Evaluation, Treatment and Prevention of Blood and Bodily Fluid Exposures

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Association of Occupational Health Professionals in Healthcare is an accredited provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation.
Learning Objectives

- To learn about the incidence of needle stick injuries
- To understand techniques to reduce needle stick injuries
- To become proficient in safe suturing techniques
- To review one institution’s struggle with reducing the incidence of needlesticks
Needlesticks

- Viruses
  - Hemorrhagic fever
  - Chikungunya
  - Dengue
  - Hepatitis B, C, D, G
  - Herpes simplex 1
  - HIV
  - Marburg
  - Varicella
  - Zika

- Prion Diseases
  - Variant Creutzfeldt-Jakob Disease (vCJD)

- Bacteria
  - Corynebacterium
  - Mycobacterium
  - Rickettsia
  - Staph
  - Step

- Fungal and Parasite
  - Blastomyces
  - Cryptococcus
  - Leishmania
  - Plasmodium
  - Trypanosoma
Non Intact Skin and Mucous Membranes

- Viral Hemorrhagic fever
- Ebola
- Hepatitis B, C
- Herpes Simplex 1
- Lassa hemorrhagic fever
- Marburg
- Yellow fever
Job Categories
University of Virginia, 2011 data.

Suture Needles

- Nurses
- Residents
- MD
- Surgeon
- Techologist
- Medical student
Location of Worker

University of Virginia, 2011 data.

![Graph showing location of worker in various rooms: Operating room, Patient rooms, Procedure room, Intensive care, ED.](image)
Risk by Device

- Syringes
- Suture needle
- Scaples
Incidence

International Healthcare Workers Safety Center, U Va Health System

- 384,000 percutaneous injuries per year
- 54,000 suture needle injuries per year or 14% of the total
- Suture needles represent 51% of all sharps injuries in the OR followed by scalpels at 12%
- Cost of $3,000 per injury without infection
- Potential cost of $258 million per year

- 4% of the cases of percutaneous injuries or other blood exposures were reported
Incidence


- 3,303 HCW needlestick injuries
- Highest claims in the hospital 159
  - Dental office 105
  - Physicians’ office 87
  - Skilled nursing facilities 81
- Suturing most common 16.7%
  - Injection 12.7%
  - Drawing blood 10%
Underreporting by MDs

- Survey of Swiss University Hospital Employees
  - 42.7% MD under reporting
  - Account for 58.6% of underreporting
- Reasons for non reporting
  - Transmission risk low 87.1%
  - Perceived lack of time 34.3%
Causes of Suture Needlesticks


- Load or position the needle into the needle holder
- Pass the needle hand to hand between team members
- Sew toward another physician
- Tie the suture with the needle in place
- Leave the needle on the field
- Place the needle in over-filled contaminated needle box
- Place the needle in poorly located needle box
Suture Safety in the Operating Room

- Most of the materials to prevent needlestick are focused on the surgery suite.
  - Hands free technique where no two surgical personnel touch the same sharp object simultaneously
    - Reduced needlesticks 59%
  - The blunt suture needles are designed for closure of fascia and muscle.
    - Most suturing outside of the operating room is for skin rather than soft tissue.
- Healthcare providers education
Location of Glove Perforations

- 14% unrecognized glove perforation
- Locations
  - Index finger 47%
  - Thumb 14%
  - Palm 14%
- Non-dominant hand
- Consider glove reinforcement at selected locations
Gloves

- Anti-viral protection
  - Dilute hypochlorite solution between layers
  - G-vir – 81% reduction in transmission of virus
- Cut resistant gloves
  - Knitted outer gloves – 6% perforation rate
  - Chain link steel undergloves
  - Kevlar
  - Stainless steel and synthetic fibers
- Protective shields
- Cut resistant not puncture resistant
- Loss of sensitivity in handling instruments
Gloves

- Single glove 14% perforation rate
- Thick vinyl gloves
- Protective shields in selected areas
  - 74% found in one of 4 areas
  - Index finger 47%, thumb 14%, palm 14%
- Double gloving
  - 19% perforation of outer glove, 6% or inner glove
  - Reduces penetration by 70-78%
- Objections
  - Poor fit
  - Loss of tactile sensitivity
  - Increased cost
Study of Gloves


