
Potential Threats Through Infectious Diseases: Hepatitis B, Hepatitis C, HIV

(Unrecognized Threats from “Old” Diseases)

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Global and US Disease Burden from Bloodborne Viral Infections

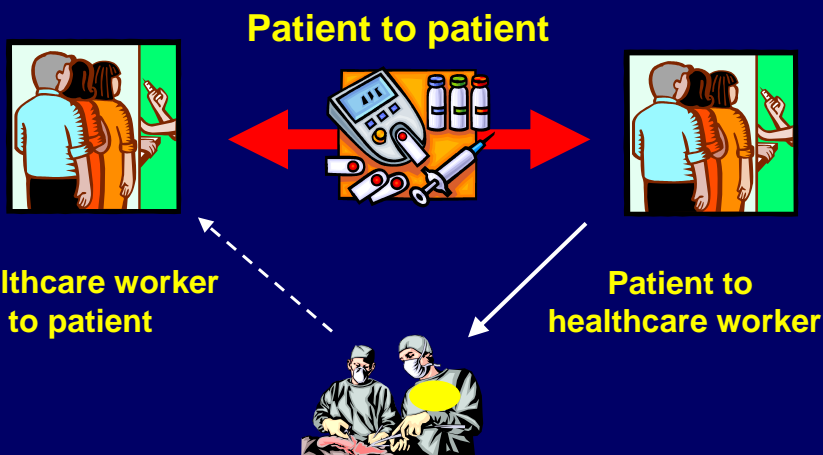
	Estimated No. Chronic Infections <u>Global</u>	<u>US</u>
HBV	370 million	1.25 million
HCV	130 million	3-4 million
HIV	40 million	1 million
HIV / HBV	(3–4 million)	(250,000)
HIV / HCV	(4–5 million)	(40-50,000)

Sources: WHO and CDC, unpublished data.

Relative Efficiency of HBV, HCV, HIV Transmission by Type of Exposure

Type of exposure to infected source	Transmission efficiency		
	HBV	HCV	HIV
Transfusion	++++	++++	++++
Injecting drug use	++++	++++	++++
Unsafe therapeutic injections	+++	+++	+
Needlestick	+++	+	<+
Sexual	+++	+	+++
Perinatal	++++	++	+++
Non-intact skin	++	+/-	+/-
Intact skin	-	-	-

HBV & HCV Transmission in Health Care Settings



Clinical Infectious Diseases 2004; 38:1592-8

Recognition of Healthcare-related Viral Hepatitis Transmission, United States

- Decreased transfusion, dialysis, and occupational risks
- Increasing recognition of outbreaks involving patient-to-patient spread
 - Detection is haphazard
 - Asymptomatic infections
 - Long incubation periods / low index of suspicion
 - Various settings, primarily those providing outpatient (ambulatory) or long-term care

Relative Infectivity of HBV, HCV, HIV

	<u>HBV</u>	<u>HCV</u>	<u>HIV</u>
IU/mL	10^{8-9}	10^5	10^3
Environmental stability	++++	++	-
Remains infectious after drying at room temp	≥ 7 d	≥ 16 h	0

Bond Lancet 1981; Kamili S, Infect Control Hosp Epi 2007, in press.

HBV and HCV Related to Health-Care in Inpatient and Outpatient Settings, U.S.

HBV

- Contaminated equipment
 - Hemodialysis
 - EEG electrodes
- Unsafe injection practices
 - Finger stick devices
 - Multi-dose medication vials
 - Jet injector
 - Dermatology practice
 - Acupuncture
 - Therapeutic injections

HCV

- Contaminated equipment
 - Hemodialysis
- Unsafe injection practices
 - Plasmapheresis
 - Multi-dose medication vials
 - Reuse of contaminated needles and syringes
 - Home infusion therapy

Transmission of Hepatitis B and C Viruses in Outpatient Settings – MMWR 2003 52:901-6

