

Psychological Effects of Sharps Injuries on Students,
Staff, and Faculty at the University of Minnesota School
of Dentistry

A THESIS SUBMITTED TO THE FACULTY
OF THE DIVISION OF DENTAL HYGIENE SCHOOL OF
DENTISTRY UNIVERSITY OF MINNESOTA

BY

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IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN DENTAL HYGIENE

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December 2019

ACKNOWLEDGMENTS

First, I would like to thank my advisor, Miranda Drake. Your hard work, expertise, and dedication helped me stay on schedule and complete this project successfully. Second, I would like to thank my instructors who taught the thesis courses for your guidance and feedback throughout this process. Lastly, I would like to thank Ashley Petersen for your statistical support. All of you contributed to the success of this project and I am so thankful for you all.

DEDICATION

This thesis is dedicated to my family. Thank you all for your support and encouragement as I pursued my career goal of becoming a dental hygiene educator. I would not have been able to accomplish this without all of your support.

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SECTION 1

INTRODUCTION

Sharps, including needles and other sharp medical instruments, are serious occupational hazards for health care workers (HCWs) (1–11). Strategies, such as “sharpless surgery”, double gloving, and blunt tip needles, have shown to reduce the risk of sharps injuries (1,7,12,13). Despite these strategies, sharps injuries continue to occur amongst HCWs (1,7,13,14). Proper management of sharps injuries is important to prevent physical and psychological consequences (1,10).

Few studies have focused on the psychological health consequences that sharps injuries can lead to (2,6,7). Psychological health contributes to overall physical health and well-being, therefore, more research is indicated for psychological consequences following a sharps injury (2,15).

Purpose of the Study

The purpose of this study was to investigate the psychological consequences, stress and depression, for University of Minnesota (UMN) School of Dentistry students, staff, and faculty who had experienced a sharps injury in the past year and UMN School of Dentistry students, staff, and faculty who had not.

Statement of the Problem

Research indicates sharps injuries are occupational hazards for HCWs, which are reduced through safer devices and education (6,7,13). In the event of a sharps injury, it is imperative for HCWs to be educated to report their injury. Unfortunately, sharps injuries continue to occur due to reasons such as ‘carelessness’, ‘excess workload’, and ‘being rushed’, which puts HCWs at risk of acquiring blood borne

diseases and psychological consequences (1–3,6–8,11,13–17). Understanding the psychological consequences of sharps injuries may help HCWs manage the psychological consequences of sharps injuries.

Significance of the Study

Sharps injuries continue to occur despite educational and engineered advancements (1–8,12,13). Studies have shown that sharps injuries lead to psychological consequences for the injured HCW (1–3,6–9,13–18). There have been no studies found in the literature that have determined the psychological consequences that sharps injuries can incur specifically for dental providers. This study may raise awareness that sharps injuries contribute to psychological consequences such as stress and depression for the affected dental provider. Encouraging dental providers to seek out psychological support after incurring a sharps injury may help to mitigate the psychological consequences.

Research Questions

- 1) What is the difference between stress scores among students, staff, and faculty at the University of Minnesota School of Dentistry who have and have not experienced a sharps injury in the past year?
- 2) What is the difference between depression scores among students, staff, and faculty at the University of Minnesota School of Dentistry who have and have not experienced a sharps injury in the past year?

Hypothesis

Null hypothesis: There is no difference in stress and depression scores between students, staff, and faculty at the UMN School of Dentistry with and without

experience of a sharps injury in the past year.

Alternative hypothesis: Students, staff, and faculty at the UMN School of Dentistry with experience of a sharps injury in the past year will have higher scores on the Perceived Stress Scale (PSS-10) and Patient Health Questionnaire (PHQ-9) as compared to students, staff, and faculty without experience of a sharps injury in the past year.

SECTION 2

REVIEW OF THE RELATED LITERATURE

Sharps injuries, including needle sticks and other percutaneous injuries, are estimated to be reported among 600,000 to 800,000 U.S. health care workers (HCWs) annually (1,2,6,12–14,16,17). This is an estimate, as literature has found that sharps injuries are largely underreported (1,4,6,8,11,12,14,16,17). According to various studies, 38%-86.3% of HCWs who experienced a sharps injury stated they did not report their injury (1,4,6,8,11,12,14,16,17).

Sharps injuries are common occupational hazards which place HCWs at risk of exposure to blood borne pathogens (1–11,14,18). Blood borne pathogens such as hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) are the most dangerous pathogens, and the most common pathogens transmitted to HCWs (1–8,11,14,18). Thirty-eight percent of HBV, 39% of HCV, and 4.4% of HIV/AIDS amongst HCWs are due to needlestick injuries (19). Even in instances where blood borne pathogens are not transmitted, sharps injuries can have severe psychological consequences, such as stress, depression, and anxiety, for HCWs (1–9,12,14–17). Additionally, research suggests sharps injuries may impact familial relationships, career satisfaction, and future plans (1–9,12,14–17).

Strategies, such as enhanced education and engineering advancements, have reduced the risk of sharps injuries (1,7,12,13). Despite these strategies, sharps injuries continue to occur due to reasons such as ‘carelessness’, ‘excess workload’, and ‘being rushed’ (1,3,5–7,11–14,17). Therefore, strategies to encourage HCWs to report their sharps injuries should be employed in order to provide post-exposure prophylaxis and psychological support to the injured HCW (1–8,12,14–17).

Although sharps injuries are occupational hazards, there is minimal literature regarding the psychological effects of sharps injuries for HCWs (2,5–7). There is insufficient knowledge regarding the psychological effects of sharps injuries for dental providers.

To study this phenomenon, a literature search was performed using Google Scholar and PubMed databases between September 2018 to September 2019. Search terms used to find primary sources included “psychiatric effects AND needle stick injuries”, “mental health AND needlestick injuries”, and “sharps injuries AND medical students”.

Psychological Effects

Merle Mishel developed the “uncertainty in illness theory”, which states that uncertainty during the diagnostic and treatment phases of an ambiguous, complex, or unpredictable illness is distressing to a person (20). This theory is comprised of 3 themes: antecedents of uncertainty, appraisal of uncertainty, and coping with uncertainty (20). Antecedents of uncertainty includes the person’s perception of illness either from symptoms or event familiarity (20). This theme discusses that education and social support are useful resources available to help with the uncertainty (20). Appraisal of uncertainty speaks to the value a person attaches to an illness, such as danger or an opportunity (20). Coping with uncertainty pertains to how a person copes with uncertainty and adapts to the illness (20). Psychological consequences after a sharps injury are postulated to occur due to the uncertainty of the infection status of the source patient (2,3,7,14).

Multiple studies have determined that HCWs with experience of a sharps

injury have a higher level of psychological stress as compared to HCWs without experience of a sharps injury (2,3,5–8,13,14,16). HCWs whose sharps injury involved a “high-risk”¹ patient, or unknown infection status of the source patient, exhibited significantly more anxiety (3,7). In addition, women have demonstrated more psychological consequences post-sharps injury as compared to men (6,8,16). Some studies have found that adequate vaccination coverage lessened the anxiety for the injured HCW, but this is a weakness in the literature as few studies have described this association (6,15). Even in cases where blood borne diseases are not transmitted, many studies have found that HCWs still experience psychological consequences with anxiety, depression, and stress being the most commonly mentioned in literature (1–4,7,8,14–16). A cross-sectional study by Ongete and Duffy (2018) found that occupational splashes, sharps, and needlestick injuries (SSNIs) negatively affected quality of life after exposure and during treatment for SSNIs (9). They found that 52% of HCWs who experienced SSNIs felt depressed, anxious, and worried (9).

These psychological consequences may be short or long term and in some cases, can lead to the development of post-traumatic stress disorder (PTSD) (2,3,14,17). The higher stress experienced by HCWs may place them at greater risk of experiencing future sharps injuries, yet, some HCWs believe that their sharps injury made them more careful to prevent future sharps injuries (1,3,6,7,13,16). Studies have indicated psychological consequences experienced post-sharps injury occur during the time period when HCWs are awaiting serological test results and

¹ Defined as a patient with a history of intravenous drug use or infection with HIV, HBV, or HCV (17).

follow-up testing (2–5,9). Research indicates the average length of psychological consequences was nine months, with follow-up testing lasting up to 12 months (2,3,13). The psychological consequences may decline upon receiving the results (2–4). On the other hand, some HCWs may doubt the accuracy of the test results, and therefore, the psychological consequences can persist for a relatively long time (2–4,8,13,17). A study by Garus-pakowska and Górajski (2019) found that 16.3% of HCWs felt a long-term fear for their own health (11). HCWs with better knowledge were more afraid of their health after being hurt and their fear lasted long (11). This may be due to HCWs with better knowledge having more awareness of the possible dangers of contaminated sharps (11).

