OUTBREAK OF HEPATITIS B IN RETIREMENT CENTER

BACKGROUND

On January 8, 2004, Acute Communicable Disease Control Program (ACDC) was notified by a hospital infection control practitioner about two patients from the same retirement center who had been diagnosed with acute hepatitis B on December 2003 (case A) and January 2004 (case B) in the hospital. Both patients were diabetic. ACDC subsequently learned that two more diabetic residents of this retirement center (cases C and D) had earlier been reported with acute hepatitis B. These cases had been investigated by public health nurses (PHNs) in two districts (Whittier district and El Monte district) in November and early December 2004. Case C, reported in November, was transferred by a family member to the hospital out of the residential district (El Monte district), so the retirement center had not been informed of this client's diagnosis. Case D was investigated as an individual case by the Whittier district, so an outbreak investigation was never initiated at that time.

ACDC launched an investigation to determine the source of acute hepatitis B among residents in the retirement center. The investigation included site visits, case findings through a serological survey, a case-control study to examine risk factors, and interviews with the retirement center personnel. The retirement center contracted with two different healthcare agencies to provide nurses for fingersticks and insulin injections in diabetic patients who could not self-administer these procedures.

METHODS

Laboratory Case Identification: To determine the hepatitis B status of residents, under ACDC direction in January 2004, the staff of the retirement center ordered hepatitis tests (IgM anti-HBc, HBsAg, HBc-Ab total, HBsAb, and transaminase levels) on all facility residents who had received fingersticks from May to December 2003. ACDC obtained blood specimens from diabetic patients who had been discharged from the retirement center before January 2004. ACDC also obtained results of previous testing for markers of hepatitis B (IgM anti-HBc, HBsAg, HBc-Ab total, HBsAb, and transaminase levels) from hospital and dialysis center records on selected patients. Agency nurses were tested for IgM anti-HBc, HBsAg, and transaminase levels at a LAC DHS Public Health Clinic. Additionally, blood samples from HBsAg positive cases were sent to specialty laboratories to determine the subtype of hepatitis B surface antigen and eAg status.

Case-Control Study: An acute case of hepatitis B was defined as a patient with a positive test for IgM anti-HBc or documented seroconversion to HBsAg+ during July to December 2003.Controls were defined as a patient who had been a resident of the retirement center anytime from May to December 2003, who received fingersticks, and who did not have serologic evidence or past or current infection or immunity to hepatitis B. Analyses excluded residents with a history of vaccination to hepatitis B (as evidenced by positive HBsAb) or a history of exposure to hepatitis B (positive HBc-Ab total), or who were chronic carriers of hepatitis B surface antigen (positive HBsAg).

ACDC staff reviewed medical charts of all diabetic patients who had fingersticks. Charts were obtained from the retirement center, hospitals, and dialysis centers. Information abstracted from patient charts included: date of all hepatitis tests, age, underlying diagnosis, use of insulin, podiatry and dentistry visits, length of time at the retirement center, and finger stick routine. ACDC also collected information about vaccination status of the agency nurses and of selected patients. For analysis, the diabetic patients were divided into three groups:1) patient who receive fingersticks exclusively from home healthcare agency nurses, 2) patients who received fingersticks occasionally from the nurses (primarily to demonstrate blood sugar levels to the physician), or 3) patients who perform their own fingersticks and never received fingersticks from the nurses.

Evaluation of Infection Control: After cases A and B were reported, ACDC directed the district PHNs to ask specific questions when they made visits to the retirement center in January 2004 as part of investigating the cases. The district PHNs questioned the agency nurses about policies and procedures regarding fingersticks. ACDC staff also conducted several interviews with the agency nurses in January 2004 about policies and procedures regarding fingersticks and universal precautions. In February 2004, ACDC investigators toured the retirement center, re-interviewed the agency nurses about policies and procedures regarding performance of fingersticks and observed a demonstration of how the nurses prepared to fingerstick a patient.

