

Transmission of Hepatitis B Virus Among Persons Undergoing Blood Glucose Monitoring in Long-Term-Care Facilities — Mississippi, North Carolina, and Los Angeles County, California, 2003–2004

Regular monitoring of blood glucose levels is an important component of routine diabetes care (1). Capillary blood is typically sampled with the use of a fingerstick device and tested with a portable glucometer. Because of outbreaks of hepatitis B virus (HBV) infections associated with glucose monitoring, CDC and the Food and Drug Administration (FDA) have recommended since 1990 that fingerstick devices be restricted to individual use (2,3). This report describes three recent outbreaks of HBV infection among residents in long-term-care (LTC) facilities that were attributed to shared devices and other breaks in infection-control practices related to blood glucose monitoring. Findings from these investigations and previous reports suggest that recommendations concerning standard precautions and the reuse of fingerstick devices have not been adhered to or enforced consistently in LTC settings (2–5). The findings underscore the need for education, training, adherence to standard precautions, and specific infection-control recommendations targeting diabetes-care procedures in LTC settings (4–6) (Box 1).

The three outbreaks described in this report were all reported by state or local health departments to CDC, which provided epidemiologic and laboratory assistance. In each of the three LTC settings, residents were tested for serologic markers for HBV infection. Under the case definitions used in these investigations, residents who tested positive for IgM antibody to hepatitis B core antigen (anti-HBc) were defined as having acute HBV infection. Residents who tested positive for hepatitis B surface antigen (HBsAg) and total anti-HBc, but who tested negative for IgM anti-HBc, were considered to have chronic HBV infection. Residents who tested positive for total anti-HBc, but who tested negative for HBsAg, or those who had antibody to HBsAg (anti-HBs) ≥ 10 milli-International Units (mIU) per milliliter were considered immune to HBV infection. Residents were considered susceptible to HBV if they had no HBV markers. A retrospective cohort study was performed as part of each investigation; the study was restricted to acutely infected and susceptible residents to identify risk factors. In all three investigations, staff members were evaluated; none were identified as sources of infection. Medical records were reviewed and infection-control procedures were assessed through direct observation and by interviews with nursing staff members.

BOX 1. Recommended practices for preventing patient-to-patient transmission of hepatitis viruses from diabetes-care procedures in long-term-care settings

Diabetes-care procedures and techniques

- Prepare medications such as insulin in a centralized medication area; multidose insulin vials should be assigned to individual patients and labeled appropriately.
- Never reuse needles, syringes, or lancets.
- Restrict use of fingerstick capillary blood sampling devices to individual patients.
- Consider using single-use lancets that permanently retract upon puncture.
- Dispose of used fingerstick devices and lancets at the point of use in approved sharps containers.
- Assign separate glucometers to individual patients. If a glucometer used for one patient must be reused for another patient, the device must be cleaned and disinfected. Glucometers and other environmental surfaces should be cleaned regularly and whenever contamination with blood or body fluids occurs or is suspected.
- Store individual patient supplies and equipment, such as fingerstick devices and glucometers, within patient rooms when possible.
- Keep trays or carts used to deliver medications or supplies to individual patients outside patient rooms. Do not carry supplies and medications in pockets.
- Because of possible inadvertent contamination, unused supplies and medications taken to a patient's bedside during fingerstick monitoring or insulin administration should not be used for another patient.

Hand hygiene and gloves

- Wear gloves during fingerstick blood glucose monitoring, administration of insulin, and any other procedure involving potential exposure to blood or body fluids.
- Change gloves between patient contacts and after every procedure that involves potential exposure to blood or body fluids, including fingerstick blood sampling. Discard gloves in appropriate receptacles.
- Perform hand hygiene (i.e., hand washing with soap and water or use of an alcohol-based hand rub) immediately after removal of gloves and before touching other medical supplies intended for use on other patients.

Nursing Home A, Mississippi

During November–December 2003, the Mississippi Department of Health received reports of two fatal cases of acute HBV infection among residents of nursing home A. The first patient with recognized symptoms of HBV infection had received serologic testing for viral hepatitis infection in June 2003 as part of a hospital emergency department evaluation

for abdominal pain. Although this patient was found to have a positive test for IgM anti-HBc, indicating acute HBV infection, and the finding was noted in the patient's chart in September 2003, nursing home A did not contact the state health department or initiate an internal investigation. Subsequently, the patient died.

