

Comparison of the Knowledge and Comfort zone of the Manitoban  
general and pediatric dentists in treating dental trauma

by

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## **Abstract**

Injury to the teeth in pediatric patients may have serious and far-reaching consequences, including a significant emotional impact. The objective of this study was to compare and evaluate the knowledge of Manitoba general and pediatric dentists in treating dental trauma patients. A web-based survey was sent to all 19 Manitoba pediatric dentists, and a random 25% sample size of Manitoba general dentists (145 general dentists). Statistical analysis was performed using R program. The non-parametric Wilcoxon Mann-Whitney test was used to compare the two groups. For all of the analyses, the significance level of  $<0.05$  was chosen to show strong evidence against the null hypothesis. The main finding was that the majority of pediatric dentists treated trauma patients with more severe injuries, such as luxation, avulsion and alveolar fracture, much more frequently than general dentists. Additionally, a large number of dentists did not feel very confident about their knowledge and skills in treating trauma patients ( $P < 0.05$ ). Overall, multiple statistically significant differences between the two groups were alarming, and changes in the teaching curriculum may help to improve treatment outcomes in children with dental trauma.

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## **Introduction**

Injury to the teeth in pediatric patients may have serious and far-reaching consequences, including a significant emotional impact. Tooth injury (Dental trauma) refers to injury or trauma to tooth structure and periodontal tissue (gingiva, periodontal ligament, alveolar bone), and nearby soft tissues, such as the lips, tongue, et cetera. Dental trauma can vary from just a concussion or a subluxation, to a more severe injury, such as alveolar fracture and jaw fractures (please refer to Appendix 1).

Dentoalveolar trauma is very common (2) and occurs most often in play, sports activities, traffic accidents or violence (3-6).

Dental trauma most often affects upper central incisors, which results in a negative impact on appearance, aesthetic, self-confidence and oral quality of life (7-10).

## **Prevention of Dental Traumas**

Studies have suggested that ice hockey, handball and soccer are associated with the highest incidence of dental injuries (23). Mouthguards are able to distribute the forces, and therefore, reduce the impact of the injury (23). The cushioning effect of the elastic mouth guard positioned between mandible and maxilla has shown to have a significant effect on reducing multiple injuries, including luxation injuries, crown root fracture as well as condylar fractures (23).

## **Different Types of Mouthguards**

Stock (unfitted) mouthguards are made of rubber, latex or polyvinyl, and usually come in three different sizes. The cost to purchase them is the lowest of all types of mouthguards, but the greatest disadvantage is that they interfere with speech and breathing, and can be kept in place only if biting into them (23-34).

Mouth-formed (boil and bite) mouthguards are the kind that can be fitted from a manufactured kit. They have a rigid outer shell and a soft lining, therefore, provide a better fit when compared to unfitted mouthguards (23-34).

Custom-made mouthguards are the most effective type, and are processed by dentists or dental professionals. They are the most expensive type of mouthguard, and have been found to be the most comfortable and acceptable kind (23-34).

Face masks are another way of reducing injury to the eyes and face, and are widely used in contact sports, such as ice hockey and football (23).

## **Consequences of Dental Trauma Injuries**

The goal is to minimize the long-term consequences of dental trauma injuries, such as tooth loss, necrosis and infection (Inflammatory resorption), ankylosis (replacement resorption), malocclusion, et cetera. Factors such as the type of luxation, stage of root development, compression of Periodontal ligament and tooth blood supply in luxation injuries, size of apical foramen, dry time duration and non-physiologic storage have a great impact on treatment outcome (23). Some children receive inadequate treatment after they sustain such injuries (11-12).

One study found that approximately half of the patients referred to a trauma clinic had received inadequate and incomplete immediate treatment (13). Two large survey studies showed that in the USA, one in six adolescents and one in four adults had suffered from dental trauma (14-15). In Britain, one in five children had suffered a traumatic dental injury before leaving school (16).

In addition, dento-alveolar trauma constitutes 5% of all injuries for which patients seek help in emergency rooms or dental clinics (17). Such patients expect competent, immediate management from their dentist to minimize the long- and short-term consequences, and improve the prognosis of the injured teeth. Furthermore, improper management can lead to serious, far-reaching consequences, and can have a negative impact on the overall health and psychosocial well-being of the patient. Without adequate knowledge, the dentist would not be able to provide the injured patient with the best treatment option available. From this perspective, “one can postulate that the clinician’s level of knowledge in the management of dental trauma can have a direct bearing on the prognosis of the tooth or teeth” (18).

The dental undergraduate curriculum at the University of Manitoba indicates that all graduates of this school should be able to recognize and manage dento-alveolar and mucosal trauma. Despite this, there seems to be very little evidence, if any, on the knowledge of dental trauma among general dentists and dental specialists trained at this university. Currently, in the undergraduate training program at the University of Manitoba, students are taught solely didactically in terms of how to treat dental trauma injuries.



