



Major article

Outbreak of hepatitis C virus infection associated with narcotics diversion by an hepatitis C virus–infected surgical technician



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Background: Drug diversion by health care personnel poses a risk for serious patient harm. Public health identified 2 patients diagnosed with acute hepatitis C virus (HCV) infection who shared a common link with a hospital. Further investigation implicated a drug-diverting, HCV-infected surgical technician who was subsequently employed at an ambulatory surgical center.

Methods: Patients at the 2 facilities were offered testing for HCV infection if they were potentially exposed. Serum from the surgical technician and patients testing positive for HCV but without evidence of infection before their surgical procedure was further tested to determine HCV genotype and quasi-species sequences. Parenteral medication handling practices at the 2 facilities were evaluated.

Results: The 2 facilities notified 5970 patients of their possible exposure to HCV, 88% of whom were tested and had results reported to the state public health departments. Eighteen patients had HCV highly related to the surgical technician's virus. The surgical technician gained unauthorized access to fentanyl owing to limitations in procedures for securing controlled substances.

Conclusions: Public health surveillance identified an outbreak of HCV infection due to an infected health care provider engaged in diversion of injectable narcotics. The investigation highlights the value of public health surveillance in identifying HCV outbreaks and uncovering a method of drug diversion and its impacts on patients.

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Hepatitis C virus (HCV) transmission during health care procedures has been increasingly identified in the United States, with outbreaks occurring in a variety of health care settings.^{1,2} The majority of outbreaks have involved patient-to-patient transmission, largely through unsafe injection practices (eg, reuse of syringes); however, transmission from HCV-infected health care personnel to patients from diversion of injectable narcotics has been documented as well.^{1,3–8} In these instances, diversion has involved some

form of tampering with the injectable narcotic, exposing patients to a health care worker's blood. As demonstrated by these outbreaks, drug diversion by health care personnel poses a serious threat to patient safety, potentially putting large numbers of patients at risk for acquiring infections.^{8,9}

In late April 2009, Colorado state and local public health department officials conducted routine interviews¹⁰ with 2 patients newly diagnosed with acute HCV infection (index patients). Both patients denied traditional HCV infection risk behaviors or exposures, both had undergone a surgical procedure on consecutive days at the same hospital (facility A), and both had HCV genotype 1b infection. Public health officials initiated an investigation to (1) determine whether these patients acquired their infections at the facility, (2) identify the mode of transmission, (3) determine whether other patients were infected, and (4) prevent additional infections.

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Conflicts of interest: None to report.

METHODS

Review of facility A records and identification of the infected surgical technician

Following interviews with the 2 index patients, state public health officials contacted facility A to request these patients' medical records, a list of all patients who had undergone surgical procedures during the 6 days before the surgery date for the first index patient, and a list of personnel assigned to the index patients' surgical procedures. At this time, facility A management indicated that they had recently dismissed a surgical technician owing to suspicion of narcotic drug diversion. In addition, facility A's records indicated that the technician had tested positive for HCV antibodies (anti-HCV) on pre-employment screening.

Interviews with the surgical technician

This technician was contacted by a state public health official, who learned that the technician began working at an ambulatory surgical center in Colorado (facility B) following dismissal from facility A. Public health officials conducted interviews with the surgical technician to determine dates and locations of employment, whether narcotics diversion had occurred, and relevant details of the diversion. Public health officials advised the technician to refrain from providing any patient care while the investigation was pending and received consent to obtain a blood sample for HCV, hepatitis B virus (HBV), and human immunodeficiency virus (HIV) testing.

Case finding and case definitions

Following the interview with the surgical technician, public health officials requested an expanded list of patients representing persons who had undergone surgery during the time that the surgical technician performed clinical duties at facility A or B (October 21, 2008, to April 22, 2009, for facility A and May 4, 2009, to July 1, 2009, for facility B).