In December 2003, after a second patient with acute HBV infection had died, and after a third with acute HBV infection was reported, serologic testing was performed on specimens from all 158 residents. Test results were available for 160 residents, including the two decedents; 15 (9%) had acute HBV infection, one was chronically infected, 15 (9%) were immune, and 129 (81%) were susceptible. Percutaneous and other possible exposures among residents were evaluated. Among 38 residents who routinely received fingersticks for glucose monitoring, 14 had acute HBV infection, compared with one of 106 residents who did not receive fingersticks (relative risk [RR] = 39.0; 95% confidence interval [CI] = 5.3–290.0).

Glucose monitoring of 14 residents with acute HBV infection and the resident with chronic HBV infection was performed by staff members based at the same nursing station. Reviews of infection-control practices and site inspections indicated that each of the four nursing stations in nursing home A was equipped with one glucometer and one spring-loaded, pen-like fingerstick device. Staff members reported that a new end cap and lancet assembly was used for each fingerstick procedure; however, the spring-loaded barrel and glucometer were not routinely cleaned between patients. Investigators also observed that insulin and other multidose medication vials were not labeled with patient names or the dates the vials were opened. In an anonymous survey, several staff members reported observing other workers reuse a needle or lancet or fail to change gloves between patients. No other percutaneous exposures were associated with illness.

Assisted Living Center B, Los Angeles County, California

During January–February 2004, the Los Angeles County Department of Health Services received reports of four residents with diabetes in assisted living center B who had acute HBV infection during November 2003–January 2004. Because these initial reports were among residents with diabetes, serologic testing was performed in January 2004 on residents who had received fingersticks for blood glucose monitoring during May–December 2003. Of 22 residents tested (three declined), eight (36%) had acute HBV infection, including the four residents previously identified; six (27%) were immune (and excluded from the analysis), and none had chronic infection. Reviews of patient records indi-

cated that one of the acutely infected residents had been repeatedly tested at a separate hemodialysis center and had seroconverted to HBsAg-positive in July 2003. Of the nine patients who had daily exposure to fingerstick procedures performed by nursing staff, eight had acute HBV infection, compared with none among the seven residents who performed their own fingersticks (RR = undefined; CI = 2.8–undefined). Although receipt of insulin was also significantly associated with infection, two residents with acute HBV infection had not received insulin. Other percutaneous exposures (e.g., podiatric or dental care) were not associated with HBV infection.

Fingerstick procedures were often performed by nursing staff members in a central living area, with diabetes patients seated at a common table. Although residents had their own fingerstick devices, nurses reported occasionally using a pen-like fingerstick device barrel from their own kits to collect consecutive blood samples; a single glucometer was typically used for all residents. Nurses reported that they were discouraged from wearing gloves to decrease the sense of a clinical environment, and hand hygiene was not performed between procedures.

Nursing Home C, North Carolina

In May 2003, a case of HBV infection in a resident of nursing home C was reported to the North Carolina Department of Health. During June–July 2003, serologic testing was performed on specimens from all 192 residents; 11 (6%) had acute HBV infection, 16 (8%) were immune, and 165 (86%) were susceptible. No resident had chronic HBV infection. Of 45 residents who received fingersticks for glucose monitoring, eight (18%) had acute HBV infection, compared with three (3%) of 117 residents without this exposure (RR = 6.9; CI = 1.9–25.0). After data were controlled for fingerstick exposures, acute HBV infection was not associated with other percutaneous exposures (e.g., insulin injections, podiatry procedures, or phlebotomy). Two diabetes patients at nursing home C who were potential sources of the outbreak were identified retrospectively; one had clinical symptoms of hepatitis B and serologic markers of acute infection during 2002, whereas the other had chronic HBV infection and died in February 2002.

Interviews with staff and direct observation of glucose-monitoring practices revealed that only single-use lancets were used, and insulin vials were not shared among patients. However, on each wing of the facility, a single glucometer was used for all patients receiving fingersticks; glucometers were not routinely cleaned between patients. On some days, a single health-care worker performed approximately 20 fingerstick

procedures during a single work shift. In an anonymous survey, nursing staff members indicated that some health-care workers did not always change gloves between patients when performing fingerstick procedures.