However, in the graduate program, residents not only receive extensive hours of didactic courses that are comparable with the American Academy of Pediatric Dentistry guidelines, but they are also exposed to hands-on experience in treating dento-alveolar trauma due to the number of on call days and the heavy load of dental trauma patients being seen by the residents and pediatric dentists.

In Manitoba, how frequently general dentists versus pediatric dentists provide emergency services to their patients, and how they follow the guidelines to prevent the most negative outcomes, is unknown. The level of competency of general dentists versus pediatric dentists in treating traumatic cases is also unknown.

A survey of Manitoba pediatric and general dentists will help to assess the knowledge and comfort level of these practitioners in treating trauma to primary and permanent dentition. The results of this study may assist the University of Manitoba's undergraduate and graduate pediatric programs by providing information to better understand the areas of strength and any gaps in knowledge and training. Consequently, this may lead to curriculum changes in areas revealed by the study results as requiring additional training.

## **Literature Review**

### **Traumatic Dental Injury Frequencies**

Trauma to permanent teeth or “Traumatic dental injuries (TDIs)” occur frequently amongst toddlers, school aged children and teenagers. They are one of the major reasons for emergency room visits, comprising 5% of all injuries (1,17).

“A 12-year review of the literature reports that 25% of all school children experience dental trauma and 33% of adults have experienced trauma to the permanent dentition, with the majority of injuries occurring before the age of nineteen”. Luxation injuries are the most common TDIs in the primary dentition, whereas crown fractures are more commonly reported for the permanent dentition (1,19,20,21). TDIs are often challenging to treat for clinicians worldwide, therefore, proper diagnosis, treatment planning and follow up are critical to assure a favourable outcome (22).

### **Types of Dental Trauma**

There are different types of dental trauma, including: (a) infraction, where an incomplete fracture of the enamel occurs without loss of tooth structure, and usually has a good prognosis (1,22); (b) enamel fracture, where there is loss of enamel, and may require restorative treatment if there is discomfort or the tooth is sensitive (1,22); (c) enamel dentin fracture with or without pulp exposure, which requires restorative treatment plus direct pulp treatment or a partial pulpotomy (1,22); (d) root fracture, which, depending on the location of the fracture and amount of displacement, may require

extended splinting time and root canal treatment to the coronal portion (1,22); and (e) alveolar fracture, which is one of the most severe types of dental trauma and involves the alveolar bone, but may extend to an adjacent bone as well. Segmental mobility is an important sign of alveolar fracture as well as sudden change of occlusion. This type of injury requires careful reduction and four weeks of splinting time, and general anaesthesia may be needed in extensive cases where cooperation is minimal and pain control is an issue (1,22).

Luxation injuries include: (a) concussion injuries where the tooth is tender but there is no displacement (1,22); and (b) subluxation, which occurs when the tooth is tender to touch and has increased mobility but is not displaced. Both of these injuries have a fair to good prognosis (23). Other luxation injuries are: (c) extrusive luxation, which occurs when the tooth appears elongated and is mobile, and requires careful reduction and four weeks of splinting time to treat the injury (1,22); (d) lateral luxation, when the tooth is displaced in palatal or lingual position and can be mobile or locked in place with a high metallic sound on percussion, with fracture of the alveolar process usually present, and treatment that involves reduction and splinting for four weeks with a flexible splint (1,22); and (e) intrusive luxation is one of the most severe types of dental trauma injury, where the tooth is displaced axially into the alveolar bone and is immobile, and the periodontal ligament space may be absent and blood flow may be compressed leading to the

least favourable outcomes, which include necrosis, ankylosis or external resorption (22).

Avulsion is one of the most serious dental injuries, and prompt and correct management is crucial for these patients (24). Avulsion of permanent teeth comprises up to 3% of all dental injuries (1,25). The prognosis of this type of injury is very much dependent on the actions taken immediately at the place of incident, and emergency treatment that was delivered promptly by the dentist (1, 24,26,38).

### **Management of Traumatic Dental Injuries**

Upon occurrence of traumatic dental injuries, patients expect competent, prompt service from well-trained dentists and health professionals. Improper treatment of a TDI and lack of knowledge on how to manage such incidents can result in a serious negative impact on both the short- and long-term prognosis of the dentition and patient's quality of life (27). Several studies have demonstrated that immediate dental treatments are often inadequate and the American Academy of Pediatric Dentistry (AAPD) guidelines are not precisely followed by the practitioners (28). The same study showed that half of the answers to a questionnaire administered to dentists with regard to dental trauma management were incorrect (28). Other studies showed that dentists tend to over treat TDIs, and that the majority of the treatment provided was unnecessary (29, 30). A recent study demonstrated that general practitioners in Brazil who had attended postgraduate school had treated TDI's better than those who received no additional training (31).