Secondary Effects of Sharps Injuries

Psychological consequences may lead to secondary effects, namely lower levels of career satisfaction, poor familial relationships, and future plans (2–4,8,9,13,17). Multiple studies have reported that several HCWs felt that their sharps injury negatively affected their career satisfaction (2,3,7,8,13). In fact, some HCWs even re-thought their career choice because they felt that it was difficult for them to continue their work in a dangerous environment (3,13). Other HCWs developed PTSD and/or needle phobia, which resulted in them being unable to return to work (2,7). One study found that HCWs aged 20-30 years experienced the largest decrease in satisfaction with their profession after experiencing a sharps injury (8). A study by Blenkarn and Odd (2008) found that despite no seroconversion, two healthcare waste handlers who experienced a sharps injury suffered anxiety and stress and both needed a prolonged leave of absence (18). Ultimately, one of the healthcare waste

handlers resigned because they felt unable to continue duties that involved handling clinical wastes (18).

In addition to the negative effect on career satisfaction, sharps injuries can impact familial relationships (2–4,8,13,17,18). Studies have found that HCWs fear becoming infected, which in turn, could lead to infection of their partner through sexual relations (2,3,8,13). Upon recommendation to practice safe sex until follow-up testing is complete, HCWs may experience deterioration in sexual relationships or abstain from intercourse altogether so that their partner is not at risk (2–4,13). This may contribute to relationship difficulties and in extreme cases may lead to divorce (2–4,13). One nurse stated, “I was afraid to have intercourse with my spouse, but he did not understand my concerns, and we are now separated. I feel it’s because of the problems we had when I got exposed” (13).

In addition, sharps injuries can effect HCWs future plans (9). HCWs needing Antiretroviral (ARV) drugs may experience changes in their future plans likely due to the ARV drug side effects such as diarrhea, headache, loss of appetite, lethargy, and tiredness (9). In some cases, these drug effects caused HCWs to change their plans such as traveling and having children (9). For example, one HCW stated, “The side-effect of medication was unbearable. Plans for vacation were put on hold as I couldn’t travel” (9). These secondary effects of sharps injuries may be mitigated through proper psychological support (1–3,5–8,12,14–17).

Psychological Support

Psychological support can be helpful in early detection of psychological changes and preventing long-term psychological consequences such as PTSD (1–

3,5–8,12,14–17). HCWs who do not report their sharps injuries may not receive psychological support nor appropriate post-exposure prophylaxis (1,2,4,6,8,14,17). Occupational Safety and Health Administration (OSHA) requires employers to have a blood borne pathogens management plan for employees (1,13). The management plan should include information on educating employees on the importance of reporting sharps injuries (1,8,13). However, there appears to be varying levels of compliance with these guidelines (1,8,13). Management plans are important to educate HCWs about appropriate actions after experiencing a sharps injury to prevent the consequences that sharps injuries can incur (1,4,8,17). Lack of time has been cited as a common reason why HCWs do not report their injury (4,6,8,12,14). Zhang studied the psychological impact of sharps injuries on HCWs in China and suggested an easier, more convenient process may increase reporting rates (12).

If HCWs perceived low infection risk, they were less likely to report their injury (4,6,8,12). A cross-sectional study found that higher education was positively associated with reporting of incidents (4). A cross-sectional study and a face-to-face interview study found that HCWs stated receiving education periodically would be beneficial and may enhance reporting rates (3,6). A study by Moayed et. al. (2015) found that providing education to nurses after experience of a sharps injury significantly decreased their stress level (10). The education that was provided increased the amount of information participants had in the area of sharps injuries (10). Thus, research has shown that enhancing education provided to HCWs regarding blood borne pathogens may help increase reporting rates and decrease stress, which in turn, would increase post-exposure care and psychological support

(1,3,4,6,10,12,17).

The occupational hazard of sharps is acknowledged, yet, there is a lack of literature regarding the psychological effects of sharps injuries for HCWs (2,5–7). There is a gap in the literature surrounding the psychological effects of sharps injuries specifically for dental providers. Therefore, the purpose of this study was to investigate the psychological consequences, stress and depression, for UMN School of Dentistry students, staff, and faculty who had experienced a sharps injury in the past year versus those who had not.

SECTION 3

PREFACE

Background. Health care workers (HCWs) are routinely exposed to occupational hazards, such as sharps injuries, which put HCWs at risk of exposure to blood borne diseases. HCWs may also experience psychological consequences.

Methods. This study included students, staff, and faculty at the University of Minnesota School of Dentistry (n=1,113). A mixed-mode survey design was used to administer the 51-item survey.

Results. There were 319 responses, which was a 28.6% response rate. Fifty-seven were excluded and therefore, 262 were included in statistical analysis. Fifty-six participants (21%) reported having experienced a sharps injury within the past year. Participants self-reported that while awaiting blood test results they felt anxious (67%) and stressed (50%).

Discussion. Previous studies have found that HCWs with experience of a sharps injury have higher anxiety and depression scores as compared to HCWs without experience of a sharps injury.

Conclusion. This study found no statistically significant difference in PSS-10 (P=0.46) and PHQ-9 (P=0.66) scores between dental providers with and without experience of a sharps injury in the past year. This may be due to a low response rate. Future research should focus on the psychological effects of sharps injuries with a larger study population.

Manuscript

This manuscript will be submitted to the *American Journal of Injection Control (AJIC)*.

Introduction and Literature Review

Health care workers (HCWs) are routinely exposed to puncture wounds due to occupational hazards called “sharps” (1–10). Sharps are defined as needles, blades, dental instruments, and other medical instruments that could cause an injury by cutting or pricking the skin (21). Despite strategies to reduce the occurrence of sharps injuries, an estimated 600,000-800,000 sharps injuries are reported annually among U.S. HCWs (17). This is an estimate as literature has found that 38%-86.3% of HCWs stated that they did not report their injury (1,4,6,8,11,12,14,16,17).

Sharps injuries put HCWs at risk of acquiring blood borne diseases such as hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) (1–4,6,7,9,10,14,18). Additionally, research has found that HCWs may experience psychological consequences related to sharps injuries including, but not limited to stress, depression, and anxiety (1–3,6–8,13–17). Further, sharps injuries may negatively impact familial relationships, career satisfaction, and future plans (1–9,12,14–17).

The literature acknowledges the occupational hazard of sharps injuries, but tends to address the risks of blood borne infections from sharps injuries rather than the psychological effects (2,6,7). There is a gap in the literature surrounding the psychological effects of sharps injuries specifically for dental providers. Therefore, research in this area was greatly needed (2).

Previous studies of HCWs have measured depression, anxiety, stress, and

PTSD scores through instruments such as the Beck Depression Inventory (BDI), Hamilton Anxiety Scale (HAM-A), Perceived Stress Scale (PSS), and Impact of Event Scale (IES) (2,6,14). Studies have found high HAM-A scores, PSS scores, BDI scores, and evidence of PTSD in HCWs with experience of sharps injuries (2,6,14).

For this study, participants completed the Perceived Stress Scale (PSS-10) and Patient Health Questionnaire (PHQ-9) to measure their stress and depression scores respectively. The purpose was to investigate the psychological consequences, stress and depression, for UMN School of Dentistry students, staff, and faculty who had experienced a sharps injury in the past year versus those who had not.

Understanding the psychological effects of sharps injuries may allow institutions to enhance protocols that allow for proper management of sharps injuries after they occur. It is imperative that HCWs are educated and understand the reporting protocol in order to gain psychological support and prevent the physical and psychological consequences of sharps injuries (1).

Methods and Materials

This study was approved by the University of Minnesota (UMN) Institutional Review Board (STUDY00006142). A cross-sectional, descriptive, mixed-mode survey design was used to investigate the psychological effects of sharps injuries on students, staff, and faculty at the UMN School of Dentistry. This study took place at the UMN during May 2019 – December 2019. A convenience sample of UMN School of Dentistry students, staff, and faculty whose email could be located on UMN websites was used (n=1,113). Only students, staff, and faculty who worked

and/or attended classes at the UMN School of Dentistry were included in this study. Dental providers at institutions other than the UMN were not surveyed. Students, staff, and faculty at the UMN School of Dentistry who chose “never” for, “How often do you use sharps as part of your role?” were excluded. In addition, incomplete surveys were excluded. Lastly, if participants responded to both the electronic and paper survey and could be identified, only their more recent survey was included in data analysis. Duplications were identified by the student investigator only if the participant volunteered to enter their name and email into the drawing for the incentive.

The research variables in this study included sharps injuries, stress, and depression. Attribute variables included sex, race, ethnicity, job classification, age, and marital status. Confounding variables, including whether or not the participant had been diagnosed with depression and whether or not the participant indicated that they took antidepressants, were controlled by cross tabulating those survey questions with a higher depression score on the Patient Health Questionnaire (PHQ-9).

The survey was emailed to participants’ UMN email. Participants completed the survey electronically via Qualtrics. Before beginning the survey, participants could obtain the full consent form. They were made aware that the survey may elicit negative emotions as they recalled previous experiences with sharps. Participants were made aware that their participation was voluntary, and if they decided to participate, they checked “I consent” and began the electronic survey. After 2-weeks, follow-up emails were sent to all non-responders. To increase response rate, paper surveys were printed and distributed to students, staff, and faculty at the UMN

School of Dentistry.

