

Nursing2011[®]

survey results

Blood exposure risk during peripheral I.V. catheter insertion and removal

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LAST SPRING, *Nursing2011* invited nurses to participate in a survey exploring blood exposure risks from peripheral I.V. catheter insertion and removal. Although needlestick risk from I.V. catheter devices has been well documented in device studies carried out in the 1990s and early 2000s,¹⁻³ blood exposures sustained by healthcare workers during peripheral I.V. catheter insertion or removal have received less attention.

In data from the CDC on occupationally acquired HIV in healthcare workers, I.V. insertion was second only to phlebotomy among procedures causing injuries resulting in infections—despite the fact that I.V. catheter needles represent only a small fraction of sharps used in healthcare delivery.⁴

Blood exposures to nonintact skin and mucous membranes, while not carrying the same risk as sharps injuries, have nevertheless been the documented source of bloodborne pathogen transmission, although not specifically linked to I.V. catheter insertion or removal.^{5,6} In the 2001 recommendations for follow-up of occupational exposures, the CDC defined at-risk blood exposures as “contact of mucous membrane or nonintact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious.” For skin exposures, “follow-up is indicated only if there is evidence of compromised skin integrity.”⁷

Of nurses responding to this survey (N = 404), 379 indicated that they performed peripheral I.V. catheter insertions, removals, or both (those who indicated they performed neither insertions nor removals were removed from the database). They provided details on the frequency and mechanisms of blood exposures associated with I.V. catheters. For a profile of respondents to this survey, see *Take a closer look at respondents*.

As you review the results summarized here, keep in mind that survey participants were self-selected and not necessarily representative of all nurses. For example, nurses who recently sustained a blood exposure during I.V. catheter insertion or removal might have been more motivated to participate in the survey. In addition, note that not all respondents answered every question. Some percentages don't add up to 100% due to rounding.

TAKE A CLOSER LOOK AT RESPONDENTS

The average age of respondents to this survey was 46, and average years in practice was 19. The typical respondent to this survey fits this profile:

- works as a staff nurse (71%) in a hospital (82%)
- works in a medical/surgical unit (33%), ICU (15%), or ED (13%)
- has been in nursing practice for 11 years or more (64%); 47% of respondents have been in practice for at least 21 years.

1. Approximately how many peripheral I.V. catheter insertions do you perform per month?

- Mean: 38
- Median: 15
- Low: 1
- High: 600

N = 353

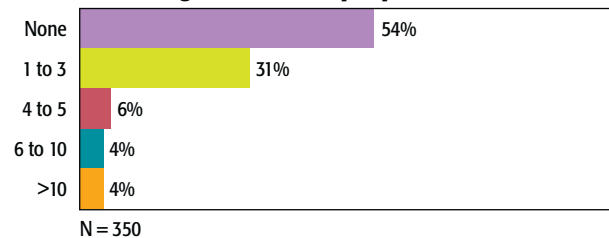
Among respondents, this procedure is a common, if not daily, part of practice.

2. Approximately how many peripheral I.V. catheter removals do you perform per month?

- Mean: 30
- Median: 20
- Low: 0
- High: 500

N = 374

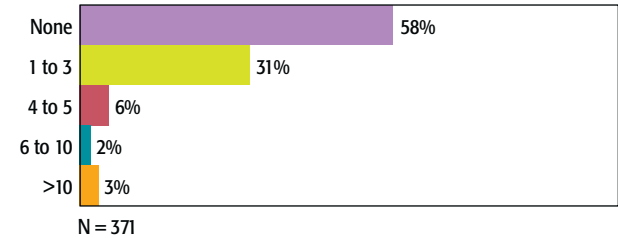
3. Excluding needlesticks, estimate how many times per month you experience mucous membrane or skin contact with blood during insertion of a peripheral I.V. catheter.



A large proportion of respondents (46%) estimated that they sustained at least one blood exposure a month during I.V. catheter insertion. Of respondents reporting one or more exposures (N = 160), more than two-thirds (69%) reported 1 to 3 exposures a month. But 13% reported 4 to 5 and 9% reported 6 to 10. Another 9% reported more than 10 exposures a month during I.V. catheter insertions. These numbers indicate that blood exposures during insertions are common, and in some cases frequent, events.

Based on these data, we estimated an average blood exposure rate of 4.4 per 100 I.V. catheter insertions (4,400 per 100,000 insertions) among survey respondents.

4. Excluding needlesticks, estimate how many times per month you experience mucous membrane or skin contact with blood during removal of a peripheral I.V. catheter.



