Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis
Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV)

- Bloodborne viruses
- Can produce chronic infection
- Transmissible in healthcare settings
Preventing Transmission of Bloodborne Viruses in Healthcare Settings

• Promote hepatitis B vaccination
• Treat all patients as potentially infectious
• Use barriers to prevent blood/body fluid contact
• Prevent percutaneous injuries
Preventing Percutaneous Injuries

- Eliminating unnecessary needle use
- Using devices with safety features
- Developing safe work practices for handling needles and other sharp devices
- Safely disposing of sharps and blood-contaminated materials
Factors Influencing Occupational Risk of Bloodborne Virus Infection

• Prevalence of infection among patients
• Type of exposure and type of virus
• Nature and frequency of blood exposures
Prevalence of Bloodborne Virus Infection in Patients

• Generally higher in hospitalized patients than general population

• Varies with geographic area

• Varies with patient risk factors (injecting drug use, multiple sex partners)
Risk of HBV, HCV and HIV Transmission after Occupational Percutaneous Exposure

- HBV risk varies depending on e-antigen status of source person
  - If e-antigen positive, risk is up to 30%
  - If e-antigen negative, risk is 1-6%

- HCV risk is 1.8% (range of 0 - 7%)

- HIV risk is 0.3% (range of 0.2 - 0.5%)
Frequency of Percutaneous Injury in US Healthcare Personnel

- 384,325 annually (about 1000 per day) percutaneous injuries are sustained by healthcare personnel in US hospitals*
- The number of injuries sustained outside of hospital settings is unknown
- Frequency of percutaneous injury varies by occupation and healthcare setting

* Panlilio, AL, et. al. Estimate of the Annual Number of Percutaneous Injuries in U.S. Healthcare Workers. 4th Decennial Conference, March 5-9, 2000
Exposure Types for Blood/Body Fluid Exposures* June 1995-December 2000
(n=12,678)

- Percutaneous: 10,378 (82%)
- Mucous membrane: 1817 (14%)
- Non-intact skin: 352 (3%)
- Bite: 131 (1%)

* Exposure*
Device Types for Percutaneous Injuries
June 1995-December 2000
(n=10,378)

- Hollow-bore needle (60%)
- Solid sharp (32%)
- Suture needle (17%)
- Scalpel (7%)
- Other (8%)
- Glass (2%)
- Other/unknown (6%)
Postexposure Management

• Clear policies/procedures
  – Confidentiality of exposed and source persons
  – Management of exposures
  – Posted in visible place
• Training of healthcare personnel
• Rapid access to
  – clinical care
  – postexposure prophylaxis (PEP)
  – testing of source patients/exposed persons
• Injury prevention assessment
Elements of Postexposure Management

- Wound management
- Exposure reporting
- Assessment of infection risk
  - type and severity of exposure
  - bloodborne infection status of source person
- Appropriate treatment, follow-up, and counseling
Postexposure Management: Wound Care

- Clean wounds with soap and water
- Flush mucous membranes with water
- No evidence of benefit for:
  - application of antiseptics or disinfectants
  - squeezing ("milking") puncture sites
- Avoid use of bleach and other agents
Postexposure Management: The Exposure Report

- Date and time of exposure
- Procedure details…what, where, how, with what device
- Exposure details…route, body substance involved, volume/duration of contact
- Information about source person and exposed person
Postexposure Management: Assessment of Infection Risk

- Type of exposure
  - percutaneous
  - mucous membrane
  - non-intact skin
  - bites resulting in blood exposure

- Body substance
  - blood
  - bloody fluid
  - Semen, vaginal secretions, CSF, pleural, peritoneal, pericardial, amniotic
Postexposure Management: Assessment of Infection Risk

- Source person
  - presence of HBsAg
  - presence of HCV antibody
  - presence of HIV antibody
Postexposure Management: Unknown or Untestable Source

- Consider information about exposure
  - where and under what circumstances
  - prevalence of HBV, HCV, or HIV in the population group

- Testing of needles and other sharp instruments NOT RECOMMENDED
  - unknown reliability and interpretation of findings
  - hazard of handling sharp instrument
Postexposure Management: Evaluating the Source

- Informed consent should be obtained in accordance with state and local laws

- Confidentiality of the source person
Occupational HBV Exposures
Concentration of HBV in Body Fluids

High
Blood
Serum
Wound exudates

Moderate
Semen
Vaginal Fluid
Saliva

Low/Not Detectable
Urine
Feces
Sweat
Tears
Breast Milk
Elements of Postexposure Management: HBV

• Baseline evaluation and testing of exposed person with unknown HBV immune status
• Consideration of treatment
  – when to give
  – what to give
• Follow-up testing and counseling
Postexposure Management: Baseline HBV Testing of Exposed* Person

- Test for anti-HBs if person has been vaccinated, but vaccine response is unknown
- Baseline testing not necessary if vaccine response is known
- If exposed person has been vaccinated and is a known responder to the vaccine, no PEP is necessary
Recommended Postexposure Management: PEP for Exposure to HBV