At the end of the survey, participants had the option to provide their name and email to be entered into a drawing to win one of ten \$40 target gift cards.

Participants were made aware that they would only be contacted in the event that they won an incentive. After completing the survey, participants were provided with mental health resources at the UMN. In the event that they felt as though they needed psychological support they could use those resources to self-refer.

Instrument

The survey consisted of demographic questions, background questions, and 2 scales; the Perceived Stress Scale (PSS-10) and Patient Health Questionnaire (PHQ-9) to measure stress and depression. The PSS-10 and PHQ-9 were chosen because those instruments have been cited throughout the literature, are considered reliable and valid, and are easy to administer (22,23). Both consist of 10 Likert-type response questions with a range of total score of 0-40 for the PSS-10 and a range of total score of 0-27 for the PHQ-9. A PSS-10 total score of 0-13 indicates low stress, 14-26 moderate stress, and 27-40 high stress. A PHQ-9 total score of 1-4 indicates minimal depression, 5-9 mild depression, 10-14 moderate depression, 15-19 moderately severe depression, and 20-27 severe depression. The entire survey consisted of 51 questions and was estimated to take 10-15 minutes to complete. There were 21 background questions, which asked about the participants' experience of a sharps injury in the past year (if any). Participants who had not experienced a sharps injury in the past year could expect to complete the survey in a shorter amount of time. If a participant selected that they never work with sharps as part of their role, they

skipped to the end of the survey and their data was not analyzed as they met the exclusion criteria of never working with sharps.

The survey was piloted among UMN School of Dentistry faculty and staff during February 2019 to determine content validity and ease of use. Few revisions were made to the PHQ-9. The PHQ-9 was modified to ask about “in the last month...” rather than “over the last 2 weeks...” to be consistent with the PSS-10 timeframe. The investigators also modified one question on the PHQ-9. “Thoughts that you would be better off dead or of hurting yourself in some way” was changed to “thoughts of hurting yourself in some way” to make it less intrusive, as a few faculty stated during the pilot that that question on the PHQ-9 was uncomfortable and intrusive. Cronbach’s alpha was utilized to determine the internal consistency of the PHQ-9 since that scale was modified for this study. The Cronbach’s alpha score for the first 9 questions of the PHQ-9 was 0.83, which is generally considered to be strong internal consistency. Therefore, the reliability of the PHQ-9 did not seem to be affected by the modifications.

Statistical Analysis

Demographics, self-reported experience with sharps injuries, stress score as measured by the PSS-10, and depression score as measured by the modified PHQ-9 were analyzed. To test whether there was a difference between mean stress scores among students, staff, and faculty who had experienced a sharps injury and those who had not, a Poisson generalized linear model with robust standard errors using the outcome of PSS-10 score and primary predictor of sharps injury status with adjustment for the potential confounders of academic status (e.g., student, staff,

faculty, etc.) and age was used. An analogous model was fit to test whether there was a difference in mean modified PHQ-9 depression scores among students, staff, and faculty who had experienced a sharps injury, as compared to those who had not. For both models, the estimated mean difference in scores (stress or depression) between those who had versus had not experienced a sharps injury was reported with a 95% confidence interval.

Results

The mean PSS-10 and modified PHQ-9 scores were compared to determine if there was a difference in stress and depression scores between participants who had and had not experienced a sharps injury in the past year.

Out of 1,113 surveys distributed via Qualtrics or paper to UMN School of Dentistry students, staff, and faculty, 319 surveys were collected, which was a 28.6% response rate. Thirty-four were excluded due to the participant indicating that they never work with sharps as part of their role. Six participants completed the electronic and paper survey and were identified by the participants' name and email that the participant provided for the chance to win an incentive. Of those 6 duplicates, their more recent responses were included in statistical analysis. In addition, 17 were excluded due to missing data on the outcomes of interest (PSS-10 score and/or modified PHQ-9 score). Thus, a total of 262 participants met the inclusion criteria and were included in statistical analysis.

Characteristics of study participants

The 262 participants were comprised mostly of students (65.6%), followed by faculty (17.6%), and staff (16.8%). The student group was comprised of residents,

dental, dental therapy, dual degree (DH/DT) and dental hygiene students. Third year dental students (D3) was the student group with the most responses (14%). Most of the participants were women (69%), single (57%), and white (84%). The median age of participants without experience of a sharps injury was 28 (IQR=25-43). Most of the participants indicated that they worked with sharps 4-7 times per week (75%). The vast majority of participants had received the Hepatitis B vaccine (94%). The majority of the respondents were familiar with the UMN School of Dentistry sharps injury reporting protocol (86%). Almost half of the respondents stated that the risk of experiencing a sharps injury is worrying (40%).

Characteristics of participants with sharps injury experience

Out of the 262 participants included in statistical analysis, 56 (21%) reported experience of a sharps injury within the past year. The majority were women (64%). The median age was 26 (IQR=24-30) and most of them were single (80%). Students experienced the majority of the sharps injuries (82%), followed by staff (11%) and faculty (7%). Out of the students, D3 students were the group with the most sharps injuries (29%). The majority of participants with sharps injury experience experienced only 1 sharps injury in the past year (69%), with the most common time frame being within the past 1-6 months (45%). In addition, the majority of participants who experienced a sharps injury indicated that they work with sharps 4-7 times per week (80%). Three participants out of the 56 who experienced a sharps injury in the past year (5%) had a sharps injury that involved a high-risk patient, all of whom reported their sharps injury after it occurred.

Characteristics of sharps injuries

Participants felt as though their sharps injury was caused most commonly by a lack of concentration (41%), followed by feeling rushed (39%), and stressful environment (27%). Other dental instrument (e.g. bur, explorer, tofflemire band) was the type of sharps that accounted for the most sharps injuries (46%), followed by scalpel (27%), needle (21%), and ultrasonic tip (5.4%). The majority of the sharps injuries occurred during use of sharps (45%), 27% occurred after use of sharps, and 48% indicated that their injury occurred in a preclinical and/or laboratory situation. The majority of participants thought their most recent sharps injury was avoidable (90%) and indicated that they were familiar with the School of Dentistry's sharps reporting protocol (88%). However, less than half reported their sharps injury after it occurred (39%). The most common reason for not reporting was "low risk of infection" (53%) followed by "takes too much time" (18%). One participant stated that their reason for not reporting was because they were treated poorly by staff after reporting their first sharps injury, so they decided that it was not worth the trouble to report their most recent sharps injury.

This survey asked participants to recall how they felt the month following their most recent sharps injury. The majority of the participants felt fine (57%), followed by anxious (38%), and stressed (29%). Of those who reported their sharps injury, while waiting for blood test results, the majority felt anxious (67%) followed by stressed (50%). Of those who went through blood testing, most received their blood test results in less than 1 month (94%). The majority felt as though they received adequate support after reporting (82%). The vast majority of participants felt as though their sharps injury had no negative impacts on personal relationships

(96%) or career satisfaction (91%). No participants considered a career change after their most recent sharps injury.

PSS-10 and modified PHQ-9 scores of the participants

Results answering the research questions are presented in Table IV. The mean PSS-10 score for participants who experienced a sharps injury in the past year was 15 (moderate stress) as compared to 13 (low stress), which was the mean PSS-10 score for participants without experience of a sharps injury in the past year. Participants with a sharps injury in the past year had a mean PSS-10 score that was 5.8% higher than participants without a sharps injury in the past year (95% CI: 9.1% lower to 23% higher; $p=0.46$). Participants with experience of a sharps injury in the past year had a mean PHQ-9 score of 4.2 as compared to participants without experience of a sharps injury in the past year who had a mean modified PHQ-9 score of 3.7. A PHQ-9 score of 1-4 indicates minimal depression and 5-9 indicates mild depression. Participants with a sharps injury in the past year had a mean modified PHQ-9 score that was 6.3% higher than participants without a sharps injury in the past year (95% CI: 19% lower to 40% higher; $p=0.66$). After further adjustment for self-reported depression status, those with a sharps injury had mean PSS-10 scores that were 1.2% higher (95% CI: 14% lower to 19% higher; $p=0.88$) and mean modified PHQ-9 scores that were 2.7% higher (95% CI: 22% lower to 35% higher; $p=0.85$) than those without a sharps injury (see Table V). The results demonstrated that there was no statistically significant difference in PSS-10 and modified PHQ-9 scores between participants with and without experience of a sharps injury in the past year. Based on the results, we were not able to reject the null hypothesis.

Discussion

This survey assessed the psychological effects of sharps injuries for students, staff, and faculty at the UMN School of Dentistry. Self-reported feelings of anxiety and stress while awaiting blood test results, a high incidence of sharps injuries amongst students, and a high rate of underreporting were the main findings of this study.

This study found no statistically significant difference in mean PSS-10 or modified PHQ-9 scores between students, staff, and faculty who had and had not experienced a sharps injury in the past year. Due to the low response rate, this study did not have enough power to detect small differences in mean PSS-10 or modified PHQ-9 scores between the group of providers with and the group of providers without experience of a sharps injury in the past year. In addition, using scales that ask about stress and depression symptoms in the past month may not have been the best way to identify stress and depression post sharps injuries that occurred greater than one month ago.

