Injury Reports in a Dental School: A Two-Year Overview

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Abstract: As teaching institutions, it is vital for dental schools to collect data on accidental injuries to identify potential problems, improve the quality of care of patients, and educate future practitioners about risk management. Our data reveal important trends concerning such injuries. These data were compiled over a two-year period (2001-03) from accident reports at one dental school. We categorized the accidents as follows: source (instrument causing the injury), recipient of injury, time of day, location within the dental school where the injury occurred, and body part injured. The population examined in this study consisted of predoctoral and postdoctoral dental students, staff, faculty, and patients of the dental school. The majority of injuries occurred in the predoctoral clinic toward the middle to the end of the scheduled clinic periods. The instrument most likely involved was a needle, and the body part most commonly injured was a finger. The collection and analysis of injury data may be used to identify trends that will aid in the prediction and prevention of these injuries and, at a national level, serve as a benchmark that other dental schools can employ to assess their relative frequency of injury.

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Injuries in a dental school come from many causes. Some are related, directly or indirectly, to patient treatment. Others occur during preclinical laboratory exercises or in a dental laboratory. Still other types of accidents occur that are unrelated to dentistry, including injuries related to a fall, collision, bump, repetitive motion, or broken objects. The Medical College of Georgia School of Dentistry has an ongoing process to record these injuries. The current study analyzes these reports and compares them with other dental institutions and the private sector.

A number of studies relating the occurrence of percutaneous injuries have been reported in dental schools and in the private sector. The variety of methods used to report the incidence of percutaneous injuries are injuries/year, rate/100 person-years, injuries/10,000 patient visits, injuries/1,000 procedures, and mean number of injuries/20 days. With this variance in reporting, only trends may be compared. Overall incidence rates for percutaneous injury in dental schools have ranged from 1.97/10,000 visits to 12.5/10,000 visits. Some of these analyses include only faculty and staff, whereas others include students and residents. Younai et al. observed a considerably higher rate of injury for third-year students compared to fourth-year, suggesting an elevated risk in the third year. In an observational study of dental residents, the majority of percutaneous injuries occurred extraorally during removable prosthetic procedures. In the private sector, the highest rate of injury was noted in pediatrics (0.52/20 days) and prosthodontics (0.41/20 days), with the lowest being in endodontics (0.12/20 days), orthodontics (0.17/20 days), and periodontics (0.18/20 days). In the same study, general dentists incurred 0.29 injuries/20 days. Siew et al. extrapolated this data to calculate the rate of injury per dentist to be 3.35 incidents per year. Dental schools report that between 31 and 36 percent of percutaneous injuries result from needlesticks. Burs are involved 8 to 26 percent of the time, with scalers and curettes accounting for another 12 percent, collectively. Using these rates as guidelines, dental schools may evaluate their risk of occurrence and determine if additional safety precautions are needed or if modification of current procedures might be indicated. Thus, accurate and complete documentation of injuries is of the utmost importance. Sharing of this information between institutions could benefit faculty, staff, students, and patients. Yet, information on injuries is astonishingly scarce. It is also important to assess the types and frequency of accidents not directly related to patient care.

Accidents that are unrelated to patient care occur in every working environment and deserve equal consideration with patient-related accidents.
and injuries. Safety in the workplace is a major concern and was one factor driving implementation of the Occupational Safety and Health Administration (OSHA) guidelines. Although dental schools are not immune to nondental accidents, little information is available to draw any conclusions concerning the impact of these incidents on educational programs. McDonald et al. state that “while the situation in an institutional and teaching environment is not identical to that encountered in general dental practice, many of the factors which contribute to accidents are present in both settings, and thus the pattern of events in accident causation is likely to be comparable.”

Thus, we need more information about all accidents in dental schools, including incidents that do not directly involve patient care.

Our study compares injury data at our dental school to previously published data and identifies trends and parameters (instrument, time of day, time of year, treatment type, and experience of operator) that are relevant to injuries within the dental school environment and the private sector.

**Methods**

We collected data over a two-year period to evaluate the incidence and possible patterns of injury occurring within our dental school. During the time frame of this study, there was an average of fifty-eight students per class. In addition, there were approximately twenty-eight dental hygiene students and thirty-six residents per year. At our school, policies for reporting injuries were as follows. Upon occurrence, each incident was immediately reported to the faculty member supervising clinical operations at that time. In an emergency situation, the proper measures were taken to limit further injury. In a nonemergency situation, the incident was reported, the necessary information was recorded, and the appropriate action was initiated. The data were collected during the 2001 and 2002 academic years, from August 1, 2001, through July 31, 2003. This time frame was selected because it represents the last two years prior to our dental school beginning a transition from a predominantly discipline-based clinical curriculum to a hybrid-based clinical curriculum. It is our intent to compare similar data collected in our new clinical operations with that of this study.