A study conducted by de Franca et al. concluded that the majority of dentists would not completely follow the guidelines in avulsion cases (32). Cohenca et al. showed that there is a need to improve the knowledge of dentist in the USA regarding current guidelines for emergency treatment of avulsed teeth (33).

The dental undergraduate curriculum at the University of Manitoba states that all graduates of this school should be able to adequately manage dental trauma patients. This study will provide an understanding of how often general dentists would provide emergency services to such patients, and if they feel confident in the adequacy of the knowledge and training they received in dental school, or if they felt additional continuing education courses were necessary to enable them to provide better service to their patients.

## **Objectives**

1. To determine the frequency of treating dental trauma patients by general dentists compared to pediatric dentists.
2. To determine the age group pediatric dentists normally see in their office compared to general dentists.
3. To determine the most common type of dento-alveolar trauma general dentists would treat compared to pediatric dentists.
4. To determine the most common type of dento-alveolar trauma general dentists would refer compared to pediatric dentists.
5. To determine the most common type of luxation injury general dentists would treat compared to pediatric dentists.
6. To compare and evaluate the knowledge and comfort level of Manitoba general dentists in treating dental trauma patients in the pediatric population compared to pediatric dentists.
7. To understand how frequently general dentists provide emergency services to their patients, if at all, and their level of confidence in providing such services compared to pediatric dentists.

### **Null Hypothesis**

The null hypothesis for statistical testing is that there is no difference in the knowledge and comfort level of Manitoba general dentists and pediatric dentists in treating dental trauma.

### **Alternate Hypothesis**

Findings would show that there is a significant difference in the knowledge and comfort level of Manitoba general dentists compared to pediatric dentists in treating trauma patients. Pediatric dentists would treat younger populations, and therefore, more trauma patients compared to general dentists. Both would treat different types of dental trauma, however, general dentists would refer more complicated types of dento-alveolar trauma including alveolar fracture and severe luxation injuries, compared to pediatric dentists. Graduates of the University of Manitoba feel more confident in terms of treating trauma patients compared to graduates of other universities, due to the amount of training and exposure they receive during their training.

## **Materials and Methods**

In this cross-sectional study, an online survey was conducted (please refer to Appendix 2) to investigate the objectives of the study. The survey questions included the year of graduation of the practitioners, the place of training, the types of dental traumas, the frequency of receiving dental trauma patients at their office and their level of confidence in treating these patients.

The University of Manitoba's Health Research Ethics Boards (HREB) approved the study on August 15, 2015 (please refer to Appendix 3). The survey was distributed to all 19 Manitoba pediatric dentists and a 25% sample size of Manitoba general dentists using a web-based software (Survey Monkey) to ensure anonymity of the respondents. Hidden identity ensured that no identifiable information, such as browser type and version, operating system or email address was stored with the answers.

Once the approval was received from the HREB, The Manitoba Dental Association (MDA) provided the email addresses to the Survey Monkey and recommended that dentists participate to assist in achieving a high response rate, but the participation was voluntary and no incentive was offered. Data collection for the study started on February 15, 2016, and ended on March 28, 2016. The survey was sent initially on February 15, 2016, and was resent on February 29, 2016, and March 21, 2016. After three email requests to complete and submit the survey, the collected data was accepted as the final amount and a decision was made not to resend the survey.

All the information was stored securely and was accessed only by the study conductor (Shima Amel-Gharib) and her Supervisor (Dr.Charles Lekic).



**Inclusion/Exclusion Criteria**

Inclusion criteria was all 19 Manitoba pediatric dentists and a 25% sample size of Manitoba general dentists. Exclusion criteria was the remainder of 75% of Manitoba general dentists.

**Sample Size and Disclosure Statement**

The sample consisted of 19 Manitoba pediatric dentists and 25% of Manitoba general dentists. The 25% of Manitoba general dentists was considered to be the proper sample size (145 out of 580), as within this number it was expected that there would be sufficient information to investigate the objective and to compare and evaluate the knowledge and comfort level of Manitoba general and pediatric dentists in treating dental trauma patients.

The list of all Manitoba general dentists and pediatric dentists was extracted from the MDA directory. The list of general dentists was randomized using Microsoft Excel and inserting a new column on the list next to the list of the email addresses. A random number between one and four was chosen, and from there every fourth dentist from the list was selected to be contacted via email by the MDA. A disclosure statement was attached to the email that was sent to prospective participants to obtain informed consent (please refer to Appendix 4).

