Bloodborne pathogen risk reduction activities in the body piercing and tattooing industry

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Background: This study examines how well regulations for bloodborne pathogens (BBPs), established primarily to reduce exposure risk for health care workers, are being followed by workers and employers in the tattooing and body piercing industry.
Method: Twelve shops performing tattooing and/or body piercing (body art) in Pennsylvania and Texas were assessed for compliance with 5 administrative and 10 infection control standards for reducing exposure to BBPs.
Results: All shops demonstrated compliance with infection control standards, but not with administrative standards, such as maintaining an exposure control plan, offering hepatitis B vaccine, and training staff. Shops staffed with members of professional body art organizations demonstrated higher compliance with the administrative standards. Shops in locations where the body art industry was regulated and shops in nonregulated locations demonstrated similar compliance, as did contractor- and employee-staffed shops.
Conclusions: Regulations to control occupational exposure to BBPs have been in place since 1991. This study corroborates noncompliance with some standards within the body art industry reported by previous studies. Without notable enforcement, regulation at national, state, or local levels does not affect compliance. In this study, the factor most closely associated with compliance with administrative regulations was the artist's membership in a professional body art association.
Key Words: Bloodborne pathogens; OSHA standards; infection control; body art; tattoo; body piercing.

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Many workers risk occupational exposure to bloodborne pathogens (BBPs) when performing daily duties. Research on this risk began in the 1980s and focused on health care workers employed in hospital settings. This research resulted in a variety of work practice guidelines issued by the Centers for Disease Control and Prevention (CDC)[1-3] and 2 sets of major regulations administered by the Occupational Safety and Health Administration (OSHA).[4,5] Congressional findings relating to the initial implementation of the OSHA Bloodborne Pathogens Standard in 1991 state that ''compliance with the bloodborne pathogens standard has significantly reduced the risk that workers will contract a bloodborne disease in the course of their work.''[5]

While it is generally acknowledged that health care workers are at highest risk of occupational exposure to BBPs, all workers who use or encounter sharps on the job are also at risk. Huy et al[6] identified the need to address exposure risks comprehensively among community workers (a term used for non–health care workers also at risk of exposure to BBPs) and suggested that standards relating to BBP exposure risk reduction may not be relevant or practical in many non–health care settings. One subset of community workers—body artists (ie, body piercers and tattoo artists)—use sharps in the course of their work and are covered by the OSHA Bloodborne Pathogen Standard.[7] Because little research has been done to date on preventing exposures to blood and body fluids among body artists, the effectiveness of these standards in nonhospital settings is less clear.

In our study, we examined how well standards established to reduce risk of exposure to BBPs, written primarily for health care workers, are being followed by workers and employers in tattooing and body piercing (hereinafter referred to as body art) shops. We visited 12 body art shops in Texas and Pennsylvania to examine

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compliance with key BBP exposure prevention standards. Key standards were derived from OSHA regulations,[4] which rely on workplace recommendations provided by the National Institute for Occupational Safety and Health (NIOSH)[8,9] and the CDC.[1-3] Although the state of Texas also licenses tattoo and certain body piercing studios and mandates additional requirements for studios and artists, we found no substantial variation from OSHA regulations and did not examine the Texas requirements separately.[10] In addition to compliance with exposure prevention standards, we examined responses to 3 secondary questions:

1. Are shops in local- or state-regulated locations more likely to comply with BBP exposure prevention activities?
2. Does artist membership in body art professional associations positively affect a shop's compliance with BBP exposure prevention standards?
3. Do differences in compliance exist between shops staffed by contractors and those staffed by employees?

We were interested in answering these questions because several studies have shown that shop placement in a regulated location, staffing with employees (vs independent contractors), and staffing with artists who belong to a professional organization are variables related to compliance with BBP exposure prevention standards.[11-13]

METHODS

Recruitment

The number of body art shops in the United States is unknown, so obtaining a statistically representative sample of this working population was not feasible. In conducting this study, we chose a convenience sample of 12 body art shops to examine overall compliance with key BBP exposure prevention standards and address our 3 study objectives. Our goal was to recruit an equal number of shops that met our criteria of interest: shops in locations that regulated and did not regulate body art, employee- and contractor-staffed shops, and shops affiliated and not affiliated with professional associations, including the Association of Professional Piercers (APP) and the Alliance for Professional Tattooists (APT). Because there are no national laws regulating body art, we considered a shop to be in a regulated location when a state, county, or city decided to implement regulations specifically covering body art shops and the work practices of body artists. We considered a shop to be ''association-affiliated'' when 2 or more staff members were APP/APT members. Even though the APP and APT do not grant affiliation to entire shops, some evidence suggests that shops staffed by association members are more likely to comply with BBP exposure prevention standards.[14]