The incidents were divided into two categories: nonclinical and clinical. Nonclinical incidents were those not related to the clinical environment, but included injuries caused by dental instruments used in nonclinical settings such as preclinical courses and labs, patient-related laboratory work, and sterilization. Accidental injuries caused by a fall or collision were also included under this heading. A clinical incident involved injuries sustained during or relating to patient treatment. With each incident, the date, time of day, recipient of the injury, source of potential cross-contamination (where applicable), physical location of the incident within the dental school, injured part of the body, and instrument causing the injury were recorded. When a student was involved with the incident, the academic year of that student also was recorded.

**Results**

**Nonclinical Incidents**

There were thirty-one nonclinical incidents recorded over the two-year period. This equates to an average of 15.5 incidents per year. Students attended classes and clinics every month of the year. Accidents of this nature therefore occurred throughout the year.

*Cause of Injury.* Figure 1 shows the instrument causing the nonclinical injuries and the relative percentage of each. Over the two-year period, 45 percent (fourteen out of thirty-one) of the general incidents were the result of a fall or collision. One fall involved slipping on a wet floor, whereas the cause of the others ranged from falling out of a chair to passing out after getting up out of a chair (nonclinical setting). One visitor collapsed while waiting in the main lobby of the first floor of the dental school and was transported by ambulance to the emergency room of a local hospital. There was one incident of a student getting dental stone thrown into an eye while trimming a model.

Nine injuries (29 percent) were caused by the use of a dental instrument or a piece of equipment. Cutting fingers or hands with the bard parker blade was the cause of 30 percent (three out of nine) of nonclinical injuries caused by a dental instrument. Other instrument-related injuries were caused by a needle, an endodontic file, a lab knife, an explorer, and a periodontal scaler. Two of the incidents resulted from employees cutting themselves while using a pair of office scissors. The remainder of the incidents (16 percent) were of unknown causes.

*Injured Part of the Body.* The most common
The site of nonclinical injury was the finger (25 percent or eight out of thirty-two). The thumb was counted separately and accounted for 16 percent of all injuries. The torso sustained 13 percent of all nonclinical incidents. The remainder of the injuries affected the ankles, eyes, legs, hand, head, and nose.

**Location of the Incident.** The student laboratory was the site of 23 percent (seven out of thirty-one) of the accidents, and the sterilization area accounted for another 13 percent. The patient treatment areas of the school were the site of 32 percent of nonclinical incidents. These incidents were not unique to a particular clinic. Public areas of the dental school including the lobbies, lounge, stairwell, and parking deck were the locations for 26 percent of reported injuries.

**Time of Day.** The majority, 71 percent (twenty-two out of thirty-one), of the accidents involving injury occurred in the morning hours between 7:30 a.m. and 11:30 a.m., and over half of those (59 percent) were before 9:30 a.m. (Figure 2). There were no nonclinical incidents reported after 3:00 p.m.

**Day of Week.** Nonclinical injuries were more prevalent earlier in the week and tapered off steadily through Friday (Figure 3).

**Date.** Figure 4 shows the trends of injuries when traced throughout the year. The first and third quarters had a larger number of incidents when compared with the second and fourth.

**Recipient of the Injury.** The recipients of the injuries in nonclinical incidents fell into a clear pattern. Staff, including dental assistants, executive assistants, clerical assistants, janitorial staff, and others, comprised 40 percent of the reported incidents. Collectively, the student and resident population accounted for approximately half of the incidents, whereas patients comprised only 10 percent. Faculty were involved in only 3 percent of the incidents.

**Clinical Incidents**

There were a total of thirty-three incidents related to the clinical treatment of patients in our school equating to 5.24 incidents per 10,000 patient visits. These data reveal a slightly higher incident rate than the 3.59 per 10,000 patient visits reported by Younai.5

**Instrument Causing the Injury.** Figure 5 shows the instrument causing the clinical injuries and the relative percentage of each. The instrument most often responsible for injury in a clinical setting was the needle, involved in 45 percent (fifteen out of thirty-three) of the incidents. Bard Parker blades were involved in 24 percent of the incidents, and there were...
five bur sticks (15 percent). The remaining incidents were caused by other dental instruments such as explorers or scalpels. One incident was the result of a patient biting a dental student.