A representative from the County of Los Angeles, Department of Health Services, Health Facilities Division, made a visit to the retirement center in February 2004 to interview the agency nurses about fingerstick procedures. The same representative made visits to the two home health agencies to determine whether those agencies maintain the community standard of care for infection control.

RESULTS

Serologic Study: Of the 25 patients identified as receiving fingersticks, hepatitis tests were obtained on 22 of them (88%). Fourteen had serologic markers to hepatitis B of which eight were determined to have acute hepatitis B (including cases A-D). All eight patients with acute hepatitis B were IgM anti-HBc+ and HBsAg+. Only three patients had evidence of prior immunization, and four had evidence of prior exposure to hepatitis B. No chronic carriers were identified. Six patients had no markers for acute or chronic hepatitis B and these were considered controls. Both nurses tested negative for markers of acute or chronic hepatitis B.

Of the eight cases, six (75%) samples of blood were available for surface antigen typing and testing for eAg status. All six were genotype A/subtype adw2—which accounts for most of the HBV infections acquired in the USA. In addition, all six were eAg+—which is an indication of acute disease and high transmissibility.

Case-Control Study: Eight patients were excluded from analysis because they had a history of vaccination or prior exposure to hepatitis B on sero-survey resulting in a study population of eight cases and six controls. Eight patients received twice-a-day fingersticks from agency nurses, five received occasional fingersticks, and one did not receive fingersticks from the agency nurses. All eight patients with acute hepatitis B received fingersticks twice a day from agency nurses. In contrast, we found no cases of hepatitis B among those who occasionally or never received fingersticks by the agency nurses. These differences are statistically significant ($p<0.05$). There was no statistically significant association with podiatry or dentistry visits or any other collected risk factors.

The earliest onset of acute hepatitis B was determined to be in July of 2003—a dialysis patient, who had repeatedly tested negative for HBsAg, seroconverted to HBsAg+ at that time. Subsequently the patient tested positive for IgM anti-HBc in February 2004. Four more residents (cases A-D) were hospitalized in November through January with markers of acute hepatitis B. Three more asymptomatic cases with a positive HBc-IgM were identified by sero-survey in January 2004.

Infection Control: Investigation revealed several breaches of infection control. First, when interviewed by the district PHN in January during the investigation of one of the first reported patients, the agency nurses did not show a familiarity with universal precautions that can prevent cross-contamination (i.e., using gloves for all percutaneous procedures, changing gloves between patients, washing hands between patients, etc.). Moreover, at the site visit in February, agency nurses admitted seeing blood 2-3 times a week on their gloves after performing fingersticks. Fingersticks were performed in a common central living area and the Health Facilities investigation revealed that patients were gathered, three at a time, to have fingersticks around a non-sterile table. A common glucometer was used for all patients. There was no easily accessible sink for nurses to wash their hands between patients. Finally, the nurses reported being discouraged from wearing gloves as a means of decreasing the clinical or medical atmosphere at the retirement center. One nurse admitted that in a hurry, she would sometimes re-use a pen-like fingerstick

device from her personal kit on patients. Both agency nurses gave a history of incomplete hepatitis B vaccination.

DISCUSSION

Based on the findings of the sero-survey and the case-control study, twice-daily fingersticks from the agency nurses was highly associated with the acquisition of acute hepatitis B at the retirement center. An additional finding was that one out of eight acute hepatitis B patients had seroconverted in July. That patient may have acquired acute hepatitis B outside of the retirement center. That patient continued to test positive for eAg seven months after acquisition of hepatitis B—which indicates a high level of viremia. The infective dose of hepatitis B is very small and the virus can survive on surfaces for up to seven days. Cross-transmission could have occurred with contaminated equipment or healthcare workers hands.

Of the two patients that did not contract hepatitis B yet received fingersticks twice daily from the agency nurses, one was vaccinated and the other was discharged in August—potentially before transmission took place.