- Single glove versus no glove reduced blood volume by 52%
- Double glove offered no additional protection
- Virus inhibiting gloves reduced by 81%
- Critical factors
  - Needle diameter
  - Puncture depth
- Not critical
  - Puncture speed
  - Puncture angle
  - Glove stretching
Alternatives to Sutures

- Staples
- Tape skin closures
- Tissue adhesive
- Combination of tissue adhesive and skin tape
- Combination of sutures and tape for thin or poor skin
- Hair apposition technique
Alternatives

How do they compare

- Cochrane group found no difference between adhesives and sutures – dehiscence, infection, MD satisfaction, cosmetic results
- Cochrane group found no difference between adhesives and tapes – infection, cosmetic, patient or MD satisfaction
- Tensile strength sutures, staples, skin glue, skin adhesives
Blunt Needles

- Reduces needle injuries by 59%
- Used for fascia and muscle
- Not used on skin or SQ tissue
- Blunt tip geometry allows for soft tissue penetration
- “Universal adoption by surgeons”
- Less convenient to use and associated with less satisfaction
Staples

- **Advantages**
  - Fast wound closure
  - Little irritation or infection risk

- **Disadvantages**
  - Cannot be used on the face, neck, hands or feet
  - Need for removal
  - Questionable cosmetic results
  - Study comparing sutures to staples, staples had less procedure time and infection rate but more pain
Tape skin closures

- Nichi-strip, curi-strip and Steri-strips have the highest ranking

**Advantages**
- Good for superficial, well approximated wounds
- Does not need anesthesia or removal
- Provides added protection when sutures are remove

**Disadvantages**
- Limited to areas of tensile strength
- May need tincture of benzoin
- Higher rate of dehiscence
- Cannot get wet
- May come off easily
Tissue Adhesive

Advantages

- No need for anesthesia
- Easy to perform
- No need to have the material removed
- Forms a strong, flexible bond
- Inherent antibacterial properties
- Less time to apply
- Equivalent cosmetic, infection rate and dehiscence rate
- Alternative to suturing in episiotomy, nail bed repair, skin graft, wound sealant,
Tissue adhesive

Disadvantages

- Limited sites for use
- Low tensile strength
- Keep out of the eyes
- Not for areas of highly mobile, high usage and friction, exact alignment
Single Handed Needle Holder Loading


- Initially the needle is picked up by the needle driver
- Once through the skin the needle is pulled through the tissue with a tissue forceps
- The tissue forceps is used to position the needle on the needle driver
- Any manipulation of the needle is done by the forceps
- Once the procedure is complete, the needle is placed in the contaminated needle box
- The needle is never touched
Suture Safety Technique

- Load or reposition needle in needle holder with instrument not fingers
- Do not pass the needle hand to hand between team members
- Do not sew towards another person
- Do not tie the suture while holding the needle
- Do not leave the needle in the field when completed
- Do not leave the needle in overfilled contaminated box
Procedure trays

- Many procedures trays stock only straight needles
  - Central lines
  - Arterial lines
  - Chest tubes
- Straight needles used to secure line in place
- Straight needles have a high incidence of needlesticks
- Replace all trays with needle holders and curved needles
- Manufacturers unable or unwilling to convert all their stock to remove needles
- Move to staples or glue in all trays
OSHA Regulations

- Written report
- Standard precautions
- Eliminate or minimize worker exposure
- Provide protective equipment
- Prohibit bending, recapping, breaking, or removing needles
- Offer free Hep B vaccine
- Train worker
- Post-exposure evaluation and follow up
Risk of HIV Transmission

- Risk
  - Blood
  - Semen
  - Vaginal secretions
  - CSF
  - Synovial fluid
  - Pleural fluid
  - Peritoneal fluid
  - Pericardial fluid
  - Amniotic fluid
  - Concentrated urine in lab

- No risk
  - Urine
  - Saliva
  - Non-purulent sputum
  - Stool
  - Emesis
  - Nasal discharge
  - Tears
  - Sweat
Risk of HBV, HCV and HIV Transmission for Percutaneous Exposure