## **Survey Application**

The survey included a total of 13 questions (please refer to Appendix 2). The first two questions asked the year of the graduation and place of training for general dentists and separately then from pediatric dentists. The participants were asked how often they treated patients with dento-alveolar trauma (range of options for responses was maximum three or more patients a month, one or two patients a month on average, one patient every few months to rarely, if any); the age group of patients they normally saw (range of options for responses was zero to five, five to ten, teenagers and older to adult only); the most common type of dento-alveolar trauma they would treat in the office (range of options for responses was from enamel/dentin fracture with no pulp exposure or with pulp exposure, luxation, avulsion to alveolar fractures); the most common dento-alveolar trauma they referred (options for responses was from enamel/dentin fracture with/without pulp exposure, luxation, avulsion to alveolar and root fracture); and the most common type of luxation injury they treated in the office (options responses were concussion, subluxation, lateral luxation, extrusion, intrusion, avulsion to root-fracture).

Participants were also asked if they felt they had adequate training in dental school (yes/no response); if they felt they had to take continuing education courses related to dental trauma to be able to better treat their patients (yes/no response); if they provided emergency services to their patients (yes/no response) and how often they provided that kind of service (range of options included every month, once or twice every six months or rarely if any); and if they felt competent about their knowledge and skills for such services (yes/no response).

## **Statistical Analysis**

All data were collected through Survey Monkey, and were imported into Microsoft Excel. Statistical analysis was performed using R program (R Development Core Team 2008. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0). Frequencies and incidences were organized into tables for each objective. Non-parametric Wilcoxon Mann-Whitney test was used to compare the general dentists to the pediatric dentists. For all of the analyses, a significance level of  $<0.05$  was chosen to show strong evidence against the null hypothesis. Individual variables were created for each potential answer to each question, i.e., a binary yes/no variable for each possible reply, and a code of one if the respondent checked the box, and zero if they it was left blank.

## **Results**

The survey was emailed to 19 Manitoba pediatric dentists and 25% of Manitoba general dentists (145 out of 580).

### **Survey Participation and Response Rate**

A total of 95 responses were collected, however, five responses were incomplete, and therefore, discarded from the overall data. The total response rate was 57% (95 out of 164), with 52% participation by pediatric dentists (10 out of 19) and 58% participation by of general dentists (85 out of 145).

### **Survey results**

Appendix 4 demonstrates the survey results. Tables 1 to 11 show the results related to the frequency and incidences of each question, as per objective, by general dentists versus pediatric dentists. The tables also demonstrate *p*-values calculated utilizing Non-Parametric Wilcoxon Mann-Whitney test.

Results from this study have shown that there are differences in terms of how often pediatric dentists and general dentists provide care to dental trauma patients in their offices (Table 1).

Table 1- Frequency and incidences of treating dental trauma patients by general dentists compared to pediatric dentists.

	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Maximum 3 or more a month	6.25% (5/80)	30% (3/10)	0.0138
1 or 2 patients a month on average	11.25% (9/80)	70% (7/10)	0.0001
1 patient every few months	60.00%(48/80)	0% (0/10)	0.0004
Rarely if any	22.50% (18/80)	0% (0/10)	0.0972

It is evident that in most cases there is a significant difference in the frequency of treating dental trauma patients by general dentists as compared to pediatric dentists. Almost one-third of pediatric dentists saw three or more dental trauma patients each month, and two-thirds saw one or two dental trauma patients on average, with a *p*-value of 0.0138 and 0.0001 respectively. This amount is significantly lower amongst general dentists (6.25% and 11.25% in order). The majority of general dentists (82.50%) saw one patient every few months as a result of dental trauma related issues, or rarely if any, with the *p*-value of 0.0004 and 0.0972 respectively. It is clear from the above table that all the pediatric dentists saw one or two dental trauma patients on average, or more.

Furthermore, results showed differences in terms of the age groups of the patients seen for dental trauma when comparing general dentists to pediatric dentists (Table 2).

Table 2- Frequency of the age group of the patients seen by general dentists compared to pediatric dentists.

	General Dentist Frequency (n/N)	Pediatric Dentist Frequency (n/N)	P-value
Zero to Five years of age	20.11% (35/79)	47.62% (10/10)	0.0010
Five to Ten years of age	31.04% (54/79)	28.57% (6/10)	0.6030
Teenagers and older	37.93% (66/79)	23.81% (5/10)	0.0137
Only adults	10.92% (19/79)	0.00% (0/10)	0.0837

Clearly all pediatric dentists saw patients as young as newborn to toddlers, compared to less than half of general dentists who saw this population, which was statistically significant ( $p$ -value 0.0010). On the other hand, while the majority of general dentists saw teenagers and older, only half of the pediatric dentists normally saw this age group of patients, with the  $p$ -value of 0.0137. Interestingly, 19 out of 79 general dentists had practices limited to adult patients.

The two groups showed some similarities and also slight differences in terms of the specific type of dental trauma they usually treated (Table 3).

Table 3- Frequency and incidences of the type of dental trauma treated by general dentists compared to pediatric dentists.