Reports of outbreaks of hepatitis B in diabetics in nursing homes and hospitals have been increasing and these have been associated with poor infection control or shared diabetic equipment (glucometers or fingerstick devices). Glucometers and fingerstick devices are clearly labeled by manufacturers for single patient use only because of the potential for cross contamination with bloodborne pathogens. The reuse of glucometers and fingerstick devices, even with a change of lancets between patients, has been associated with the transmission of hepatitis B.

Given the breaches of infection control identified in this investigation, it is reasonable to conclude that this outbreak was associated with breaks in infection control during the fingerstick procedure though we cannot rule out other methods of transmission. Each of the above factors created and facilitated the possibility of cross-infection with bloodborne pathogens. Furthermore, the practices were contrary to community standard for percutaneous procedures. However, at this time we cannot determine what single break in infection control led to the transmission of hepatitis B to the eight patients.

Recommendations: From the findings, the ACDC recommended that the retirement center follow the principles of infection control. The recommendations included:

- using a sterile, single-use finger-stick device (to protect healthcare workers from touching used lancets),
- using individual glucometers for each patient,
- developing a facility-specific procedure for testing diabetics,
- developing a competency tool to assess healthcare workers' knowledge of and compliance with the policy,
- using universal precautions, including changing gloves between patients and disinfecting hands, and
- reducing the number of finger sticks in residents who are non-insulin dependent.

ACDC also recommended that the retirement center and their home health agency's staff receive proper infection control and bloodborne pathogens training. They were required to show new policies and procedures for bloodborne pathogens and on-going in-service plan to ACDC and their appropriate licensing agencies (Health Facilities or Department of Social Services). Furthermore, ACDC recommended that the medical director of the retirement center notify each of the patients that tested positive for acute hepatitis B of their test results and that patients or their guardians should be counseled about the medical ramifications of acquiring acute hepatitis B. Tests for HBsAg were advised to be repeated in six months to determine if the patient has become a carrier of hepatitis B since this may have implications for further treatment and monitoring of their condition.

Conclusions: ACDC conducted an investigation that included case identification, a case control study, an evaluation of infection control, and providing hepatitis education information. ACDC provided letters to the retirement center and the home health agencies outlining the findings from the investigation and

recommendations for enhancing infection control. After ACDC reviewed their corrective action plan, ACDC made some comments and gave feedback. ACDC and district public health nurses educated the retirement center staff and home health nurses regarding hepatitis and emphasized the importance of good hand washing techniques and universal precautions. The results of the investigation emphasize the need to restrict use of fingerstick devices to individual patients and that, when invasive procedures are performed on multiple patients, gloves should be changed after contact with each patient. The agencies complied with our recommendations and their administrators and staff trained with an infection control practitioner regarding bloodborne pathogens. ACDC expects that the three agencies will provide yearly updates on bloodborne pathogen standards to their staff.

ACDC did not recommend the retirement center to provide all diabetic patients hepatitis B vaccine because the costs were high and most medical insurances did not cover for adult hepatitis B vaccine. Anyhow, not only did we work with the retirement center in controlling the conditions that facilitated the transmission of hepatitis B, we also contributed this outbreak to the CDC. In March, 2005, the CDC published a MMWR report on the transmission of hepatitis B virus among persons undergoing blood glucose monitoring in long term care facilities. The report included recommended practices for the performance of figersticks in non-acute healthcare settings. Locally, it will be sent by the California Department of Social Services to all residential care facilities for the elderly (RCFE) in California this summer to provide them the knowledge to achieve the prevention of nosocomial hepatitis B.

ADDITIONAL RESOURCES

CDC. Nosocomial hepatitis B virus infection associated with reusable fingerstick blood sampling devices—Ohio and New York City. MMWR 1997; 46:217–21.

CDC. 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. MMWR 2005; 54:220-23.

Khan AJ, Cotter SM, Schulz B, Hu X, et al. Nosocomial transmission of hepatitis B virus infection among residents with diabetes in a skilled nursing facility. ICHE 2002; 23(6):313.