Again, responses indicate that a large proportion of respondents (42%) sustained at least one blood exposure a month during I.V. catheter removal. Of those in the group reporting exposures (N = 156), nearly three-quarters (74%) estimated they had 1 to 3 exposures a month; 14%, 4 to 5; 5%, 6 to 10, and 6%, more than 10 exposures a month during I.V. catheter removals.

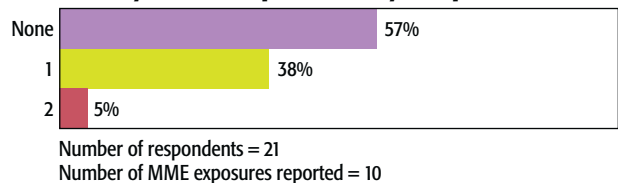
Based on these data, we estimated an average blood exposure rate of 4.5 per 100 I.V. catheter removals (4,500 per 100,000 removals).

5. In the past year, approximately how many times has blood contacted your eyes, nose, or mouth during insertion of a peripheral I.V. catheter?



Almost 13% (21 of 168 respondents) sustained a total of 32 mucous membrane exposures (MMEs) in the previous year. Although 88% of respondents reported having no MMEs during the previous year, other respondents skipped this question. In calculating an exposure rate, we assumed that non-respondents (N = 186) also had no exposures. Based on these data, we calculated a MME rate of 19.2 per 100,000 I.V. catheter insertions.

6. How many of these exposures did you report?



Of total MMEs sustained by respondents (as indicated in question 5), 69% (22/32) were not reported. As a comparison, the CDC's underreporting rate for sharps injuries is 57%.⁸

7. If you didn't report one or more exposures, why not? (Check all that apply.)

Too busy	35%
Didn't think exposure was significant	87%
Concerned about others' perceptions	9%
Other, please specify	4%

Total respondents = 23

For clarity, we divided these 23 respondents into two groups: those who had MME exposures in the previous year (as indicated by their response to question 5) and those who didn't but who answered affirmatively to question 3 or 4 (or both) about blood exposures during I.V. catheter insertion or removal.

Of the group sustaining MME exposures (N = 14):

- 1 indicated that he or she was too busy to report.
- 9 said they didn't think the exposure was significant. Of these, 2 also indicated they were concerned about what others would think.
- 4 replied "too busy" and "not significant." One person added, under "other," that he or she didn't have enough staff to leave the patient.

Of those who said they experienced one or more blood exposures per month but not an MME exposure (N = 9), 2 said they were too busy to report, 6 said they didn't think the exposure was significant, and 1 checked both categories. (Most responses to "other" were invalid; for example, the respondent wrote "not applicable" or something similar.)

8. Of exposures that you reported, how many were treated with HIV postexposure prophylaxis (PEP)?

All respondents (N = 34) said "none."

9. If you didn't receive PEP, why not?

Of the 29 responses to this question, 6 indicated that the exposure was low risk or that PEP wasn't indicated or needed; another 4 indicated that the patient was HIV-negative. Two nurses replied that PEP "wasn't offered" or was "not available." And one responded "the hospital said it wasn't their responsibility, I needed to contact my agency." These responses underscore the need for employers to provide clear information to employees about PEP protocols in compliance with Occupational Safety and Health Administration (OSHA) requirements, and to ensure that PEP is readily available at all times as required by law.

10. In the past year, how many blood contacts to nonintact skin (such as a cut, abrasion, or wound) have you experienced during insertion of a peripheral I.V. catheter?

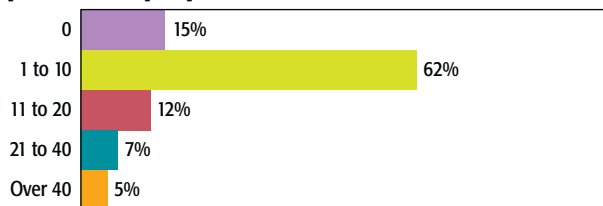


N = 336

Although 295 respondents (88%) reported having no exposures to nonintact skin during the past year, some respondents skipped this question. In calculating an exposure rate, we assumed that nonrespondents (N = 17) also had none. Based on these data, we calculated a rate of 109 exposures to nonintact skin per 100,000 I.V. catheter insertions.

Overall, 3% of insertion-related exposures were in the "at-risk" category (contact of blood with mucous membrane/nonintact skin) as defined by the CDC.⁷ We estimated the chances of sustaining an at-risk exposure when performing peripheral I.V. catheter insertions to be 0.1%.

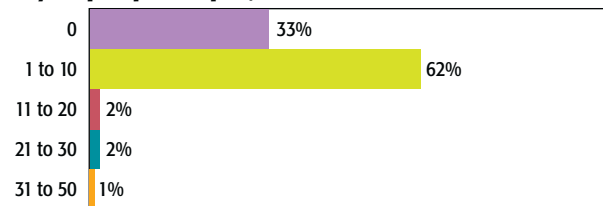
11. In the past month, approximately how many times has blood contacted one or both of your gloves while you performed a peripheral I.V. catheter insertion?



