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Outbreaks of Infections Associated with Drug Diversion by US Healthcare Personnel

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Background:
In May 2012, the New Hampshire Department of Health and Human Services began investigating a cluster of hepatitis C virus (HCV) infections at a single hospital.[1] This investigation uncovered a large HCV outbreak, spanning several years, involving more than a dozen hospitals, and impacting thousands of patients in eight states. This outbreak was caused by an HCV infected traveling radiology technician who, in August 2013, admitted to having been addicted to narcotics and diverting medications such as fentanyl away from patients.[2]

The National Association of Drug Diversion Investigators defines drug diversion as "any criminal act of deviation that removes a prescription drug from its intended path from the manufacturer to the patient."[3] Mechanisms of diversion by healthcare personnel can include documentation of a medication dose not actually administered to the patient but saved for use by the healthcare professional, theft by scavenging of wasted medication (e.g., removal of residual medication from used syringes), and theft by tampering (e.g., removal of medication from medication container or syringe and replacement with saline or other similar-appearing solution that may be administered to patients). This review offers a summary of available information about the types of infections, drugs, mechanisms of diversion and healthcare personnel that have been associated with outbreaks stemming from this activity.

Methods:
The authors reviewed internal records and CDC-authored reports related to the U.S. outbreaks from drug diversion by healthcare personnel for the 14-year period extending from January 1, 2000, through December 31, 2013. A PubMed search was conducted for outbreak investigations occurring during the same time period using combinations of key words including outbreak, diversion, and narcotics.

Results:
The authors identified 6 outbreaks of infections that resulted from drug diversion by healthcare personnel in the U.S. healthcare settings in the past 10 years. Two outbreaks resulted in gram-negative bacteremia in 34 patients; the remaining 4 outbreaks resulted in HCV infection in 84 patients. Tampering with injectable controlled substances was documented or suspected in all of the outbreaks; fentanyl was diverted in at least 4 of these events. Implicated healthcare professionals included 3 technicians and 3 nurses (including 1 certified registered nurse anesthetist (CRNA)).[4,5]

Summary of bacterial outbreaks:
- Illinois, 2006: 9 medical-surgical patients at a hospital had developed *A.xylosoxidans* bacteremia. All of the infected patients received morphine or used contaminated needles or syringes to extract the morphine from cartridges.
- Minnesota, 2011: Gram-negative bacteremia developed in 25 surgical patients at a hospital.[6,7] The predominant pathogens identified in blood cultures from infected patients were *K. oxytoca* and *O. arnthopi.* The nurse reported peeling back the foil covering on the ports of bags containing drugs such as hydromorphone, withdrawing narcotic with a syringe, replacing displaced liquid with saline solution, and returning the bags to the lock box.

Summary of Hepatitis C virus outbreaks
- Texas, 2004: 16 surgical patients at a hospital had development of HCV infection.[8,9,10] All 16 patients had received care from an HCV-infected CRNA. The CRNA admitted to drug diversion by removing portions of fentanyl from vials that were designated from an impending patient procedure and with a syringe transferred this fentanyl to a vial kept for personal use, which as likely contaminate with the CRNA's blood.
- Florida, 2008: 5 interventional radiology patients at a hospital had developed HCV infection.[11,12] A radiology technician was found to be infected with an HCV strain that was genetically related to the patient isolates. The technician reported removing syringes containing residual fentanyl from used sharps containers, self-administering from a syringe prepared for a patient, refilling the syringe and returning the syringe to the patient care area.
- Colorado, 2009: 18 patients developed HCV infection at a hospital.[5] The technician reported removing pre-drawn syringes of fentanyl from unattended anesthesia carts, self-injecting, refilling the syringes with saline, and returning the syringes to the cart.
- New Hampshire, Kansas, Maryland 2012: 45 cardiac catheterization/interventional radiology patients from 4 hospitals in 3 states developed HCV infections.[1,2,13] An HCV-infected traveling radiology technician admitted to stealing syringes filled with narcotics, self-injecting, refilling with saline, and placing them back into the procedure area.

Discussion:
- For HCV, drug diversion has emerged as the leading cause of healthcare transmission between infected healthcare professionals and patients.[14]
- These outbreaks highlight gaps in the prevention, detection, and response to drug diversion in U.S. healthcare facilities.
- Under Title 21, CFR Section 1301.71(a) the Drug Enforcement Administration (DEA) "requires that all registrants provide effective controls and procedures to guard against theft and diversion of controlled substances.[15]

Key take-aways:
- **Outbreaks of HCV and other infections have highlighted the need for system-wide improvements to address the problem of drug diversion in the healthcare community.**
- **Basic patient safety includes effective, reliable safeguards to maintain the security of injectable medications in any healthcare setting.**

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