Reported by: *R Webb, MD, M Currier, MD, J Weir, KM McNeill, MD, Mississippi Dept of Health. E Bancroft, MD, D Dassey, MD, J Maynard, D Terashita, MD, Los Angeles County Dept of Health Svcs, California. K Simeonsson, MD, A Chelminski, J Engel, MD, North Carolina Dept of Health and Human Svcs. JF Perz, DrPH, AE Fiore, MD, IT Williams, PhD, BP Bell, MD, Div of Viral Hepatitis, National Center for Infectious Diseases; T Harrington, MD, C Wheeler, MD, EIS officers, CDC.*

Editorial Note: Lack of adherence to standard precautions and failure to implement long-standing recommendations against sharing fingerstick devices place LTC residents at risk for acquiring infections from bloodborne pathogens such as HBV (2,3,7). In nursing home A, the spring-loaded barrel of a fingerstick device was used for multiple patients. Previous outbreaks have been linked to such devices when the platform or barrel supporting the disposable lancet was reused for multiple patients, when used lancets were stored with unused lancets, or when lancet caps were reused (2,3; CDC, unpublished data, 1999). In assisted living center B, nursing staff members routinely administered fingersticks without wearing gloves or performing hand hygiene between patients, and spring-loaded fingerstick devices were also occasionally shared.

In nursing home C, as with other recent outbreaks (8; CDC, unpublished data, 2002), transmission of HBV among residents with diabetes occurred despite use of single-use fingerstick devices or insulin medication vials that were dedicated for individual patient use. In these settings, glucose monitors, insulin vials, or other surfaces contaminated with blood from an HBV-infected person might have resulted in transfer of infectious virus to a health-care worker's gloves and to the fingerstick wound or subcutaneous injection site of a susceptible resident. Similar indirect transmission of HBV in health-care settings through contaminated environmental surfaces or inadequately disinfected equipment has been reported with other health-care procedures, such as dialysis (6,9). HBV is stable at ambient temperatures; infected patients, who often lack clinical symptoms of hepatitis, can have high concentrations of HBV in their blood or body fluids (6). To prevent patient-to-patient transmission of infections through cross-contamination, health-care providers should avoid carrying supplies from resident to resident and avoid sharing devices, including glucometers, among residents.

The risk for patient-to-patient transmission of HBV infection can be reduced by implementing specific prevention measures (Boxes 1 and 2). LTC staff often perform numerous percutaneous procedures; frequent blood glucose monitoring

BOX 2. Recommended medical management, training, and oversight measures to prevent patient-to-patient transmission of hepatitis viruses from diabetes-care procedures in long-term-care settings

- Regularly review patient schedules for fingerstick blood glucose sampling and insulin administration and reduce the number of percutaneous procedures to the minimum necessary for appropriate medical management of diabetes and its complications.
- Ensure that adequate staffing levels are maintained to perform all scheduled diabetes-care procedures, including fingerstick blood glucose monitoring.
- Consider diagnosis of acute viral hepatitis infection in patients with illness that includes hepatic dysfunction or elevated liver transaminases (serum alanine aminotransferase and aspartate aminotransferase).
- Provide a full hepatitis B vaccination series to all previously unvaccinated staff members with exposure to blood or body fluids. Check and document postvaccination titers 1–2 months after completion of the vaccination series.
- Establish responsibility for oversight of infection-control activities. Investigate and report any suspected case of newly acquired bloodborne infection.
- Require staff members to know standard precautions and demonstrate proficiency in taking these precautions with procedures involving potential blood or body fluid exposures.
- Provide staff members who perform percutaneous procedures with infection-control training that includes practical demonstration of aseptic techniques and instruction regarding reporting exposures or breaches. Conduct annual retraining of all staff members who perform procedures with exposure to blood or body fluids.
- Assess compliance with infection-control recommendations (e.g., hand hygiene or glove changes) by periodic observation of staff and tracking use of supplies.

increases opportunities for bloodborne pathogen transmission. The outbreak investigations reported here identified residents with diabetes who received fingersticks from nursing staff members as often as four times per day, according to their physician's routine orders, despite having consistently normal glucose levels. Expert panels have concluded that approximately 8 years are needed before the benefits of glycemic control result in reductions in microvascular complications (1,10). In LTC settings, schedules for fingerstick blood sampling of individual patients should be reviewed regularly to reduce the number of percutaneous procedures to the minimum necessary for their appropriate medical management. In each of the investigations described in this report, implementation of

infection-control measures (Boxes 1 and 2) was recommended, along with follow-up serologic testing for markers of HBV.

