

# Characterization of Blood-borne Pathogen Exposures During Dermatologic Procedures: The Mayo Clinic Experience

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## PRACTICE POINTS

- Most blood-borne pathogen (BBP) exposures in dermatologic staff occur due to medical sharps as opposed to splash incidents.
- The most common implicated task in resident physicians and practicing dermatologists is suturing or assisting with suturing, and the most commonly associated instrument is the suture needle. In contrast, ancillary staff experience most BBP exposures during handling of sharps, wires, or instruments, and the injection syringe/needle is the most common instrument of injury.
- Quality improvement measures are needed in prevention of BBP exposures and should focus on identified risk factors among occupational groups in the workplace.

Dermatologists are at risk for blood-borne pathogen (BBP) exposures. We conducted a retrospective review of incidence reports to identify the incidence of BBP exposures in dermatologic procedures. Secondary aims included identification of the type of exposure, type of procedure associated with each exposure, anatomic locations of exposures, and instruments involved in each exposure. Data were obtained at 3 Mayo Clinic sites in Scottsdale, Arizona; Jacksonville Florida; and Rochester, Minnesota, from 2010 to 2021. Two hundred twenty-two exposures were identified over an 11-year period. Results indicated that quality improvement measures should focus on training all dermatologic staff to reduce BBP exposures.

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Dermatology providers are at an increased risk for blood-borne pathogen (BBP) exposures during procedures in clinical practice.<sup>1-3</sup> Current data regarding the characterization of these exposures are limited. Prior studies are based on surveys that result in low response rates and potential for selection bias. Donnelly et al<sup>1</sup> reported a 26% response rate in a national survey-based study evaluating BBP exposures in resident physicians, fellows, and practicing dermatologists, with 85% of respondents reporting at least 1 injury. Similarly, Goulart et al<sup>2</sup> reported a 35% response rate in a survey evaluating sharps injuries in residents and medical students, with 85% reporting a sharps injury. In addition, there are conflicting data regarding characteristics of these exposures, including common implicated instruments and procedures.<sup>1-3</sup> Prior studies also have not evaluated exposures in all members of dermatologic staff, including resident physicians, practicing dermatologists, and ancillary staff.

To make appropriate quality improvements in dermatologic procedures, a more comprehensive understanding of BBP exposures is needed. We conducted a retrospective review of BBP incidence reports to identify the incidence of BBP events among all dermatologic staff, including resident physicians, practicing dermatologists, and ancillary staff. We further investigated the type of exposure, the type of procedure associated with each exposure, anatomic locations of exposures, and instruments involved in each exposure.

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The eTable is available in the Appendix online at [www.mdedge.com/dermatology](http://www.mdedge.com/dermatology).

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**Methods**

Data on BBP exposures in the dermatology departments were obtained from the occupational health departments at each of 3 Mayo Clinic sites—Scottsdale, Arizona; Jacksonville, Florida; and Rochester, Minnesota—from March 2010 through January 2021. The institutional review board at Mayo Clinic, Scottsdale, Arizona, granted approval of this study (IRB #20-012625). A retrospective review of each exposure was conducted to identify the incidence of BBP exposures. Occupational BBP exposure was defined as any percutaneous injury or mucosal exposure with foreign blood, tissue, or other bodily fluids that placed the health care worker at risk for communicable infections. Secondary aims included identification of the type of exposure, type of procedure associated with each exposure, common anatomic locations of exposures, and common instruments involved in each exposure.

*Statistical Analysis*—Variables were summarized using counts and percentages. The 3 most common categories for each variable were then compared among occupational groups using the Fisher exact test. All other categories were grouped for analysis purposes. Medical staff were categorized into 3 occupational groups: practicing dermatologists; resident physicians; and ancillary staff, including nurse/medical assistants, physician assistants, and clinical laboratory technologists. All analyses were 2 sided and considered statistically significant at  $P < .05$ . Analyses were performed using SAS 9.4 (SAS Institute Inc).

**Results**

*Type of Exposure*—A total of 222 BBP exposures were identified through the trisite retrospective review from March 2010 through January 2021. One hundred ninety-nine (89.6%) of 222 exposures were attributed to needlesticks and medical sharps, while 23 (10.4%) of 222 exposures were attributed to splash incidents (Table).