Injured Part of the Body. As with the nonclinical incidents, the thumb was considered separately from the fingers. Fingers were by far the most common injured body part, involved in almost half of the incidents (45 percent). The thumb was second with nine injuries (27 percent). The remaining parts of the body (arm, hand, palm, knee, and leg) were all of equal proportion with one injury (3 percent) each.

Location of the Incident. Almost 60 percent of the incidents occurred in the largest student clinic (containing seventy-two operatories). Nine percent occurred in the emergency clinic, and 6 percent in clinics used for oral surgery, endodontics, periodontics, and faculty practice. The remainder of the incidents occurred in the general practice residency clinic, periodontal residency clinic, and prosthodontic residency clinic, reporting one injury each.

Time of Day. Over three-quarters (76 percent) of the clinical incidents occurred after 1:30 p.m. Of those occurring in the morning hours, 15 percent occurred between 9:00 and 10:00 a.m. (Figure 2).

Day of Week. The larger percentage of clinical injuries occurred on Tuesday, accounting for one-third of the injuries happening in a week’s time (Figure 3). A greater number of clinical incidents was reported in the days and weeks following the break in the academic schedule.

Date. The yearly trend for clinical incidents was similar to that of the nonclinical incidents, with the highest number in the first and third quarters and the lower number of incidents in the second and fourth quarters (Figure 4).

Recipient of the Injury. Students (freshmen, sophomores, juniors, seniors) and residents accounted for almost three-quarters (74 percent) of the reported injuries, whereas the faculty had only one reported incident from August 2001 through July 2003. Juniors represented 36 percent of all clinical injuries. Staff members were involved in 19 percent of all the incidents.
Day of Week

Figure 3. Day of week injuries occurred, by percentage

**Discussion**

Our data suggest that differences among individuals and the prevailing circumstances of clinical versus nonclinical incidents were significant enough to consider each separately. In a clinical setting, the student was most likely to be injured, and the injury was most likely caused by a needle. The student/faculty ratio did not correlate with the number of injuries. As stated earlier, a greater number of clinical incidents was reported in the days and weeks following the break in the academic schedule. This is an intuitive observation relating to inexperience and the need to reestablish the mental acuity and routine necessary in clinical practice, particularly for students. Somewhat less intuitive was the time of day that the majority of accidents occurred. The majority of injections were given during the beginning of each clinical setting, but the larger numbers of needlesticks occurred from the middle to end of the appointments. Students may have become tense as patients began to lose adequate anesthesia and the time to complete the clinical procedure elapsed. A large percentage of these injuries occurred when the students attempted to recap the needle. Attempts at reducing the number of needlesticks have included the development of various safety devices and the implementation of special techniques.\(^{15-19}\) However, the introduction of safety needles in the dental environment has not necessarily proven to be safer than traditional anesthetic needles.\(^{15}\) It is the opinion of at least one author that “the problem is not a lack of safety devices on the market but failure to use these devices.”\(^{20}\) Students are instructed as to the proper technique of uncapping and recapping the needle. This technique must be reinforced by each faculty instructor during the clinical experience.

There is very little in the literature to compare to the 15.5 nonclinical incidents per year observed in this study. Due to the nature of the accidents, it is more appropriate to report these as incidents per year; however, the likelihood of any accident increases
with the number of individuals entering the building. As the number of clinical incidents should increase with the number of students, faculty, and patients in the clinic, the nonclinical incidents should therefore decrease at that same time. It is also understandable that the number of nonclinical incidents would be higher prior to the start of a clinic period, while pre-care set-up and preparations are being completed. Preclinical courses are carried out in both the morning and afternoon, thus negating any time of day bias due to nonclinical injuries associated with these activities. Understanding the reality of after-hours lab work, the absence of nonclinical incidents reported by students after 5:00 p.m. indicates a lack of compliance with reporting.

A more varied array of instruments was involved with nonclinical injuries than clinical injuries. A bard parker blade was a major contributor to these nonclinical injuries. There was no bias as to the time of day for nonclinical injuries to students.

Almost half of the nonclinical incidents (45 percent) had nothing to do with dental instruments. While the number of clinical vs. nonclinical incidents may have varied throughout any given day, the distribution of the two was virtually identical by year’s end. This means that almost a quarter of the incidents reported during the time frame of this study were due to accidental injury. Some of the nonclinical incidents involve patients suffering a fall. These falls were more likely to occur in the morning hours of winter months when the floors had a greater chance of being wet and slippery. An equal number of falls may have occurred as patients left following their dental treatment. However, due to decreased severity of the injuries and a desire of the individual to depart the premises, these incidents may have had less chance of being reported.

