NOTES

Nosocomial Infections in Human Immunodeficiency Virus–Infected Patients in a Long-Term-Care Setting

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To our knowledge, the epidemiology of hospital-acquired infections in human immunodeficiency virus (HIV)–infected patients during long-term care has not been reported. For 13 months, we observed HIV-infected patients (50 men and 15 women) in a dedicated 21-bed unit in a long-term-care facility to determine the rate of nosocomial infections. The mean age of the patients was 39 years (range, 22–78 years); 74% of the patients had CD4 cell counts of < 200/mm³. There was a total of 152 infections (24 infections per 1,000 long-term-care days). The factors associated with the occurrence of a nosocomial infection were low CD4 cell counts, poor functional status, and longer duration of stays at the facility. The three most common infections were *Clostridium difficile*–associated diarrhea, primary bacteremia, and urinary tract infection. Eighteen hospital-manifested opportunistic infections occurred. More than 50% of the cases of bacteremia were due to multidrug-resistant organisms. Nosocomial infections occur commonly in HIV-infected patients in long-term care and thus are important considerations in patient management.

Patients with HIV infection who require long-term subacute nursing care have many risk factors for infection including immunosuppression, the presence of invasive devices, and the use of antibiotics; however, there are few published data concerning the epidemiology of nosocomial infections among these patients. The opening of a subacute nursing-care unit at one of our institutions provided us with an opportunity to study this question.

**Methods**

Oak Forest Hospital (Oak Forest, IL) is a 900-bed long-term-care (LTC) facility with a 21-bed unit for HIV-infected patients who require subacute-level nursing care (> 5 hours of nursing care daily). From January 1994 through January 1995, all patients admitted to this unit were followed up prospectively to detect hospital-acquired infections and hospital-manifested opportunistic infections. Standard definitions were used [1]. Hospital-manifested opportunistic infections were defined as those due to reactivation of latent pathogens. Patients’ functional levels were assessed with use of the Barthel index [2]; scores of < 50 indicate moderate-to-severe dependence. Categoric data were evaluated with the χ² test, and continuous variables were evaluated with analysis of variance (ANOVA) if they were normally distributed or with the Mann-Whitney U test if they were nonparametric. Multivariate analysis was done by logistic regression.

**Results**

During the 13-month study period, there were 75 admissions of 65 patients (table 1). The mean length of stay was 84 days (median length of stay, 73 days; range, 4–370 days). A total of 152 infections (24 infections per 1,000 LTC days) occurred; 134 were hospital-acquired infections (21.4 infections per 1,000 LTC days), and 18 were hospital-manifested opportunistic infections (2.7 infections per 1,000 LTC days). Twenty-four patients (32%) had no infections, 28 (38%) had one or two infections, and 23 (30%) had three-to-nine infections. The mean number of days before the first infection developed was 30.1 (range, 3–93 days).

Factors associated significantly with infection were the Barthel index (40 and 63, with and without infections, respectively; P = .01) and total number of days spent on the unit (99 days, and 52 days, with and without infections, respectively; P = .001). An association with the CD4 cell count approached significance (109 and 152, with and without infection, respectively; P = .06). The use of chronic trimethoprim-sulfamethoxazole (TMP-SMZ) for *Pneumocystis carinii* pneumonia (PCP) prophylaxis did not affect the risk of infection (data not shown).
Multivariate analysis did not reveal any independently significant risk factor.

There were 37 episodes of *Clostridium difficile*–associated diarrhea (CDAD) in 27 patients (5.85 episodes per 1,000 LTC days); 36 episodes occurred in patients who had received antibiotics within 2 weeks before their infections developed. There was one possible epidemiologically related cluster of four cases. There were 30 episodes of primary bloodstream infections in 18 patients (4.7 episodes per 1,000 LTC days), 17 of whom were receiving intravascular medication or feeding. Thirteen of the episodes of bacteremia were polymicrobial. Antibiotic-resistant *staphylococci* and enterococci accounted for >50% of all episodes of bacteremia (table 2). No association between the chronic use of TMP-SMZ or clarithromycin and the occurrence of bacteremia due to multidrug-resistant bacteria was evident. There were 24 episodes of urinary tract infection (UTI) in 16 patients (3.8 episodes per 1,000 LTC days); 70% of the episodes were polymicrobial, and nine of the 16 patients had urinary catheters.

