

# Compliance With Universal Precautions In A Medical Practice With A High Rate Of HIV Infection

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**Abstract:** *Background:* Universal precautions have been recommended to limit occupational exposure to the human immunodeficiency virus (HIV) and other infectious agents, but whether these recommendations have been incorporated into routine practice has not been demonstrated.

*Methods:* Using a one-group, before-after design, we assessed the knowledge and attitudes concerning universal precautions and the level of compliance with these recommendations. The health care professionals had various levels of training and worked in an ambulatory practice with a high rate of HIV. A total of 195 procedures involving potential exposure to various body fluids were observed.

*Results:* No improvement in compliance with recommended precautions was observed following a didactic educational program for either latex glove use (44 percent versus 49 percent,  $\chi^2 < 1, P > 0.2$ ) or appropriate use of hand washing (34 percent versus 47 percent,  $\chi^2 = 3.38, P = 0.07$ ). Faculty demonstrated the lowest levels of adherence to universal precautions. While knowledge of precautions was high, staff members at all levels overestimated their own compliance with these recommendations.

*Conclusions:* Although the number of observations limits the conclusions, the results suggest that the basic protective measures included in universal precautions are not being routinely applied in ambulatory medical practice. Furthermore, didactic educational programs might not be sufficient to improve compliance. Finally, faculty in training programs should monitor their own compliance with universal precautions because of their responsibilities as role models for physicians in training. (J Am Board Fam Pract 1992; 5:313-8.)

In addition to its devastating effects on patients, the epidemic of human immunodeficiency virus (HIV) infection and the acquired immunodeficiency syndrome (AIDS) has posed new problems for health care providers. Concerns about possible acquisition of HIV infection in the workplace are supported by well-documented case reports of occupational exposure to body fluids with subsequent seroconversion in health care workers who have had no other recognized risk factors.<sup>1</sup> Based on a prospective study of health care workers occupationally exposed to HIV, the Centers for Disease Control (CDC) has estimated that the risk of acquiring HIV after a needle-stick exposure from a known carrier is approximately 0.4 percent.<sup>2</sup> The risk of HIV infection from other types of occupational exposure is unknown, but probably less.

In response to increasing concerns regarding the infectivity of HIV and hepatitis B virus (HBV), universal precautions have been proposed by the CDC for use in all health care centers in the United States to supplement existing infection control policies.<sup>3,4</sup> According to these guidelines, health care workers should treat blood and a limited number of other body fluids from all patients as potential sources of HIV and HBV infections.<sup>3,4</sup>

Previous investigators<sup>5</sup> found poor compliance with these guidelines by health care workers having regular contact with potentially infected patients, and their study was terminated so that an educational program could be implemented to motivate employees to use safer behaviors. In-service education has improved knowledge and changed attitudes regarding the risks of acquiring HIV infection in other settings,<sup>6,7</sup> but meaningful changes in behavior have been more difficult to establish. Continuing medical education programs have had limited success in changing physician practice.<sup>8,9</sup>

The primary goal of this study was to assess the knowledge and attitudes concerning universal

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precautions and the level of compliance with these recommendations by health care professionals at various levels of training in a family medicine residency program. The outpatient practice where this study was conducted is located in a large metropolitan hospital in the mid-Atlantic region of the United States. Epidemiologic data from the CDC have suggested that the number of HIV-infected patients is likely to be higher in this region than in other geographic areas of the United States.<sup>10</sup> According to the computerized practice database, more than 200 HIV-infected patients have received ongoing care in this office. AIDS also has been the most common admitting diagnosis to the practice inpatient service since 1987. Given the high visibility of AIDS-related care in the office and the formal and informal teaching relating to the clinical care of HIV-infected patients, we hypothesized that compliance with universal precautions would be high and that physicians with the most training and experience in caring for HIV-infected patients would be the most compliant with these recommendations. A second goal of this study was to measure any changes in compliance with universal precautions following a didactic, educational program designed to make clinicians more aware of these recommendations.