N = 364

Respondents sustained an average of 10 blood contacts to gloves per month during I.V. insertions.

12. In the past month, approximately how many times have you unexpectedly come into contact with blood in a patient's room (for example, blood on bed rail, bedside tray, or pump touchpad)?

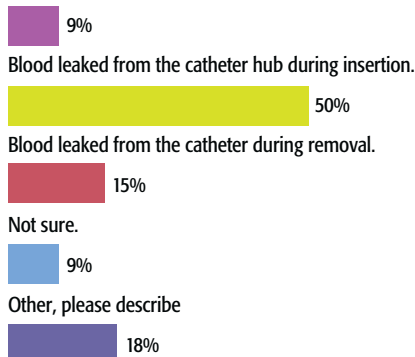


N = 369

Among respondents, the average number of blood contacts sustained per month in patient rooms was 3.55.

13. Thinking about your **most recent** blood exposure, how did it occur?

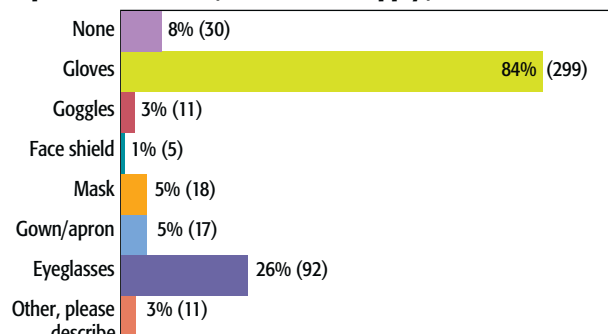
During I.V. catheter insertion, blood flicked from the stylet as it was removed from the catheter.



N = 340

Half of respondents reported that their most recent exposure involved blood leaking from an I.V. catheter hub during insertion, and another 15% said the exposure occurred from blood leaking during removal. Of the 60 respondents (18%) who responded "other," 6 said the exposure was related to I.V. tubing manipulation (for example, "blood leaked from catheter when extension tubing was attached," "I.V. tubing broke") and 5 said the patient took out the I.V., accidentally or on purpose ("patient ripped out I.V., blood everywhere," "patient trying to remove the I.V.," "unexpected blood on patient side rail from accidentally pulled I.V.").

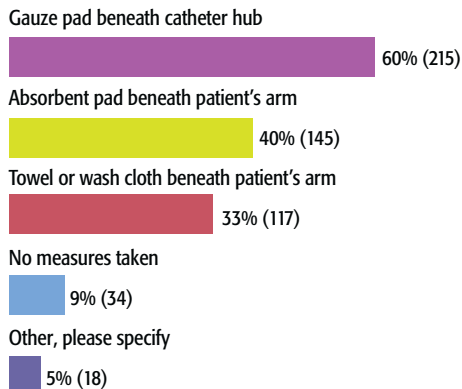
14. Thinking about your **most recent** blood exposure, what personal protective equipment were you wearing when the exposure occurred? (Check all that apply.)



Number of responses to each option shown in parentheses.

Most respondents appear to routinely wear gloves to protect their hands, perhaps because glove use is also required for patient safety reasons. Blood contact with intact skin isn't considered to be at risk while contact with mucous membranes is.⁷ Yet only 4% of respondents were wearing goggles or a face shield when their exposure occurred. Although 26% were wearing eyeglasses, these don't prevent blood exposures; one respondent, describing an exposure that occurred during disposal, said, "Blood flicked into my eyes—I was wearing glasses and it still got into my eyes." Blood can also drip down from the forehead into the eyes.

15. During peripheral I.V. catheter **insertion**, what measures do you take to absorb blood? (Check all that apply.)



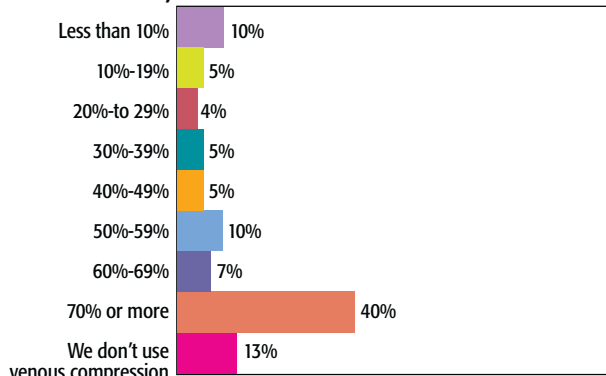
Number of responses to each option shown in parentheses.

