

Virus Transmission in Health Care Settings: Precautions, Epidemiologic Experience, and Common Sense

Hospitals, clinics, the private offices of physicians and dentists, and other health care facilities are all settings in which there is the potential for transmission of infectious agents from patients to personnel and from personnel to patients. Infections may also be transmitted from patient to patient, not merely by proximity to each other in this context but also with the inadvertent assistance of health care personnel.

Whether instances of transmission at health care facilities are recognized and corrected depends upon many factors. Case-finding is less of a problem for nosocomial bacterial infections than for viral infections. Bacteria usually have short incubation periods and more frequently affect patient groups that have longer hospital stays. In contrast, viral infections, particularly blood-borne viral infections, may have incubation periods of weeks, months, or even years. Their linkage to a health care setting as the place of acquisition also depends upon many factors. If the infected persons are workers at the same health facility, these personnel are likely to call the situation to the facility's attention themselves. For patients, a case association with the health care setting becomes more problematic the longer the incubation period.

The chance of linking the infection to its source is greater in the case of patients with a need for continuing care at the same facility or by the same person. Even when persons with the same disease who need chronic care are treated at separate facilities, viral exposure particular to some form of therapy may be recognized.¹ Otherwise, health departments' thoroughness in asking about epidemiologic background when they investigate reported viral illnesses offers the best opportunity to make the association with health care sources. Epidemiologists who are genuinely inquisitive are more likely to uncover a need for further investigation than those who merely fill out forms. Alert to similar circumstances of medical exposure among two or more cases, they will often find "coincidences" that need exploration. Hlady and coworkers recognized that a visit to a Florida dermatologist was common to eight persons with hepatitis B virus infection over a 6-year period.² An investigation uncovered 50 of his patients who were infected—and more may exist—

through his failure to practice universal precautions and sterile surgical technique.

Stool precautions have been practiced for decades for infections recognized as transmissible from person to person by the fecal-oral route. For hospitalized patients (apart from those on pediatric wards), stool precautions are probably most commonly used when symptoms and signs compatible with hepatitis A virus (HAV) infection are present. Doebbeling and coworkers investigated a nosocomial epidemic in which a hospital burn center in Iowa became the focus of HAV infection.³ A father and his son, simultaneously admitted, both happened to be in the late incubation period of that agent.

A burn center is not a setting in which the introduction of HAV would be expected. This is an important point: during incubation, fecally transmitted infections may be found in any patient admitted to any section of a hospital or any clinic. Formal stool precautions are neither practical nor appropriate as a routine measure, and it is at this point that common sense supplements the infection control manual. Regardless of stool precautions, the careful handling of fecal containers with gloved hands is always important.⁴

Eating food in the burn center proved to be the most important factor associated with HAV infection. This finding implies a slight, unsurprising casualness about food items in such a unit. Staff and patients in parts of a hospital where longer stays are the norm (e.g., rehabilitation wards, orthopedic services) become comfortable with each other in that setting, and staff—appropriately—become less professionally formal. In contrast, on an acute care service or in the emergency room, one seldom sees a clerk eating at the nursing station or a nurse munching a cracker.

Of note also in Doebbeling et al.'s report is the fact that nurses working 12-hour shifts were significantly more likely to become infected than those working 8-hour shifts. The length of actual patient-care contact was important in itself, as would be expected, but it was no more associated with child than adult patients, which might not be expected. More important, the longer shifts would understandably lead to eating and snacking more often within the center, and to the lowering of vigilance because of fatigue.

Another noteworthy finding in Doebbeling et al.'s study is that there was an association of HAV infection with providing hydrotherapy and working in the tub room. Although this association is statistically not as strong as that for eating in the burn center, these circumstances are suspicious. HAV would be found in serous exudations during the period of viremia and in crusts for some time thereafter. Any open lesion is a potential way of introducing HAV contamination (as well as hepatitis B (HBV), hepatitis C (HCV), and other blood-borne agents) into the environment. The major difference is that HAV is relatively easily transmitted from hand to mouth, whereas HBV, HCV, and most blood-borne viruses are transmitted poorly or not at all by oral introduction.⁴⁻⁶ Another mechanism of spread, therefore, would be from HAV-contaminated droplets splashed onto environmental surfaces.