### Methods

This study was conducted in a university-based family practice outpatient office, where 12 attending physicians and 18 residents provide ongoing primary care to approximately 10,000 active patients. An average of 8 3rd-year medical students rotate through the office every 6 weeks for a required clerkship. Eight registered nurses and 5 medical technicians perform venipuncture and assist with other procedures involving potential exposure to various patient body fluids.

Data for this study were collected over two consecutive 3-week periods using a one-group, before and after (preexperimental) design. The 6-week study duration was chosen to allow inclusion of the same group of medical students in the observation periods both before and after the educational intervention. In the first 3 weeks, single-blinded observations of behaviors related to universal precautions were recorded. The observer was a registered nurse who also served as the coordinator for clinical trials in the office. Her

presence was unobtrusive to the staff, who were, by design, unaware that observations were being made. For each potential exposure, she recorded the training level of the person observed, the body fluid for which potential contact was anticipated, and the appropriate use of gloves and hand washing. Observations were made for 1 hour each day in the office laboratory and at nursing stations on a rotating schedule in an attempt to minimize any systematic bias in the selection of staff observed.

At the end of this observation period, a questionnaire was distributed to all the office staff at a regularly scheduled conference. Ten questions addressed attitudes and perceptions regarding staff behaviors, and ten items explored knowledge of universal precautions and isolation procedures in the family medicine setting. Response options consisted of 5-point scales that ranged from strongly disagree to strongly agree.

The intervention consisted of a didactic lecture given by the second author after collecting the questionnaires at the staff meeting. The risks of occupational exposure were reviewed using materials provided by the CDC (Hospital Infections Program, Health Care Worker Surveillance Project, August 15, 1983–April 20, 1989), and the importance of universal precautions was reinforced.

Compliance with universal precautions was measured in the same manner for the second 3-week period, after which the questionnaire was again distributed.

Data from the clinical observations and the questionnaires were analyzed, and the chi-square statistic was used to compare preintervention and postintervention compliance. Because of small subgroup sizes, tests of statistical significance were not used in the subgroup analyses. Selected data from the self-administered questionnaires are summarized in Table 1, also without statistical reference, because the preintervention and postintervention groups did not consist entirely of the same individuals.

### Results

Ninety-seven potential exposures to various body fluids were observed in the preintervention period, and 98 exposures were observed during the post-intervention period. Of all 195 observations, 163 (84 percent) involved the handling of open

**Table 1. Attitudes of Health Care Professionals Regarding Universal Precautions Before and After an Educational Intervention.**

Attitudes	Mean Preintervention and Postintervention Values*									
	Attending Physician		Resident Physician		Medical Student		Nurse		Medical Technician	
	Pre (n = 8)	Post (n = 5)	Pre (n = 14)	Post (n = 13)	Pre (n = 10)	Post (n = 9)	Pre (n = 3)	Post (n = 3)	Pre (n = 4)	Post (n = 4)
I feel I understand universal precautions	4.1	4.1	4.1	4.8	4.1	4.2	3.3	3.7	4.3	4.8
All patients should be considered potentially infected with HIV	3.0	3.2	4.1	4.9	4.7	4.6	5.0	4.7	4.0	5.0
The facilities make following universal precautions easy	2.8	3.2	3.7	3.4	3.6	3.9	4.3	4.7	4.5	4.8
I feel my peers follow universal precautions at all times	2.5	2.0	2.5	2.1	3.2	2.7	3.0	3.3	4.3	4.0
I feel I follow universal precautions at all times	3.1	2.8	3.0	3.1	3.5	3.8	4.0	2.7	4.0	4.3

\*Mean values on a scale from 1 = strongly disagree to 5 = strongly agree.

containers or wet specimens, including urine (93 exposures), vaginal discharge (68), and penile discharge (4) in the office laboratory. The remaining 32 (16 percent) involved venipuncture and needle disposal.

