

Hepatitis B Exposure in a Dialysis Unit

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May 13, 2011

The Page

- The staff educator of the inpatient dialysis unit contacts IC regarding the discovery of a patient who had been receiving dialysis in the unit and was subsequently found to have active hepatitis B.

The Case

- Patient JF is a 55 yo woman with a history of renal failure due to IgA nephropathy. She is s/p cadaveric renal transplant 5 years previously. She was admitted two weeks ago to re-initiate hemodialysis due to graft failure.
- She underwent dialysis on:
 - 2/7/09, 2/9/09, 2/11/09
- During that admission, she was noted to have elevated liver transaminases. Work-up revealed active hepatitis B.

The Case, continued

- PMH
 - ESRD due to IgA nephropathy, previously received hemodialysis
 - Cadaveric renal transplant 5 years prior, failed due to rejection
 - Hepatitis B immune
- Lab data: 2/16/09
 - Hepatitis B sAg: positive
 - Hepatitis B cAb: positive
 - Hepatitis B c IgM: nonreactive
 - Hepatitis B sAb: positive
 - Hepatitis B viral load PCR: > 50,000,000
 - Hepatitis C Ab: nonreactive

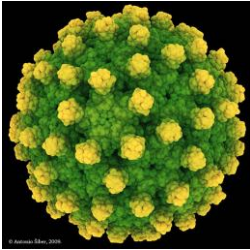
The Problem

- Patient with active hepatitis B underwent hemodialysis without use of a dedicated dialysis machine or an isolation room
- Process for monitoring hepatitis B status flawed
- Dialysis unit following standard precautions consistent with acute-care setting, but maintenance dialysis for chronic hemodialysis occurring in the same unit.

Outline

- Hepatitis B
 - Diagnostic challenges
- Hepatitis B transmission in the healthcare setting
- Recommendations for the dialysis setting
 - Acute vs. chronic setting
- Investigation and findings

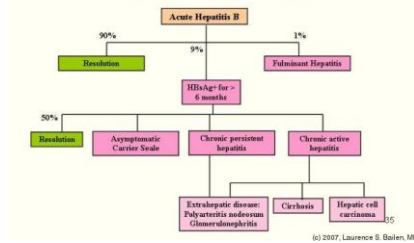
Hepatitis B



- More than 2 billion people infected worldwide
- Highly infectious. 30% risk of seroconversion after percutaneous exposure
 - Risk for Hepatitis C is 1.8%
 - Risk for HIV is 0.3%

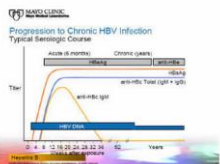
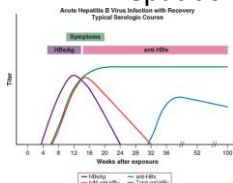
http://asberifs.hr/galerija_virusa/virus_hepatitis_B.jpg

Hepatitis B: Clinical Outcomes of Acute HBV Infections



rachel.worldpossible.org/ocw.tufts.edu/data

Hepatitis B serologies



Test		Interpretation
HBsAg	Hepatitis B surface antigen	HBV infection
IgM anti-HBc	Antibody to hepatitis B core antigen	Acute or recent HBV infection
IgG anti-HBc	Antibody to hepatitis B core antigen	Chronic or remote HBV infection
HBsAb	Antibody to hepatitis B surface antigen	Immunity to HBV (vaccine-induced or results of prior infection)
HBeAg	Hepatitis B e antigen	Active replication
HBV DNA	HBV viremia	Active replication

www.clevelandclinimed.net/medicalpubs/disease/management/hepatology/hepatitis-B/images



<http://static3.edashcms.com/img/240/0/0/0/images>

Hepatitis transmission in the healthcare setting

- Hepatitis B and C a concern
- Fairly high-profile of late due to transmissions related to endoscopy procedures and multi-dose vials
- Not addressing HCW-to-patient transmission
- Patient-to-patient transmission often reported in nonhospital settings
 - IC resources and oversight lacking

HBV Transmission

- Percutaneous or mucosal exposure to blood or body fluids
- Environmental
 - HBV remains viable for up to 7 days
 - HBV at titers of 10^{2-3} virions in absence of visible blood
- HBV detected in dialysis setting:
 - Clamps, scissors, dialysis machine control knobs, door knobs

“Patient to patient transmission of hepatitis B virus: a systemic review of reports on outbreaks between 1992-2007”

- Published reports from USA and EU
- 33 outbreaks
- 471 patients
- 16 fatalities
- Settings involved:
 - 30.3% dialysis units
 - 21.2% medical wards
 - 21.2% nursing homes
 - 15.2% surgery wards
 - 12.1% outpatient clinics

Lanini S et al. BMC Medicine 2009;7: 15: 1-9.