No incentives were offered to shops or body artists to participate in this study. All study participants signed an informed consent form. This study was approved by NIOSH's Human Subjects Review Board (HSRB 03-DSHEFS-02XP).

Table 1 summarizes the characteristics of the shops in our study. We evaluated 2 body piercing–only shops; to maximize the number of procedures that could be observed, the remaining 10 shops offered both services. With one exception, shops were staffed only with employees or with self-employed contractors. We considered the 1 shop that had both types of staff to be an employee-staffed shop, because only 1 of the 7 staff members was a contractor.

We selected 2 areas in Pennsylvania (a state that does not regulate body art) and 2 areas in Texas (a state that regulates body art) for recruitment efforts: the city of Philadelphia and an area northwest of Philadelphia (bound roughly by Scranton and Harrisburg), and the city of Dallas and an area west of Dallas encompassing the city of Fort Worth. For each of these locations, we compiled a list of tattoo and body piercing shops from telephone book yellow pages, Internet searches, and APP and APT member lists.

In Pennsylvania, we initially contacted 21 shops. Of these, 5 were ineligible and 3 refused to participate. We recruited 6 shops from the remaining 13. Of these, 4 performed both piercing and tattooing. This provided 10 possible procedure–shop combinations for observation, 5 in Philadelphia and 5 outside the city. Although we selected the state of Pennsylvania because it had not enacted body art regulations, the city of Philadelphia had recently adopted local regulations governing the operation and conduct of tattoo and body piercing establishments. These regulations required that all body art facilities comply with OSHA BBP regulations, established sanitation/safety conditions for body art shops, established the professional qualifications and practices of artists, and required that each artist successfully complete a BBP training course given by the Philadelphia Department of Public Health.[15] Therefore, 3 of the 6 shops visited were licensed and regulated as body art shops, 5 of the 6 shops were staffed primarily by artists who were members of APP or APT, and 2 of the 6 shops were employee-staffed and 4 were contractor-staffed.

In Texas, we initially contacted 17 shops. Of these, 5 shops were ineligible and 2 refused to participate. We recruited 6 participating shops from the remaining 10. Piercing and tattooing were offered at all 6 shops, for 12 possible procedure–shop combinations for observation (6 in Dallas and 6 in Fort Worth). Of the 6 shops, 2 were staffed primarily by artists who were

Table 1. Shop characteristics

Shop identifier	State	Number of artists	APP/APT members	State/local regulated	Piercings only	Tattoos only	Tattoos and piercings	Contractor-staffed	Employee-staffed
A	PA	4	3*	x	x				x
B	PA	3	2*	x			x	x	
C	PA	7	5*	x			x	x	
D	PA	3	3*		x				x
E	PA	2	0				x	x	
F	PA	7	3*				x	x	
G	TX	3	0	x			x	x	
H	TX	5	1	x			x		x
I	TX	4	4*	x			x	x	
J	TX	7	0	x			x		x
K	TX	4	0	x			x	x	
L	TX	7	3*	x			x		x†
Totals	12	56	24 (43%)	9 (75%)	2	0	10	7	5

*Considered an association-affiliated shop.
†Shop is staffed with 6 employees and 1 contractor.

members of APP or APT; 3 of the 6 shops were employee-staffed, and 3 were contractor-staffed.

Data collection and analysis

Before data collection, we reviewed OSHA's regulations and standards for exposure to BBPs and published studies of body artists[11,13] to determine key factors relating to the occupational risk of body artists to BBP exposure. From this review, 9 a priori exposure prevention activities emerged:

1. Develop/use a written exposure control plan.
2. Maintain an injury log to document needlesticks.
3. Offer the hepatitis B vaccine to artists when hired and document declinations.
4. Provide initial and annual follow-up BBP training for artists.
5. Prevent cross-contamination.
6. Dispose of sharps properly.
7. Use appropriate personal protective equipment (PPE).
8. Wash hands after each procedure.
9. Dispose of contaminated waste properly.