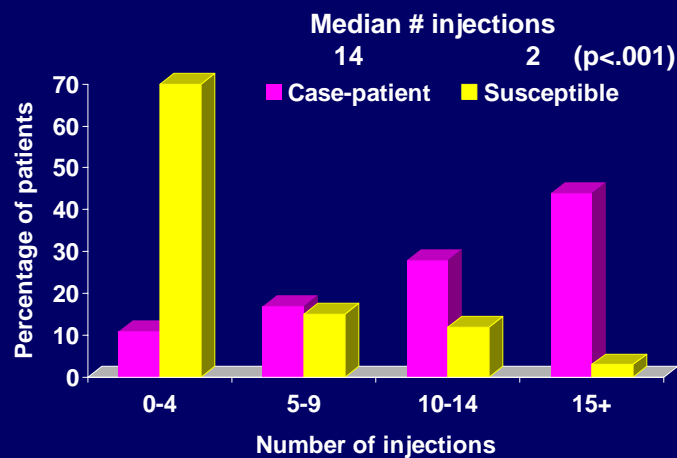
- Private Medical Practice: New York City, 2001
 - 38 HBV infections associated with unsafe injection practices
- Endoscopy Clinic: New York City, 2001
 - 19 HCV infections likely due to contamination of multiple-dose anesthetic vials
- Oncology Clinic: Nebraska, 2002
 - 99 HCV infections associated with syringe reuse leading to contamination of common saline bag
- Pain Remediation Clinic: Oklahoma, 2002
 - 71 HCV and 31 HBV infections due to syringe reuse

HBV Transmission Private Medical Practice, 2001

- Two patients aged >75 yrs with acute hepatitis B
 - Both visited same private practice in incubation period
- Lookback among 1,042 patients seen in last 2 yrs
 - 38 with acute and 4 with chronic infection
 - HBV sequences identical
- Retrospective cohort study (n=275)
 - RR 13.6 (95% CI 2.4-undefined) for receiving injections
 - AR 27% among those who received ≥ 1 injection versus 0 among those who received no injections

Source: CDC. MMWR 2003;52(38)

Frequency of Injections HBV Cases vs. Susceptibles, 2001



Procedures and Location for Handling Injectable Medications and Supplies

- Injections administered at almost every visit
 - B12, dexamethasone, atropine used to make patients “feel better”
 - Two or three medications drawn from multiple dose vials with the same needle and syringe
- Same workspace was used to prepare, dismantle, and dispose of injection equipment

Injection Preparation and Disposal



HCV Transmission Private Endoscopy Practice, 2001

- 4 patients hospitalized with acute hepatitis C May 2001
 - All underwent endoscopy at clinic A 3/28-3/30/01
- Lookback investigation for 9-day period
 - Infection attack rate of 44% (12/27) for 3/28-3/30
 - One patient with chronic infection identified
 - All acute HCV patients' procedures followed
 - All patients' strains genotype 2c (rarest in world)
- Extended offer of testing back to Jan 2000

Source: CDC. MMWR 2003;52(38)

HCV Infection Rates by Type of Procedure

<u>Procedure</u>	<u>HCV Attack Rates</u>		<u>RR</u> <u>(95% CI)</u>
	<u>Exposed</u>	<u>Not Exposed</u>	
EGD	60%	27%	2.2 (0.8-6.3)
Colonoscopy*	33%	57%	0.6 (0.2-1.5)
Biopsy	45%	29%	1.6 (0.4-5.6)

* Source patient's procedure

No association with endoscopy type or biopsy

Purchase Order Amounts for Injection Supplies

<u>9/00-4/01</u>	<u>Expected use*</u>	<u># Ordered</u>
IV catheters	1530	1439
Needles	4590	600

* Based on number of procedures performed

Anesthesiologist admitted to re-inserting used needles into multi dose vials

HCV Transmission Oncology Clinic, 2002

- Cluster of 6 patients with rare genotype (3a)
 - All attended same oncology clinic
- Lookback conducted for 20 month period
 - 99/486 (20%) HCV positive
 - 95/95 tested genotype 3a (rare in US)
- Retrospective cohort study
 - RR 10.0 (95% CI 5.9-16.8) for implanted central venous line
 - AR 61% among those with CV line versus 6% among those without CV line

HCV Transmission Oncology Clinic, 2002

- Nurse drew blood from central line, then reused same syringe to perform saline flush
 - Solution from 500cc bag used for multiple patients
 - New syringe was used for each patient
- No transmission occurred after practice was stopped.

Oklahoma Pain Remediation Clinic

- August 2002 – 6 patients with acute hepatitis C who all received treatment at a single pain clinic
- Nurse anesthetist filled single needle and syringe with enough sedation medication to treat up to 24 sequential patients
 - Administered through heparin locks
- Lookback investigation for entire two year time period of clinic operation
 - 71 (9%) clinic-associated HCV infections
 - 31 (4%) clinic-associated HBV infections
- US \$25 million settlement

Comstock et al. ICHE, 2004, 25:576-583

Blood Glucose Monitoring

- Fingersticks = Percutaneous Exposures
- Risks for bloodborne pathogen transmission
 - HBV, HCV, and HIV
 - Settings in which multiple persons require FS
- Hazard was identified shortly after insulin was introduced in 1922 and pre-dates identification of hepatitis B virus