- Hep B: 23-62%
- HIV: 1.8%
- HIV percutaneous: 0.3%
- HIV mucous membrane: 0.09%
- 57 known HCW conversions since December 2012
  - 48 percutaneous
  - 5 mucous membrane
  - 2 both
- 18 failures of PEP
  - All treated with Zidovudine alone
## Risk and Bodily Fluids

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Low Risk</th>
</tr>
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<tbody>
<tr>
<td>Blood</td>
<td>Urine</td>
</tr>
<tr>
<td>Amniotic Fluid</td>
<td>Vomit</td>
</tr>
<tr>
<td>CSF</td>
<td>Saliva</td>
</tr>
<tr>
<td>Breast milk</td>
<td>Feces</td>
</tr>
<tr>
<td>Pericardial fluid</td>
<td>Sweat</td>
</tr>
<tr>
<td>Peritoneal fluid</td>
<td>Tears</td>
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<tr>
<td>Pleural fluid</td>
<td></td>
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<tr>
<td>Synovial fluid</td>
<td></td>
</tr>
<tr>
<td>Unfixed human tissue</td>
<td></td>
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<tr>
<td>Exudates</td>
<td></td>
</tr>
<tr>
<td>Vaginal secretions</td>
<td></td>
</tr>
<tr>
<td>Semen</td>
<td></td>
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<tr>
<td>Saliva with blood (dental procedures)</td>
<td></td>
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</tbody>
</table>
Risk Factors for HIV Seroconversion

- Deep injury
- Device visibly contaminated
- Need placed directly in vein or artery
- Large diameter needle
- Terminal disease in source
- High HIV load

<table>
<thead>
<tr>
<th>Exposure route</th>
<th>% risk of HIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle stick</td>
<td>0.3</td>
</tr>
<tr>
<td>Mucous membrane</td>
<td>0.03</td>
</tr>
<tr>
<td>Anal intercourse</td>
<td>3.0</td>
</tr>
<tr>
<td>Vaginal intercourse</td>
<td>0.2</td>
</tr>
<tr>
<td>Oral intercourse</td>
<td>0.04</td>
</tr>
<tr>
<td>Needle sharing</td>
<td>0.67</td>
</tr>
</tbody>
</table>
Baseline Evaluation of HCW

- HBV
  - If person was vaccinated, response unknown
  - None if never vaccinated or known response
- HCV
- HIV
Treatment of Exposures
Post Exposure Prophylaxis

- Prophylaxis should be started as rapidly as possible after the exposure
- Optimal treatment unknown
- Historical treatment for 4 weeks
  - Nucleoside two drug
  - Protease inhibitor three drug regime
  - Ritonavir boosted regime
- Compliance was 70-80%
  - Improve compliance with weekly phone calls for 4 weeks
Follow Up Testing for HCW

- **HIV** at baseline, 6 weeks, 12 weeks, 6 months if source positive or unknown
  - HIV testing at 12 months if HCV positive
- **HCV**
  - Baseline, 2 months, 4 months, 6 months
  - AST not needed
- **HBV**
  - Not vaccinated or no response
  - Baseline, 6 weeks, 6 weeks, 6 months
Recommended HIV PEP

- Emtricitabine/Tenofovir (Truvada) + Raltegravir (Isentress) or Dolutegravir (Tivicay)
- Alternative – Emtricitabine/Tenofovir (Truvada) + Ritonavir (Novir) boosted with Darunavir (Prezista) or Atazanavir (Reyataz)
PEP is recommended when occupational exposures to HIV occur

HIV status of the exposure source patient should be determined, if possible, to guide need for HIV PEP

PEP medication regimens should be started as soon as possible after occupational exposure to HIV, and they should be continued for a 4-week duration

New recommendation—PEP medication regimens should contain 3 (or more) antiretroviral drugs for all occupational exposures to HIV
Expert consultation is recommended for any occupational exposures to HIV.

Close follow-up for exposed personnel should be provided that includes counseling, baseline and follow-up HIV testing, and monitoring for drug toxicity; follow-up appointments should begin within 72 hours of an HIV exposure; and

New recommendation—if a newer fourth-generation combination HIV p24 antigen–HIV antibody test is utilized for follow-up HIV testing, HIV testing may be concluded 4 months after exposure.