*Anatomic Sites Affected*—The anatomic location most frequently involved was the thumb (130/217 events [59.9%]), followed by the hand (39/217 events [18.0%]) and finger (22/217 events [10.1%]). The arm, face, and knee were affected with the lowest frequency, with only 1 event reported at each anatomic site (0.5%) (eTable). Five incidents were excluded from the analysis of anatomic location because of insufficient details of events.

*Incident Tasks and Tools*—Most BBP exposures occurred during suturing or assisting with suturing (64/210 events [30.5%]), followed by handling of sharps, wires, or instruments (40/210 events [19.0%]) and medication administration (37/210 events [17.6%]) (eTable). Twelve incidents were excluded from the analysis of implicated tasks because of insufficient details of events.

The tools involved in exposure events with the greatest prevalence included the suture needle (76/201 events [37.8%]), injection syringe/needle (43/201 events [21.4%]), and shave biopsy razor (24/201 events [11.9%]) (eTable). Twenty-one incidents were excluded from the analysis of implicated instruments because of insufficient details of events.

**Incident Type by Occupational Group**

	Practicing dermatologist (n=33)	Resident physician (n=105)	Ancillary staff (n=84)	Total (N=222)
Incident job description, n (%)				
Attending physician	33 (100)	0 (0)	0 (0)	33 (14.9)
PGY-1 resident	0 (0)	4 (3.8)	0 (0)	4 (1.8)
PGY-2 to PGY-4 resident	0 (0)	101 (96.2)	0 (0)	101 (45.5)
Nurse/medical assistant	0 (0)	0 (0)	75 (89.3)	75 (33.8)
Physician assistant	0 (0)	0 (0)	2 (2.4)	2 (0.9)
Clinical laboratory technologist	0 (0)	0 (0)	7 (8.3)	7 (3.2)
Type of exposure/incident event <sup>a</sup>				
Needlestick/medical sharps item	29 (87.9)	93 (88.6)	77 (91.7)	199 (89.6)
Splash	4 (12.1)	12 (11.4)	7 (8.3)	23 (10.4)

Abbreviation: PGY, postgraduate year.

<sup>a</sup>Fisher exact test,  $P = .725$ .

*Providers Affected by BBP Exposures*—Resident physicians experienced the greatest number of BBP exposures (105/222 events [47.3%]), followed by ancillary providers (84/222 events [37.8%]) and practicing dermatologists (33/222 events [14.9%]). All occupational groups experienced more BBP exposures through needlesticks/medical sharps compared with splash incidents (resident physicians, 88.6%; ancillary staff, 91.7%; practicing dermatologists, 87.9%;  $P=.725$ ) (Table).

Among resident physicians, practicing dermatologists, and ancillary staff, the most frequent site of injury was the thumb. Suturing/assisting with suturing was the most common task leading to injury, and the suture needle was the most common instrument of injury for both resident physicians and practicing dermatologists. Handling of sharps, wires, or instruments was the most common task leading to injury for ancillary staff, and the injection syringe/needle was the most common instrument of injury in this cohort.

Resident physicians experienced the lowest rate of BBP exposures during administration of medications (12.7%;  $P=.003$ ). Ancillary staff experienced the highest rate of BBP exposures with an injection needle (35.5%;  $P=.001$ ). There were no statistically significant differences among occupational groups for the anatomic location of injury ( $P=.074$ ) (eTable).

## Comment

In the year 2000, the annual global incidence of occupational BBP exposures among health care workers worldwide for hepatitis B virus, hepatitis C virus, and HIV was estimated at 2.1 million, 926,000, and 327,000, respectively. Most of these exposures were due to sharps injuries.<sup>4</sup> Dermatologists are particularly at risk for BBP exposures given their reliance on frequent procedures in practice. During an 11-year period, 222 BBP exposures were documented in the dermatology departments at 3 Mayo Clinic institutions. Most exposures were due to needlestick/sharps across all occupational groups compared with splash injuries. Prior survey studies confirm that sharps injuries are frequently implicated, with 75% to 94% of residents and practicing dermatologists reporting at least 1 sharps injury.<sup>1</sup>

Among occupational groups, resident physicians had the highest rate of BBP exposures, followed by nurse/medical assistants and practicing dermatologists, which may be secondary to lack of training or experience. Data from other surgical fields, including general surgery, support that resident physicians have the highest rate of sharps injuries.<sup>5</sup> In a survey study ( $N=452$ ), 51% of residents reported that extra training in safe techniques would be beneficial.<sup>2</sup> Safety training may be beneficial in reducing the incidence of BBP exposures in residency programs.

