

Bloodborne Virus Transmission from Healthcare Worker to Patient

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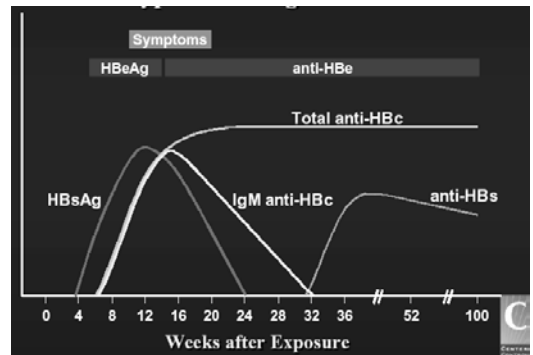
Objectives

- Gain an appreciation of the risk for transmission of a bloodborne pathogen from infected HCW to patient
- Understand those situations which appear to pose a risk for transmission of a bloodborne pathogen from infected HCW to patient
- Become familiar with the Canadian guidelines for bloodborne pathogen infected HCWs

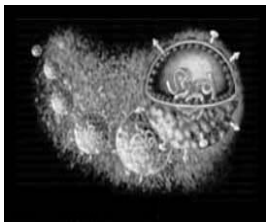
Hepatitis B



- Small double-stranded DNA virus
- 3 major antigens: “s”, “e”, and “c”
- Incubation 60-110 days
- Areas of endemicity
- <10% chronic carriers

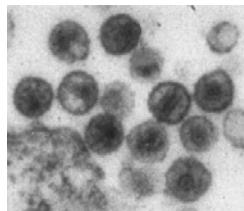


Hepatitis C



- Single stranded RNA virus
- Incubation 6-7 weeks
- Acute symptoms unusual
- ~75% develop chronic disease
- Diagnosed by positive HCV serology confirmed by positive pcr

HIV



- Enveloped RNA retrovirus
- Targets cells with CD4 receptor molecules
- Diagnosed by positive serology (EIA confirmed by WB)
- Monitored by CD4 counts and HIV viral load

Occupational Bloodborne Pathogen Infections

Infection	Attack rate	Intervention
Hepatitis B	eAg-: 2-5% eAg+: 20-40%	Pre-and post-exposure prophylaxis
Hepatitis C	1.2-10%	None proven
HIV	0.1-0.4%	Post-exposure prophylaxis

Occupational Bloodborne Pathogen Infections

- Risk for transmission related to
 - ✍ host susceptibility
 - ✍ nature of the injury
 - ✍ magnitude of the inoculum
 - ✍ source viremia level
 - ✍ availability/effectiveness of PEP

Estimated prevalence of BBP among US HCWs performing invasive procedures

Infection	Estimated prevalence	Dentists n=150,000	Surgeons n=130,000
HBV sAg +	0.4-0.8%	600-1200	520-1040
eAg +	0.1-0.2%	120-140	104-208
HCV	1-1.5%	1500-2250	1300-1950
HIV	0.05-0.1%	75-150	65-130

Sources of Information on Risk of BBP Transmission from HCWs to Patients

- Surveillance data; investigations of clusters of cases linked to infected HCWs
- Prospective studies of contacts of infected HCWs
- Studies of patients with no identified risk factors for infection
- Mathematical models

HCW to Patient HBV - Dentistry

Country	Yr	Cases	Survey	Disposition	Outcome
US	72	13	no	Stopped practice [?]	
US	74	55	no	Returned to practice with gloves [?]	0 transmissions
US	75	43	no	Returned to practice with gloves [?]	1 transmission; restricted
US	78	6	yes	Returned to practice with gloves*	0 transmissions
US	79	12	yes	Stopped practice*	
US	80	55	yes	Returned to practice with gloves [?]	0 transmissions
US	80	4	no	Returned to practice with gloves*	0 transmissions
US	84	24	yes	Stopped practice*	

HCW to Patient HBV – Obs/Gyn

Country	Yr	Cases	Survey	Disposition	Outcome/Comments
UK	78	8	no	Restricted*	Gyn
US	79	4	no	Returned double gloving + modifications*	Gyn 0 transmissions
UK	76-9	9	no	Restricted*	Obs/Gyn
US	84	6	yes	Returned with modifications*	1 transmission; restricted; Obs/Gyn
UK	87	22	yes	Stopped practice*	Obs/Gyn
UK	93	3	yes	Restricted ^c	Obs
UK	94	1	yes	Restricted ^c	Gyn

HCW to Patient HBV- CV Surgery

Country	Yr	Cases	Survey	Disposition	Outcome/Comments
Norway	78	5	yes	Returned to practice*	Acute HBV resolved
Netherlands	79	3	no	Returned to practice [?]	Acute HBV resolved
UK	87	17	yes	Restricted*	
UK	90	5	yes	?*	
UK	92-3	20	yes	Stopped practice*	
US	92	19	yes	Stopped practice*	Acute HBV to carrier status

HCW to Patient HBV - Other

Country	Yr	Cases	Survey	Disposition	Outcome/Comments
Switzerland	73-7	36	no	Worked with modifications*	2 transmissions; GP
US	87	5	no	Restricted	General surgeon
UK	88	1	no	Restricted ⁺	General surgeon
Canada	91	4	yes	Restricted*	Orthopedic surgeon
UK	95	1	yes	Restricted ⁺	General surgeon

HCW to Patient HBV – Prospective Surveillance

- 228 contacts of HBsAg + HCWs tested negative for HBV (*N Engl J Med 1975*)
- 213 patients exposed to 6 chronic carriers (including 2 surgeons, 1 eAg+) tested HBV negative (*Hepatology 1986*)
- No transmissions in 30 of 49 tested patients exposed to orthopedic resident with acute hepatitis B (*JAMA 1978*)
- 1 HBV/1648 patients (0.06%, upper 95% CI= 0.36%) of 6 eAg+ HCW (*Consensus conference 1996*)