An estimated 70,000–80,000 HBV infections occur each year in the United States. Most of these infections occur among young adults with behavioral risk factors (i.e., sexual contact and injection-drug use); these adults should receive hepatitis B vaccine. Preventing transmission of HBV among patients in long-term-care settings requires adherence to recommended infection-control practices and prompt response to identified instances of transmission. Routine hepatitis B vaccination or screening of LTC residents is not recommended. In the outbreaks described in this report, initial cases were not identified or investigated in a timely fashion, resulting in missed opportunities to correct deficient practices and interrupt transmission. Evidence of acute viral hepatitis in any LTC resident should prompt a thorough investigation. For a case involving a resident with diabetes, fingerstick blood sampling procedures and insulin administration should receive particular scrutiny. Health departments should encourage reporting of such cases and offer assistance in identifying the source of infection. CDC continues to support investigations in LTC and other health-care settings and is working toward improved implementation of the infection-control recommendations described in this report.

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References

- American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 2004;27:S15–35.
- CDC. Nosocomial transmission of hepatitis B virus associated with a spring-loaded fingerstick device—California. *MMWR* 1990;39:610–3.
- CDC. Nosocomial hepatitis B virus infection associated with reusable fingerstick blood sampling devices—Ohio and New York City, 1996. *MMWR* 1997;46:217–21.
- CDC. Update: universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR* 1988;37:377–88.
- American Association of Diabetes Educators. Educating providers and persons with diabetes to prevent the transmission of bloodborne infections and avoid injuries from sharps. Chicago, IL: American Association of Diabetes Educators; 1997. Available at <http://www.aadnet.org/PublicAffairs/PositionStatements/EducProvidersBloodborneInfections.pdf>.
- Williams IT, Perz JF, Bell BP. Viral hepatitis transmission in ambulatory health care settings. *Clin Infect Dis* 2004;38:1592–8.
- Desenclos JC, Bourdiol-Razes M, Rolin B, et al. Hepatitis C in a ward for cystic fibrosis and diabetic patients: possible transmission by spring-loaded finger-stick devices for self-monitoring of capillary blood glucose. *Infect Control Hosp Epidemiol* 2001;22:701–7.
- Khan AJ, Cotter SM, Schulz B, et al. Nosocomial transmission of hepatitis B virus infection among residents with diabetes in a skilled nursing facility. *Infect Control Hosp Epidemiol* 2002;23:313–8.
- CDC. Recommendations for preventing transmission of infections among chronic hemodialysis patients. *MMWR* 2001;50(No. RR-5).
- Brown AF, Mangione CM, Saliba D, Sarkisian CA; California Healthcare Foundation/American Geriatrics Society Panel on Improving Care for Elders with Diabetes. Guidelines for improving the care of the older person with diabetes mellitus. *J Am Geriatr Soc* 2003;51:S265–80.

Salmonellosis Associated with Pet Turtles — Wisconsin and Wyoming, 2004

Salmonellosis associated with small pet turtles in the United States was a major public health concern in the 1970s (1). In 1975, the Food and Drug Administration (FDA) banned commercial distribution of small turtles (i.e., those with a carapace of <4 inches) (2). The FDA ban prevents an estimated 100,000 cases of salmonellosis among children each year (3). However, a recent resurgence in the sale of small turtles has generated concern. In Wisconsin and Wyoming, at least six human cases of salmonellosis have been linked to such turtles. This report describes the investigation into those cases. The findings underscore the need for health and environmental officials to prevent illegal distribution of small turtles and consider patient contact with turtles when investigating salmonellosis cases.

Wisconsin

Case 1. While vacationing with her family in Wisconsin in late July 2004, a Kansas girl aged 4 years was taken to an emergency department with diarrhea and fever of 4 days' duration. Her mother was instructed to keep the child on a clear liquid diet until the diarrhea ceased, and the child was released. The next day, the patient was taken to an urgent-care clinic for treatment of bloody diarrhea, cramps, and fever. Stool cultures yielded *Salmonella enterica* serotype Pomona, a rare serotype. The child was placed on a 3-day course of trimethoprim/sulfamethoxazole, and the illness resolved after 5 days.

Epidemiologic investigation by the Wisconsin Division of Public Health (WDPH) determined that the family had purchased a small turtle at a souvenir shop (store A) in northwest Wisconsin. Warned by the public health nurse of the possible link between the turtle and the child's illness, the family removed the turtle, so the animal was not available for testing.

Cases 2 and 3. In July 2004, a boy aged 2 years was taken to his physician with watery diarrhea and fever of 4 days'