The most common implicated task in resident physicians and practicing dermatologists was suturing or assisting with suturing, and the most common implicated

instrument was the suture needle. Prior studies showed conflicting data regarding common implicated tasks and instruments in this cohort.<sup>1,2</sup> The task of suturing and the suture needle also were the most implicated means of injury among other surgical specialties.<sup>6</sup> Ancillary staff experienced most BBP exposures during handling of sharps, wires, or instruments, as well as the use of an injection needle. The designation of tasks among dermatologic staff likely explains the difference among occupational groups. This new information may provide the opportunity to improve safety measures among all members of the dermatologic team.

*Limitations*—There are several limitations to this study. This retrospective review was conducted at a single health system at 3 institutions. Hence, similar safety protocols likely were in place across all sites, which may reduce the generalizability of the results. In addition, there is risk of nonreporting bias among staff, as only documented incidence reports were evaluated. Prior studies demonstrated a nonreporting prevalence of 33% to 64% among dermatology staff.<sup>1-3</sup> We also did not evaluate whether injuries resulted in BBP exposure or transmission. The rates of postexposure prophylaxis also were not studied. This information was not available for review because of concerns for privacy. Demographic features, such as gender or years of training, also were not evaluated.

## Conclusion

This study provides additional insight on the incidence of BBP exposures in dermatology, as well as the implicated tasks, instruments, and anatomic locations of injury. Studies show that implementing formal education regarding the risks of BBP exposure may result in reduction of sharps injuries.<sup>7</sup> Formal education in residency programs may be needed in the field of dermatology to reduce BBP exposures. Quality improvement measures should focus on identified risk factors among occupational groups to reduce BBP exposures in the workplace.

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## APPENDIX

**eTABLE. Incident Details by Occupational Group**

	Practicing dermatologist (n=33)	Resident physician (n=105)	Ancillary staff (n=84)	Total (N=222)	P value
Incident primary body part, n (%) <sup>a</sup>					.074 <sup>b</sup>
Thumb	17/30 (56.7)	64/103 (62.1)	49/84 (58.3)	130/217 (59.9)	
Hand	4/30 (13.3)	19/103 (18.4)	16/84 (19.0)	39/217 (18.0)	
Finger	6/30 (20.0)	4/103 (3.9)	12/84 (14.3)	22/217 (10.1)	
Other	3/30 (10.0)	16/103 (15.5)	7/84 (8.3)	26/217 (12.0)	
Eye	2/30 (6.7)	8/103 (7.8)	2/84 (2.4)	12/217 (5.5)	
Mouth	1/30 (3.3)	2/103 (1.9)	2/84 (2.4)	5/217 (2.3)	
Nose	0/30 (0)	2/103 (1.9)	2/84 (2.4)	4/217 (1.8)	
Leg	0/30 (0)	2/103 (1.9)	0/84 (0)	2/217 (0.9)	
Arm	0/30 (0)	1/103 (1.0)	0/84 (0)	1/217 (0.5)	
Face	0/30 (0)	0/103 (0)	1/84 (1.2)	1/217 (0.5)	
Knee	0/30 (0)	1/103 (1.0)	0/84 (0)	1/217 (0.5)	
Incident task, n (%) <sup>c</sup>					.003 <sup>b</sup>
Suturing/assisting with suturing	11/31 (35.5)	42/102 (41.2)	11/77 (14.3)	64/210 (30.5)	
Handling of sharps/wires/instruments	5/31 (16.1)	14/102 (13.7)	21/77 (27.3)	40/210 (19.0)	
Administering medication	7/31 (22.6)	13/102 (12.7)	17/77 (22.1)	37/210 (17.6)	
Other	8/31 (25.8)	33/102 (32.4)	28/77 (36.4)	69/210 (32.9)	
Sharps disposal/waste/red bag	0/31 (0.0)	12/102 (11.8)	12/77 (15.6)	24/210 (11.4)	
Capping/uncapping needles/sharps	1/31 (3.2)	4/102 (3.9)	4/77 (5.2)	9/210 (4.3)	
Passing/reaching for instruments/sharps	2/31 (6.5)	4/102 (3.9)	3/77 (3.9)	9/210 (4.3)	
Instrument/equipment cleaning	1/31 (3.2)	2/102 (2.0)	5/77 (6.5)	8/210 (3.8)	
Shave biopsy, injury with razor	2/31 (6.5)	4/102 (3.9)	1/77 (1.3)	7/210 (3.3)	
Surgical procedure	1/31 (3.2)	3/102 (2.9)	1/77 (1.3)	5/210 (2.4)	
Performing swab	0/31 (0)	3/102 (2.9)	0/77 (0)	3/210 (1.4)	
Laboratory assay/experiment	1/31 (3.2)	0/102 (0)	1/77 (1.3)	2/210 (1.0)	
Biopsy (unspecified)	0/31 (0)	1/102 (1.0)	0/77 (0)	1/210 (0.5)	
Preparing room for clinic procedure	0/31 (0)	0/102 (0)	1/77 (1.3)	1/210 (0.5)	

