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Improved Compliance With Universal Precautions in the Operating Room Following an Educational Intervention

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ABSTRACT

Observation of surgical personnel in four specialties (cardiothoracic, general, gynecologic, and orthopedic) in the operating room was performed prior to implementation of an educational intervention designed to improve compliance with Universal Precautions and at 1- and 2-years post-intervention. Use of protective eyewear and double gloving increased following the intervention, whereas the incidence of documented blood and body fluid exposures decreased (*Infect Control Hosp Epidemiol* 2001;22:522-524).

Surgical personnel are at risk of infection from bloodborne pathogens following percutaneous injuries caused by needles and sharp instruments, and from mucus membrane exposure.¹⁻³ Exposure to infectious material can be minimized by adherence to Standard Precautions⁴ and through the use of safer needle devices and other technologies to minimize contact with sharp instruments. We previously assessed healthcare worker (HCW) compliance with Universal Precautions and risky behaviors in four surgical specialties (cardiothoracic, general, gynecologic, and orthopedic surgery) at our hospital during a 5-month period in 1996.⁵ We directly observed high rates of blood and body fluid exposures and suboptimal compliance with Universal Precautions among personnel in these high-risk specialties. Following these baseline observations, an educational intervention aimed at improving compliance with Universal Precautions and decreasing body-substance exposures was administered to operating room (OR) personnel in the same four surgical specialties. Follow-up observations to determine the impact of the educational intervention performed at two separate time points are reported in this article.

METHODS

Baseline and post-intervention assessments were conducted at Barnes-Jewish Hospital, a 1,200-bed tertiary-care hospital affiliated with Washington University School of Medicine. Hospital policy during the study period required that Universal and Standard Precautions be followed for all patients regardless of diagnosis.

Baseline observations were conducted by three trained research assistants between June and October 1996 in the cardiothoracic, general, gynecologic, and orthopedic surgery ORs.⁴ During the period December 1996 through February 1997, all attending surgeons and OR staff in these four surgical specialties, as well as third-year medical students and first-year surgery and obstetrics-gynecology residents, were required to attend a 1-hour didactic lecture focusing on the epidemiology and occupational transmission of bloodborne pathogens, methods to prevent exposures, procedure for reporting exposures, and options for

postexposure prophylaxis. Participation was mandatory for all first-year residents and medical students, with documented attendance for the lecture greater than 95%. Although participation was required, attendance was documented for only 67% of nurses and staff and 45% of attending physicians. Participants were given protective eyewear and a 3"×5" card with information on bloodborne pathogen exposure prevention, exposure reporting, and postexposure prophylaxis. Posters emphasizing recommended precautions and how to report exposures and injuries were positioned on the walls in all OR suites and over all scrub sinks. In April 1997, all OR nurse managers and attending surgeons were sent a letter summarizing the baseline observation data, along with a copy of the results describing the blood and body fluid exposure rates and compliance with Universal Precautions.

Third-year medical students and first-year residents also were required to participate in a "Safety Skills" workshop in June 1997 (documented attendance greater than 95% for both). The hands-on sessions trained medical students to perform phlebotomy, blood culture, intravenous catheter placement, and arterial blood gas and tuberculin skin testing more safely. Training for first-year residents included all of the above procedures plus training on central-line placement, trauma resuscitation, and surgical procedures. At each station, clinical experts instructed trainees on the proper and safe performance of procedures. Objectives for each module included learning the correct technique, identifying steps in procedures where bloodborne pathogen exposures could occur, and identifying techniques to decrease exposures. Trainees then were required to demonstrate proficiency in the safe performance of each procedure on medical training arms and mannequins.