If a newer testing platform is not available, follow-up HIV testing is typically concluded 6 months after an HIV exposure.
Exposure Assessment

- Was there an exposure?
- Source known or unknown
  - If known
    - Asymptomatic or low viral load
    - Symptomatic or AIDS
    - HIV negative
- Mucous membrane and non-intact skin
  - Small volume - drops
  - Large volume
- Percutaneous injuries
  - Less severe – solid needle or superficial injury
  - More severe
Follow-Up of Healthcare Personnel (HCP) Exposed to Known (HIV)–Positive Sources

- Exposed HCP should be advised to use precautions (e.g., use of barrier contraception and avoidance of blood or tissue donations, pregnancy, and, if possible, breast-feeding)
  - during the first 6–12 weeks after exposure.
- Possible drug toxicities
  - Possible drug interactions
  - The need for adherence to PEP regimens
- Follow-up testing and appointments:
  - HIV testing at baseline and at 6 weeks, 12 weeks, and 6 months after exposure;
  - Reevaluation of exposed HCP within 72 hours after exposure
- Complete blood counts and renal and hepatic function tests (at baseline and 2 weeks after exposure)
Situations for Which Expert Consultation for HIV PEP Is Recommended

- Known or suspected resistance of the source virus to antiretroviral agents
- Toxicity of the initial PEP regimen
- Symptoms (e.g., gastrointestinal symptoms and others) are often manageable without changing PEP regimen by prescribing antimotility or antiemetic agents
- Counseling and support for management of side effects is very important, as symptoms are often exacerbated by anxiety
- Serious medical illness in the exposed person
- Significant underlying illness
Situations for Which Expert Consultation for HIV PEP Is Recommended

- Delayed (i.e., later than 72 hours) exposure report
- Interval after which benefits from PEP are undefined
- Unknown source (e.g., needle in sharps disposal container or laundry)
- Use of PEP to be decided on a case-by-case basis
- Consider severity of exposure and epidemiologic likelihood of HIV exposure
- Do not test needles or other sharp instruments for HIV
- Known or suspected pregnancy in the exposed person
- Provision of PEP should not be delayed while awaiting expert consultation
Situations Needing Expert Consultation

- Delayed exposure reporting >24-36 hours
- Unknown source
- Pregnancy or breast feeding
- Imitating an expanded regimen
- Exposure to a heavily treatment experienced source
- Resistance to source virus to anti-retroviral agents
Managing Occupational Exposures to HIV & Hepatitis?

PEP line

The PEP line offers health care providers around-the-clock advice on managing occupational exposures to HIV and hepatitis B & C.

Who should call the PEP line?
Clinicians caring for health care workers who are exposed to blood-borne pathogens. Exposed health care workers may call the PEP line but are encouraged to first seek prompt local medical attention.

National Clinicians’ Post-Exposure Prophylaxis Hotline

1-888-448-4911
24 hours a day • 7 days a week

For questions regarding the clinical management of HIV/AIDS, contact the

Warmline
National HIV Telephone Consultation Service

1-800-933-3413

Offering treating clinicians current HIV clinical and drug information and expert case consultation.

The National HIV/AIDS Clinicians’ Consultation Center is a component of the AIDS Education and Training Centers Program funded by the Ryan White CARE Act of the Health Resources and Services Administration HIV/AIDS Bureau in partnership with the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

Visit the Center website www.nccc.ucsf.edu for additional information.
Reluctance in Taking Anti-Retroviral Meds


- Compared side effects of 26 HCP to 27 HIV + on HAART regime
- Higher in HCPs than HIV +
- HCP
  - 88.5% fatigue
  - 88.5% had GI side effects
  - 69.2% drug rash
  - 38.5% liver dysfunction
  - One withdrawal
  - None become HIV infected
Unconsented HIV Testing for Exposed HCP


• What if the source refuses HIV testing
• HIV testing is regulated by state law
• Vary by procedural elements including
  • Who can authorize
  • How is test documented in record
  • Who gets informed of test results
• 36 states allow for unconsented testing
• Specimen already available
• 4 states require a court order
• 15 states have no specific rule or incompatible laws
HIV Window of Detection