Latex gloves were worn during 44 percent of the potential exposures in the preintervention period and 49 percent of the exposures after the educational program ( $\chi^2 < 1, P > 0.2$ ). Glove use was observed during 12 (52 percent) of 23 venipunctures before and 5 (55 percent) of 9 venipunctures after the intervention. For each of the other body fluids, gloves were worn during less than 50 percent of the potential exposures observed. The wearing of latex gloves was examined in relation to the professional level of the staff person observed (Figure 1). Attending physicians who completed their residency training before 1981 had the lowest rate of glove use and did not improve after the educational program.

Appropriate hand washing was observed following 34 percent of the potential exposures in the preintervention period and following 47 percent after the educational program ( $\chi^2 = 3.38, P = 0.07$ ). When blood specimens were handled, hand washing was recorded for only 28 percent of the observations made. Rates of hand washing were similar for attending physicians, residents, students, and technicians.

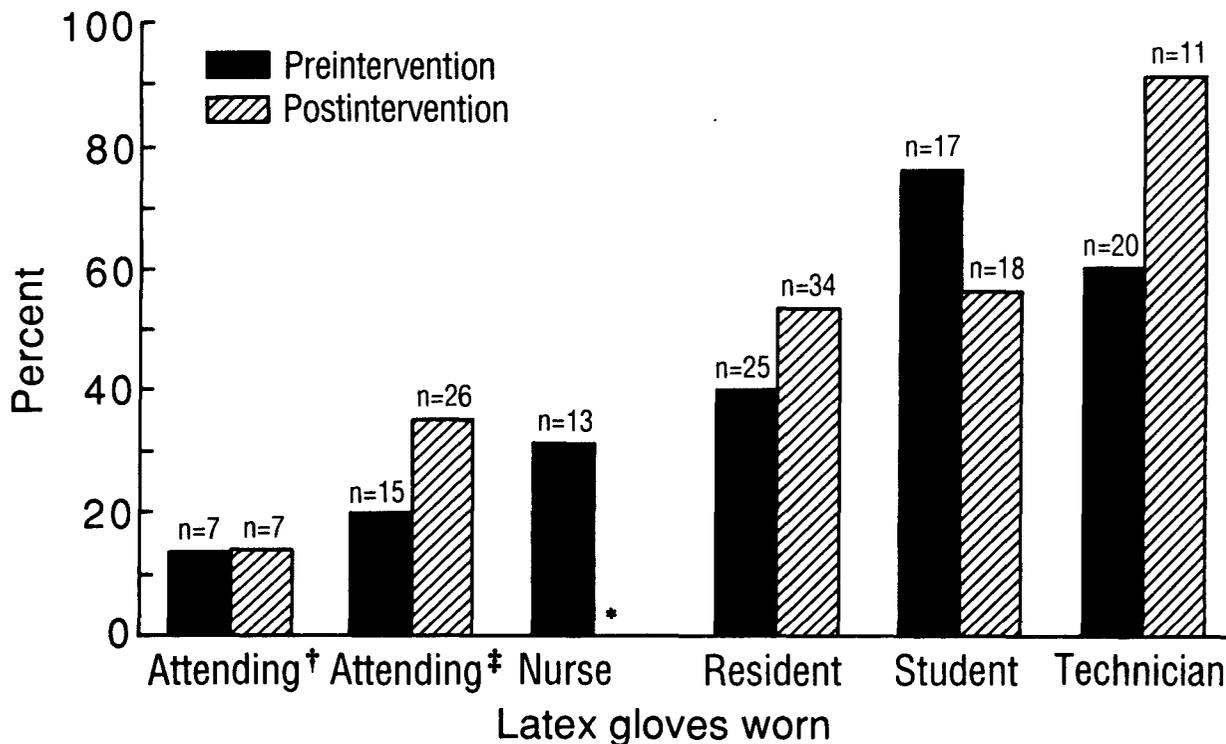
A total of 39 personnel completed the first questionnaire, and most of these same individuals