There were 61 other infections in 26 patients. Forty-three of these infections were hospital-acquired, including secondary bacteremias (table 2) (n = 14); skin, soft-tissue, and bone infections (n = 9); vascular-catheter-site infections (n = 7); bacterial pneumonia (n = 6); UTIs (n = 3); fever of unknown origin, which responded to broad-spectrum antibiotics (n = 2); and vaginitis (n = 1).

There were 18 episodes of hospital-manifested opportunistic infections, including mucocutaneous herpes simplex infections (n = 7); clinically diagnosed pneumocystic pneumonia (n = 4); varicella-zoster virus infection (n = 3); mycobacterial infections (n = 2); cytomegalovirus retinitis (n = 1); and candidal esophagitis (n = 1).

Thirty-four patients (52%) died during their stay on the unit; 15 (44%) of these deaths were related to infections. Pneumonia caused eight deaths and thus was associated with the highest fatality rate (80%). Five deaths were due to catheter-related bloodstream infections.

### Discussion

On an LTC unit specifically for HIV-infected patients, hospital-acquired infections occurred at a rate of 21.4 infections per 1,000 LTC days and hospital-manifested opportunistic infections at a rate of 2.7 infections per 1,000 LTC days. Risk factors for infection included low CD4 cell counts, poor functional status, and length of stay on the unit. The three most common infections were CDAD, primary bacteremia, and UTIs. The mortality rate among patients on the unit was high (52%), but this finding was not unexpected given that many of the patients were referred for terminal care. Infections contributed to >40% of the deaths.

Two studies [3, 4] have examined the nosocomial infection rates among HIV-infected patients, but these studies were limited to patients in an acute care setting. Weber et al. [3] compared hemophiliac patients who were HIV positive, had AIDS, or were HIV negative. They found similar nosocomial infection rates among the HIV-negative and HIV-positive patients (1.18...
infections per 1,000 hospital days and 1.84 infections per 1,000 hospital days, respectively), but they found a considerably higher rate among hemophilic patients with AIDS (6.48 infections per 1,000 hospital days). The most common infections in the HIV-infected group were bacteremia and UTI. Goetz et al. [4] studied HIV-infected patients at a Veterans Affairs Medical Center for 2 years. The nosocomial infection rate was 11.9 infections per 1,000 hospital days. The most common infections were UTI, pneumonia, and bacteremia.

There are no published data on infection rates in HIV-infected patients in LTC. Nosocomial infection rates for patients without HIV infection in LTC facilities range from 2.6 to 13.5 infections per 1,000 LTC days. The most common infections include urinary, respiratory, skin or soft-tissue, and gastrointestinal infections [5–8].

The burden of multiple antibiotic-resistant strains was very high in our patient population (table 2); however, we could not associate the occurrence of these strains with prior TMP-SMZ or clarithromycin use. This may reflect the acquisition of bacteria during prior acute-care hospital stays and/or cross colonizing from other patients on our unit, both of which could obscure the relation of antibiotic use to emergence of resistance.

In conclusion, rates of hospital-acquired infections and hospital-manifested opportunistic infections are high among HIV-infected patients in a LTC setting. Many of our patients’ infections were common bacterial nosocomial infections, and these contributed to a significant number of deaths. Because patients with AIDS are living longer, increasingly more patients will require LTC; thus, nosocomial infections will probably contribute to an increase in morbidity, mortality, and cost of this care. In addition, the occurrence of antibiotic-resistant bacteria is likely to be a problem in this high-risk population.

References