Recent HBV Outbreaks Associated with Blood Glucose Monitoring

- Shared fingerstick devices
 - 1999 – VA – Assisted Living Centers – 4 cases
 - 1999 – CA – Nursing Home – 4 cases
 - 2003 – MS – Nursing Home – 15 cases
 - 2003 – CA – Assisted Living Center – 8 cases
 - 2005 – VA – Assisted Living Centers (2) – 11 cases
- Dedicated fingerstick devices
 - 1999 – CA – Skilled Nursing Facility – 5 cases
 - 2002 – CA – Subacute Hospital – 3 cases
 - 2003 – NC – Nursing Home – 11 cases

HBV and HCV Related to Healthcare Procedures United States - Summary

- Relatively rare events - not “associated” with sporadic or background infections
 - Difficult to detect
 - Extent of problem unknown
- Most due to unsafe injection practices
- Preventable
 - Single use of disposable needles and syringes
 - Multi-dose vials
 - Limit to single patient; or
 - Restrict to clean centralized preparation area

Unsafe Injection Practices Worldwide

- Inadequate supplies of sterile syringes
- Inadequate sterilization of reusable syringes and needles
- Administration by non-professionals at home
- Syringes shared with others (family, neighbors)
- Overuse of therapeutic injections



Household Survey of Injections Received Romania, June 1997 - May 1998

<u>Type of injection</u>	<u>Participants who received an injection</u> N=3676			<u>Number of Injections received</u>		
	<u>No.</u>	<u>%</u>	<u>(95% CI)</u>	<u>Total</u>	<u>Median</u>	<u>Range</u>
Vaccine-related	365	10	(8-11)	988	2	1-15
Therapeutic	1334	36	(33-39)	19,630	8	1-735

HCV Related to Healthcare Procedures Moderate/High Endemic Countries

- Associated with “background” infections
 - unsafe therapeutic injections
 - hospitalization, surgery, dental work
- Geographic clustering by age, town, region
 - considerable variation within and between countries

Unsafe Injections and HCV Infection Moderate Endemicity Countries

<u>Country</u>	<u>History of Reused Needles/Syringes</u>		
	<u>HCV Pos</u>	<u>HCV Neg</u>	<u>OR (95% CI)*</u>
Italy	63%	31%	3.8 (2.7, 5.3)
	89%	53%	7.0 (4.4, 11.2)
	76%	72%	1.2 (0.6, 2.5)
Taiwan	26%	8%	4.2 (1.2, 14.5)
Pakistan (≥ 5 /yr)	36%	6%	8.2 (1.9, 41.4)

* Adjusted for other risk factors

Healthcare Procedures and HCV Infection Moderate Endemic Countries

<u>Country</u>	<u>Surgery</u>		<u>Dental</u>	
	<u>HCV Pos</u>	<u>HCV Neg</u>	<u>HCV Pos</u>	<u>HCV Neg</u>
Case-Control				
Italy	17%*	2%	22%*	11%
Cross-Sectional				
Italy	56%*	36%	91%*	80%
	77%	57%	90%	90%
Taiwan	13%	3%	24%	28%
Pakistan	No data		33%	39%
Japan	32%*	10%	No data	

* P<.05, after adjusting for other risk factors

Global Burden of HCV Infections Attributable to Contaminated Health Care Injections

	<u>HBV</u>	<u>HCV</u>
Annual number of infections (million)	21	2
Attributable fraction for injections	32%	40%
Projected deaths 2000-2030	75,000	24,000
Disability adjusted life years (million)	3	0.3

Source: Hauri et al., Int J STD & AIDS 2004;15:7-16

Preventing Transmission of Bloodborne Pathogens in the Healthcare Setting

- Donor screening; viral inactivation
- Appropriate cleaning and disinfection
- Engineering controls (to prevent injuries)
- Hepatitis B vaccine for all HCWs at risk
- Standard (universal) precautions (infection control)
- Safe injection practices

Safe Injection Practices

- Educate/re-educate all staff
- Aseptic technique
 - Single use of disposable injection equipment
 - Avoid contamination of multi-dose vials
 - Restrict to individual patients
 - Use only in centralized medication preparation area
- Blood glucose monitoring
 - Avoid shared equipment including glucometers
 - Preference for auto-disabling single use lancets
 - Reduce percutaneous procedures to minimum necessary for appropriate diabetes management
 - Adequate staffing for scheduled diabetes care
 - Train, assess, and monitor staff