	General Dentist Frequency (n/N)	Pediatric Dentist Frequency (n/N)	P-value
Enamel/dentin fractures with no pulp exposure	44.72% (72/78)	29.17% (7/10)	0.03025
Enamel/dentin fractures with pulp exposure	24.22% (39/78)	20.83% (5/10)	0.99999
Luxation	17.39% (28/78)	25.00% (6/10)	0.14500
Avulsion	10.56% (17/78)	16.67% (4/10)	0.20930
Alveolar Fracture	3.11% (5/78)	8.33% (2/10)	0.14080

As the data revealed, enamel/dentin fractures with no pulp exposure was the most common dental trauma treated by both general dentists and pediatric dentists, however, general dentists saw this kind of dental trauma more frequently, which is statistically significant (  $p$ -value of 0.03025). Understandingly, pediatric dentists saw more complicated dental trauma injuries, such as luxations, avulsions and alveolar fractures, compared to general dentists. The  $p$ -values, however, were not below the significance level of 0.05 in these categories.

Another interesting finding of this study was in terms of the types of trauma the two groups would not see in their offices, but would rather to refer to other specialists. There were significant similarities and slight differences in this aspect, as signified in the table below (Table 4).

Table 4- Frequency and incidences of the type of dental trauma referred by general dentists compared to pediatric dentists.

	General Dentist Frequency ( $n/N$ )	Pediatric Dentist Frequency ( $n/N$ )	P- value
Enamel/dentin fractures with no pulp exposure	1.52% (2/80)	7.69% (1/10)	0.2232
Enamel/dentin fractures with pulp exposure	5.30% (7/80)	15.39% (2/10)	0.2716
Luxation	6.06% (8/80)	0.00% (0/10)	0.3036
Avulsion	9.85% (13/80)	7.69% (1/10)	0.6163
Alveolar Fracture	35.61% (47/80)	23.08% (3/10)	0.0877
Root Fracture	25.00% (33/80)	15.38% (2/10)	0.1989
None	16.66% (22/80)	30.77% (4/10)	0.4182

There is no statistically significant difference between the type of dental trauma general dentists would not treat but would refer to other specialists, as compared to pediatric dental specialists. Both groups rarely referred less complicated types of dental trauma, including enamel/dentin fracture with or without pulp exposure, and frequently referred the more complicated injuries, such as alveolar fractures, to the other specialists. One-third of pediatric dentists treated all types of dental-trauma patients, as compared to general dentists who reported treating a much lower number of these cases (only 16.66%).

Additionally, there was more similarity between the two groups with regard to the type of luxation injury they normally treat, as compared to differences between the groups (Table 5).

Table 5- Frequency and incidences of the most common type of luxation injuries treated by general dentists compared to pediatric dentists.

	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Concussion	25.14% (45/76)	19.23% (5/10)	0.5865
Subluxation	19.55% (35/76)	26.92% (7/10)	0.1591
Lateral luxation	14.53% (26/76)	7.69% (2/10)	0.3746
Extrusion	10.06% (18/76)	7.69% (2/10)	0.8037
Intrusion	8.94% (16/76)	19.23% (5/10)	0.0474
Avulsion	8.38% (15/76)	15.39% (4/10)	0.1515
Root fracture	13.40% (24/76)	3.85% (1/10)	0.3304



As indicated by the information extracted from the above table, there are no significant differences between the two groups in terms of the type of the luxation injury they treat, with the exception of the intrusion injuries.

Concussion, subluxation and lateral luxation were the most common luxation injuries treated by both groups. Although not statistically significant, pediatric dentists treated avulsion injuries more often than general dentists.

The following three tables (Tables 6-8) show how the two groups felt about the training they received during their undergraduate/graduate program, if they had taken any continuing education courses, or if they felt it was necessary to take any to be able to better treat their dental trauma patients. With this information, one can compare and evaluate the knowledge and comfort level of Manitoba general dentists versus pediatric dentists in treating dental trauma patients in a pediatric population.

Table 6- Frequency of general dentists compared to pediatric dentists who received adequate training in their graduate/undergraduate programs.

Adequate Training	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Yes	63.29% (50/79)	100% (10/10)	0.02076
No	36.71% (29/79)	0% (0/10)	0.02076

A very interesting finding was that there was a statistically significant difference between the two groups in terms of receiving adequate training in their programs. All of the pediatric dentists said they felt confident in the amount of training they received in their program versus, less than two-thirds of the general dentists expressing the same answer.

Table 7- Frequency of general dentists compared to pediatric dentists who took continuing education courses.

Continuing Education Course in Dental Trauma	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Yes	60.76% (48/79)	70% (7/10)	0.5784
No	39.24% (31/79)	30% (3/10)	0.5784

There was no significant difference between the two groups in terms of requiring continuing education courses, with both groups primarily answering “yes” to this question, indicating that they had taken additional educational courses related to dental trauma.

Table 8- Frequency of general dentists compared to pediatric dentists who felt they needed to take continuing education courses to better treat their dental trauma patients.