**Unvaccinated**
- HBIG x 1 and initiate hepatitis B vaccine series

**Previously vaccinated**
- Test exposed person for anti-HBs
  1. If adequate, no treatment
  2. If inadequate, HBIG x 1 and vaccine booster
Side Effects of Hepatitis B Vaccine

• Pain at injection site
• Mild to moderate fever
• Anaphylaxis in an estimated 1 in 600,000 doses given
• No serious adverse events detected through surveillance
• No risk of adverse effects to fetus
## Efficacy of HBV PEP*

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Prevention of HBV Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple doses of HBIG alone when 1st dose initiated within 1 week</td>
<td>70-75%</td>
</tr>
<tr>
<td>Hepatitis B vaccine series alone</td>
<td>70-75%</td>
</tr>
<tr>
<td>Combination of HBIG and vaccine series</td>
<td>85-95%</td>
</tr>
</tbody>
</table>
Hepatitis B Vaccine: Long-Term Efficacy

- Anti-HBs titers decline to <10 mIU/mL in 30-50% of adults within 8-10 years after vaccination
- Exposure to HBV results in anamnestic anti-HBs response that prevents clinically significant HBV infection
- Immune memory remains intact for at least 20 years after immunization
- Chronic HBV infection rarely documented among vaccine responders
- **Booster doses currently not recommended**
Postexposure Management: Follow-up HBV Testing of Exposed Person

• Perform follow-up anti-HBs testing in healthcare personnel who receive hepatitis B vaccine
  – test for anti-HBs 1-2 months after last dose
  – anti-HBs response to vaccine cannot be ascertained if HBIG received in the previous 3-4 months
Postexposure Management: HBV Postexposure Counseling

• Refrain from donating blood, plasma, organs, tissue, or semen.

• No need for:
  – modification of sexual practices or refraining from becoming pregnant or breastfeeding
  – modification to patient care responsibilities for exposed person

• If acute HBV infection, evaluate according to published recommendations
Occupational HCV Exposures
Occupational Transmission of HCV

• Inefficiently transmitted by occupational exposures

• Average incidence 1.8% (range 0-7%) following percutaneous exposure from HCV-positive source

• Case reports of transmission from blood splash to mucous membrane

• Prevalence 1-2% among healthcare personnel
  – Lower than among adults in the general population
  – 10 times lower than for HBV infection
Elements of Postexposure Management: HCV

- Baseline evaluation and testing
- Follow-up testing and counseling
- PEP Not recommended after exposure
  - immunoglobulin not effective
  - no data on use of antivirals (e.g., interferon), and may be effective only with established infection
  - antivirals not FDA approved for this setting
Postexposure Management: Baseline HCV Testing of Exposed Person

- If HCV-positive source, test exposed person for anti-HCV and ALT
- If source not infected, baseline testing not necessary
Postexposure Management: HCV Postexposure Counseling

- Refrain from donating blood, plasma, organs, tissue, or semen.
- No need for:
  - modification of sexual practices or refraining from becoming pregnant
  - special precautions to prevent secondary transmission.
  - modification to patient care responsibilities for exposed person, even if HCV infected
Occupational HIV Exposures
## Occupations of US Healthcare Personnel with Documented/Possible Occupational AIDS/HIV Infection

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Documented</th>
<th>Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>24</td>
<td>34</td>
</tr>
<tr>
<td>Laboratory technician, clinical</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Physician, nonsurgical</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Health aide/attendant</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Housekeeper/maintenance worker</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Emergency medical technician/paramedic</td>
<td>----</td>
<td>12</td>
</tr>
<tr>
<td>Dental worker, including dentist</td>
<td>----</td>
<td>6</td>
</tr>
<tr>
<td>Laboratory technician, nonclinical</td>
<td>3</td>
<td>----</td>
</tr>
<tr>
<td>Physician, surgical</td>
<td>----</td>
<td>6</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Embalmer/morgue technician</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Technician, dialysis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Technician, surgical</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Technician/therapist, other than above</td>
<td>----</td>
<td>9</td>
</tr>
<tr>
<td>Other healthcare occupations</td>
<td>----</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>57</strong></td>
<td><strong>137</strong></td>
</tr>
</tbody>
</table>
Details of the 57 Exposures Resulting in Occupational HIV Transmission

- Percutaneous: 48
- Mucous membrane: 5
- Both: 2
- Unknown: 2

Unknown: 2
Both: 2
Mucous membrane: 5
Average Risk of HIV Infection to Healthcare Personnel by Exposure Route

- Percutaneous: 0.3%
- Mucous membrane: 0.09%
- Non-intact skin: <0.1%
Risk Factors for HIV Transmission After Percutaneous Exposure to HIV-Infected Blood:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Adjusted Odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep injury</td>
<td>15 (6.0-41)</td>
</tr>
<tr>
<td>Visible blood on device</td>
<td>6.2 (2.2-21)</td>
</tr>
<tr>
<td>Procedure involving needle</td>
<td>4.3 (1.7-12)</td>
</tr>
<tr>
<td>placed in artery or vein</td>
<td></td>
</tr>
<tr>
<td>Terminal illness in source patient</td>
<td>5.6 (2.0-16)</td>
</tr>
<tr>
<td>Postexposure use of zidovudine</td>
<td>0.19 (0.06-0.52)</td>
</tr>
</tbody>
</table>
Post Exposure Prophylaxis Issues
Animal Studies of PEP Efficacy