The practicality and usefulness of the information gained from our study depend greatly on the accuracy and completeness of the data collected.
Much concern has been expressed in the literature about the underreporting of injuries occurring in the dental teaching environment, as well as in the private sector. It is unlikely that the data presented in the current study represent 100 percent of all the incidents that occurred in our dental school. If the response rate for the current study is similar to the 19 percent reported by Kotelchuck et al., it would be difficult to draw any conclusions regarding the statistical validity of any report to date. Unfortunately, it is reasonable to conclude that the incidents reported captured only a small representation of the actual number of incidents. Several rationales have been proposed for why staff and students do not report an incident including: the injury or splash was minor; the patient was at low risk; the instrument or device was clean; the proximity for delivery of care; and good local antisepsis immediately after the accident. Another reason for failure to report incidents involves the embarrassment that a faculty member, staff, or student might have in admitting that they experienced an exposure incident.

Judging from the low reported injury rate for faculty in the current and other studies, there might also be some reluctance among faculty members to strictly comply with the written guidelines of CDC with regard to the reporting of injuries. In a previous study, only half of faculty who experienced occupational exposures reported a problem to someone in authority. Smoot reported that “most students indicate that they do not see routine precautions undertaken by staff and residents, and no requirement for the compliance is enforced.” The importance of properly reporting all occupational bloodborne exposures to the proper authorities must first be promoted throughout the faculty of each institution before it can be expected to be appreciated by the student body and staff. Exposure incidents do in fact occur. They are not to be ignored but rather reported immediately, especially if there is a possibility of exposure to bloodborne pathogens. Time is certainly of the essence in such exposures, and it is necessary that appropriate counseling and post-exposure prophylaxis occur as soon as possible. The implications of injury reporting also should not be lost on the private sector. The protocol, if reinforced in dental school, will have a greater chance of being followed once the individual moves into private practice.

Little has been written concerning the costs to an institution or private practice associated with workplace injuries. In a study by McDonald et al. covering a three-year period, costs of over $6,700
were attributed to causes such as the lost time of the injured worker, the time taken by the first aid attendant, the cost of first aid supplies, and time taken by senior staff involved in health and safety management.\textsuperscript{3}

The legal implications of work-related injuries, although considerable, are often overlooked in the literature. Each state has its own laws on workers’ compensation, but most possess an “exclusive remedy” provision. This provision precludes an employee from filing suit against employers to recover damages for occupational disease or injury. Exceptions to this provision are cases involving nonemployees. Dental students are classified as nonemployees. Tereskerz reported that “medical schools and teaching hospitals are at potential risk of civil suits for a sharp object injury to a medical student.”\textsuperscript{20}

The Occupational Safety and Health Administration (OSHA) has promulgated a Bloodborne Pathogens (BBP) Standard requiring that engineering and workplace controls be used to eliminate or minimize employee exposure to bloodborne pathogens. The court in \textit{American Dental Association vs. Morton} has already held that the BBP standard for institutions is a feasible means to attenuate the hazard by enforcement of the BBP rule.\textsuperscript{20} The direct costs, indirect costs, and legal implications are important considerations when discussing workplace injuries, but “we must never lose sight of the human dimension of the problem.”\textsuperscript{20}

The data in our study demonstrate the potential of injury data to aid in understanding trends, costs, and potential preventative strategies. Much more could be gained if a standard method of recording and reporting similar reports from various institutions were to be developed and implemented. Once obtained, these data could be used as benchmarks for all dental schools in determining their relative frequency of injury. It must be noted that although certain sources of potential injury may be more prevalent than others, the overall incidence of injury is relatively small considering the total number of patient visits recorded.

Fortunately, none of the injuries reported in this study were permanent or life-threatening. Workplace injuries will continue regardless of our efforts. The responsibility is ours to identify the risks and take all measures reasonably possible to decrease their incidence and severity.

\section{Conclusions}

Students are involved in most injuries reported in a dental school, both clinical and nonclinical. The majority of clinical injuries from this study were caused by needlesticks, and the majority of nonclinical injuries were the result of cuts from Bard Parker blades.

To better identify the type of injuries common to dental schools, a standardized method of documentation should be implemented. We would suggest using the number of incidents per 10,000 patient visits when comparing clinical data and the number of incidents per year when comparing nonclinical data. Separating nonclinical incidents into those involving dental instruments and those of accidental injuries will also help identify areas requiring corrective measures.

An environment of support is essential for accurate accounting of incidents. Additional research is critical to not only document such incidents, but to evaluate their occurrence, identify policies and procedures necessary to decrease their frequency, and re-evaluate those procedures to test their effectiveness.

\section{REFERENCES}