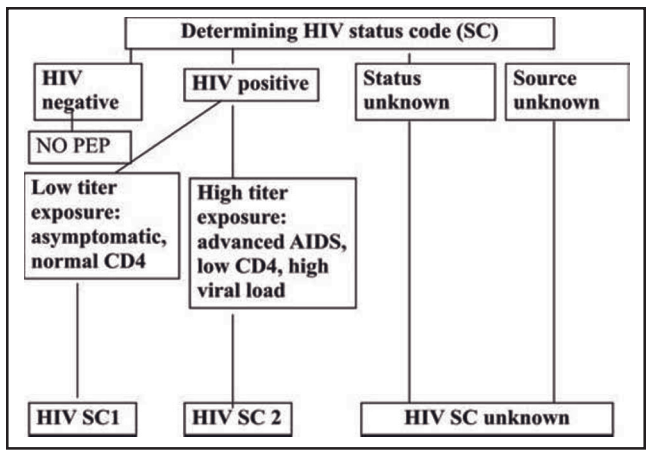

Fig 2 : Algorithm to show determination of status code (SC) of source (Source: NACO guidelines)

Table 2

Recommended post exposure prophylaxis for exposure to HBV [1,2]

Vaccination status of exposed HCW	Antibody response status		
	Source HBsAg positive	Source HBsAg negative	Source unknown or not available for testing
Unvaccinated	HBIG* x 1dose and initiate HBV vaccine series+	Initiate HBV vaccine series	Initiate HBV vaccine series
Previously vaccinated			
Known responder	No treatment	No treatment	No treatment
Known non-responder	HBIG x 1 dose and initiate revaccination OR HBIG x 2 doses#	No treatment	Consider revaccination If known high-risk source, treat as if HBsAg positive
Antibody response Unknown	Test exposed HCW for anti HBs. If adequate**, no treatment necessary.If inadequate, administer HBIG x 1 and vaccine booster. Consider testing HCW for HBsAg	No treatment	Test exposed HCW for anti HBs.If adequate, no treatment required.If inadequate, administer vaccine booster & recheck titer in 1-2 months

*Dose of Hepatitis B immunoglobulin (HBIG) is 1000-2000 IU intramuscularly for adults. Available as 0.5 ml ampoule of 1000 IU and 1 ml vial of 2000 IU. Children: 32-48 IU/Kg body wt.

+ Hepatitis B vaccine is to be given intramuscularly in deltoid region. A 1.0 ml dose contains 20 mcg of HBsAg protein. A dose of 20 mcg of antigen protein is recommended for adults and children 10 years and older. Three doses must be given 1st dose on elected date, 2nd dose 1 month later and 3rd dose at 6 months from first dose. For more rapid immunization, the 3rd dose may be given 2 months after the initial dose with a booster at 12 months.

The option of giving one dose of HBIG and reinitiating the vaccine series is preferred for non-responders who have not completed a second 3-dose vaccine series. For persons who previously completed a second vaccine series but failed to respond, two doses of HBIG are preferred.

**A responder has adequate (10 IU/L) levels of anti HBs antibody

A non responder has anti HBs antibody levels of less than 10IU/L

within 7 days [2,3] following guidelines as in Table 2.

HCV exposure: At this time there are no recommendations of PEP for HCV [2]. Immunoglobulin and ribavirin are ineffective. For the source, baseline testing for anti HCV antibodies is warranted. For the exposed HCW, carry out baseline anti HCV and ALT. Efforts should be made to determine the genotype of source HCV for management.

HIV exposure: PEP for exposure to HIV should be started preferably within the next one hour. If delay is more than 36 hours, expert consultation is advised. PEP, when started, should continue for 28 days. Typical schedules are basic two drug regimen appropriate for low risk exposures and expanded three drug regimen for exposures with increased risk of transmission. If source case is found to be negative for anti HIV and does not belong to the "high-risk" category, PEP is discontinued. When PEP is initiated, baseline serum creatinine, liver function tests with enzymes and complete blood counts must be done. Various regimens of basic and expanded drugs are as shown in Table 3 [1]. Starter packs of the recommended drugs for exposure to HIV and HBV (HBV vaccine, HBIG) should be available in well-advertised places such as casualty, designated ward/department and medical stores. Each pack can have doses to cover three days that will take care of weekends or holidays.