The same general considerations, with somewhat different emphases, apply to blood-borne viruses as to agents transmitted by the fecal-oral route. When no infectious event occurs, we properly credit the infections control regulations. When outbreaks occur, we usually add to, or tighten, these rules. There is, however, a practical limit. Relatively minor breaches of precautions for infection control occur in all well-run hospitals. With no intention of encouraging carelessness, one must recognize that the very best professionals are human and will have occasional lapses. Fortunately, such lapses usually result in no unfortunate consequences. A survey of HAV-free burn centers across the United States could well turn up a majority in which eating on the wards occurs to the same extent as in the center investigated. Food will often be brought in without precautions; for instance, patients' families bring homemade foods for staff to express appreciation. We should recognize, therefore, that apart from obviously dangerous practices, the concatenations of circumstances that result in the "natural experiments" of nosocomial epidemics are the exception rather than the rule.⁷

We should call attention to a potential downside to the report of the Iowa HAV epidemic. If hospital personnel are too

Editor's Note. See related articles by Hlady et al. (p 1689) and Doebbeling et al. (p 1679) in this issue.

concerned about their own possible infection, the patient receives minimal or inadequate attention, both physically and psychologically, or may even be refused care. Widely publicized during the AIDS epidemic, such responses have properly led to the questioning of the professional commitment of some health care workers.

Unfortunately, the universal precautions promulgated by the Centers for Disease Control (CDC) in 1988 are commonly construed as a list of the seemingly innumerable ways in which blood-borne viruses may infect health care personnel.⁸ Misread in this way, they may contribute to neglect of the patient "posted for precautions," or even to an unwillingness to enter the patient's room. If anxiety can be put aside, however, the CDC statement provides a safe and comfortable path through the daily work routine.

Both national surveillance studies and prospective studies indicate that work in the health care setting has been associated with human immunodeficiency virus (HIV) transmission very infrequently.⁹ For reasons not understood, HIV infections of hospital workers due to needlesticks and the like have been very few, in contrast with infections by the blood-borne hepatitis viruses. The Florida dermatologist transmitted HBV but not HIV by his failure to observe precautions, even though HIV-infected patients were in his practice.²

The term "universal precautions" was perhaps not the best title for the 1988 CDC document, because the two words may promote the feeling that health care facilities are dangerous environments where bad things are likely to happen unless we are extraordinarily careful. What I think they are meant to tell us, however, is that any patient, regardless of diagnosis, has the potential to transmit an infection of which we may or may not be aware. Hence, we need to use the same precautions for every patient. They tell us also that health care facilities are places where we do need to be careful; a workable set of precautions should be integrated into a routine that becomes second nature. Such precautions do not guarantee that no untoward event will ever occur, but the odds are against it if we use common sense. □

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New Lessons from China: Equity and Economics in Rural Health Care

The article by Clayton and colleagues, "Hepatitis B Control in China: Knowledge and Practices among Village Doctors,"¹ in this issue of the Journal and recent press articles²⁻⁴ on problems in health care in China raise important questions about the changes in a rural health care system that 15 years ago had been widely viewed as a model for other developing countries. It was then extensively reported that China's innovations in health services had brought health care and medical care to a rural population of some 800 million people (80% of China's total population), a group that had previously largely lacked access to personnel trained in modern medical methods and to facilities equipped with modern medical technology.

A series of reports during the 1970s described China's development of its barefoot doctors, the cooperative medical care system, and a three-level health care

system. These services were grounded in the rural economic, social, and political units called "communes" and their component production teams and production brigades. Barefoot doctors were peasants, trained for relatively brief periods, who performed health care and medical care services on a part-time basis and who were paid by the production brigade in the same way as the peasants who did agricultural work. The cooperative medical care system was a form of medical care insurance supported by the commune economy and by the peasants' regular small payments towards higher-level medical care.

The three-level health care system consisted of (1) basic production-brigade health stations staffed by barefoot doctors, midwives, and health aides; (2) better-equipped commune facilities supported by the entire commune and staffed by full-time physicians and nurses; and (3)

county hospitals, supported by the central government, that were staffed by primary care physicians and some specialists and that provided a higher technical level of care. When necessary, patients would be transferred to higher-level facilities and their care paid for by the cooperative medical care system.⁵⁻⁸

Dramatic improvements in the health status of the rural Chinese population were reported, and, although it was difficult to determine to what extent these changes were due to advances in health services or to the remarkable improvements in nutrition, housing, education, and other social conditions, it seemed clear that China's medical and health care system was playing an important role in rural areas. Indeed, the World Health Organization (WHO), the United Nations

Editor's Note. See related article by Clayton et al. (p 1685) in this issue.