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Risk of Hepatitis C Virus Transmission from Patients to Healthcare Workers: A Prospective Observational Study

Transmission of hepatitis C virus (HCV) requires contact with contaminated blood. Healthcare workers (HCWs) are considered to be at risk of HCV infection. Percutaneous exposure to contaminated needles and sharp objects or blood splashes represents the suspected routes of transmission.[1,2]

Between 1995 and 2009, we conducted this single-center prospective study at Paracelsus Medical University Salzburg, Austria, which annually manages approximately 95,000 inpatient and 370,000 outpatient contacts. The investigation was designed to evaluate rates and potential risk factors for HCV transmission and the course of HCV-infected sources.

A protocol was established to record injuries and ensure follow-up. (1) Personnel were repeatedly informed by letter or e-mail about the investigation and proceedings in case of a needlestick or sharps injury. Employees were instructed to follow a wound site decontamination procedure consisting of mechanically encouraging bleeding and rinsing of the wound, applying soap and water followed by 75% alcohol. In case of detectable HCV antibodies, HCV infection was confirmed by HCV polymerase chain reaction (PCR) and genotyping in patients and HCWs. (2) HCV antibodies and PCR were determined at 4, 24, and 48 weeks after exposure. (3) HCWs were given a questionnaire to document demographic data. Questions aimed to elucidate the type of injury, device involved (hollow bore vs solid device), use of gloves, time and depth of injuries, needle placement in the patient's vein or artery, and estimation of the amount of transmitted blood. Standard assays were used at the respective times during the study for HCV antibody, RNA, and genotyping; details can be requested from the corresponding author.

In total, 4,611 needlestick and sharps injuries were reported from 4,463 individual HCWs, corresponding to 354.5 ± 81.8 incidents annually. Complete data were obtained from 3,917 needlestick and sharps injuries for analysis. Among these, 168 patients had detectable HCV antibodies, and HCV

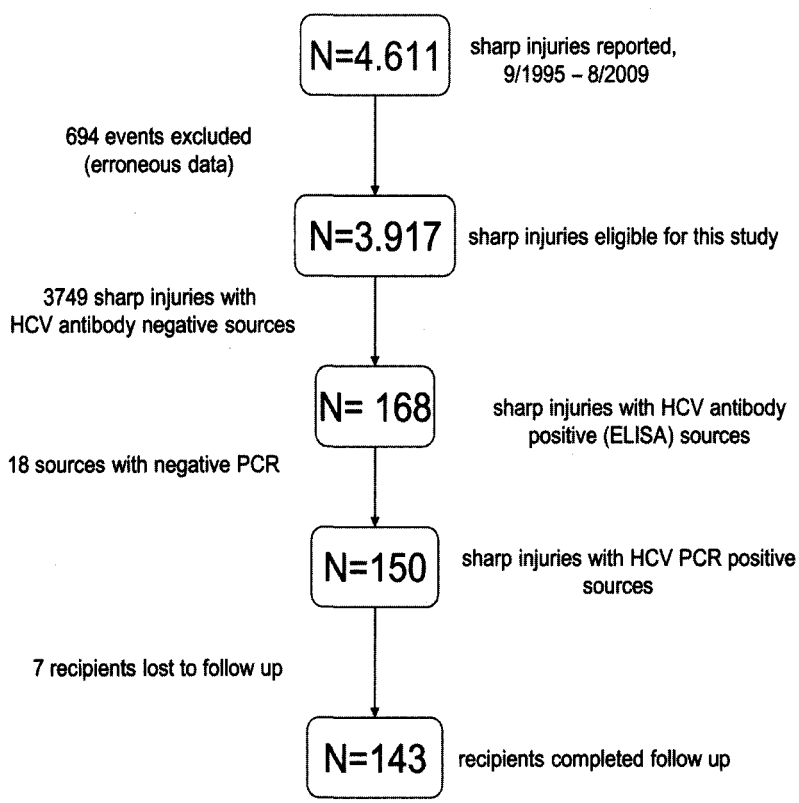

FIGURE 1. Flow diagram of reported sharps injuries. A total of 4,611 needlestick and sharps injuries were reported during the study period, and 150 incidents with hepatitis C virus (HCV) polymerase chain reaction (PCR)–positive source patients occurred; of these, 143 completed the 12-month follow-up period. ELISA, enzyme-linked immunosorbent assay.