Other studies have found that HCWs in medical settings with experience of sharps injuries have higher HAM-A (anxiety), BDI (depression), and mental health scores as compared to HCWs without sharps injury experience (6,15). This study did not produce statistically significant results. Previous studies had more participants and a higher percentage of participants with experience of sharps injuries as compared to this study, which may be one reason as to why previous studies were able to detect differences in scores between groups of providers with and without experience of sharps injuries (6,15). Studies involving larger sample sizes are needed

in order to have enough statistical power to accurately detect small differences between groups of providers with and without experience of sharps injuries.

Similar to previous studies, this study found that providers experienced psychological consequences during the time period of waiting for blood test results (2–5,9). A study by Sohn (2006), found that HCWs self-reported that their stress and depression levels were elevated after being injured (6). Similarly, a study by Kasatpibal (2016), found that most HCWs reported anxiety and stress while waiting for blood test results (4). In this study, participants reported that they felt anxious and stressed as they waited for blood test results. However, these findings, and findings from previous studies, relied on participants recollection of their feelings, which is subject to recall bias (4,6).

The stress, depression, and anxiety HCWs experience may result in negative impacts on career satisfaction and familial relationships (2,4,13). A study found that HCWs aged 20-30 experienced the largest decrease in satisfaction with their profession after experience of a sharps injury (8). This study found that 5 participants (8.9%) felt as though their most recent sharps injury slightly impacted their satisfaction with their career. All 5 participants were dental students with a mean age of 25. As far as impacts on familial relationships, this study found that 2 participants (3.6%) felt as though their most recent sharps injury slightly impacted personal relationships. Both participants were dental students and single. There may be a few reasons as to why this study does not support the findings of previous studies. First, there was a low response rate (28.6%) with only 56 participants who experienced a sharps injury in the past year. Out of those participants, 80% were

single, which may be why many participants did not feel as though their sharps injury negatively impacted familial relationships. Secondly, previous studies have determined their claim from interviews with HCWs and open-ended questions on surveys, whereas, this study did not perform interviews or use open-ended questions (2,13). In this study, there were only three questions that asked about impacts on career satisfaction and familial relationships and those questions were quantitative. Using qualitative questions that asked about impacts on career satisfaction and familial relationships may have yielded more meaningful information. Lastly, the questions asked about 'career' satisfaction, which students may not have found applicable. More research is needed to determine if sharps injuries impact career satisfaction and familial relationships.

This study supports the findings of a previous study by Garus-pakowska in that women and those with less experience are the groups that are the most worried about the risk of experiencing a sharps injury (11). In this study, 40% indicated that the risk of experiencing a sharps injury is worrying. Most of them were women (75%) and students (80%). Interestingly, those who had experienced a sharps injury were more worried (55%) as compared to those who had not experienced a sharps injury (36%). This may be because providers with experience of a sharps injury fear the possibility that they could experience repeated sharps injuries (3). HCWs may experience even greater fear and anxiety if their sharps injury involved a high-risk patient or if the infection status of the source patient was unknown (3,7). In this study, there were three participants who experienced a sharps injury that involved a high-risk patient. All three participants self-reported that they felt anxious as they

waited for the blood test results, however, none of their PSS-10 or modified PHQ-9 scores were significantly higher than the mean PSS-10 or modified PHQ-9 scores for other participants with experience of a sharps injury.

A previous study found that students experience a high amount of sharps injuries due to their inexperience and numerous encounters with patients (12). In addition, an excess workload may lead to sharps injuries (3). In this study, participants with experience of a sharps injury were mostly students and worked with sharps 4-7 times per week. Specifically, D3 students was the student group with the most sharps injuries. Forty-three percent of D3s that responded to the survey experienced a sharps injury in the past year. Students in their D3 year start clinical encounters with patients for the first time. Being inexperienced and having an excess workload of working with sharps 4-7 times per week may increase students' likelihood of experiencing sharps injuries (12).

Sharps injuries occur due to reasons such as excess workload and lack of time (3,4,6,8,12,14). In addition, these are also reasons as to why providers do not report their sharps injury (3,4,6,8,12,14). Studies have found that 38%-86.3% of HCWs who experienced a sharps injury do not report their injury (1,4,6,8,11,12,14,16,17). This study supports the findings of previous studies as 61% of students, staff, and faculty who experienced a sharps injury stated they did not report their injury. In addition to reasons such as excess workload and lack of time, HCWs may fear the social consequences such as their injury being an indication of poor work performance and/or fear that they will be blamed for their injury (3). This study had one participant who stated that they were treated poorly by staff after reporting a

previous sharps injury, which lead them to not report their most recent sharps injury. Underreporting may also occur due to the feeling that everything will be fine because of a “low risk source” (3,4,6,8,12,17). This study found that the majority of participants who experienced a sharps injury stated that they felt fine the month following their sharps injury (57%). This is likely because 48% of participants indicated that their injury occurred in a preclinic/lab setting that did not involve a real patient and thus, the participant may have felt there was a low risk of disease transmission. This misperception that instruments used in preclinic/lab settings are sterile because they are only used on typodonts may lead to inappropriate post-exposure management (4). Studies have found that HCWs stated receiving education periodically would be beneficial and may enhance reporting rates (3,6).

This study had a number of limitations. First, there was a low response rate, which impacts the representativeness of the population being surveyed and the findings were not able to be generalized outside the UMN School of Dentistry. The low response rate may have been due to busy schedules and/or participants may have felt like the survey did not pertain to them. The low-response rate may have been why there was no statistically significant difference between the group with sharps injury experience and the group without sharps injury experience. Second, as with many previous studies, this study was retrospective and asked participants to recall if they had a sharps injury in the past year and how they felt during that period, which is subject to recall bias (2,4,14). Third, this study did not consider stressors, such as familial and/or work stressors, that could lead to stress and depression in participants (6). Fourth, using a mixed-mode survey design resulted in participants completing

both the electronic and paper survey. Six duplicates were identified by the participant entering their name and email on both the electronic and paper survey. There may have been other duplicates that were unidentifiable. Fifth, the PSS-10 was always administered before the modified PHQ-9, which may have led to order fatigue for the modified PHQ-9. Sixth, participants may have under-reported their challenges. Lastly, using scales that ask about stress and depression symptoms in the past month may not be the best way to identify stress and depression post sharps injuries that occurred greater than one month ago. Further research is needed to assess the psychological effects of sharps injuries; however, prospective research could be hampered by underreporting of sharps injuries (2).

Conclusion

This study found no statistically significant difference in PSS-10 and modified PHQ-9 scores between students, staff, and faculty with and without experience of a sharps injury in the past year. However, participants that went through blood testing self-reported that while waiting for blood test results, they felt anxious and stressed. Students, and those who work with sharps 4-7 times per week, experienced the most sharps injuries likely due to inexperience and busy schedules. Sharps injuries were underreported due to a perception of low risk. However, reporting of all sharps injuries is critical to ensure post-exposure prophylaxis and counseling. Therefore, strategies to encourage HCWs to report their sharps injuries should be employed (3).

SECTION 4

TABLES

Table I. Summary of study population characteristics by sharps injury status

	No sharps injury¹ (n = 206)	Sharps injury¹ (n = 56)	Total
Role			
Students	126 (62%)	46 (82%)	172 (65.6%)
Staff	38 (18%)	6 (11%)	44 (16.8%)
Faculty	42 (20%)	4 (7%)	46 (17.6%)
Experience in dental profession²			
<1 year	2 (2.7%)	0 (0%)	
1-5 years	3 (4.1%)	1 (11%)	
6-10 years	14 (19%)	1 (11%)	
11-20 years	13 (18%)	3 (33%)	
21-30 years	12 (16%)	1 (11%)	
>30 years	29 (40%)	3 (33%)	
Age	28 (25, 43)	26 (24, 30)	
Female	144 (70%)	36 (64%)	
Marital status			
Married	86 (42%)	11 (20%)	
Widowed	3 (1.5%)	0 (0%)	
Divorced	9 (4.4%)	0 (0%)	
Single	105 (52%)	44 (80%)	
Latino origin	9 (4.4%)	1 (1.8%)	
Race³			
White	173 (86%)	47 (87%)	
Black or African American	7 (3.5%)	2 (3.7%)	
American Indian or Alaskan native	4 (2.0%)	0 (0%)	
Asian	20 (10%)	6 (11%)	
Other race	8 (4.0%)	1 (1.9%)	
Received hepatitis B vaccine	191 (98%)	54 (100%)	

1. Summaries are median (first quartile, third quartile) or n (percent) where percent is of non-missing data.
2. Only faculty and staff respondents were asked this question.
3. Respondents were able to select more than one category.