Using materials developed for previous studies,[12,13] we prepared an observation form to use at each shop to record multiple data elements relating to these topics.

We visited the 12 recruited shops (Table 1) and evaluated 18 procedure–shop combinations (9 piercing and 9 tattooing). At each shop, an industrial hygienist first conducted an entrance interview with the owner/manager and employees to be observed. The industrial hygienist asked the owner/manager for copies of BBP-relevant written documents and walked around the shop and observed and recorded 1 or more tattooing or piercing procedures (as available). To end the visit, the industrial hygienist asked the owner/manager to describe procedures not observed.

After the site visits, we adjusted 4 of the 9 prevention activities to more precisely describe the activities we examined at each site visit. The cross-contamination category was too broad, so we divided it into 5 separate activities:

1. Clean/sterilize equipment appropriately.
2. Clean/disinfect contaminated surfaces appropriately.
3. Cover tattoo equipment during procedures.
4. Change gloves when appropriate.
5. Ensure that eating and drinking does not occur in the procedure areas.

We changed "using PPE" to "using gloves when appropriate," because artists did not use other PPE, nor did it appear necessary for them to do so. We added a second sharps handling activity, which we identified as "locating a sharps container close to work station," because our observations identified areas of concern before the actual action of sharps disposal. We also divided the training activity into 2 elements, "providing annual BBP training" and "documenting training," because we noted discrepancies between what shop owners and employees told us about staff training. This process resulted in 15 exposure prevention activities that were observed and analyzed. Table 2 summarizes the 15 BBP exposure prevention activities that we identified, along with the related OSHA standard paragraph for each element and a brief description of the paragraph.

RESULTS

Table 3 provides stratified summaries of compliance rates at each of the 12 shops for the 15 key BBP exposure risk reduction standards by regulation status, by association-affiliation status, and by staffing type.

Table 2. Description and OSHA references for BBP exposure prevention standards

Exposure prevention standard	OSHA standard-29 CFR	Brief description/purpose of standard
Written exposure control plan (ECP)	1910.1030(c)(1)(i)	ECP documents tasks/procedures/jobs where occupational exposures may occur; must address training, PPE, vaccination, and other provisions.
Maintaining sharps injury log	1910.1030(h)(5)(i)	The log helps identify and evaluate devices used in the workplace and to identify problem areas in the facility; reviewed annually for training purposes.
Offering/documenting hepatitis B vaccine	1910.1030(f)(1)(i)	Employer must offer free vaccine to employees with potential occupational exposure to blood, within 10 days of assignment; declinations must be documented.
Providing annual BBP training	1910.1030(g)(2)(i)	Employees with potential job exposure must receive initial and annual training on BBP hazards and protective measures to minimize risk of occupational exposure.
Documenting training	1910.1030(h)(2)(i)	Training records help determine if training adequately addresses job risks and helps track relationships between exposure incidents/various jobs/level of training.
Cleaning/sterilizing equipment appropriately	1910.1030(d)(4)(ii)	All equipment must be properly cleaned and decontaminated after use.
Cleaning/disinfecting contaminated surfaces	1910.1030(d)(4)(ii)(A)	Contaminated environmental and working surfaces must be cleaned with an appropriate disinfectant.
Covering tattoo equipment during procedures	1910.1030(d)(4)(ii)(B)	Protective coverings should be used for equipment that is hard to clean and decontaminate.
Disposing of sharps properly	1910.1030(d)(4)(iii)(A)(1)	Contaminated sharps shall be discarded immediately or as soon as feasible in containers that are closable, puncture-resistant, and leakproof.
Locating sharps container near workstation	1910.1030(d)(4)(iii)(A)(2)(i)	Sharps containers shall be easily accessible to personnel and located as close as feasible to the immediate area where sharps are used; they should not be overfilled.
Using gloves when appropriate	1910.1030(d)(3)(ix)	Gloves must be used if there is reasonable anticipation of employee hand contact with blood/body fluids or when handling/touching contaminated surfaces/items.
Changing gloves when appropriate	1910.1030(d)(3)(ix)(A)	Gloves must be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or cease to be functional barriers.
Washing hands when needed	1910.1030(d)(2)(v)	Employees must wash hands immediately or as soon as feasible after removing gloves or other PPE.
Eating/drinking does not occur in procedure area	1910.1030(d)(2)(ix)	Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where occupational exposure may occur.
Handling biohazard waste properly	1910.1030 (d)(4)(iii)(B)	Autoclave efficiency must be verified by means of biological/chemical indicators. Spore testing should be conducted when necessary.