In conjunction with public health officials, facilities A and B contacted patients by letter and/or phone to advise them of their potential exposure to HCV.^{11,12} Patients were offered free testing for HCV infection and serum alanine aminotransferase (ALT) levels through a contracted laboratory (as outlined below). Patients who tested positive for HCV infection were referred for follow-up care and medical management.

Colorado physicians and laboratories are required to report to the state or local health department any tests that indicate HCV infection.^{13,14} These reports are maintained within a state disease reporting system, from which the 2 index patients were identified for routine public health interviews. For this investigation, facilities A and B also reported positive and negative HCV infection test results to the state health departments for individuals who were tested through the contracted laboratory. The names and birth dates of these patients were matched to the state disease reporting system to identify patients already diagnosed with HCV infection and to determine whether HCV infection had been documented before the surgical procedure at facility A or B.

For all patients identified with HCV infection, public health officials assessed the patient's medical history, previous hepatitis test results, risk factors for HCV infection, and date and time of surgical procedure through a review of the medical records from facility A or B and data captured in the disease reporting system.¹⁰ Patients were classified according to five case definitions developed for this investigation (Table 1).

Commercial laboratory testing of patients for HCV

Public health officials recommended that patients undergo testing for serum ALT levels and for the presence of anti-HCV, with confirmatory testing by a recombinant immunoblot assay (RIBA) when necessary. For patients who underwent their first anti-HCV test within 6 weeks after the date of their surgical procedure, HCV RNA testing was also recommended. All patients found to have a positive anti-HCV or RIBA test result were tested for the presence of HCV RNA to identify ongoing infections. For those with detectable HCV RNA, HCV genotype testing was performed.

Molecular investigation of HCV

Serum specimens from patients identified to be HCV RNA-positive were forwarded to the Centers for Disease Control and Prevention (CDC), Division of Viral Hepatitis laboratory if they were HCV genotype 1b (the same as the surgical technician) or an unknown HCV genotype and if, based on review of the disease reporting system or patient interview, the patient was not known to have HCV infection before the surgical procedure. A specimen submitted from the surgical technician was also forwarded to the CDC. At the CDC, serum samples were tested for HCV RNA by polymerase chain reaction (PCR) using the AMPLICOR HCV Test, version 2.0 (Roche Molecular Systems, Branchburg, NJ), with a lower limit of detection of ~50 copies/mL. Then HCV genotype was determined using the VERSANT HCV Genotype 2.0 Assay (LiPA) (Siemens Healthcare Diagnostics, Tarrytown, NY). Subsequently, the subgenotype was determined from a 300-nucleotide NS5B coding region of the HCV genome.^{15,16}

The genetic relatedness of virus from the surgical technician and patients was determined by analysis of HCV quasi-species by sequencing a segment amplified from the E1-hypervariable region 1 (HVR1) of the HCV genome (291 nucleotides in length), as described previously.¹² The E1-HVR1 quasi-species sequences from the surgical technician and patient specimens were compared with each other, and also compared with the sequences of 5 randomly selected individuals with HCV genotype 1b infection from the Third National Health and Nutrition Examination Survey (NHANES III), a representative sample of the noninstitutionalized civilian population of the United States.¹⁷

Statistical analysis

The pairwise genetic distances of nucleotide quasi-species sequences were estimated with the DNADIST program in the PHYLIP package, version 3.68 (Joseph Felsenstein, University of Washington, Seattle, WA). Differences in the distributions of the HVR1 genetic distances were compared using the ANOVA program in SAS for Windows, version 9.3 (SAS Institute, Cary, NC). A *P* value <.05 was considered significant.

Facility A and B onsite evaluations

Public health officials conducted an onsite evaluation and review of infection control practices at facilities A and B. Surgical procedures at both facilities were observed, and selected personnel were interviewed to ascertain storage, preparation, and waste procedures for parenteral medication, with a focus on controlled substances (eg, fentanyl).

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