Need Continuing Education Course	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Yes	68.83% (53/77)	30% (3/10)	0.01684
No	31.17% (24/77)	70% (7/10)	0.01684

Another remarkable finding was that there was a statically significant difference between the two groups in terms of the feeling of urgency to take continuing education courses to be able to better treat their patients. Most general dentists answered “yes” to this question with only three out of ten pediatric dentists providing the same response.

Finally, the last three tables (Tables 9-11) helped in understanding how frequently general and pediatric dentists provided emergency services, if any, to their patients, and their level of confidence in providing such services.

Table 9- Frequency of general dentists who provided on call/emergency services in their office compared to pediatric dentists.

Provided On Call Service in Office	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Yes	68.83% (53/77)	100% (10/10)	0.03996
No	31.17% (24/77)	0% (0/10)	0.03996

There was a significant difference in the frequency of general dentists providing on call services to their patients, as compared to pediatric dentists. All pediatric dentists replied “yes” to this question, compared to less than two-thirds of general dentists who said they provided emergency services to their patients.

Table 10- Frequency of providing emergency treatment for dento-alveolar trauma patients by general dentists compared to pediatric dentists.

	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Every Month	4.91% (3/61)	20% (2/10)	0.08971
Once or Twice Every Six Months	32.79% (20/61)	70% (7/10)	0.02634
Rarely if Any	62.30% (38/61)	10% (1/10)	0.00229

There is a statistical difference between the two groups in this category as well. While two-thirds of the pediatric dentists said they provided emergency services to dento-alveolar trauma at least once or twice every six months, the majority of general dentists said they rarely had to provide this kind of service.

Table 11- Frequency of general dentists who felt comfortable in their knowledge and skills to manage dento-alveolar trauma patients compared to pediatric dentists.

Was training enough to treat dento-alveolar trauma patients?	General Dentist Frequency ( <i>n/N</i> )	Pediatric Dentist Frequency ( <i>n/N</i> )	P-value
Yes	76.56% (49/64)	100% (10/10)	0.09073
No	23.44% (15/64)	0% (0/10)	0.09073

While no statistically significant difference between the two groups was found in this category, all pediatric dentists said they felt confident in their knowledge and skills to provide treatment to dental trauma patients, compared to more than two-thirds of the general dentists who provided similar responses to this question.

Results from this study have shown that there is significant difference in the provision of care of pediatric patients with dental trauma between general dentists and pediatric dentists. This will be further addressed in the discussion section.

## **Discussion**

The purpose of this study was to evaluate the knowledge and comfort level of general dentists and pediatric dentists in treating dento-alveolar trauma in pediatric patients. Inadequate management of the dental trauma patients can have a profound impact on their quality of life, and major negative consequences on the psychological and social well-being of individuals, specifically, the pediatric population. Victims of such incidents deserve prompt, competent and comprehensive treatment. A profound understanding of the results of this survey, which was sent electronically to all pediatric dentists and a sample of 25% general dentists, may help improve the graduate and undergraduate programs by better assessing their level of strength and perhaps improve areas in which the survey revealed that practitioners may require additional training. Overall, the results of the survey showed significant differences between the two examined groups in treating trauma patients when considering the severity of the injury and the knowledge and comfort of the dentists in providing treatment.

### *Severity of the injury*

The majority of pediatric dentists indicated that they treated trauma patients with more severe injuries, such as luxation, avulsion and alveolar fracture much more frequently than general dentists. This was a natural assumption, as pediatric dentists naturally see a younger population who are at greater risk of dental trauma due to a higher level of activity and participation in sports at younger age, compared to the adult population. This is similar to what *Gelndor et al.* found in their study (19,39,40).

Simultaneously, general dentists identified treating injuries to the teeth hard tissue including enamel/dentin fracture with/without pulp exposure more commonly as compared to pediatric specialists, treating mostly injuries to the periodontium, including luxation and avulsion. This finding was interesting and questionable. One would wonder if it was because general dentists did not receive more complicated types of dental injury patients, or if was a result of general dentists referring more advanced injuries to other specialists. The results of this study were inconclusive and did not provide a clear answer to this dilemma. It was demonstrated that more pediatric dentists treat all trauma cases in their offices, versus fewer general dentists doing so, but this was not statistically significant.

#### *Knowledge and Comfort Level*

This study confirmed that the knowledge and comfort level of general dentists treating trauma patients was significantly different than the knowledge and comfort level of pediatric dentists. A number of general dentists identified that they did not receive adequate training during their undergraduate years, and they required continuing education courses to fill this knowledge gap. However, only about two-thirds of them, in fact, took a course to improve their knowledge and skills. This magnifies the need to increase the amount of dental trauma management didactic and practical teaching courses in the curriculum. Although to date MEDLINE searches have not found a survey comparing the knowledge and comfort level of general dentists and pediatric dentists in treating trauma patients, similar studies were in agreement with the findings of this study in this area (29,35) Additionally, one-third of general

dentists declared that they did not provide on call services. Currently, as per the survey results, all of the pediatric dentists provided emergency services. The Health Sciences Center in Winnipeg provides such services by pediatric dental residents supervised by their attending dentists, however, all the mentioned specialists in pediatric dentistry as well as the hospital center are located in Winnipeg, Manitoba (29,35).