Exposure control plan

As required by OSHA regulation, a written exposure control plan is the first step in developing an effective BBP exposure prevention program. No shop in our study had executed such a plan, and only 2 shops had any written standard operating procedures.

Sharps injury log

Although no shop maintained a formal sharps injury log, 3 shops maintained forms or logs that captured adequate sharps injury information. The 3 shops, 2 in Philadelphia (regulated by the city) and 1 in Texas, were affiliated with either the APP or APT, and 2 were employee-staffed.

Hepatitis B vaccination

Only 1 employee-staffed shop, which was affiliated with the APP and in a regulated location, complied with the requirement to offer the vaccine and document artist declinations. (We did not validate responses because of the sensitive nature of medical information and the adverse impact that activity might have on respondents' candor.) Some shop owners/managers stated that artists could get the vaccine if they asked, but this did not meet the requirement to actively offer the vaccine within 10 days of employment, at no cost, to employees at risk for BBP exposure. The managers of 3 of the 7 contractor-staffed shops explicitly stated that individual artists were responsible for getting the vaccine because they were contractors.

Annual BBP training

Most shop owners/managers believed that the artists had received some previous training, usually when attending a conference, and only 5 shops, all association-affiliated, provided evidence that artists had received required initial and annual training. Of these 5 shops,

Table 3. BBP exposure prevention compliance by regulation, association affiliation, and employee status

BBP exposure prevention standard	State/local-regulated shops (n = 9), n (%)	Nonregulated shops (n = 3), n (%)	Association-affiliated shops (n = 7), n (%)	Non–association-affiliated shops (n = 5), n (%)	Contractor-staffed shops (n = 7), n (%)	Employee-staffed shops (n = 5), n (%)[‡]
Administrative						
Developing/using a written exposure control plan	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Maintaining an injury log	2 (22)	1 (33)	3 (43)	0 (0)	1 (14)	2 (40)
Offering/documenting hepatitis B vaccine	1 (11)	0 (0)	1 (14)	0 (0)	0 (0)	1 (20)
Providing annual BBP training	3 (33)	2 (67)	5 (71)	0 (0)	2 (29)	3 (60)
Documenting training	3 (33)	0 (0)	3 (43)	0 (0)	1 (14)	2 (40)
Infection control						
Cleaning/sterilizing equipment appropriately	8 (89)	3 (100)	7 (100)	4 (80)	7 (100)	4 (80)
Cleaning/disinfecting contaminated surfaces appropriately	9 (100)	3 (100)	7 (100)	5 (100)	7 (100)	5 (100)
Covering tattoo equipment during procedures	4 (50)[*]	1 (50)[*]	2 (40)[†]	3 (60)	7 (100)	2 (67)[†]
Disposing of sharps properly	6 (67)	1 (33)	5 (71)	2 (40)	5 (71)	2 (40)
Locating sharps container close to workstation	6 (67)	3 (100)	6 (86)	3 (60)	4 (57)	5 (100)
Using gloves when appropriate	9 (100)	3 (100)	7 (100)	5 (100)	7 (100)	5 (100)
Changing gloves when appropriate	7 (78)	2 (67)	7 (100)	2 (40)	5 (71)	4 (80)
Washing hands when needed	9 (100)	3 (100)	7 (100)	5 (100)	7 (100)	5 (100)
Eating/drinking does not occur in procedure area	9 (100)	2 (67)	7 (100)	4 (80)	6 (86)	5 (100)
Handling biohazard waste properly	9 (100)	3 (100)	7 (100)	5 (100)	7 (100)	5 (100)

[*]Denominator reduced by 1 in each cell: 1 regulated shop and 1 nonregulated shop did not perform tattooing.
[†]Denominator reduced since 2 shops did not perform tattooing.
[‡]A shop staffed by 1 contractor and 4 employees was considered to be an employee-staffed shop for analysis purposes.