HCW to Patient HBV- Summary

- ~ 45 HCWs have transmitted HBV to approximately 400 patients
- Since 1987 (and the introduction of universal precautions) there have been no further reports of HBV transmission in dentistry
- Prospective studies unrelated to transmissions have rarely detected infections

HCW to Patient HBV- Summary

- Risk of infection 0.9-13% of patients in cluster investigations where rates could be determined
- Surgical assistants and attending surgeons
- Not always recognized breaches in surgical technique
- Postulated factors: poor visualization of operative field, “blind” suturing, glove punctures, confined field

HCW to Patient HBV- Summary

- Factors associated with HBV transmission (with caveats!)
 - ✗ high infectivity of HCW (eAg positive)
 - ✗ major surgical procedures
 - ✗ breaks in infection control practices

HCW to Patient HIV

- In July 1990 the CDC reported that a young woman with AIDS had most likely acquired her HIV-1 infection while undergoing invasive dental procedures by a Florida dentist with AIDS
- Nucleotide sequencing and epidemiologic data indicated that 6 patients were infected during their dental care
- Precise mode of transmission could not be identified

HCW to Patient HIV

- Information (as of January 1995) for 61 HCWs in the US, UK, and Australia
 - ≈ 33 dentists or dental students; 14 surgeons; 12 nonsurgical physicians; 2 surgical technicians; 1 each: medical student, dental assistant, podiatrist
 - 22,171 patients of 51 HCWs tested (17% of treated patients)
 - 113 HIV infected patients
 - No HCW to patient HIV transmissions identified
- Ann Intern Med 1995; 122:653-7.*

Probable transmission HIV Orthopedic Surgeon to Patient

- 53 year old surgeon diagnosed with AIDS in March 1994; stopped operating Oct 1993
- Reported percutaneous injuries as frequently as once/week
- 983/3004 patients responded to request for serological testing
- 1 tested positive for HIV (1.02/1000 patients)

HCW to Patient HCV

Country	Yr	Cases	Survey	Disposition	Outcome/Comments
Spain	88-94	5	no	Returned to work after R _x	HCV neg. on R _x Cardiac surgeon
Germany	93-00	1	yes	?	Rate 0.04%; 95% CI: 0.008-.25% Obs/Gyn
UK	93-5	1	yes	Restricted	Rate 0.36%; 95% CI: 0.006-1.98% Cardiothoracic
Germany	98	5	yes	?	Anaesthesiology asst. IC breaches
UK	97	1*	started	?	Preliminary report
Spain	?	~200	started	Practice terminated	Anaesthesiologist drug addict

HCW to Patient HIV/HCV- Summary

- Risk very low but not fully quantified
- Risk factors for HIV and HCV transmission from infected HCW to patient have not been determined but some similarities to HBV

Consensus Conference on Infected Health Care Workers

- Convened by Health Canada in November 1996
- Goals
 - ≈ understand the epidemiology of the transmission of BBP from infected HCWs to patients
 - ≈ revise the recommendations to prevent and manage the transmission of BBP from HCWs to patients

Consensus Conference Recommendations

- Importance of increasing compliance with infection control practices
 - ≈ monitoring compliance with UP
 - ≈ engineering controls to reduce potential exposures to blood
 - ≈ reporting and reviewing exposure incidents
 - ≈ use of personal protective equipment
 - ≈ education

Consensus Conference Recommendations

- Immunization and screening
 - ≈ All HCWs exposed (or potentially) to BBP should be immunized with HBV vaccine
 - ≈ Mandatory immunization for HCWs involved in exposure-prone procedures with mandatory testing for antibody production

Consensus Conference Recommendations

- Referral to an Expert Panel
 - ≈ All HCWs who perform exposure-prone procedures have an ethical obligation to know their serologic status re:BBPs
 - ≈ All HCWs who perform exposure-prone procedures and learn they are infected with a BBP have an ethical obligation to report the fact to their regulatory body

Consensus Conference Recommendations

- ≈ Regulatory bodies should take an active role in overseeing the infected HCWs practice
- ≈ Expert panels should be established to review the HCWs practice to address whether the HCW is safe to continuing exposure-prone procedures

Consensus Conference Recommendations

- Trace-back and Look-back Activities
- Disclosure to Patients
- Retraining and Supporting Infected HCWs

Addressing HCW safety to Practice

- Specific infection and viral load
- Risk analysis of work activities
- Procedural techniques
- Skill and experience of the HCW
- Evidence of prior transmission
- Compliance with UP and other infection control practices

Addressing HCW Safety to Practice

- Likelihood of compliance with practice recommendations
- Relevant ethical principles

Exposure-prone procedures

- Procedures during which transmission of a BBP is most likely to occur
 - ≈ digital palpation of a needle tip in a body cavity or the simultaneous presence of the HCWs fingers and a needle or other sharp object/instrument in a blind or highly confined anatomic site, or
 - ≈ repair of major traumatic injuries, or
 - ≈ major cutting or removal of any oral or perioral tissue, including tooth structures
- During which blood from an injured HCW may be exposed to the patient's open tissues

Bloodborne Virus Transmission from Healthcare Worker to Patient

- There have been well-documented transmissions of HBV, HCV, and HIV from infected HCWs to patients during the course of medical care
- The risk is low and the relative magnitude of risk mirrors that of occupational transmissions

Bloodborne Virus Transmission from Healthcare Worker to Patient

- In the future, the risk of HCW to patient transmission of HBV should be eliminated
- HCW to patient transmission of HCV may become more important an issue
- There are Canadian Guidelines for management of the HCW infected with HBV, HCV, or HIV