### *Overview*

At the start of this study, finding some statistically significant differences between the two groups was expected; nevertheless, the findings are alarming. In general, the results of this study raise a major unsettling concern that should a trauma happen outside of the city, would pediatric patients receive prompt, proper, comprehensive services? The answer, according to the findings of this study, is that there is a 30% chance that they would not receive this kind of care (19). This is most important in time sensitive dental trauma events including avulsion and luxation injuries when they occur outside of the city (32,38). This information is applicable to the University of Manitoba Undergraduate and Graduate programs, as it may be beneficial to improving this aspect of their curricula.

### *Study Limitations:*

This study was limited by the number of dentists who responded to the survey, with 57% participation of general dentists and 52% participation of pediatric dentists (only 95 participants in total, with 5 incomplete surveys). Another limiting factor was the sample size of general dentists (145) and pediatric dentists (19). It was also evident that 10% of the participants skipped at least one or two questions, suggesting that the survey might have been too long for some participants.

### *Future Studies:*

Future studies in this area should consider providing an incentive for participation to increase the response rate. This can include a lottery-style draw, which has been shown to be very effective (36). Additionally, sending the survey to all general dentists in Manitoba, or across the country, would increase the power of the study (35,37). Finally, creating a shorter questionnaire would likely increase the chances of receiving a greater number of responses within each survey (31,35,36,37).



## **Conclusions**

Overall, the findings of this study suggest:

1. In general, pediatric dentists treated dental trauma patients much more frequently than general dentists.
2. Pediatric dentists primarily treated more complicated types of dental trauma, including avulsion and luxation injuries (injuries to the periodontium), whereas general dentists primarily saw injury solely to the teeth, including enamel/dentin fracture.
3. A large number of dentists felt there was a knowledge gap and lack of skills in order to treat dental trauma patients.
4. A significant proportion of the general dentists did not provide emergency care to their patients.

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## Appendix 1- Explanation of trauma terms:

1. Concussion: An injury to the tooth-supporting structures without increased mobility or displacement of the tooth, but with pain to percussion.

2. Subluxation: An injury to the tooth supporting structures resulting in increased mobility, but without displacement of the tooth. Bleeding from the gingival sulcus confirms the diagnosis.

3. Extrusion: Partial displacement of the tooth out of its socket  
An injury to the tooth characterized by partial or total separation of the periodontal ligament resulting in loosening and displacement of the tooth.

4. Lateral luxation: Displacement of the tooth *other than axially*. Displacement is accompanied by comminution or fracture of either the labial or the palatal/lingual alveolar bone.

5. Intrusion - Intrusive luxation: Displacement of the tooth *into* the alveolar bone. This injury is accompanied by comminution or fracture of the alveolar socket.

6. Avulsion: The tooth is completely displaced *out* of its socket. Clinically the socket is found empty or filled with a coagulum.

7. Enamel infraction: An incomplete fracture (crack) of the enamel without loss of tooth structure.

8. Enamel fracture: A fracture confined to the enamel with loss of tooth structure.

9. Enamel-dentin fracture: A fracture confined to enamel and dentin with loss of tooth structure, but not involving the pulp.

10. Enamel-dentin-pulp fracture (Complicated crown fracture):

A fracture involving enamel and dentin with loss of tooth structure and exposure of the pulp.

11. Crown-root fracture without pulp involvement: A fracture involving enamel, dentin and cementum with loss of tooth structure, but not exposing the pulp.

12. Crown root fracture with pulp involvement: A fracture involving enamel, dentin, and cementum with loss of tooth structure, and exposure of the pulp.

13. Root fracture: A fracture confined to the root of the tooth involving cementum, dentin, and the pulp. Root fractures can be further classified by whether the coronal fragment is displaced.

14. Alveolar fracture: A fracture of the alveolar process; may or may not involve the alveolar socket.

15. Fracture of mandible or maxilla: A fracture involving the base of the mandible or maxilla and often the alveolar process (jaw fracture). The fracture may or may not involve the alveolar socket.