3 were in regulated locations and were employee-staffed. Shop owners/managers did not consider themselves responsible for ensuring that contracted artists were trained annually. They considered contractors responsible for obtaining their own training.

Documention of training

Three shops, all in regulated locations and association-affiliated, maintained adequate training documentation. Two of these 3 shops were employee-staffed.

Cleaning and sterilizing equipment

Reusable tattoo instruments included tubes and, in some cases, needle bars. Reusable piercing instruments included tapers, forceps, and pliers. Cleaning involved placing items in an ultrasonic cleaner for 30 minutes, followed by rinsing and drying. Shops changed ultrasonic cleaning solutions at various rates. After drying, items were packaged and autoclaved for sterilization. Compliance with this activity was high. Only 1 shop did not follow recommended cleaning and sterilizing procedures; this shop was in a regulated location, was employee-staffed, and was not affiliated with the APT or APP. Compliant shops used steam autoclaves with temperature indicators in every package; 2 shops reported that they did not conduct periodic spore destruction tests to verify the effectiveness of the autoclave. The rate of spore testing for the other shops ranged from every week to every 2 months.

Cleaning/disinfecting contaminated surfaces

All shops complied with this standard. Work surfaces were sprayed with a disinfectant and then wiped after each procedure. Tatttooists used alcohol or MadaCide to disinfect work surfaces. Piercers used MadaCide to disinfect work area and client chair/table surfaces. Most artists followed a cleanup procedure that allowed the disinfectant to remain on the work surface while they completed other tasks. Artists in 1 shop actually timed the disinfectant sit time.

Covering tattoo equipment during procedures

Protective covering (eg, disposable plastic wrap) is required for tattoo machines that cannot be cleaned and sterilized as described above. Coverings should be replaced daily or when visibly contaminated. Half of the shops that offered tattooing (5 of 10) complied with this activity. Although 3 noncompliant shops covered their tattoo machines, the plastic was not changed daily. Machines were not covered in plastic in 2 shops, and the only cleaning observed was a wipe down with a paper towel.

Disposing of sharps properly

Seven shops fully complied with this standard. Of these, 6 shops were located in regulated locations, 5 were contractor-staffed and 5 were association-affiliated. Although artists were observed disposing needles in an appropriate sharps container, they varied considerably in their handling of the needles after a procedure and before disposal. Some tattoo artists placed the needle–bar combo in a sharps disposal container, while others placed the needle–bar combo in a container for the needle to be broken off after cleaning. All piercers placed needles on the work area instead of immediately disposing of them. Only 1 piercer picked up the needle with a pair of forceps for disposal. Sharps disposal containers were generally clean and in a stable location; however, we noted 1 sharps disposal container sitting open on the floor and another overfilled.

Locating sharps disposal container near workstation

Of the 12 shops, 9 complied with this standard. The 3 shops that were noncompliant were all located in regulated locations and were contractor-staffed. Filled sharps disposal containers were stored in the biohazard area in all shops, but not all were sealed.

Using gloves when appropriate

Artists in all 12 shops complied with this activity. Most artists wore nonpowdered, nonsterile latex gloves during piercing and tattooing procedures. A few artists wore nitrile, PVC, or polymer-coated latex gloves. When performing piercing procedures, 2 piercers wore sterile gloves; 1 piercer wore 2 pairs of gloves.

Changing gloves when appropriate

Of the 12 shops, 9 complied with this standard. One artist touched his face while wearing contaminated gloves during a procedure. One tattoo artist failed to remove his gloves when answering the phone and when writing notes several times during a procedure. All 7 association-affiliated shops were in compliance, but only 2 of the 5 shops not affiliated with associations were in compliance. There was little difference in compliance among shops based on regulation and staffing status.

Washing hands

All shops demonstrated 100% compliance. All artists washed their hands after removing gloves.

No eating or drinking in procedure areas

All but 1 shop complied with this standard. There, artists were observed eating at their stations (but not during a procedure). That shop was located in a nonregulated location, was contractor-staffed, and was not association-affiliated.