Follow-up of HCW

Hepatitis exposed HCW should be tested for HBsAg at six weeks, three months and six months. If vaccinated, test for anti HBs antibodies, two months after last dose of vaccine. However, anti HBs cannot be undertaken if HBIG has been given within the last 6-8 weeks. The HCW is advised to use barrier precautions (condom) and refrain from donating blood/plasma/organs/tissue or semen during the follow-up period.

HCV-exposed HCW should be tested for anti HCV and ALT at 4-6 weeks and at least 4-6 months post exposure; confirm repeatedly positive anti HCV ELISA results with supplemental tests (Recombinant Immunoblot Assay RIBA or HCV RNA). Test for HCV RNA, where facilities exist, may be done at four weeks for an earlier diagnosis. HCV seroconversion occurs silently, hence tests should be carried out periodically. Genotyping is helpful in planning therapy should seroconversion occur. Genotype 2 and 3 are more likely to respond to therapy with pegylated interferon along with ribavirin as compared to genotype 1 [2].

HIV exposed HCW should have repeat HIV antibody testing at six weeks, three and six months post-exposure. Symptoms of acute retroviral syndrome must be borne in mind. Extended follow-up of 12 months is recommended for a HCW exposed to HIV-HCV co-infected source. Complete blood counts, serum creatinine, LFT including enzymes should be repeated two weekly. Those receiving a protease inhibitor, should have blood sugar levels monitored. If patient is on indinavir (IDV) or tenofovir (TDF), then urine analysis

Table 3

Recommended HIV post-exposure regimens [1,2]

	Preferred	Alternatives	Not recommended
Basic two drug regimen	Zidovudine (AZT) 300 mg twice daily + Lamivudine (3TC) 150 mg twice daily or Emtricitabine (FTC) 200 mg once daily*	Stavudine (d4T) + Lamivudine (3TC) or Emtricitabine (FTC)	Nevirapine (NVP) Delavirdine (DLV) Abacavir (ABC) Zalcitabine (ddC) Didanosine (DDI) Stavudine (d4T)
	Tenofovir (TDF) 300 mg once daily +Lamivudine (3TC) 300 mg once daily or Emtricitabine (FTC) 200 mg once daily**	Didanosine (ddI) + Lamivudine (3TC) or Emtricitabine (FTC)	
Expanded regimens (three drugs)	Basic regimen +Lopinavir-ritonavir (LPV/r) 400/100 mg twice daily	Basic + Atazanavir-ritonavir (ATV/r) Basic + Fosamprenavir-ritonavir (FPV/r) Basic + Indinavir-ritonavir (IDV/r) Basic + Saquinavir/ritonavir (SQV/r) Basic + Efavirenz (EFV)	

*Less well tolerated than Tenofovir- containing regimen; available as Combivir (ZDV +3 TC) one tablet twice daily. ** Better tolerated.

should be included.The HCW is advised to use barrier precautions (condom) and refrain from donating blood/ plasma/organs/tissue or semen during the follow-up period.

Special Considerations

In delayed exposure report (> 24-36 hours post exposure), the time period after which PEP is not beneficial is not clearly defined. Therefore start PEP if indicated [1,2]. In cases of unknown source (e.g. injury while handling waste), the need for PEP is decided on a case to case basis. The severity of injury and likelihood of infected material have to be considered [1,2]. Known or suspected pregnancy in exposed individual does not preclude the use of optimal PEP regimens. However, there are recommendations against use of efavirenz (EFV) as well as a combination of didanosine (ddI) and stavudine (d4T). One should access latest information if there is a need to change regimen [1].

Adverse Reactions of PEP Regimen

Adverse symptoms with PEP for HIV are in the form of nausea, vomiting, diarrhea and fatigue. These symptoms can be alleviated with proper counseling to take the drugs after meals, adding antiemetic, antimotility drugs and analgesics. When symptoms are troublesome, changing the schedule to lower doses at frequent intervals may help [9]. Drug-interactions must also be borne in mind [10].

Conflicts of Interest

None identified

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