Why Discuss Bloodborne Pathogens with Needlestick Injuries (NSI)?

**NSI Surveillance**

- Hepatitis B Surveillance
- Hepatitis C Surveillance
- HIV Surveillance

Epidemiology of HBV

- 3,050 acute clinical cases reported 2013
- # reported cases of acute hepatitis B ↓ 62% (from 8,036 in 2000)
- Estimated # new cases 2013-19,764
- Overall incidence rate 2013-1.0 cases/100,000

Morbidity & Mortality of HBV

- ↑ to 1.4 million chronic infected in U.S.
- ~ annual number of U.S. deaths: 2-4,000
- Risk for premature death from cirrhosis or hepatocellular carcinoma 15-25%
- Signs & symptoms vary by age
- Highest rates in men age 25-44 in 2013
- Disease ↑ severe in those >60 years
- 82% ↓ new infections since 1991

Transmission of HBV

- Sexual (hetero-, MSM)
- Parenteral (injection drug use, needlestick injury)
- Perinatal (mother to infant)
- Other (open sore contact, sharing razors/toothbrushes)
HBV Treatment

- Adefovir dipivoxil (Hepsera)
- Interferon α-2b (Intron A)
- Pegylated interferon (Pegasys)
- Lamivudine (Epivir-HBV)
- Entecavir (Baraclude)
- Telbivudine (Tyzeka)
- Tenofovir (Viread)

**FDA Licensed HBV Treatments**

Source: [http://www.fda.gov/forpatients/illness/hepatitisbc/ucm408658.htm](http://www.fda.gov/forpatients/illness/hepatitisbc/ucm408658.htm)

HBV Transmission to Patients

- >350 patients infected with hepatitis B following procedures by HBV-infected HCWs
- Examples of procedures: dental and surgeries
- 1990-2009, 18 HBV infection outbreaks associated with improper use of blood glucose monitoring equipment


HBV Seroconversion Risk Post NSI

- 6-30% if source patient HBsAg + & HCW NOT vaccinated
- Risk ↑ if source individual is hepatitis B e antigen +, a marker of ↑ infectivity
- Vaccine available pre- & post-exposure
- HBIG also available post-exposure
- Effectiveness: 75% with HBIG; 85-95% with HBVac post-exposure
- Highly preventable

Epidemiology of HCV

- 3.2 million with chronic infection in U.S.
- In 2013, estimated:
  - # of reported acute cases: 2,138
  - estimated # new cases: 29,718
  - 151.5%↑ in cases from 2010-2013

Morbidity & Mortality of HCV

- 70-80% have no signs or symptoms
- 75-85% develop chronic infection
- 60-70% evidence of active liver disease
- 1-5% mortality
- 5-20% will develop cirrhosis in 20-30 yrs.
- #1 indication for liver transplant in U.S.
- Can go decades from chronic infection to liver disease

Source: [http://www.cdc.gov/hepatitis/HCV/HCVfaq.htm](http://www.cdc.gov/hepatitis/HCV/HCVfaq.htm)

Transmission of HCV

- Injection drug use *(most common)*
- Receipt of donated blood, blood products, organs before 1992
- NSI in healthcare settings
- Vertical (mother to infant)
- Less frequently *(inefficient)* by:
  - Sex *(see next slide)*
  - Sharing personal blood-contaminated items
  - Other invasive procedures (e.g., injections)

HCV Sexual Transmission

- *Controversial role of sexual activity*
- 15-20% with acute HCV have sexual exposure w/o other risk factors
- 1.5% average prevalence of HCV in studies of long-term spouses of HCV+
- ↑ reports HCV infection among MSM w/o hx. of IDU no ↑ than heterosexuals
- Overall, HCV sexual transmission possible but inefficient
Transmission From Health Care Procedures

- Recognized primarily in context of outbreaks
  - Chronic hemodialysis
  - Hospital inpatient setting
  - Private practice setting
  - Home therapy
- Unsafe injection practices
  - Reuse of syringes & needles
  - Contaminated multi-dose medication vials

HCV Treatment

- 6 known genotypes; 50 subtypes of HCV (type 1 most common in U.S.)
- Treatment:
  - Pegylated interferon & ribavirin
  - Addition of 2 protease inhibitors for Genotype 1
  - 2 new anti-virals added in 2013

What about Other Blood Exposures?