Handling of biohazard waste

All shops complied with this standard. During tattooing, artists discarded disposable supplies (eg, paper towels, gauze, rubber bands, ink cups, work area coverings) immediately after use. Most piercers left their disposable items, including the autoclave wrappings and gauze pads, on the worktable until after the procedure. The exception was gloves, which were always disposed of immediately after removal. At the end of the procedure, the reusable items were placed in a container and the needle was placed in a sharps disposal container. Then the disposable items were gathered into a ball and disposed of in the trashcan. Most shops reported having a biomedical waste company collect the sharps disposal containers on various schedules. A Texas shop had not disposed of sharps containers at its new location and had not yet made arrangements to do so.

DISCUSSION

Although the BBP exposure prevention standards that we examined have been in place since publication of the 1991 OSHA BBP Standard, the body art shops that we studied demonstrated poor compliance with administrative standards (ie, exposure control plan, injury log, training, offering/documenting hepatitis B vaccine). No shop maintained an exposure control plan, and only 1 shop offered the vaccine to staff artists and documented declinations. The 5 unaffiliated shops did not comply with any administrative elements. The shops in regulated locations and shops that were employee-staffed demonstrated marginally better compliance.

The shops demonstrated better compliance with infection control standards. Compliance was 75% or higher for all infection control elements with the exception of proper disposal of sharps (58%) and covering tattoo equipment (50%). Association-affiliated shops were 100% compliant with 7 of 10 activities, and unaffiliated shops were 100% compliant with 4 of 10 activities. Association-affiliated shops demonstrated compliance equal to or better than the unaffiliated shops on 10 of the infection control standards.

The results of our study indicate slightly better compliance with BBP exposure prevention standards than has been demonstrated in previous studies. Studies of Minnesota tattoo artists in 2000 by Raymond et al[11,12] permitted a comparison of our results for 2 of the 5

administrative standards (exposure control plan and hepatitis B vaccine) and for all 10 infection control standards. Our study demonstrated higher compliance rates for sharps disposal container location (83% vs 8%), no smoking/drinking in the procedure area (92% vs 33%), and handwashing after glove removal (100% vs 45%). The only standard for which the Raymond et al study demonstrated higher compliance was maintenance of an exposure control plan (21% vs 0%).[12] Weber[14] studied 2 body piercing shops in Florida in 2001 and reported that artists from both shops had received BBP training, 1 of the 2 shops offered the hepatitis B vaccine, but neither shop maintained an exposure control plan. Weber also reported problems with proper and timely disposal of sharps and potential cross-contamination of supplies and equipment.

The study of Raymond et al suggested that tattoo shops in areas with local regulations may better comply with BBP exposure prevention standards than those in nonregulated locations.[12] We did not find such an association. We found little difference in compliance whether shops were located in regulated or nonregulated locations. This difference in findings between the 2 studies may be due to differences in enforcement of the BBP regulations in Minnesota versus enforcement in Texas and Philadelphia. The number of states explicitly regulating the body art industry has increased considerably in recent years. In 1989, 31 states and the District of Columbia had no state legislation regulating body art; by 2003, only 8 states and the District of Columbia did not regulate body art.[16] While this demonstrates an awareness among state legislators of the occupational and public health issues relating to body art, the efforts may be meaningless unless regulations are enforced. Some shop staff believed state and local regulations to be only a paperwork exercise; others indicated that regulatory compliance staff had no idea how the body art industry functioned.

Compliance differed between association-affiliated and unaffiliated shops. Compliance with BBP exposure prevention standards in association-affiliated shops was better than or equal to that of unaffiliated shops for 14 of the 15 standards. Only association-affiliated shops demonstrated any compliance with the administrative standards. The study of Raymond et al revealed similar findings.[12]

In our study, 7 shops were contractor-staffed, and 5 shops were employee-staffed. Most of the contractor-staffed shop owners/managers felt that they had little responsibility for the administrative standards and that individual contractors were responsible for their own training and vaccines. Under OSHA's multiemployer citation policy, the shop owner may be equally or solely liable for violations of the BBP regulations even if the shop is staffed only by independent contractors.[17] Management is usually responsible for ensuring compliance with the BBP standard and for the safety of staff (whether employee or contractor) at the worksite. It appears that further guidance and interpretation of the responsibilities of shop owners in relation to contractor staff, as well as communicating these responsibilities in an understandable fashion, is still needed.