- Exact time of detection depends on test used, host responses and viral characteristics
- P24 antigen detection within 1 week of infection
- Newer generation antibody assays 3-4 weeks after infection
- Viral RNA testing within 2 weeks
- Most use antibody assay
- No test is perfect for those with early exposure
HBV Infections

- 75-90% vaccinated
- Most infectious of the three at risk viruses
- Can live on countertops for 7 days.
HBV PEP: Efficacy

Efficacy in preventing HBV infection

- Multiple doses of HBIG alone within one week of exposure: 70-75%
- HBV vaccine series: 70-90%
- HBIG and HBV: 85-95%
HBV in HCWs

- 34 of 35 HCWs who seroconverted received 3 or more doses and were non-responders
- No role for antiviral drug PEP
### Recommended Post-Exposure Prophylaxis for Hepatitis B Virus

<table>
<thead>
<tr>
<th></th>
<th>HBsAg positive</th>
<th>HBsAg negative</th>
<th>Source unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unvaccinated/ non-immune</td>
<td>HBIGb × 1 initiate HBV vaccine series</td>
<td>Initiate HBV vaccine series</td>
<td>Initiate HBV vaccine series</td>
</tr>
<tr>
<td>Previously vaccinated, known responder</td>
<td>No treatment</td>
<td>No treatment</td>
<td>No treatment</td>
</tr>
<tr>
<td>Previously vaccinated, known non-responder</td>
<td>HBIGb × 1 and initiate revaccinate or HBIGb</td>
<td>No treatment</td>
<td>No treatment unless known high-risk source;</td>
</tr>
<tr>
<td>Previously vaccinated, antibody response unknown</td>
<td>Single vaccine booster dose</td>
<td>No treatment unless known high-risk source; if high-risk source, if then treat as if source were HBsAg positive</td>
<td>No treatment</td>
</tr>
</tbody>
</table>
Post HBV Vaccine Immunity

- HCW with low anti-HBsAb titers after vaccination
  - Test for HBsAG, evaluate for chronic HBV infection
  - If HBsAG negative, repeat series
  - If titers still low, consider non-responder and give HBIG
- Routine booster vaccination not recommended for HCW who were initially responded, titers have waned/
  - 60% of initial responders lose detectable responses in 8 yrs.
HCV

- Not efficiently transmitted through occupational exposure
- Rarely occurs with mucous membrane exposure
- No transmission from intact or non-intact skin exposure to blood
- Environmental exposure not significant risk factor except in hemodialysis setting
HCV PEP

- No proven effective PEP
- Immunoglobulins and anti-viral agents not recommended
- Interferon not found to be effective
- HCV antibodies not protective
- Important to identify
Hepatitis C

- Hep C not transmitted efficiently
  - Incidence is 1.8%
  - Hollow bore needle not mucous membrane exposure

- Management
  - Source testing of patient anti-HCV
  - HCW baseline anti-HCV and ALT
  - Follow up testing in 4-6 months

- No prophylaxis recommended such as IB and antiviral agents
  - No special precautions

- New treatment with chronic Hep C
  - On December 19, 2014, the FDA approved the combination of ombitasvir/paritaprevir/ritonavir and dasabuvir (Viekira Pak)
Surveillance

- Need to increase the 4% reporting rate
- Set up system to identify needlesticks
- Many times source panel ordered without employee panel ordered
  - SOURCE PANEL: RAPID HIV antibody, Hep B antigen, Hep C antibody
  - EMPLOYEE PANEL: Hep B antigen, Hep C antibody, Hep B antibody, HIV antibody, CMP, UCG
- Track all source to employee panels
Post Exposure Education

- Determine what technique was used
- What procedure was done
- Was proper procedure done with the proper technique
- Staff education
- Staff monitoring
- Change procedure, technique or equipment
Take Home Points

- Double gloving
- Use other techniques to suture if possible
- Consider other skin closure techniques
- Never touch the needle when suturing
- Remove straight needles from procedure trays
- Three antiviral treatment for HIV PEP
- Track needlestick by using source lab orders
- Investigate and educate all staff on needlesticks
Contact Information

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Suture Safety Video
https://www.youtube.com/watch?v=tV0FxHh08S8