Table II. Summary of sharps experience and attitudes by sharps injury status

	No sharps injury¹	Sharps injury¹
	(n = 206)	(n = 56)
Frequency of sharps use		
Rarely	16 (7.8%)	2 (3.6%)
Once per week	11 (5.3%)	3 (5.4%)
2-3 times per week	27 (13%)	6 (11%)
4-7 times per week	152 (74%)	45 (80%)
Risk of sharps injury is worrying	75 (36%)	31 (55%)
Familiar with sharps injury protocol	177 (86%)	49 (88%)

1. Summaries are n (percent) where percent is of non-missing data.

Table III. Summary of injury characteristics, reporting experience, and attitudes of those having experienced a sharps injury

	Sharps injury¹ (n = 56)
Number of sharps injuries during the past year	
1	38 (69%)
2	10 (18%)
3	5 (9.1%)
4	0 (0%)
5	1 (1.8%)
>5	1 (1.8%)
Timing of most recent sharps injury	
Within the past month	16 (29%)
Within the past 1-6 months	25 (45%)
Within the past 6-12 months	14 (25%)
Feelings during the month following most recent sharps injury²	
Scared	12 (21%)
Depressed	2 (3.6%)
Stressed	16 (29%)
Anxious	21 (38%)
Upset	10 (18%)
Fine	32 (57%)
Most recent sharps injury negatively impacted personal relationships	
Yes, slightly	2 (3.4%)
No	53 (96%)
Most recent sharps injury decreased career satisfaction	
Yes, slightly	5 (8.9%)
No	51 (91%)
Considered a career change after most recent sharps injury	
	0 (0%)
Most recent sharps injury was avoidable	
	44 (90%)
Cause of most recent sharps injury²	
Unfamiliar technique	13 (23%)
Patient moved their head/body	4 (7.1%)
Injured by a third party (i.e., another provider)	2 (3.6%)
Tiredness	3 (5.4%)
Lacking concentration	23 (41%)
Feeling rushed	22 (39%)
Stressful environment	15 (27%)
Unsafe instrument placement	10 (18%)
Accidental	2 (3.6%)
Not being careful	1 (1.8%)
Other	2 (3.6%)
Type of injury for most recent sharps injury	
Needle	12 (21%)
Scalpel	15 (27%)
Ultrasonic tip	3 (5.4%)
Other dental instrument	26 (46%)
Timing in appointment of most recent sharps injury	
While setting up/before seating the patient	6 (11%)
During use of the sharps	25 (45%)
After use of the sharps	15 (27%)
Research use	1 (1.8%)
In preclinic/lab	9 (48%)
Most recent sharps injury involved a high-risk patient	
	3 (5.5%)
Reported most recent sharps injury	
	22 (39%)
Received adequate support after reporting³	
	18 (82%)
Time to receive blood test results⁴	
<1 month	17 (94%)
1-6 months	1 (5.6%)
Reason for not reporting sharps injury^{2,5}	
Takes too much time	6 (18%)
Infection risk was low	18 (53%)
Not familiar with the reporting protocol	4 (12%)
Other	19 (56%)

1. Summaries are n (percent) where percent is of non-missing data.
2. Respondents were able to select more than one category.
3. Of those who reported
4. Of those who went through blood testing
5. Of those who did not report

Table IV. Perceived Stress Scale (PSS-10) scores and Modified Patient Health Questionnaire (PHQ-9) scores by sharps injury status

	No sharps injury¹	Sharps injury¹
	(n = 206)	(n = 56)
PSS-10 score	13 (6.8)	15 (6.8)
PSS-10 stress assessment		
Low stress (0-13)	110 (53%)	26 (46%)
Moderate stress (14-26)	90 (44%)	26 (46%)
High stress (27-40)	6 (2.9%)	4 (7.1%)
Modified PHQ-9 score	3.7 (3.9)	4.2 (3.3)
PHQ-9 depression assessment		
Minimal depression (1-4)	144 (70%)	36 (64%)
Mild depression (5-9)	48 (23%)	17 (30%)
Moderate depression (10-14)	10 (4.9%)	3 (5.4%)
Moderately severe depression (15-19)	2 (1.0%)	0 (0%)
Severe depression (20-27)	2 (1.0%)	0 (0%)

1. Summaries are mean (standard deviation) or n (percent) where percent is of non-missing data.

Table V. Modified Patient Health Questionnaire (PHQ-9) scores for participants diagnosed with depression by sharps injury status

	No sharps injury	Sharps injury
Diagnosed with depression	27	9
PHQ-9 depression assessment		
Minimal depression (1-4)	11 (41%)	3 (33%)
Mild depression (5-9)	12 (44%)	5 (56%)
Moderate depression (10-14)	2 (7%)	1 (11%)
Moderately severe depression (15-19)	1 (4%)	0 (0%)
Severe depression (20-27)	1 (4%)	0 (0%)
Prescribed an antidepressant¹	18	9
PHQ-9 depression assessment		
Minimal depression (1-4)	8 (44%)	3 (33%)
Mild depression (5-9)	7 (38%)	5 (56%)
Moderate depression (10-14)	1 (6%)	1 (11%)
Moderately severe depression (15-19)	1 (6%)	0 (0%)
Severe depression (20-27)	1 (6%)	0 (0%)
Took antidepressant as prescribed²	13	6
PHQ-9 depression assessment		
Minimal depression (1-4)	6 (46%)	1 (17%)
Mild depression (5-9)	4 (30%)	4 (66%)
Moderate depression (10-14)	1 (8%)	1 (17%)
Moderately severe depression (15-19)	1 (8%)	0 (0%)
Severe depression (20-27)	1 (8%)	0 (0%)

1. Of those who were diagnosed with depression

2. Of those who were prescribed an antidepressant

FIGURES

Figure I. Relationship between Perceived Stress Scale (PSS-10) scores and Modified Patient Health Questionnaire (PHQ-9) scores

