

# Assessing blood pathogen exposure risk beyond accidental needlesticks



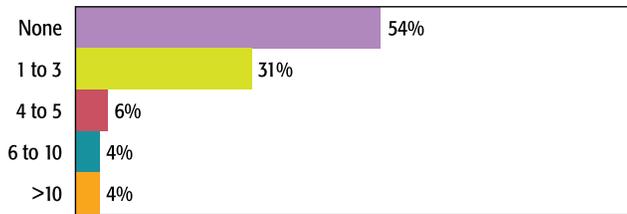
## Introduction

Healthcare professionals using sharps devices are generally aware of the hazards associated with accidental percutaneous needlesticks. However, this is not the only risk of potential exposure to contaminated blood during venipuncture. Mucocutaneous exposure through the eyes, nose or mouth as well as contact with nonintact skin (eg., dermatitis, cuts or abrasions) increase the risk for disease transmission including hepatitis B, hepatitis C and HIV. Exposure during peripheral I.V. catheter insertion and removal is a particular problem. In a 2011 study of more than 400 nurses, 31% of respondents said they had one to three mucocutaneous exposures per month when inserting or removing a peripheral I.V. catheter<sup>1</sup>.

## Study Results

Following are the results of a survey conducted by Nursing 2011 titled *“Blood exposure risk during peripheral I.V. catheter insertion and removal”*<sup>2</sup>.

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?



N = 350

46% of respondents estimated that they had sustained at least one blood exposure per month during an I.V. catheter insertion.

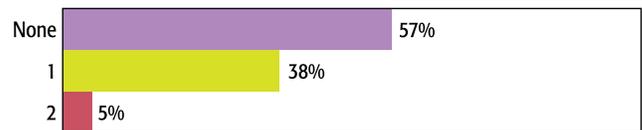
In the **past year**, approximately how many times has blood contacted your eyes, nose or mouth during **insertion** of a peripheral I.V. catheter?



N = 168

Almost 13% (21 of 168 respondents) sustained a total of 32 mucous membrane exposures (MMEs) in the previous year.

How many of these exposures did you report?



Number of respondents = 21

Number of MME exposures reported = 10

57% of these exposures went unreported.

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.

9%

Blood leaked from the catheter hub during insertion.

50%

Blood leaked from the catheter during removal.

15%

Not sure.

9%

Other, please describe.

18%

N = 340

50% of respondents reported that their most recent exposure involved blood leaking from an I.V. catheter hub during insertion.

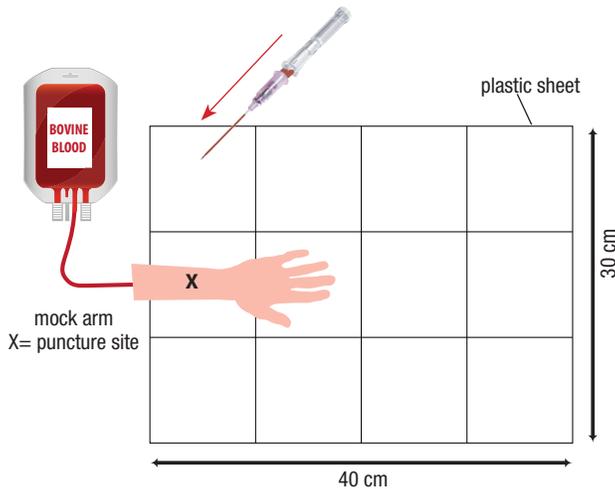
## Evaluating Blood Splatter Using Safety I.V. Catheters

Research conducted by the Department of Infectious Diseases at the Hamamatsu University School of Medicine in Japan studied the volume and patterns of blood splatter of various safety I.V. catheters including Terumo's Surflash® Plus.<sup>2</sup>

### Methods

**STEP 1.** A mock arm was filled with bovine blood, adjusted to a blood pressure of 20 mmHg.

**STEP 2.** The arm was placed on a 30cm x 40cm plastic sheet which was divided into twelve squares measuring 10cm x 10cm as shown below.



**STEP 3.** Fifty catheters of each brand were inserted and the stylet was removed.

**STEP 4.** Blood was collected from the plastic sheet by wiping ten times in the vertical direction and ten times in the lateral direction by using an adenosine triphosphate (ATP) swab test kit.