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eTABLE. (continued)

	Practicing dermatologist (n=33)	Resident physician (n=105)	Ancillary staff (n=84)	Total (N=222)	P value
Incident tools involved, n (%) <sup>d</sup>					.001 <sup>b</sup>
Suture needle	10/28 (35.7)	49/97 (50.5)	17/76 (22.4)	76/201 (37.8)	
Syringe/needle	4/28 (14.3)	12/97 (12.4)	27/76 (35.5)	43/201 (21.4)	
Shave biopsy razor	3/28 (10.7)	11/97 (11.3)	10/76 (13.2)	24/201 (11.9)	
Other	11/28 (39.3)	25/97 (25.8)	22/76 (28.9)	58/201 (28.9)	
Scalpel blade	3/28 (10.7)	6/97 (6.2)	5/76 (6.6)	14/201 (7.0)	
Microtome blade	0/28 (0)	1/97 (1.0)	7/76 (9.2)	8/201 (4.0)	
Electrocautery tip	1/28 (3.6)	3/97 (3.1)	3/76 (3.9)	7/201 (3.5)	
Scissors	0/28 (0)	4/97 (4.1)	2/76 (2.6)	6/201 (3.0)	
Fluid/blood splash	1/28 (3.6)	3/97 (3.1)	0/76 (0)	4/201 (2.0)	
Retractors, skin/bone hooks	2/28 (7.1)	0/97 (0)	2/76 (2.6)	4/201 (2.0)	
Needle (unspecified)	1/28 (3.6)	2/97 (2.1)	0/76 (0)	3/201 (1.5)	
Biopsy needles	0/28 (0)	2/97 (2.1)	0/76 (0)	2/201 (1.0)	
Glass	1/28 (3.6)	0/97 (0)	1/76 (1.3)	2/201 (1.0)	
Needle driver	1/28 (3.6)	1/97 (1.0)	0/76 (0)	2/201 (1.0)	
Pickups/forceps/hemostats/clamps	1/28 (3.6)	0/97 (0)	1/76 (1.3)	2/201 (1.0)	
Surgical razor	0/28 (0)	1/97 (1.0)	0/76 (0)	2/201 (1.0)	
IV needle	0/28 (0)	1/97 (1.0)	0/76 (0)	1/201 (0.5)	
Swab culturette	0/28 (0)	1/97 (1.0)	0/76 (0)	1/201 (0.5)	

Abbreviation: IV, intravenous.

<sup>a</sup>There were insufficient details for 5 incidents.

<sup>b</sup>Fisher exact test.

<sup>c</sup>There were insufficient details for 12 incidents.

<sup>d</sup>There were insufficient details for 21 incidents.