were included in the 34 personnel who completed the second questionnaire. In both instruments factual knowledge of all staff regarding HIV transmission and universal precautions was high (range, 90 to 100 percent correct). The majority of the staff (88 percent) agreed or strongly agreed that they understood universal precautions as outlined by the CDC (Table 1). Consistent with this understanding, most of the staff (81 percent) agreed or strongly agreed that all patients should be considered potentially infected with HIV. The exceptions were the attending staff, who neither agreed nor disagreed with this statement. The members of each professional group tended to rate their own compliance with universal precautions as higher than that of their peers.

Staff members were also asked to estimate the percentage of time that they wore gloves for handling specific body fluids. Attending and resident physicians estimated that they wore gloves when handling blood 61 to 80 percent of the time, whereas students, nurses, and technicians estimated their own use at between 81 and 99 percent. Overall, attending physicians judged themselves as least compliant of all staff groups, and technicians estimated themselves as most compliant regarding glove usage.

### Discussion

Although universal precautions are recommended for all medical settings to prevent transmission of infectious agents, including HIV,<sup>3,4</sup>



**Figure 1. Percentage of observations for which latex gloves were worn during potential body fluid exposure.**

\*Inadequate number of observations for a postintervention measurement.

<sup>†</sup>Residency completed before 1981.

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there are few data that show whether these recommendations have been adopted into routine practice. In this study in an ambulatory family practice setting, both professional and nonprofessional staff demonstrated poor compliance with glove use and hand-washing recommendations. Given the large number of patients receiving treatment for AIDS and other HIV-related conditions in this medical practice, the finding that the basic protective measures of glove use and hand washing were employed for less than 50 percent of the potential body fluid exposures was surprising and suggests that clinicians have not made these practices routine.

Authors of a previous study of adherence to universal precautions by medical staff in an emergency department reported similar levels of compliance.<sup>5</sup> Their study was aborted prematurely so that an in-service training program for employees could be implemented to effect changes in compliance. In our study, substantive changes in behaviors were not observed after a traditional educational program. There are limited published data that address whether medical education programs can alter physician behavior.<sup>8,9</sup> Although provider knowledge and attitudes regarding uni-

versal precautions can improve following an educational intervention,<sup>6</sup> a didactic program might not be sufficient to change how routine clinical procedures are performed. Results of research in related areas have indicated that more creative educational interventions might be necessary to change these behaviors.<sup>8,9</sup> We are currently evaluating the effect of providing feedback to physicians regarding their compliance with universal precautions relative to their peers.

A disturbing finding in this study was the inverse relation between years of formal education and adherence to universal precautions. Modeling by faculty is an important part of the medical training of medical students and residents. The clinical skills and behaviors of attending physicians have a strong influence on residents' subsequent practice behaviors.<sup>11,12</sup> In this study attending staff were less compliant with recommendations for latex glove use than either residents or students. Faculty who completed their residency training prior to the recognition of AIDS (i.e., before 1981) demonstrated the lowest levels of compliance with universal precautions. Because of the recency of the HIV epidemic,

senior clinicians might not be appropriate role models for medical students and residents, who are learning to incorporate universal precautions (formally recommended in 1987) into their clinical routine. Quill<sup>11</sup> has suggested that a special effort should be made to educate or re-educate physicians who serve as preceptors and role models in areas where they demonstrated low compliance. Researchers<sup>13</sup> involved in a large survey of primary care physicians in England suggested that physicians in general practice are reluctant to change their infection control procedures. Physicians in training programs, however, might need to monitor their own behaviors more carefully because of their responsibilities as role models for physicians in training.