### Results

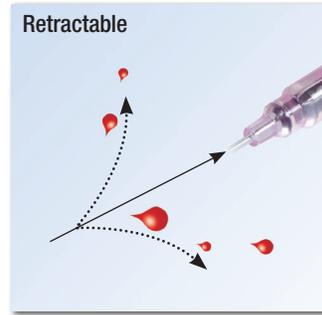
In the graph to the right, the location of the bar indicates the distance that the blood splattered from the insertion site. The height of the bar indicates the volume of blood. Two of the three products tested produced blood splatter. Autoguard BC (BD), which uses a retractable safety mechanism, produced blood splatter ranging from 10cm to 35cm from the puncture site. Introcan Safety 3 (B.Braun), which uses a clip to cover the needle tip, produced blood splatter ranging from 13cm to 86cm.

SurFlash® Plus (Terumo) with passive safety and full needle encapsulation did not produce any measurable blood splatter.

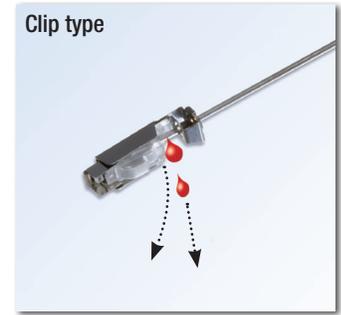
### Mechanisms of Blood Splatter

**Retractable catheters** induce blood splatter from inner needle by needle retraction.

**Some passive safety catheter devices** utilize a clip to cover the needle tip. These clips may trap blood particles which can drip upon removal.

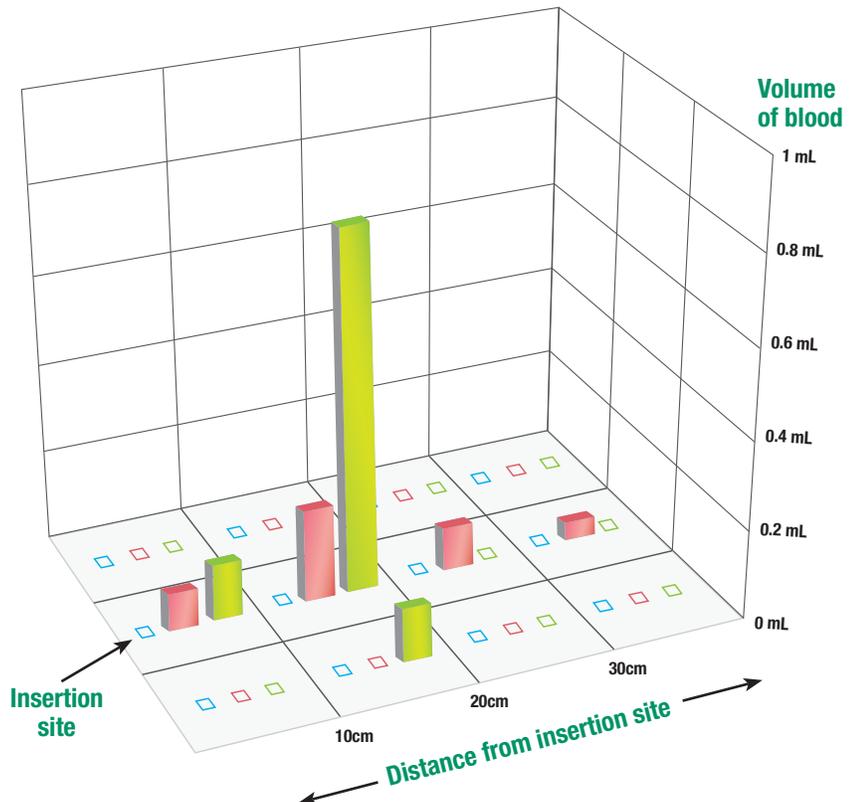


Blood splatter during needle retraction



Blood splatter / dripping from a clip type safety catheter

### Distance and Volume of Blood Splatter (µL)



### References

- CDC statistics on occupationally acquired HIV: procedure/device involved in percutaneous exposure in 46 healthcare workers with documented occupationally acquired HIV. United States through June 1997. In: Jagger J, Perry J, eds. *Preventing Occupational Exposures to Bloodborne Pathogens: Articles from Advances in Exposure Prevention, 1994-2003*. Charlottesville, VA: International Healthcare Worker Safety Center, University of Virginia; 2004:187.
- Horii, T *Blood Splatter Induced By Using Safety Intravenous Catheters*

SurFlash® Plus	Autoguard BC	Introcan Safety 3
<span style="color: blue;">■</span> Blood Registered	<span style="color: red;">■</span> Blood Registered	<span style="color: green;">■</span> Blood Registered
<span style="border: 1px solid blue; display: inline-block; width: 10px; height: 10px;"></span> No Blood Registered	<span style="border: 1px solid red; display: inline-block; width: 10px; height: 10px;"></span> No Blood Registered	<span style="border: 1px solid green; display: inline-block; width: 10px; height: 10px;"></span> No Blood Registered