“Patient to patient transmission of hepatitis B virus: a systemic review of reports on outbreaks between 1992-2007”

Table 1: Summary of the most frequent transmission pathways and most frequent healthcare settings involved.

Healthcare setting	Transmission pathways					Blood products	Undefined	Total
	Multi-vials	Capillary blood sampling	Multiple deficiencies in standard precautions	Transvenous biopsy				
Dialysis	5	-	1	-	-	1	3	10
Medicine	3	3	-	-	-	1	-	7
Nursing home	-	6	-	-	-	-	1	7
Surgery	-	-	-	3	-	-	2	5
Outpatient clinics	2	-	2	-	-	-	-	4
Total	10	9	3	3	-	2	6	33

Lanini S et al. BMC Medicine 2009;7: 15: 1-9.

“Nonhospital health care-associated hepatitis B and C virus transmission: US, 1998-2008”

- Review of CDC records & reports + published medical literature
- HBV: 18 outbreaks resulting in 173 transmissions
- HCV: 16 outbreaks resulting in 275 transmissions
- No healthcare-associated HIV
- More than 60,000 persons at risk for bloodborne infections

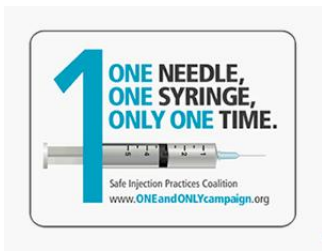
Thompson ND et al. Ann Intern Med 2009; 150: 33-39.

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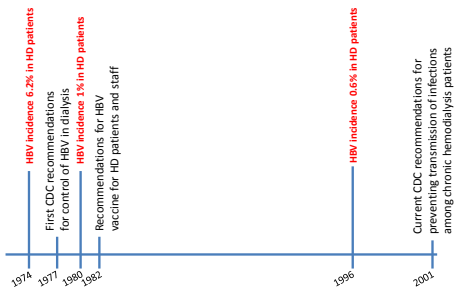
- All 6 dialysis outbreaks involved HCV transmissions (40)
- All 15 LTCF outbreaks involved HBV transmission (97)

- Mechanism for patient-to-patient transmission:
 - For outpatient clinics and HD centers: syringe re-use, contamination of injectable medications or flush
 - Single use medication vials and saline used for multiple patients
 - Outbreaks in LTCF involved reuse of fingerstick devices meant for individual use or improper sharing of equipment

Thompson ND et al. Ann Intern Med 2009; 150: 33-39.



HBV in Dialysis: Timeline



1977 CDC Recommendations

- HBV serologic surveillance of patients and staff
 - Ongoing monthly surveillance for susceptible patients
- Isolation of HBsAg-positive patients in a separate room
- No shared staff during shift
- No shared dialysis equipment between HBsAg positive and negative patients
- Assignment of a supply tray to each patient
- Cleaning & disinfection of nondisposable items
- Glove use for contact with equipment or patients; change gloves between patients
- Routine cleaning & disinfection of equipment & environmental surfaces

Reasons why Hepatitis B transmissions keep happening in dialysis

- Failure to routinely screen and failure to review results
- Failure to segregate: staff members, supplies, equipment
- Multi-dose vials



2001 Recommendations for preventing transmission of infections among chronic hemodialysis patients

- **Infection control practices for hemodialysis units.**
 - Infection control precautions specifically designed to prevent transmission of bloodborne viruses and pathogenic bacteria among patients.
 - Routine serologic testing for hepatitis B virus and hepatitis C virus infections.
 - Vaccination of susceptible patients against hepatitis B.
 - Isolation of patients who test positive for hepatitis B surface antigen.
- **Surveillance for infections and other adverse events.**
- **Infection control training and education.**