Post-intervention observations of HCWs in the same four surgical specialties were conducted 1 year (June-August 1997) and 2 years (June-August 1998) after the baseline observations by the same lead observer as in the baseline period and by two newly trained research assistants (trained by the lead observer). Eligible procedures for the study included operations performed on adult patients in cardiothoracic, general, gynecologic, and orthopedic surgery. Cases were selected randomly to ensure a representative sample of surgeons and operating rooms. The same data collection form and definitions were used for documenting non-compliance with Universal Precautions, risky behaviors involving sharp instruments or needles, and blood and body fluid exposures, as previously described.⁴ Approval for these studies was obtained from the Institutional Review Board of Washington University.

RESULTS

During the post-intervention follow-up study, 103 cases (322 hours) were observed in 1997, and 66 cases (223 hours) were observed in 1998. The distribution of surgical cases, demographic characteristics of the surgeries, and number of HCWs observed during the three time periods (pre-intervention and the two post-intervention years) are shown in Table 1. The surgical case mix and number of

TABLE 1
CHARACTERISTICS OF OPERATING ROOM CASES OBSERVED

Characteristic	1996	1997	1998
	No. (%)	No. (%)	No. (%)
Total surgical cases observed	76 (100)	103 (100)	66 (100)
Orthopedic	24 (32)	36 (35)	16 (24)
Gynecologic	20 (26)	27 (26)	20 (30)
General	21 (28)	25 (24)	21 (32)
Cardiothoracic	11 (14)	15 (15)	9 (14)
Hours of observation	200 (100)	322 (100)	223 (100)
Mean patient age, $y \pm$ (SD (range))	57 \pm 18 (18-87)	54 \pm 19 (17-94)	54 \pm 16 (16-86)
Mean estimated blood loss, mL (range)	291 (0-500)	281 (0-1,800)	320 (0-1,200)
Mean procedure length, min (range)	130 (13-374)	151 (21-521)	154 (26-426)
Healthcare workers by job type	597 (100)	783 (100)	502 (100)
Attending physician	74 (12)	102 (13)	71 (14)
House staff	120 (20)	170 (22)	107 (21)
Anesthesia (MD or CRNA)	151 (25)	164 (21)	101 (20)
Scrub nurse or surgical assistant	122 (21)	156 (20)	107 (22)
Circulator	88 (15)	131 (17)	86 (17)
Medical student	42 (7)	60 (7)	30 (6)

Abbreviations: CRNA, certified registered nurse anesthetist; MD, doctor of medicine; SD, standard deviation.

TABLE 2
COMPLIANCE WITH WEARING PROTECTIVE EYEWEAR AND DOUBLE GLOVING PRE- AND POST-EDUCATIONAL INTERVENTION

Compliance, by Job Category	Pre-intervention (1996)	Post-intervention (1997 and 1998)	P*
	n/N (%)	n/N (%)	
Compliance with eyewear			
Attending surgeons	22/74 (30)	67/173 (39)	.178
House staff	52/120 (43)	176/277 (64)	.0002
Anesthesiologists (MD or CRNA)	55/151 (36)	131/265 (49)	.009
Scrub nurse or surgical assistant	83/122 (68)	208/263 (79)	.019
Circulators	80/88 (91)	209/217 (96)	.056
Medical students	30/42 (71)	62/90 (69)	.768
Total	322/597 (54)	853/1,285 (66)	<.0001
Compliance with double gloving [†]			
Attending surgeons	19/74 (26)	102/172 (59)	<.0001
House staff	51/118 (43)	194/274 (71)	<.0001
Scrub nurse or surgical assistant	17/114 (15)	97/260 (37)	<.0001
Medical students	10/38 (26)	42/82 (51)	.011
Total	97/344 (28)	435/788 (55)	<.0001

Abbreviations: CRNA, certified registered nurse anesthetist; HCW, healthcare worker; MD, medical doctor.

* P values obtained using the chi-square test.

[†] Circulators and anesthesia personnel were not expected to double glove during surgical cases. Data regarding glove use was not available for 14 HCWs in 1996 (2 house staff, 8 scrub nurses, and 4 medical students), for 11 HCWs in 1997 (1 attending surgeon, 3 house staff, 3 scrub nurses, and 4 medical students), and for 4 HCWs in 1998 (4 medical students).