All staff and trainees tended to overestimate their compliance with universal precautions. An interesting observation was that medical students, residents, and attending staff all stated that their own compliance with universal precautions was greater than that of their peers. A study of emergency department personnel also showed that staff significantly overestimated their compliance with these recommendations.<sup>14</sup> We did not examine the reasons for noncompliance with universal precautions by the medical personnel in our office. Trauma center personnel have indicated that there often is inadequate time for donning appropriate protective clothing and that cumbersome gloves, masks, and goggles can reduce dexterity during invasive procedures.<sup>14</sup> These problems would seem to be less applicable to the procedures routinely performed in an ambulatory practice. There is a general concern that the protection provided by latex gloves is imperfect, particularly with respect to needle sticks.<sup>4,5</sup> Physicians in primary care, as a result of their long-term relationships with patients, might individualize the risk assessment for HIV transmission with each patient<sup>14</sup> and act accordingly.

There were methodologic limitations inherent in the design of this study. Strictly speaking, universal precautions as outlined by the CDC do not include urine as an infectious source unless it is grossly contaminated with blood. Nonetheless, many hospitals, including ours, have recommended that all body fluids be considered poten-

tially infectious to eliminate a clinical judgment prior to taking appropriate protective measures. Excluding the observations relating to urine would reduce further the already small number of true exposures in this study. Even so, although the sample size limits the conclusions, glove use and hand washing were observed to be low for all body fluids. Finally, the before-after study design did not control for exposure to those influences, other than the planned educational intervention, that might have affected compliance with universal precautions. These limitations do not diminish the finding that basic protective measures against HIV infection are not being routinely used by health care personnel in the ambulatory setting. This study should be replicated with larger sample sizes to assess more adequately the interactions of factors that underlie this poor compliance before programs to change behavior can be designed.

## References

1. Centers for Disease Control. Update: acquired immunodeficiency syndrome and human immunodeficiency virus infection among health care workers. *MMWR* 1988; 37:229-39.
2. *Idem*. Public Health Service statement on management of occupational exposure to human immunodeficiency virus, including considerations regarding zidovudine postexposure use. *MMWR* 1990; 39(RR-1):1-14.
3. *Idem*. Recommendations for prevention of HIV transmission in health-care settings. *MMWR* 1987; 36(Suppl 2):1S-18S.
4. *Idem*. Update: universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR* 1988; 37:377-82, 387-8.
5. Baraff LJ, Talan DA. Compliance with universal precautions in a university hospital emergency department. *Ann Emerg Med* 1989; 18:654-7.
6. Wertz DC, Sounson JR, Liebling L, Kessler L, Heeren TC. Knowledge and attitudes of AIDS health care providers before and after education programs. *Public Health Rep* 1987; 102:248-54.
7. O'Donnell L, O'Donnell CR. Hospital workers and AIDS: effect of in-service education on knowledge and perceived risks and stresses. *NY State J Med* 1987; 87:278-80.
8. White CW, Albanese MA, Brown DD, Caplan RM. The effectiveness of continuing medical education in changing the behavior of physicians caring for patients with acute myocardial infarction. A con-

- trolled randomized trial. *Ann Intern Med* 1985; 102:686-92.
9. Lloyd JS, Abrahamson S. Effectiveness of continuing medical education. *Eval Health Professions* 1979; 2:251-80.
  10. Centers for Disease Control. 1988 Update: AIDS and HIV infection in the United States. *MMWR* 1989; 38(Suppl 4).
  11. Quill TE. Medical resident education. A cross-sectional study of the influence of the ambulatory preceptor as a role model. *Arch Intern Med* 1987; 147:971-3.
  12. Ficklin FL, Browne VL, Powell RC, Carter JE. Faculty and house staff members as role models. *J Med Educ* 1988; 63:392-6.
  13. Foy C, Gallagher M, Rhodes T, Setters J, Philips P, Donaldson C, et al. HIV and measures to control infection in general practice. *BMJ* 1990; 300:1048-9.
  14. Campbell S, Maki M, Henry K. Compliance with universal precautions among emergency department personnel. Presented at the Sixth International Conference on AIDS. San Francisco. June 20-24, 1990.