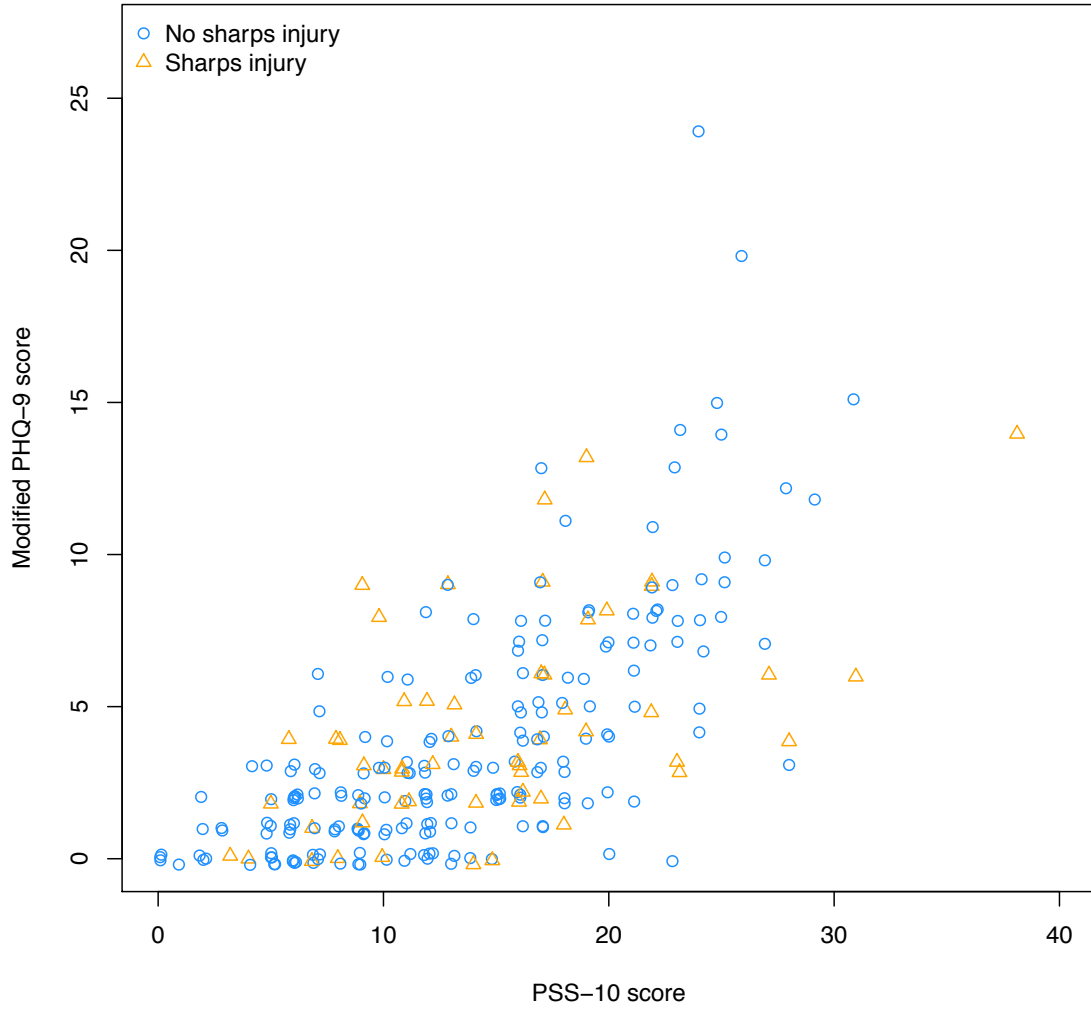


Figure II. Feelings while waiting for blood test results

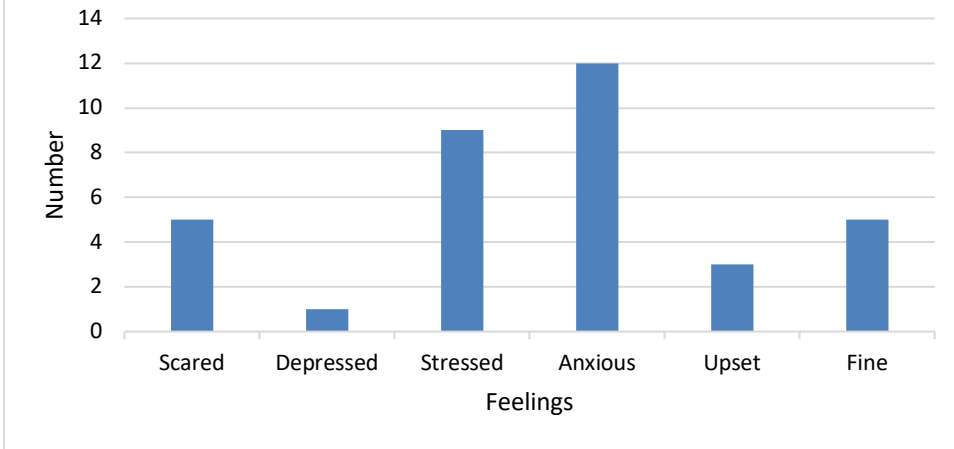
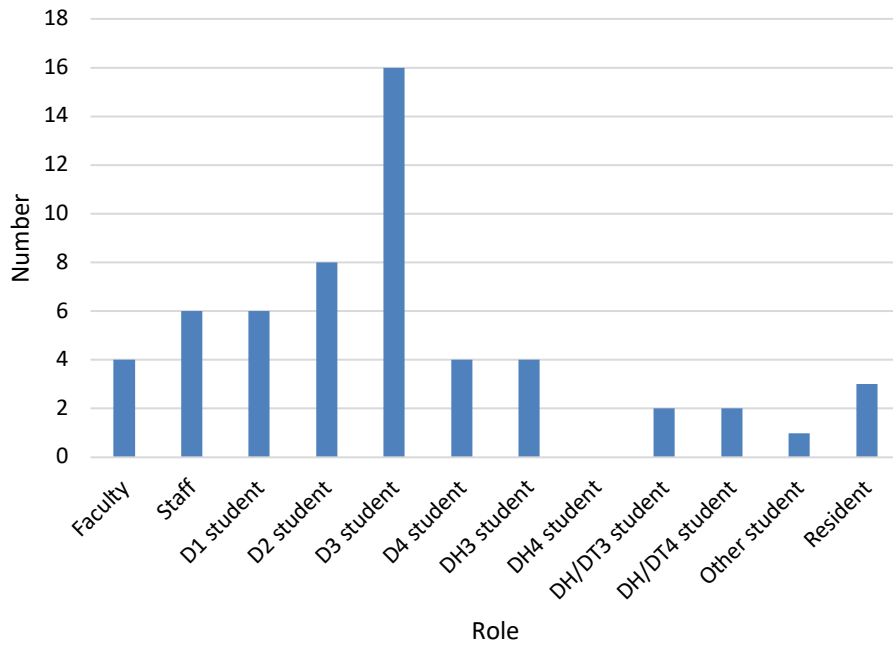


Figure III. Sharps Injury Experience by Role



SECTION 5

PRACTICAL APPLICATION

This study contributes to the body of knowledge in regard to how sharps injuries may impact the stress and depression levels of students, staff, and faculty at the University of Minnesota School of Dentistry. Although this study did not produce statistically significant results, students, staff, and faculty with experience of a sharps injury self-reported that they felt anxious and stressed while awaiting blood test results. This suggests that the time period between experiencing a sharps injury and receiving blood test results can be distressing. Providing periodic education to providers may increase reporting rate, which could also increase the amount of psychological support, which may mitigate psychological effects. Further studies with larger sample sizes are needed to study the mental health impact of sharps injuries on HCWs including dental providers. Future studies should also attempt to control for extraneous variables such as familial and work stressors. In addition, use of qualitative questions may produce more meaningful information.

SECTION 6

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APPENDICES

Appendix A: Letter of Institutional Review Board (IRB) Approval

UNIVERSITY OF MINNESOTA

Twin Cities Campus

*Human Research Protection Program
Office of the Vice President for Research*

*Room 350-2
McNamara Alumni Center
200 Oak Street S.E.
Minneapolis, MN 55455
612-626-5654
irb@umn.edu
<https://research.umn.edu/units/irb>*

APPROVAL OF NEW STUDY

April 3, 2019

Miranda Drake

612-735-3345
mdrake@umn.edu

Dear Miranda Drake:

On 3/26/2019, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Psychological Effects of Sharps Injuries on Dental Providers
Investigator:	Miranda Drake
IRB ID:	STUDY00006142
Sponsored Funding:	None
Grant ID/Con Number:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	<ul style="list-style-type: none"> • Protocol, Category: IRB Protocol; • Consent Form, Category: Consent Form; • Questionnaire, Category: Other;

The IRB determined that the criteria for approval have been met and that this study involves No greater than minimal risk

This study was approved under Expedited Category:

Driven to DiscoverSM

- (7) Research on individual or group characteristics or behavior or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB approved the study on 4/3/2019. This study does not require continuing review. The revised Common Rule (2018 Rule) eliminated continuing review for most minimal risk research approved on or after January 21, 2019. The elimination of continuing review does not eliminate reporting requirements or submission of modifications for IRB review and approval. Information about 2018 Rule requirements and investigator responsibilities can be found in the Investigator Manual (HRP-103). You must also submit a Modification in ETHOS for review and approval prior to making any changes to this study.

If consent forms or recruitment materials were approved, those are located under the Final column in the Documents tab in the ETHOS study workspace.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the [HRPP Toolkit Library](#) on the IRB website.

For grant certification purposes, you will need the approval and last day of approval dates listed above and the Assurance of Compliance number which is FWA00000312 (Fairview Health Systems Research FWA00000325, Gillette Children's Specialty Healthcare FWA00004003).

Sincerely,

Jeffery P Perkey, CIP, MLS
IRB Analyst

We value feedback from the research community and would like to hear about your experience. The link below will take you to a brief survey that will take a minute or two to complete. The questions are basic, but your responses will help us better understand what we are doing well and areas that may require improvement. Thank you in advance for completing the survey.

Even if you have provided feedback in the past, we want and welcome your evaluation.

<http://z.umn.edu/irbsurvey>

Psychological Effects of Sharps Injuries on Students, Staff, and Faculty at the University of Minnesota School of Dentistry (STUDY00006142)

You have been selected to take part in a research study because you work or attend classes at the University of Minnesota School of Dentistry and may be exposed to sharps. This study is being conducted by a Master of Science in Dental Hygiene student at the University of Minnesota and is self-funded.

The purpose of the study is to determine the difference in stress and depression between students, staff, and faculty who have experienced a sharps injury and students, staff, and faculty who have not experienced a sharps injury. This survey could lead you to experience negative emotions as reading the questions may bring back negative experiences.

We expect that the study will take between 10-15 minutes to complete. If you choose to be entered into a drawing to win one of ten \$40 gift cards, please write your name and email address at the end of the survey.

Your participation in this study is voluntary. If you decide to participate, read through the consent form, check "I consent", and begin the paper-survey to follow.

Consent Form

Title of Research Study: Psychological Effects of Sharps Injuries on Students, Staff, and Faculty at the University of Minnesota School of Dentistry (STUDY00006142)

Investigator Team Contact Information: Jill Hormann

For questions about research appointments, the research study, research results, or other concerns, call the study team at: 763-954-1296

Investigator Name: Miranda Drake Investigator Departmental Affiliation: Division of Dental Hygiene Phone Number: 612-625-8970 Email Address: mdrake@umn.edu	Student Investigator Name: Jill Hormann Phone Number: 763-954-1296 Email Address: mudr0012@umn.edu
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Supported By: This research is supported by the University of Minnesota and self-funded by the student investigator.

Key Information About This Research Study

The following is a short summary to help you decide whether or not to be a part of this research study. More detailed information is listed later on in this form.

What is research?

- The goal of research is to learn new things in order to help people in the future. Investigators learn things by following the same plan with a number of participants, so they do not usually make changes to the plan for individual research participants. You, as an individual, may or may not be helped by volunteering for a research study.

Why am I being invited to take part in this research study?

We are asking you to take part in this research study because you work or attend classes at the University of Minnesota School of Dentistry and may be exposed to sharps.

What should I know about a research study?

