

## Patient-to-Patient Transmission of Hepatitis C Virus

Cancer affects almost 10 million people in the United States (1) and leads to 560 000 deaths annually (2). Survivors frequently receive chemotherapy during multiple clinic visits each year. Because of pervasive dread associated with the diagnosis of cancer in western cultures, quality of treatment is defined by the health care team's assiduous attention to detail and sensitivity to patients' emotional needs.

Imagine the astonishment, then, of vulnerable patients with cancer observing poor infection-control techniques by a health care professional attending their central venous catheters. Furthermore, consider the anguish if the patients subsequently learn that they were victims of preventable, health care-associated infections with hepatitis C virus (HCV). The virus is itself associated with a social stigma, affecting patients' relationships with sexual partners and family members (3).

In this issue, Macedo de Oliveira and colleagues document a large outbreak of hepatitis C among patients with cancer receiving chemotherapy at a freestanding clinic in Nebraska (4). An egregious practice led to the epidemic. The clinic nurse would routinely draw blood from the central venous catheters, and, after sending the specimens to the laboratory, would use the same syringe to aspirate fluid from a 500-mL saline bag and then flush the central or peripheral venous catheters of subsequent patients. Obviously, blood from a patient with hepatitis C had contaminated the common-use saline bag. The attack rate for the 367 patients studied during a 16-month period was 27%, and the statistical model of recorded data suggests that the ID<sub>50</sub> (the dose leading to infection of 50% of the exposed population) for patients at risk was 3 flushes (30 to 60 mL of saline).

The investigation from the Centers for Disease Control and Prevention clearly showed that the inadequate infection-control practices caused the HCV infections. The salient findings were the dose-response curve showing a direct relationship between the number of saline flushes and the infection rate; the presence of a single, uncommon genotype of HCV in the 99 patients; and the prompt end of the outbreak when the implicated nurse was dismissed. In a sad footnote to the study, several anxious patients approached the hospital's infection-control committee 9 months after the epidemic began. Unconscionably, the administrators referred the complaints back to the freestanding clinic, citing a lack of jurisdiction. The hospital would have served the public interest far better had the administrators immediately reported the patients' concerns to the Nebraska State Health Department or to the Centers for Disease Control and Prevention.

Despite the presence of published infection-control guidelines (5) and the dictates of common sense, the literature on the transmission of HCV from patient to patient

in health care systems has been growing steadily. For example, contaminated multidose vials of saline used to flush intravenous catheters were the likely cause of infections of 3 patients on a cardiology ward (6), 13 patients on a hematology ward (7), 3 patients on a medical ward (8), and 5 patients on a hemodialysis unit (9). A multidose vial of propofol was implicated in a cluster of 4 infected patients on a gynecologic surgery ward (10). In addition, the investigation of an epidemic involving 6 patients attending a pain remediation clinic showed higher HCV infection rates among patients treated after an HCV-infected patient during the same visit. A nurse anesthetist had used the same syringe-needle set to sequentially administer sedation medications each day (11). Six patients acquired HCV in the liver unit of a tertiary care center. The 2 risk factors for infection were longer hospital stay and hospitalization with an HCV-infected roommate (>5 days with an HCV-infected roommate had an odds ratio of 12) (12).

Why would an educated health care worker today reuse a syringe on multiple patients or use a syringe to draw fluid from a common 500-mL saline bag after obtaining a blood specimen with the same syringe? Why would anyone dispense medication to multiple patients from a common vial? One answer is a sense of time pressure due to a heavy nursing workload. Health care organizations could avoid the risk to patients by developing policies to limit the number of patients that a nurse or physician could manage alone; when the number of patients exceeds that threshold, new professional staff members would need to be added. Another possible reason is cost containment, which might lead to using multidose vials for expensive injectable drugs that are dosed on a per-kilogram basis. However, unless the pharmacist carefully draws up the medication under strict aseptic conditions in the pharmacy, this practice poses an infectious hazard. Another, and unfortunate, reason for poor infection-control practices is simply an unthinking force of habit in performing routine work activities. In that case, the solution might be careful oversight, institutional professionalism, rewards for good practices, and punishments for major breaches of infection-control standards.

This outbreak teaches several important lessons. First, health care organizations must develop up-to-date infection-control practices, not just in hospitals but in all hospital-associated and freestanding outpatient facilities. A responsible organization that is empowered to suspend unsafe programs must critically examine established practices at least annually. Prefilled single-use syringes for flushing catheters must become the system-wide standard in hospitals and clinics to minimize transmission of bloodborne pathogens. These actions will add to the cost of care, but our obligation to provide safe care leaves no room for compromise.

Second, since the literature is replete with examples of patient-to-patient transmission of HCV, all patients with

vascular access lines should be considered vulnerable and should be shielded from an exposure to a roommate infected with a bloodborne pathogen. In 1 study, the provision of dedicated space, equipment, and nursing staff to “isolate” patients with HCV in a dialysis unit was associated with a reduction in the historical seroconversion rate from 6.8% to 1.0% (13). In clinics in which closely adjacent patients receive multiple infusions and flushes, we suggest that patients with central venous catheters be physically separated to limit opportunities for cross-infection.

In an accompanying article in this issue, Ciano and colleagues report an HCV transmission rate of zero among a subset of 912 patients at risk after gastroscopy (14). All 912 had endoscopy with an instrument that had been used earlier on the same day in patients with HCV infection and had been subsequently cleaned by using standard disinfecting practices. The authors correlated the lack of transmission with the robust cleaning, disinfecting, and drying procedures routinely applied to the instruments between patients. Although the authors imply that good infection-control practices were responsible for the excellent results, the absence of HCV infection could also have resulted from an inherently low rate of transmission after endoscopy. Even in this large sample of patients, the upper end of the 95% CI around the point estimate of zero is 4.2% (14), implying that nonzero transmission rates are statistically likely. Nevertheless, the study shows that a thoughtful and systematic process of applying assiduous infection-control policies in the outpatient arena was associated with very low rates of infection and may have been responsible for the favorable findings.

Hospitals in the United States, the Joint Commission on Accreditation of Healthcare Organizations, and the Centers for Disease Control and Prevention have placed a low priority on encouraging effective outpatient infection-control activities. It is very difficult to define rates of adverse events without a system to measure infectious outcomes in patients after health care visits that place them at risk for care-related infection. Because hospitals and clinics lack surveillance capacity, they do what they can, which is to emphasize good processes of infection-control care. In the future, widespread introduction of computerized medical records may be an important step toward generating better data on infectious outcomes. Given the shift in the venue of care from hospitals to clinics, we must develop effective systems to monitor outcomes of infection-control practices in the outpatient setting.

Health care in the United States has much to celebrate: Our advances in drug therapy, imaging, and non-invasive surgery have reduced hospital stays and allowed more outpatient care with an improved quality of life. However, the report by Macedo de Oliveira and colleagues (4) is a sobering reminder of the shortcomings in our existing policies, our safety net systems, and our sense of personal responsibility to provide safe care.

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