Responses to "other" included the following:

- "apply pressure to vein above cannula when removing stylus and connecting line."
- "gauze at bedside to use as needed."
- "alcohol pad."
- "It depends, as most of my patients are prisoners and have their hands cuffed."

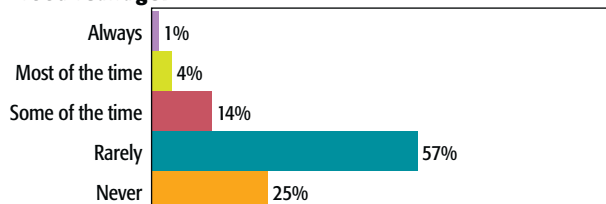
One respondent noted that the introduction of safety-engineered equipment had dramatically reduced blood exposures.

16. Estimate the percentage of I.V. starts for which you successfully stop blood flow using venous compression (after peripheral I.V. insertion but before connecting catheter to line).



N = 344

17. When you're performing peripheral I.V. catheter **insertions**, how often do your patients comment about blood leakage?



N = 341

18. In the past year, what type of training have you received regarding bloodborne pathogens and prevention of occupational blood exposures? (Check all that apply.)

Self-study (online or paper)



Instructor-led training



On-the-job training from another clinician



Other, please specify



Number of responses to each option shown in parentheses.

73% of respondents indicated that the training they received on bloodborne pathogens was “self-study.” OSHA requires that training include an “opportunity for interactive questions and answers with the person conducting the training session.”

Conclusions

The total rate of at-risk blood exposures for I.V. catheter insertions revealed in this survey is 128 per 100,000 insertions (the combined rate for MMEs and nonintact skin exposures as indicated in questions 5 and 10). It’s useful to compare this rate with those for needlestick injuries (NSIs) from I.V. catheters: For conventional I.V. catheters (which are no longer in widespread use in the United States), a rate of 7.5 NSIs per 100,000 devices was found in a 1997 study, and 6.6 per 100,000 in a 2000 study.^{1,2} For safety-engineered I.V. catheters, the rate was 1.2 per 100,000 devices (0.7 per 100,000 in the 2000 study).

While we’ve succeeded in dramatically reducing sharps injuries from I.V. needle-catheter devices over the last decade through the widespread implementation of safety-engineered alternatives,⁹ there has been less focus on decreasing blood exposures from I.V. catheter procedures. As previously discussed, we estimate an average blood exposure rate of 4,400 per 100,000 catheter insertions among survey respondents, in contrast to an average MME rate of 19.2 per 100,000 insertions. This indicates that *at-risk* blood exposures involving I.V. catheters—exposures to mucous membrane and nonintact skin—are much lower in frequency than those to intact skin, which aren’t considered at-risk. Nevertheless, they should be minimized.

The findings on lack of eye protection are troubling, because conjunctival exposures are those most frequently associated with pathogen transmission among all types of blood exposures.⁶ Healthcare workers who perform I.V.

catheter procedures should wear eye and face protection. Eyeglasses are not enough. Eye protection should incorporate a seal above the eyes to prevent blood from dripping from the forehead into the eyes.

Overall, the results underscore the need for ongoing efforts to consider all avenues of blood exposure risk during both the insertion and removal of peripheral I.V. catheters. Prevention strategies should encompass the design of these devices to minimize leakage around and from the catheter hub and splatter from the catheter during insertion and removal, as well as the systematic use of personal protective equipment, including gloves and eye and face protection, when performing this common—and exposure-prone—procedure.

Finally, if you experience a blood exposure, make sure you get the assessment and care you need. (See *After an exposure: know your rights.*) ■

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AFTER AN EXPOSURE: KNOW YOUR RIGHTS

Postexposure treatment must be free:

OSHA requires your employer to provide medical evaluation and follow-up, including blood testing, lab work, postexposure prophylaxis (where medically indicated), and appropriate counseling, at no cost to you.

Postexposure treatment must be timely and confidential:

“Following a report of an exposure incident, the employer shall make *immediately available* to the exposed employee a confidential medical evaluation and follow-up, *including... post-exposure prophylaxis, when medically indicated.*” [emphasis added]

Source: OSHA bloodborne pathogens standard, 1910.1030(f)(1)(ii) and 1910.1030(f)(3).

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¹ Onia R, Eshun-Wilson I, Arce C, et al. Evaluation of a new safety peripheral IV catheter designed to reduce mucocutaneous blood exposure. *Curr Med Res Opin.* 2011;27(7):1339-1346.

² Bausone-Gazda D, Lefaiver CA, Walters SA. A randomized controlled trial to compare the complications of 2 peripheral intravenous catheter-stabilization systems. *J Infus Nurs.* 2010;33(6):371-384.