MMWR 2001 / Vol. 50 / No. RR-5

Infection Control Precautions for All Patients

- Wear disposable gloves when caring for the patient or touching the patient's equipment at the dialysis station; remove gloves and wash hands between each patient or station.
- Items taken into the dialysis station should either be disposed of, dedicated for use only on a single patient, or cleaned and disinfected before being taken to a common clean area or used on another patient.
 - Non-disposable items that cannot be cleaned and disinfected (e.g., adhesive tape, cloth-covered blood pressure cuffs) should be dedicated for use only on a single patient.
 - Unused medications (including multiple dose vials containing diluents) or supplies (e.g., syringes, alcohol swabs) taken to the patient's station should be used only for that patient and should not be returned to a common clean area or used on other patients.
- When multiple dose medication vials are used (including vials containing diluents), prepare individual patient doses in a clean (centralized) area away from dialysis stations and deliver separately to each patient. Do not carry multiple dose medication vials from station to station.
- Do not use common medication carts to deliver medications to patients. Do not carry medication vials, syringes, alcohol swabs, or supplies in pockets. If trays are used to deliver medications to individual patients, they must be cleaned between patients.

Infection Control Precautions for All Patients

- Clean areas should be clearly designated for the preparation, handling, and storage of medications and unused supplies and equipment. Clean areas should be clearly separated from contaminated areas where used supplies and equipment are handled. Do not handle and store medications or clean supplies in the same or an adjacent area to where used equipment or blood samples are handled.
- Use external venous and arterial pressure transducer filters/protectors for each patient treatment to prevent blood contamination of the dialysis machines' pressure monitors. Change filters/protectors between each patient treatment, and do not reuse them. Internal transducer filters do not need to be changed routinely between patients.
- Clean and disinfect the dialysis station (e.g., chairs, beds, tables, machines) between patients.
 - Give special attention to cleaning control panels on the dialysis machines and other surfaces that are frequently touched and potentially contaminated with patients' blood.
 - Discard all fluid and clean and disinfect all surfaces and containers associated with the prime waste (including buckets attached to the machines).
- For dialyzers and blood tubing that will be reprocessed, cap dialyzer ports and clamp tubing. Place all used dialyzers and tubing in leakproof containers for transport from station to reprocessing or disposal area.

Hepatitis B Vaccination

- Vaccinate all susceptible patients against hepatitis B.
- Test for anti-HBs 1-2 months after last dose.
 - If anti-HBs is <10 mIU/mL, consider patient susceptible, revaccinate with an additional three doses, and retest for anti-HBs.
 - If anti-HBs is >10 mIU/mL, consider patient immune, and retest annually.
 - Give booster dose of vaccine if anti-HBs declines to <10 mIU/mL and continue to retest annually.

Management of HBsAg-Positive Patients

- Follow infection control practices for hemodialysis units for all patients.
- Dialyze HBsAg-positive patients in a separate room using separate machines, equipment, instruments, and supplies.
- Staff members caring for HBsAg-positive patients should not care for HBV-susceptible patients at the same time (e.g., during the same shift or during patient changeover).

Hemodialysis in Acute Care Settings

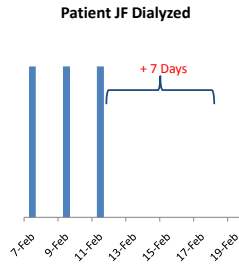
- For patients with acute renal failure who receive hemodialysis in acute care settings, Standard Precautions as applied in all healthcare settings are sufficient to prevent transmission of bloodborne viruses.
- *However*, if both acute and chronic renal failure patients receive hemodialysis in the same unit, infection control precautions specifically designed for chronic hemodialysis units should be applied to *ALL* patients.

Back to the exposure

- Patient with active hepatitis B underwent hemodialysis without use of a dedicated dialysis machine or an isolation room
- Process for monitoring hepatitis B status flawed
- Dialysis unit following standard precautions consistent with acute-care setting, but maintenance dialysis for chronic hemodialysis occurring in the same unit.