Study strengths

Compared with other studies of the body art industry, our study examined a broader geographic selection of shops and targeted specific shop characteristics (ie, association membership, regulations, and staffing) for recruitment. Our assignment of a positive/negative compliance rating to a prevention standard was based on 3 separate factors: individual artist responses, shop owner/manager responses, and an industrial hygienist's review of records and work practices. This latter validation step minimized the possibility of response bias by the artist or owner/manager.

Study limitations

Body piercing and tattooing are difficult occupations to study, because no reliable national statistics about body art exist, many shops do not advertise and cannot be easily located, most shops are small businesses with minimal record keeping, and body art skills are largely self-taught or informally passed on from artist to artist.[18] These limitations make recruitment and site assessments for a national study difficult and thus more costly.

We did not ask individual artists about their personal hepatitis B vaccination status or their personal history of needlesticks or other BBP exposure incidents. We likely could have drawn more conclusions had we had that information, but we were concerned that many body artists might decline to participate had they been asked.

The number and type of body art procedures monitored varied considerably from site to site and depended on the client load for the given days that we had scheduled with the shops. The rate of compliance with the infection control standards that we found might not be representative for all artists and all procedures at that shop. In addition, as has been demonstrated in many studies over many years, the presence of observers likely altered the normal work routines for some artists. This ''Hawthorne effect'' would imply that the artists observed might have demonstrated higher compliance with BBP exposure prevention standards than they would in their usual work setting.[19]

Our study was not sufficiently large to examine the differences in criteria for membership in APP and APT.

We used the affiliation designation for shops because our preliminary work and contacts with body art professionals indicated that shops with artists who are association members are more likely to follow guidance provided by the associations.

We did not examine all possible infection control and BBP exposure prevention standards that have been examined in other studies For example, Raymond et al[11,12] collected information on 62 infection control elements and analyzed 31 of them. Data reduction to the 15 elements that we include in our study unavoidably causes a loss of precision.

A common limitation of this and similar studies that rely on voluntary participation is the possibility that the participants who chose to be included in the study are those who are most compliant with recommended work practices. This may be true for our study because we used voluntary participants and did not use randomized recruitment procedures.

CONCLUSION

Although the OSHA Bloodborne Pathogen Standard applies to ''all occupational exposure to blood or other potentially infectious materials,'' the text of the standard appears to focus on health care and related occupational settings.[20] Additional work is needed to better translate the existing BBP exposure prevention standards to non–health care occupations. The shops that we studied complied with most infection control standards, though their compliance with administrative standards lagged. Without increased enforcement or increased efforts to communicate these standards to body artists and shops, increasing compliance is unlikely. Cooperative ventures between government agencies and professional organizations like the APP and APT may result in improved translation and better reach into the body art community. The success of such ventures would have to be evaluated, because it is estimated that no more than 10% of all body artists are represented by APP and APT (unpublished NIOSH report, 2004).

Because the number of body art shops is increasing overall and not all are located in geographical areas covered by local or state regulations, an opportunity exists for Infection Control Practitioners to reach out to the shops and artists and offer assistance in ensuring infection control practices are followed. In addition, there is a definite role for Infection Control Practitioners in providing consultation to the national professional body art associations regarding best practices and training for their constituents.

NIOSH recently conducted a BBP-related health communications campaign directed to the body art community of artists, shop owners, body art professional organizations, and those who regulate or inspect body art shops. To effectively reach these diverse audiences the campaign utilized multiple communications pathways: (1) 3 sets of key BBP exposure prevention messages direct-mailed to all body art shops in the United States, (2) a body art webpage developed and posted to the CDC website presenting current occupational safety and health information relevant to the body art industry (http://www.cdc.gov/niosh/topics/bbp/bodyart/), and (3) a body art ''blog'' posted to further discussion of emerging occupational safety and health issues of concern to the body art community (http://www.cdc.gov/niosh/blog/nsb020408 bodyart.html). We have heard from multiple body artists and shop owners that BBP standards and regulations, including such basics as sterilization and cross-contamination, are not adequately understood by those inspecting and regulating the body art industry. We would encourage artists, owners and regulators to use the CDC webpage and blog to engage in ongoing discussions of BBP and other occupational safety and health issues. While regulations are a critical first step in reducing BBP exposures and other hazards in the workplace, they will not be fully effective without knowledge-based enforcement and the close involvement of artists, shop owners, and body art organizations.

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