- Someone will explain this research study to you.
- Whether or not you take part is up to you.
- You can choose not to take part.
- You can agree to take part and later change your mind.
- Your decision will not be held against you.
- You can ask all the questions you want before you decide.

Why is this research being done?

The purpose of this study is to determine the difference in stress and depression between students, staff, and faculty who have experienced a sharps injury and students, staff, and faculty who have not experienced a sharps injury. The benefit of this study is to increase awareness of the psychological consequences that could be experienced after experiencing a sharps injury.

How long will the research last?

We expect that the study will take between 10-15 minutes to complete.

What will I need to do to participate?

You will be asked to respond to questions on the survey, which consists of demographic questions, background questions, and two tests that are commonly used for diagnosing stress and depression; the Perceived Stress Scale (PSS-10) and Patient Health Questionnaire (PHQ-9).

More detailed information about the study procedures can be found under “What happens if I say yes, I want to be in this research?”

Is there any way that being in this study could be bad for me?

This survey could lead you to experience negative emotions as reading the questions may bring back negative experiences.

Will being in this study help me in any way?

There are no benefits to you from your taking part in this research. We cannot promise any benefits to others from your taking part in this research. However, possible benefits to others include increased awareness that sharps injuries can contribute to psychological effects experienced by dental providers. This in turn may increase reporting rates and access to psychological support to decrease psychological consequences.

What happens if I do not want to be in this research?

You do not have to participate in this research. Instead of being in this research study, your choices may include: declining to participate in this study with no consequence or not completing the survey upon starting it with no consequence.

Detailed Information About This Research Study

The following is more detailed information about this study in addition to the information listed above.

How many people will be studied?

We expect about 1000 people will be in this research study.

What happens if I say “Yes, I want to be in this research”?

If you consent, you will begin the survey, which consists of demographic questions, background questions, and two tests that are used to determine stress and depression severity. This survey should take about 10-15 minutes to complete. At the end of the survey, you may write your name and email address if you would like to be entered into a survey to win one of ten \$40 gift cards. You have a 1% chance of winning. This information will only be used to contact you in the event that you win.

What happens if I say “Yes”, but I change my mind later?

You can leave the research study at any time and no one will be upset by your decision. Choosing not to be in this study or to stop being in this study will not result in any penalty to you or loss of benefit to which you are entitled. This means that your choice not to be in this study will not negatively affect your right to your academic standing as a student or your present or future employment. This also means that your choice not to be in this study will not affect your relationship with the student and/or principal investigator nor will it affect your grade in any course.

Will it cost me anything to participate in this research study?

Taking part in this research study will not lead to any costs to you.

What happens to the information collected for the research?

Efforts will be made to limit the use and disclosure of your personal information, including research study and medical records, to people who have a need to review this information. We cannot promise complete confidentiality. Organizations that may inspect and copy your information include the Institutional Review Board (IRB), the committee that provides ethical and regulatory oversight of research, and other representatives of this institution, including those that have responsibilities for monitoring or ensuring compliance. Your information that is collected as part of this research will not be used or distributed for future research studies, even if all of your identifiers are removed. If you choose to enter your name and email address at the end of the survey, that information will only be used to contact you in the event that you win one of

the ten \$40 gift cards.

Will I receive research test results?

Most tests done on samples in research studies are only for research and have no clear meaning for health care. The investigator(s) will not contact you or share your individual test results.

Whom do I contact if I have questions, concerns or feedback about my experience?

This research has been reviewed and approved by an IRB within the Human Research Protections Program (HRPP). To share feedback privately with the HRPP about your research experience, call the Research Participants' Advocate Line at 612-625-1650 or go to <https://research.umn.edu/units/hrpp/research-participants/questions-concerns>. You are encouraged to contact the HRPP if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

Will I have a chance to provide feedback after the study is over?

The HRPP may ask you to complete a survey that asks about your experience as a research participant. You do not have to complete the survey if you do not want to. If you do choose to complete the survey, your responses will be anonymous.

If you are not asked to complete a survey, but you would like to share feedback, please contact the study team or the HRPP. See the “Investigator Contact Information” of this form for study team contact information and “Whom do I contact if I have questions, concerns or feedback about my experience?” of this form for HRPP contact information.

What happens if I am injured while participating in this research?

This is a minimal risk study. This survey could lead you to experience negative emotions as reading the questions may bring back negative experiences.

Your signature documents your permission to take part in this research. You will be provided a copy of this signed document upon your request.

Choose consent option below before beginning the paper survey:

I consent

I do NOT consent

Appendix C: Survey

1. Which describes your role within the School of Dentistry?

- D2 student (IF D2, SKIP TO Q3)
- D3 student (IF D3, SKIP TO Q3)
- D4 student (IF D4, SKIP TO Q3)
- DH3 student (IF DH3, SKIP TO Q3)
- DH4 student (IF DH4, SKIP TO Q3)
- Dual Degree (DH/DT3) student (IF DUAL DEGREE, SKIP TO Q3)
- Dual Degree (DH/DT4) student (IF DUAL DEGREE, SKIP TO Q3)
- Faculty
- Staff
- Other (please specify): _____

2. How much experience do you have in the dental profession (not just how long you have worked at the School of Dentistry)?

- Less than 1 year
- 1-5 years
- 6-10 years
- 11-20 years
- 21-30 years
- More than 30 years
- Not applicable
- Prefer not to answer

3. Please enter your age.

- Age (in years): _____
- Prefer not to answer

4. Please select your sex.

- Male
- Female
- Prefer not to answer

5. Please select your marital status.

- Single
- Married
- Widowed
- Divorced
- Separated
- Never married
- Prefer not to answer

6. Are you of Spanish or Latino origin?

- Yes
- No
- Prefer not to answer

7. Please select your racial background that you identify with. **CHECK ALL THAT APPLY.**

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other
- Prefer not to answer

8. Have you been diagnosed with depression?

- Yes
- No (IF NO, SKIP TO Q11)
- Prefer not to answer

9. Have you been prescribed to take an antidepressant medication?

- Yes
- No (IF NO, SKIP TO Q11)
- Prefer not to answer

10. Do you take antidepressant medication as prescribed?

- Yes
- No
- Prefer not to answer

11. How often do you use sharps as part of your role (needles, blades such as scalpels, dental instruments and other medical instruments that could cause an injury by cutting or pricking the skin)?

- Never (IF NEVER, PROCEED TO THE END OF THE SURVEY)
- Rarely
- Once per week
- 2-3 times per week
- 4-7 times per week

12. Definition of sharps injury: an incident that cause a sharps to penetrate the skin.

Does the risk of experiencing a sharps injury generally worry you?

- Yes
- No

13. Are you familiar with the School of Dentistry sharps injury protocol?

- Yes
- No

14. Have you received the Hepatitis B vaccine?

- Yes
- No
- Unsure

15. Have you experienced any kind of sharps injury **during the past year**?

- Yes
- No (IF NO, SKIP TO Q32)

16. How many sharps injuries have you experienced **during the past year**?

- 1
- 2
- 3
- 4
- 5
- More than 5

17. When did your **MOST RECENT** sharps injury occur?

- Within the past month
- Within the past 1-6 months
- Within the past 6-12 months
- Greater than 1 year ago

18. How did you generally feel during the month following your most recent sharps injury?

CHECK ALL THAT APPLY.

- Scared
- Depressed
- Stressed
- Anxious
- Upset
- Fine
- Other (please specify): _____

19. Do you feel like your most recent sharps injury negatively impacted personal relationships (i.e. with your spouse, significant other, friends, family, etc.)?

- Yes - greatly
- Yes - slightly
- No
- Unsure

20 Do you feel like your most recent sharps injury decreased your satisfaction with your career

choice?

- Yes - greatly
- Yes - slightly
- No
- Unsure

21. Did you consider a career change after your most recent sharps injury?

- Yes
- No
- Unsure

22. Do you feel like your most recent sharps injury could have been avoided?

- Yes
- No
- Unsure

23. What was the cause of your most recent sharps injury? **CHECK ALL THAT APPLY.**

- Unfamiliar technique
- Patient moved their head/body
- Injured by a third party (i.e. another provider)
- Tiredness
- Lacking concentration
- Feeling rushed
- Stressful environment
- Other (please specify): _____

24. What type of injury was your most recent sharps injury?

- Needle
- Scalpel
- Ultrasonic tip
- Other dental instrument
- Other (please specify): _____

25. When in the appointment did your most recent sharps injury occur?
- While setting up/before seating the patient
 - During use of the sharps
 - After use of the sharps
 - Other (please specify): _____
26. Did your most recent sharps injury involve a high-risk patient (patient with a history of intravenous drug use or known infection with HIV, Hepatitis B virus (HBV), or Hepatitis C virus (HCV))?
- Yes
 - No
 - Unsure
27. Did you report your most recent sharps injury after it occurred?
- Yes
 - No (IF NO, SKIP TO Q31)
28. Did you feel like you received adequate support/counseling after reporting your sharps injury?
- Yes
 - No
29. If you went through blood testing, how long did it take until you received the test results?
- Less than 1 month
 - 1-6 months
 - 6 months-1 year
 - Greater than 1 year
 - Did not do blood testing (IF DID NOT DO BLOOD TESTING, SKIP TO Q32)
30. While waiting for the blood test results, how did that make you feel? **CHECK ALL THAT**

APPLY.