HCWs observed changed slightly in 1997 compared to the pre-intervention period, but the percentage of HCWs in each job category did not change appreciably.

The use of proper eye protection by OR personnel increased after the educational intervention, although compliance did not increase equally in all personnel (Table 2). Attending surgeons were least compliant with wearing the appropriate protective eyewear during the pre-intervention observation period, and their compliance did not increase significantly in the 2 post-intervention years of the study. Compliance with use of proper eye protection increased the

most among house staff during the 2 years after initiation of the educational programs, and also increased in anesthesia personnel scrub nurses and surgical assistants (Table 2). Circulators had the highest compliance with wearing of protective eyewear during all three observation times.

There was a significant increase in double gloving among all OR personnel following the educational intervention (Table 2). House staff complied with double gloving most frequently, whereas scrub nurses and surgical assistants had the poorest compliance with double gloving during all three observational periods. Double gloving was

more common among orthopedic surgery personnel at baseline, and their compliance continued to be highest among the four surgical specialties following the educational intervention (data not shown). Compliance with double gloving was not the same during the two post-intervention observation periods for personnel in the various specialties. Compliance with double gloving decreased for cardiothoracic personnel (from 41% in 1997 to 27% in 1998) and for gynecologic OR personnel (from 79% in 1997 to 64% in 1998), whereas compliance with double gloving increased in general surgical personnel (24% in 1997 to 58% in 1998) and remained stable in orthopedic personnel.

The observed number of percutaneous sharps injuries and cutaneous and mucous membrane exposures decreased from 17 per 200 observed hours during the pre-intervention observation period to 24 per 545 hours during the 1997 and 1998 observation periods ($P=.042$, chi-square test). All but one of the seven percutaneous sharps injuries during the three observation periods occurred in house staff, and two thirds (22/33) of the cutaneous exposures during the three observation periods occurred in attending physicians and house staff.

DISCUSSION

Reduction of occupational exposures to blood and body fluids among HCWs remains an important challenge to healthcare professionals. The Centers for Disease Control and Prevention recommended the routine use of Universal Precautions over a decade ago.⁴ Subsequently, double gloving has been shown to decrease the risk of cutaneous blood exposures to the hand during surgical procedures, compared to the use of only a single pair of gloves.^{2,6} Face shields or goggles have been shown to decrease significantly the risk of mucous membrane eye contacts with blood among surgeons.⁶ Despite these data, numerous studies indicate that HCWs fail to use consistently the personal protective equipment recommended in the CDC guidelines.^{5,7}

In our observational study reported here, the wearing of double gloves and protective eyewear by surgical personnel increased following an educational intervention designed to emphasize the need for compliance with Universal Precautions. In addition, the number of observed blood and body fluid exposures decreased, compared to the number observed prior to the educational intervention. Consistent with previous reports on increased compliance with Universal Precautions in younger physicians,⁸ house staff and medical students were more compliant than other HCWs during both the pre- and posteducational-intervention observation periods with wearing of double gloves and protective eyewear. The increased compliance in these two groups probably reflects the emphasis placed on Universal Precautions during their recent medical school training.

This study has a number of limitations, most importantly the fact that the surgical personnel were aware they were being observed and may have been more likely to comply with the hospital recommendations on Universal Precautions because of the presence of the trained

observers. Increased compliance would have been expected to affect the pre-intervention results, as well as the post-intervention results, since the same method of observation was used in all three time periods. In addition, this study was performed using a cross-sectional design, in which surgeries were selected at random for observation; thus, some of the OR personnel observed during the pre-intervention observation period were not the same as those observed during the follow-up periods, and some personnel were observed more than once within an observation period.

Previous studies have reported varying improvement in compliance with Universal Precautions after institution of an educational program.^{7,9-10} Our results demonstrate improved compliance with the use of double gloves and protective eyewear following a multifaceted educational approach. Ongoing educational programs may be the best strategy to reinforce adherence to Universal Precautions among surgical personnel.

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