We compared the rates of exposure to blood in the operating room among third-year medical students during 2005-2006 with the rates reported in a study completed at the same institution during 1990-1991. The number of medical students exposed to blood decreased from 66 (68%) of 97 students during 1990-1991 to 8 (11%) of 75 students during 2005-2006 (P<.001).

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During the third year of medical school, students are asked to participate in procedures that may potentially expose them to blood and bodily fluids. One of the first studies that documented exposure to human immunodeficiency virus (HIV) among medical students at New York–Presbyterian Hospital/Weill Cornell Medical Center (NYPH/WCMC) during 1990-1991 found that 66 (68%) of 97 third-year students experienced 1 or more exposures to blood in the operating room (OR) during their surgery clerkship (40 exposures were percutaneous and 92 were mucocutaneous).1

In the time since the last study, NYPH/WCMC developed a new protocol to ensure prompt evaluation after an exposure and required students to attend workshops in phlebotomy and lectures about infection control, standard precautions, and postexposure follow-up during an orientation. This study assessed medical students' current rates of exposure and rates of reported exposure at NYPH/WCMC and compared them to the rates reported in a similar study conducted 15 years earlier; the goal of the comparison was to develop additional policy recommendations to minimize potential exposures.

METHODS

Study design. In 2005-2006, third-year students completed an anonymous, voluntary survey about their exposure to blood and bodily fluids in the OR. This survey used the same questions as the 1990-1991 survey. It included 5 items, 3 of which were open-ended questions that required students to fill in the blanks. The survey asked about participation in operations that involved patients known to be infected with HIV and hepatitis C virus, about medical students' practices and beliefs with respect level of protection, and their knowledge of standard precautions. Universal precautions were in effect during the administration of the first questionnaire during 1990-1991, and standard precautions have since replaced universal precautions.2 Students were asked to identify the 5 components of standard precautions that we considered important: (1) use of gloves; (2) use of gowns or aprons; (3) use of eye wear, masks, and face shields; (4) treatment of all patients as if they were HIV positive; and (5) avoidance of recapping used needles. Students who sustained occupational exposures were asked to specify the context of the exposure and the hospital site where the exposure occurred. For both surveys, the questionnaire was distributed, completed, and collected during the students’ final written examination.

Statistical analysis. The data collected during 2005-2006 were compared with data from a similar study conducted at NYPH/WCMC during 1990-1991.1 The Fisher exact test was used to analyze associations between exposure and MD degree and/or PhD degree status, sex, order of clerkships, and hospital site where the exposure occurred. The Fisher exact test was also used to compare study outcomes across periods. P values were 2-sided, with statistical significance evaluated at the .05 α level. All analyses were performed with SPSS statistical software, version 15.0 (SPSS).

RESULTS

A total of 101 third-year students were surveyed for the 2005-2006 study. We analyzed 75 responses, for an overall response rate of 74%.


Details of exposures. No significant decrease occurred in the proportion of students who received a percutaneous injury or blood exposure across the clerkship groups in 2005-2006 (data not shown). The number of exposures caused by other members of the surgical operating team declined from 21 (66%) of 32 during 1990-1991 to 2 (29%) of 7 during 2005-2006 (P<.02). Two exposures occurred while disposing of sharp instruments and devices during 2005-2006.
TABLE Components of Standard Precautions Identified by 75 Third-Year Medical Students Surveyed in 2005-2006

<table>
<thead>
<tr>
<th>Component</th>
<th>No. (%) of students who identified this component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of gloves</td>
<td>53 (71)</td>
</tr>
<tr>
<td>Use of gowns</td>
<td>20 (27)</td>
</tr>
<tr>
<td>Use of eye and/or face protection</td>
<td>38 (51)</td>
</tr>
<tr>
<td>Treatment of all patients as if they are HIV+</td>
<td>2 (3)</td>
</tr>
<tr>
<td>Avoidance of recapping needles</td>
<td>4 (5)</td>
</tr>
</tbody>
</table>

**Risk factors for exposure.** In the 2005-2006 study, graduating year, sex, and MD degree and/or PhD degree status were not associated with a risk of bloodborne pathogen exposure. Neither the hospital site where the injury occurred nor the order of clerkships was found to be related to exposure (data not shown). When asked to name 5 major components of standard precautions and the extent to which they followed the recommendations, 53 (71%) of 75 students identified the use of gloves; 20 (27%) identified the use of gowns or aprons; and 38 (51%) identified the use of eye wear, masks, and face shields as a standard precaution. Only 2 students (3%) identified the treatment of all patients as if they were HIV positive as a standard precaution, and only 4 students (5%) identified the avoidance of recapping used needles (Table). Knowledge of these standard precautions did not vary significantly during the year (data not shown). Of 67 students who provided information about their practices with respect to standard precautions, 50 (75%) reported that they followed standard precautions all the time, 16 (24%) reported that they followed standard precautions occasionally, and 1 (1%) reported that he or she never followed standard precautions.

**DISCUSSION**

In the late 1990s, there were encouraging data from isolated follow-up studies that showed medical students’ exposure rates were decreasing, but the rate of exposure reporting remained low. Our study demonstrates that the incidence of percutaneous exposure in the OR has decreased significantly, even with the expansion of surgery clerkships to affiliated community hospitals. The incidence of percutaneous exposures may be decreasing because new techniques have reduced the amount of suturing involved in surgical procedures. Blunt-edged electrocautery, free ligation, and vascular clips are all important techniques for faster and safer wound closure.

Our study demonstrates that the incidence of sharp device injuries that are inflicted on students by other OR staff has decreased from 21 (66%) of 32 during 1990-1991 to 2 (29%) of 7 during 2005-2006. This trend may be explained in part by new safety protocols that encourage surgeons to call out the phrase “needle back” and to provide protection from needles by clamping the tips before handing needles to the scrub nurse. Medical students are encouraged to wear double gloves to prevent injuries from the transfer of tools. Wearing double gloves reduces the incidence of inner glove perforation by 61%. Students who hold retractors can now view the operating field, and staff are discouraged from passing tools from nurse to student to surgeon. Surgical house staff are at a similar risk for injury from sharp devices.

Even given these encouraging data, shortcomings still exist. Despite education about standard precautions, students were not able to identify all of the components of risk prevention that we considered important. Even though 50 (75%) of 67 students in the surgical rotation reported following standard precautions 100% of the time, none of the students correctly identified all components of standard precautions. Most students were not aware that they should not recap needles or that they should treat all bodily fluids as infected. The specific needle device(s) leading to percutaneous exposures was not well documented in either of our studies. Thus, we cannot be certain which interventions led to a decrease in the number of exposures.

A number of policy implications have arisen from this study. First, the medical school curriculum should continue to emphasize standard precautions and survey students frequently to assess whether their knowledge and understanding of risk-reducing habits are adequate. Second, medical students should be encouraged to treat all patients as HIV positive, to follow standard precautions during all patient encounters, and never to recap needles.

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From the New York-Presbyterian Hospital / Weill Cornell Medical Center, New York, New York (C.C., L.M.G., L.M.D., R.B.R.); and the Children’s Hospital of Philadelphia, Pennsylvania (R.G.). Address reprint requests to Lewis M. Drusin, MD, MPH, Department of Epidemiology, New York-Presbyterian Hospital/Weill Cornell Medical Center, 525 E. 68th St., New York, NY 10065-4885 (ldrusin@nyp.org). Received June 29, 2007; accepted October 9, 2007; electronically published January 2, 2008.

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