- Scared
- Depressed
- Stressed
- Anxious
- Upset
- Fine
- Other (please specify): _____

IF ANY CONDITION IS SELECTED FOR Q30, SKIP TO Q32

31. What was your reason for **NOT** reporting your sharps injury? **CHECK ALL THAT APPLY.**

- Takes too much time
- You felt that the infection risk was low
- Not familiar with the reporting protocol
- Other (please specify): _____

The following 10 questions make up the Perceived Stress Scale (PSS-10), which is the most widely used psychological instrument for measuring the perception of stress. The questions ask about your feelings and thoughts during the last month.

32. In the last month, how often have you been upset because of something that happened unexpectedly?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

33. In the last month, how often have you felt that you were unable to control the important things in your life?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

34. In the last month, how often have you felt nervous and "stressed"?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

35. In the last month, how often have you felt confident about your ability to handle your personal problems?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

36. In the last month, how often have you felt that things were going your way?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

37. In the last month, how often have you found that you could **NOT** cope with all the things that you had to do?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

38. In the last month, how often have you been able to control irritations in your life?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

39. In the last month, how often have you felt that you were on top of things?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

40. In the last month, how often have you been angered because of things that were outside of your control?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

41. In the last month, how often have you felt difficulties were piling up so high that you could **NOT** overcome them?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

The following 10 questions make up the Patient Health Questionnaire (PHQ-9), which is a common test used to measure depression severity. The questions ask about your feelings and thoughts during the last month.

42. In the last month, how often have you been bothered by "little interest or pleasure in doing things"?

- Not at all
- Several days
- More than half the days
- Nearly every day

43. In the last month, how often have you been bothered by "feeling down, depressed, or

hopeless"?

- Not at all
- Several days
- More than half the days
- Nearly every day

44. In the last month, how often have you been bothered by "trouble falling or staying asleep, or sleeping too much"?

- Not at all
- Several days
- More than half the days
- Nearly every day

45. In the last month, how often have you been bothered by "feeling tired or having little energy"?

- Not at all
- Several days
- More than half the days
- Nearly every day

46. In the last month, how often have you been bothered by "poor appetite or overeating"?

- Not at all
- Several days
- More than half the days
- Nearly every day

47. In the last month, how often have you been bothered by "feeling bad about yourself - or that you are a failure or have let yourself or your family down"?

- Not at all
- Several days
- More than half the days
- Nearly every day

48. In the last month, how often have you been bothered by "trouble concentrating on things, such

as reading the newspaper or watching television"?

- Not at all
- Several days
- More than half the days
- Nearly every day

49. In the last month, how often have you been bothered by "moving or speaking so slowly that other people could have noticed. Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual"?

- Not at all
- Several days
- More than half the days
- Nearly every day

50. In the last month, how often have you been bothered by "thoughts of hurting yourself in some way"?

- Not at all
- Several days
- More than half the days
- Nearly every day

51. If you have checked off any problems in this block (PHQ-9), how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult
- N/A (I didn't check off any of the problems in this PHQ-9 block)

Thank you for your participation in this study. Your participation is greatly appreciated.

OPTIONAL: If you would like to be entered into the drawing to win one of ten \$40 gift cards, please provide your name (first and last) so that the student investigator can contact you at your UMN email address and get the gift card to you. Your personal information will not be used for any other purpose besides contacting you in the event that you win a gift card.

Write your first AND last name if you want to be entered into the drawing:

Write your email address if you want to be entered into the drawing:

If you feel like you are experiencing mental health issues, please get help. Here are some of the resources available to you at the University of Minnesota.

1) Student Counseling Services:

Minneapolis
340 Appleby Hall
128 Pleasant Street SE
Minneapolis, MN 55455
Phone: **612-624-3323**
Walk-In Hours: M-F 9:00am-3:30pm

St. Paul
199 Coffey Hall
1420 Eckles Avenue
St. Paul, MN 55108
Phone: **612-624-3323**

2) Boynton Health: Call **612-624-1444** to schedule an appointment

3) Nurse Line: If you are unsure what type of service you need, call the Boynton Health Nurse Line at **612-625-7900**. Calls are answered 24/7.

4) For 24-hour phone and text counseling, call University of Minnesota Crisis Connection Line at **612-301-4673** or text "UMN" to **61222**

5) If you are experiencing a life-threatening emergency, please call **911**.

Appendix D: Invitation Email to Participants

Psychological Effects of Sharps Injuries on Students, Staff, and Faculty at the University of Minnesota School of Dentistry (STUDY00006142)

You have been selected to take part in a research study because you work or attend classes at the University of Minnesota School of Dentistry and may be exposed to sharps. This study is being conducted by a Master of Science in Dental Hygiene student at the University of Minnesota School of Dentistry and is self-funded.

The purpose of the study is to determine the difference in stress and depression between students, staff, and faculty who have experienced a sharps injury and students, staff, and faculty who have not experienced a sharps injury. This survey could lead you to experience negative emotions as reading the questions may bring back negative experiences.

We expect that the study will take between 10-15 minutes to complete. If you choose to be entered into a drawing to win one of ten \$40 gift cards, please enter your name and email address at the end of the survey.

Your participation in this study is voluntary. If you decide to participate, click on the survey link below.

Jill Hormann
Master of Science in Dental Hygiene Student
Division of Dental Hygiene

Follow this link to the Survey:

[Take the Survey](#)

Or copy and paste the URL below into your internet browser:

https://umn.qualtrics.com/jfe/preview/SV_bmExdrMA11DmIa9?O_CHL=preview

This email was sent to all RECIPIENTS by: UNIT NAME, UNIT ADDRESS, UNIT CITY, UNIT STATE, UNIT POSTAL CODE, UNIT COUNTRY. [Read our privacy statement.](#)

Follow the link to opt out of future emails:

[Click here to unsubscribe](#)

Appendix E: Perceived Stress Scale (PSS-10)

The following 10 questions make up the Perceived Stress Scale (PSS-10), which is the most widely used psychological instrument for measuring the perception of stress. The questions ask about your feelings and thoughts during the last month.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

3. In the last month, how often have you felt nervous and "stressed"?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

5. In the last month, how often have you felt that things were going your way?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

6. In the last month, how often have you found that you could **NOT** cope with all the things that you had to do?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

7. In the last month, how often have you been able to control irritations in your life?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

8. In the last month, how often have you felt that you were on top of things?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

9. In the last month, how often have you been angered because of things that were outside of your control?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

10. In the last month, how often have you felt difficulties were piling up so high that you could

NOT overcome them?

- Never
- Almost never
- Sometimes
- Fairly often
- Very often

Scoring: PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items.

Scores of 0-13 indicate low stress, 14-26 indicate moderate stress, and 27-40 indicate high stress.

Appendix F: Modified Patient Health Questionnaire (PHQ-9)

The following 10 questions make up the Patient Health Questionnaire (PHQ-9), which is a common test used to measure depression severity. The questions ask about your feelings and thoughts during the last month.

1. In the last month, how often have you been bothered by "little interest or pleasure in doing things"?

- Not at all
- Several days
- More than half the days
- Nearly every day

2. In the last month, how often have you been bothered by "feeling down, depressed, or hopeless"?

- Not at all
- Several days
- More than half the days
- Nearly every day

3. In the last month, how often have you been bothered by "trouble falling or staying asleep, or sleeping too much"?

- Not at all
- Several days
- More than half the days
- Nearly every day

4. In the last month, how often have you been bothered by "feeling tired or having little energy"?

- Not at all
- Several days
- More than half the days
- Nearly every day

5. In the last month, how often have you been bothered by "poor appetite or overeating"?

- Not at all
- Several days
- More than half the days
- Nearly every day

6. In the last month, how often have you been bothered by "feeling bad about yourself - or that you are a failure or have let yourself or your family down"?

- Not at all
- Several days
- More than half the days
- Nearly every day

7. In the last month, how often have you been bothered by "trouble concentrating on things, such as reading the newspaper or watching television"?

- Not at all
- Several days
- More than half the days
- Nearly every day

8. In the last month, how often have you been bothered by "moving or speaking so slowly that other people could have noticed. Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual"?

- Not at all
- Several days
- More than half the days
- Nearly every day

9. In the last month, how often have you been bothered by "thoughts of hurting yourself in some way"?

- Not at all
- Several days
- More than half the days
- Nearly every day

10. If you have checked off any problems in this block (PHQ-9), how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all
- Somewhat difficult
- Very difficult
- Extremely difficult
- N/A (I didn't check off any of the problems in this PHQ-9 block)

Scoring: The first nine items are scored 0 to 3, providing a 0 to 27 severity score.

Scores of 1-4 indicate minimal depression, 5-9 indicates mild depression, 10-14 indicates moderate depression, 15-19 indicates moderately severe depression, and 20-27 indicates severe depression.