- Risk of mucous membrane exposure low but reported
- One case of HCV & one of HCV & HIV transmission via splash to conjunctiva
- To date, no transmission to HCW through intact or non-intact skin exposure documented
- One probable HCV & HIV case from nursing home patient to HCW thru non-intact skin

Seroconversion Risk Post NSI

- Range 0-10% (22.2% in one report)
- Average 1.8%
- 1 study indicated transmission only from hollow-bore needles
- No current post-exposure prophylaxis
- No vaccine
- May be benefit for treating early acute infection

HCV Risk Reduction & Testing

- Screening & testing blood donors
- Inactivating HCV in plasma-derived products
- Testing at risk persons & providing risk-reduction counseling
- Consistent implementation & practicing of infection control in healthcare settings
- Most recent testing recommendations (see transcript)
HIV Transmission

Evidence of spread:
- Sexual contact (MSM, hetero)
- IDU
- Perinatal
- Sharps exposure
- Blood products/transfusion
- Rare- see examples

No evidence of spread:
- Shaking hands/hug/casual kissing
- Smoking
- Pets
- Insects
- Saliva/spitting
- Scratching

Source: http://www.cdc.gov/hepatitis/HCV/HCVfaq.htm#d

Diagnoses of HIV Infection among Adults and Adolescents, by Transmission Category, 2013—United States and 6 Dependent Areas
N = 47,958

Other Countries
- France 1992: orthopedic surgeon transmitted HIV to patient during surgery; testing of 982 other patients: (-)
- France 1996: nurse transmitted HIV to patient; transmission mechanism?
- Spain 2004: patient infected by surgeon during C-section; no others infected

Source: http://www.aidsmap.com/Four-cases-of-transmission/page/1324553

Other Healthcare occupation (0; 6)

Occupational Transmission*

- To date, 58 confirmed & 150 possibly occupationally acquired
- 1 confirmed case since 1999
- No new documented cases since 1999
- Data from CDC voluntary

* = through 12/2013

See Required Reading #2

Diagnoses of HIV Infection among Adults and Adolescents, by Transmission Category, 2013—United States and 6 Dependent Areas
N = 47,958

Occupations Acquiring HIV/AIDS
- Nurses (24; 37)
- Clinical lab (16; 21)
- Physicians, non-surgical (6; 13)
- Lab tech, non-clinical (4; 0)
- Housekeeper/maintenance worker (2; 14)
- Technician, surgical (2; 2)
- Embalmer/morgue tech (1; 2)
- Hospice caregiver/attendant (1; 16)
- Respiratory therapist (1; 2)
- Technician, dialysis (1; 3)
- Dental worker including dentist (0; 6)
- EMT/paramedic (0; 12)
- Physician, surgical (0; 6)
- Other/technician, therapist (0; 9)
- Other healthcare occupation (0; 6)
HIV Seroconversion Risks

- From NSI: 0.3% (1 in 300)
- From blood to mucous membrane (mouth, eyes, nose): 0.09 - 0.1% (1 in 1,000)
- From blood exposure to skin: <0.1%
- CDC website has 0.23% for NSI risk as of June 2015 (see transcript)

Risk Factors for Seroconversion

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Odds Ratio*</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep injury</td>
<td>15</td>
<td>6.0 – 41</td>
</tr>
<tr>
<td>Visibly bloody device</td>
<td>6.2</td>
<td>2.2 – 21</td>
</tr>
<tr>
<td>Device in artery/vein</td>
<td>4.3</td>
<td>1.7 – 12</td>
</tr>
<tr>
<td>Terminally ill SP</td>
<td>5.6</td>
<td>2.0 – 16</td>
</tr>
<tr>
<td>AZT PEP</td>
<td>0.19</td>
<td>0.06 – 0.52</td>
</tr>
</tbody>
</table>

*p<0.01 for all

Cardo DM et al. NEJM 1997;337:1485-90

Summary

- Epidemiology of HBV, HCV, HIV
- Surveillance & relevance to healthcare workers
- Seroconversion risks post-exposure

Other Likely Risk Factors

- viral load
- glove use
  - 50% decrease in volume of blood transmitted\(^1\)
- hollow bore vs solid bore
  - large diameter needles weakly associated with increased risk (p = 0.08)\(^2\)
- drying conditions
  - tenfold drop in infectivity every 9 hours\(^3\)