The investigation

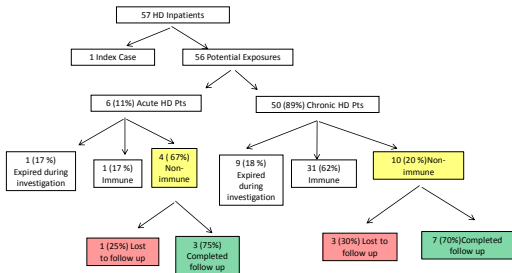
- Patient received dialysis
 - February 7th through February 11th
- Hepatitis B survives in the environment for at least 7 days
- Case finding conducted to identify all patients who received dialysis in the inpatient unit between
 - February 7th through February 18th



Exposure investigation

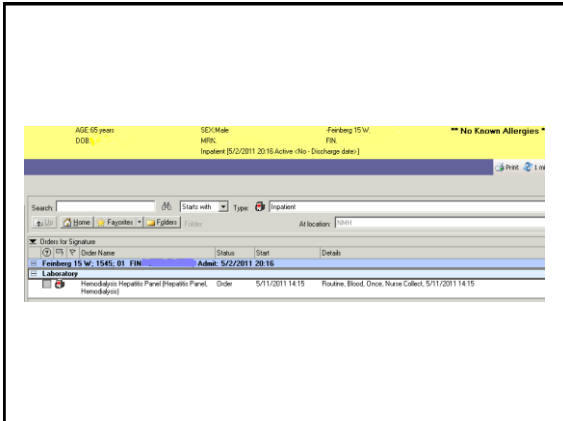
- Acute HD patients
 - Determine HBV immune status
 - Disclosure
 - Initial testing
 - Offer vaccination
 - Follow-up testing
 - 3 & 6 months
- Chronic HD patients
 - Determine HBV immune status
 - Disclosure
 - Work through dialysis centers
 - Initial testing
 - Offer vaccination
 - Follow-up testing as part of routine chronic HD testing
 - monthly

Exposure epidemiology



Hepatitis B testing in an inpatient dialysis unit

- Policy: Hepatitis B status must be determined prior to first dialysis
- Barrier: Turn around time for HBV serologies 24 hours
- Solution:
 - Dialysis-specific order set
 - Laboratory turn around time 3 hours
 - Available 7A – 9:30P 7 days a week



Hepatitis B testing in an inpatient dialysis unit

- Full policy:
 - All susceptible hemodialysis patients should be vaccinated for protection against hepatitis B
 - Patients receiving HD in the acute-care setting will be screened to ascertain their HBV status, by either a written report from the referring center or by serologic test
 - Those patients that are hospitalized greater than 30 days must be tested monthly while an inpatient
 - Outside tests obtained that re greater than 30 days from the first inpatient dialysis treatment will not be accepted. Serologies must be drawn.
 - Patients who have an isolated anti-HBc status (i.e., HBsAg negative, anti-HBs negative, anti-HBc total positive) must be tested on admission and monthly thereafter while hospitalized
 - Results will be recorded in the patient record and available to all HC personnel assigned to these patients as well as to IC.

Environment of Care Assessment

- Observations
 - Environment, personnel, attire, HH, set-up and maintenance of the patient care area, catheter insertion, access, and maintenance practices
- Evaluated for adherence to accepted standards
 - IDPH hospital licensing requirements
 - CDC HIPCAC guidelines
 - Institutional policies
 - Manufacturer’s instructions

The environment



The environment



The environment



The environment



The environment



The environment



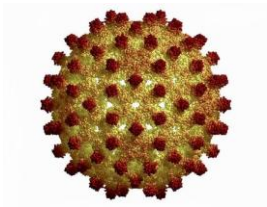
Other findings

- Hand Hygiene
- Glove use
- Common supply carts in treatment areas
- Movement of unused supplies between workstations and supply carts
- Crowding

Conclusions

- Hepatitis B exposure did not result in any conversions
- Infection Control investigation did identify many problems with practice and led to significant improvements in:
 - HBV testing
 - Environment
 - IC practices

Questions?



<http://healorhell.com/wp-content/uploads/2011/03/hepatitis-b2.jpg>