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infection was confirmed in 150. One hundred forty-three of the 150 (95.2%) employees (age, 35.1 ± 11.3 years; range, 19–61 years) completed follow-up at 48 weeks (Figure 1). Physicians and surgeons were involved in 51/150 (34.0%), nurses in 91 (60.7%), and clinical support staff in 8 (5.3%). Most of the injuries (138; 92.0%) were needlestick injuries: solid, 74 incidents (53.6%); hollow-bore needles, 64 (46.4%); knife cuts, 12 (8.0%). In 131 (87.3%) needlestick and sharps injuries, the involved health personnel wore gloves; 12 (8%) did not, and 7 (4.7%) did not specify; 11/150 incidents (7.3%) were reported from an outpatient setting, and 139 (92.7%) involved inpatients.

At the time of injury, we found 11/4,463 (0.3%) HCWs to have detectable HCV antibodies, and 4 (0.1%) were confirmed to be viremic. These had previously undiagnosed HCV GT 1b infection (3 patients) or HCV GT 2a/2c (1 patient). These 4 were not in contact with positive source patients. None of the HCWs developed anti-HCV antibodies, became viremic, or showed signs of acute hepatitis during the follow-up (0 transmissions in 150 injuries; 95% confidence interval, 0.0–3.689; Poisson distribution).

The prevalence of HCV viremia in the patient cohort was 3.3% (128/3,917). Eighty-two patients (72.6%) had GT 1, 2 (1.8%) had GT 2B, 29 (25.6%) had GT 3 infection, and 15 were not specified. The needlestick and sharps injuries led to the first diagnosis of HCV infection in 33 sources (25.8%). In total, 128 individual patients were involved in the documented 150 needlestick and sharps injuries; 1 patient was the source in 7 incidents during 6 admissions; 3 were the source in 3 incidents, at 3 admissions each; and 10 patients were involved in 2 injuries (9 during the same admission, 1 during 2 admissions). At the end of the study in 2009, either patients were contacted by telephone or history was obtained from hospital records. Data were available from 121 of the 128 individual source patients (94.5%). After a follow-up of 6.5 ± 3.9 years (1–13.6 years), 62 patients (51.2%) had died, 17 (27.4%) as a result of end-stage liver disease and 45 as a result of non-liver-related death, mainly malignancies or cardiovascular events.

It has been estimated that 39.0% of HCV infections among HCWs may be attributed to occupational exposure.[3,4] Prospective investigations reported a 1.8% (range, 0%–7%) seroconversion rate following occupational needlestick and sharps injuries.[5,6] However, the prevalence of HCV-RNA positivity among HCWs was not increased compared with the general population, although a higher seroprevalence of HCV antibodies has been reported.[7]

Herein, we report the results of a 14-year prospective study with 150 incidents involving HCV-RNA positive sources. Over a 12-month follow-up period, we did not observe HCV antibody seroconversion, and no HCW developed HCV infection. These results confirm previous work suggesting a low risk of HCWs to acquire HCV infection via work-related injuries.

There may be several factors contributing to the absence of HCV transmission. First, in 87% of incidents, HCWs used gloves. This precaution measure may reduce the transferred blood volume by more than 50%.[8] In all cases, immediate wound management was administered. Although we performed a detailed analysis of factors supposedly related to infectivity, transmission did not occur even in the presence of potential risk factors.

Data were obtained by self-reporting, and underreporting of needlestick and sharps injuries in HCWs has been documented.[9,10] We calculated that approximately 80% of doctors and nurses employed at the hospital reported at least 1 needlestick and sharps injury, suggesting that underreporting is not a major bias influencing the results of our study.

In conclusion, our study provides evidence of low risk for HCV infection of employees via sharp injuries. Additionally, our results suggest that adherence to precaution measures, such as gloves and wound cleansing, may represent protective standard procedures.

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