• Data have been difficult to interpret and extrapolate to humans, but provide encouraging evidence of the effectiveness of PEP

• Reduced PEP effectiveness if:
  – Large dose of inocula
  – Delay in time to PEP
  – Shortened duration of PEP
  – Decreased dose of PEP
Human Studies of HIV PEP Efficacy

• Little information on efficacy of PEP in humans
• Seroconversion infrequent following occupational exposure to HIV-infected blood
• Study of converters vs nonconverters showed use of zidovudine (ZDV) was associated with an 81% decrease in the risk for HIV infection
  – limitations include a small number of cases, and that cases and controls came from different cohorts (Cardo et al, NEJM 1997;337:1485-90.)
Human Studies of HIV PEP: Prevention of Perinatal Transmission

• ZDV administered during pregnancy, labor, and delivery reduced transmission by 67%
• Protective effect only partially explained by reduction in maternal viral load
• Protective effect observed when ZDV given only to newborn within the first 48-72 hours of life
Elements of Postexposure Management: HIV

- Baseline evaluation and testing of exposed person
- Consideration of treatment
  - when to give
  - what to give
  - pregnancy in exposed
- Follow-up testing and counseling
Postexposure Management: Baseline HIV Testing of Exposed Person

- EIA standard test
- Direct virus assays not recommended
  - p24 antigen
  - PCR for HIV RNA
Initiation of HIV PEP

• Regard as an urgent medical concern
  – If indicated, start PEP as soon as possible after exposure (hours rather than days)

• Interval after which PEP is no longer likely to be effective in humans is unknown
  – Initiating PEP even days or weeks after an exposure should be considered
Re-evaluation of HIV-Exposed Person

Consider re-evaluation of the exposed person within 72 hours

- additional information about the source person may become available
- if the source person has a negative HIV antibody test, stop PEP
Important Concepts about HIV PEP

- Determining which and how many agents to use for PEP
  - Professional judgement should be used based on local knowledge and experience in treating HIV
  - Regimens should be tolerable to the exposed person
Considerations When Using PEP

- Risk of Transmission
- Risk of Adverse Effects
Situations Where PEP is Rarely, if Ever, Warranted

- Intact skin contact with blood and potentially infectious body fluids
- Exposure to unknown source in populations where HIV prevalence is low
- Low-risk exposure to unknown source
Situations for Which Expert Consultation for HIV PEP is Advised

• Resistance of the source virus to antiretroviral agents
• Known or suspected pregnancy in the exposed person
• Toxicity of the initial PEP regimen
HIV PEP Considerations in Pregnant Exposed Women

• **General principles**
  – pregnancy is not a contraindication for PEP
  – exposed person should make informed decision about PEP

• **Choosing regimen is more complex**
  – may exacerbate physiologic changes in pregnancy
  – short/long-term effects on fetus/newborn unknown
  – most data are on zidovudine
  – some drugs contraindicated during pregnancy
Postexposure Management: Follow-up HIV Testing of Exposed Person

• If source HIV positive, test at 6 weeks, 3 months, 6 months
  – EIA standard test
  – direct virus assays not recommended

• Extending follow-up to 12 months
  – recommended for HCP who become infected with HCV following exposure to co-infected source
  – optional in other situations
Postexposure Management: HIV Postexposure Counseling

- Side effects of PEP drugs
- Signs and symptoms of acute HIV infection
  - fever
  - rash
  - flu-like illness
- Prevention of secondary transmission
  - sexual abstinence or condom use
  - no blood/tissue donation
- Transmission and PEP drug risks if breastfeeding

*No work restriction indicated*
Recommendations for Healthcare Facilities

- Establish a bloodborne pathogen management policy
- Implement management policies (e.g., training, hepatitis B vaccination, exposure reporting, PEP access, etc.)
- Establish laboratory capacity for bloodborne virus testing
- Select and use appropriate PEP regimens
Recommendations for Healthcare Facilities (cont.)

- Provide access to counseling for exposed personnel
- Monitor adverse events and seroconversion
- Monitor exposure management programs (e.g., time between exposure and evaluation, testing of source persons, completion of follow-up)
Conclusion

• Occupational exposure management is complex

• Prevention is best
  – hepatitis B immunization
  – avoiding occupational blood exposures
Sources of Additional Information

- Division of Healthcare Quality Promotion
  Phone: 800-893-0485
  Homepage: http://www.cdc.gov/ncidod/hip/

- Hepatitis Hotline
  Phone: 888-443-7232
  Homepage: http://www.cdc.gov/hepatitis

- Needlestick!
  Homepage: http://www.needlestick.mednet.ucla.edu
Sources of Additional Information

• National Institute for Occupational Safety and Health bloodborne pathogens website
  http://www.cdc.gov/niosh/bbppg.html

• Occupational Safety and Health Administration bloodborne pathogens website