## Appendix2-Survey

Questionnaire

Study No. \_\_\_\_

**Year of Graduation for Dental School:** \_\_\_\_\_

**Place of Training for Dental**

**School:** \_\_\_\_\_

***For Pediatric Dentists:***

**Year of Graduation for Graduate**

**School:** \_\_\_\_\_

**Place of Training for Graduate**

**School:** \_\_\_\_\_

**1. How often do you treat patients with dento-alveolar trauma? (Please choose one)**

1. ☐ Maximum 3 or more a month      2. ☐ 1 or two patients a month on average  
3. ☐ 1 patient every few month      4. ☐ Rarely if any

**2. What age group of patients do you normally see? (Choose one or more)**

1. ☐ Zero to Five y.o      2. ☐ Five to Ten y.o      3. ☐ Teenagers and older  
4. ☐ Only adult patients

**3. What is the most common type of dento-alveolar trauma you treat in your office? (Choose one or more)**

1. ☐ Enamel/dentin fractures with no pulp exposure      2. ☐ Enamel/dentin fractures with pulp exposure      3. ☐ luxation      4. ☐ Avulsion      5. ☐ Alveolar Fracture

**4. What is the most common type of dento-alveolar trauma you refer? (Choose one or more)**

1. ☐ Enamel/dentin fractures with no pulp exposure      2. ☐ Enamel/dentin fracture with pulp exposure      3. ☐ luxation      4. ☐ Avulsion      5. ☐ Alveolar Fracture  
6. ☐ Root Fracture      None

**5. What is the most common type of luxation that you treat in your office? (Choose one or more)**

1. ☐ Concussion      2. ☐ subluxation      3. ☐ lateral luxation      4. ☐ extrusion      5. ☐ Intrusion      6. ☐ avulsion      7. ☐ Root fracture

**6. Do you feel you had adequate training in your dental undergraduate/Graduate program to treat trauma patients?**      Yes ☐ No ☐

**7. Have you taken a continual education course in regards to dental trauma?**

Yes ☐ or No ☐

**8. Do you feel you need to take a continual education course to better treat your trauma patients?** Yes ☐ or No ☐

**9. Do you provide on call/emergency services in your office for your patients?**

Yes ☐ or No ☐ (If the answer is yes to this question, please answer the following two questions)

**10. During your on call services, how often do you need to provide emergency services for dento-alveolar trauma patients? (Choose one answer)**

1. ☐ every month 2. ☐ once or twice every six month 3. ☐ Rarely if any

**11. Do you feel the training you had provided you enough knowledge and competence to treat dento-alveolar trauma patients when you provide on call services?**

Yes ☐ or No ☐

## Appendix 3-HREB certificate approval

 <b>UNIVERSITY OF MANITOBA</b>	<b>BANNATYNE CAMPUS</b> <b>Research Ethics Board</b>	P126 - 770 Bannatyne Avenue Winnipeg, Manitoba Canada R3E 0W3 Telephone 204-789-3255 Fax 204-789-3414
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**HEALTH RESEARCH ETHICS BOARD (HREB)**  
**CERTIFICATE OF FINAL APPROVAL FOR NEW STUDIES**  
**Delegated Review**

<b>PRINCIPAL INVESTIGATOR:</b> Dr. Shima Amel-Gharib	<b>INSTITUTION/DEPARTMENT:</b> U of M/Dentistry	<b>ETHICS #:</b> (HS 18906) H2015:344
<b>APPROVAL DATE:</b> September 21, 2015		<b>EXPIRY DATE:</b> September 21, 2016
<b>STUDENT PRINCIPAL INVESTIGATOR SUPERVISOR (If applicable):</b> Dr. C. Lekic		

<b>PROTOCOL NUMBER:</b>	<b>PROJECT OR PROTOCOL TITLE:</b> Comparison of the Knowledge and Comfort Zone of the Manitoban General and Pediatric Dentists in Treating Dento-Alveolar Trauma in Children
<b>SPONSORING AGENCIES AND/OR COORDINATING GROUPS:</b> Pediatric Dentistry Graduate Program	

<b>Submission Date of Investigator Documents:</b> August 30, 2015	<b>HREB Receipt Date of Documents:</b> September 3, 2015
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**THE FOLLOWING ARE APPROVED FOR USE:**

Document Name	Version(if applicable)	Date
<b>Protocol:</b> Protocol (undated)		submitted August 30, 2015)
<b>Consent and Assent Form(s):</b> Consent Disclosure Statement	1.0	August 30, 2015
<b>Other:</b> Questionnaire	1.0	August 10, 2015

**CERTIFICATION**  
 The above named research study/project has been reviewed in a *delegated manner* by the University of Manitoba (UM) Health Research Board (HREB) and was found to be acceptable on ethical grounds for research involving human participants. The study/project and documents listed above was granted final approval by the Chair or Acting Chair, UM HREB.

**HREB ATTESTATION**  
 The University of Manitoba (UM) Research Board (HREB) is organized and operates according to Health Canada/ICH Good Clinical Practices, Tri-Council Policy Statement 2, and the applicable laws and regulations of Manitoba. In respect to clinical trials, the HREB complies with the membership requirements for Research Ethics Boards defined in Division 5 of the Food and Drug Regulations of Canada and carries out its functions in a manner consistent with Good Clinical Practices.

**QUALITY ASSURANCE**

- 1 -

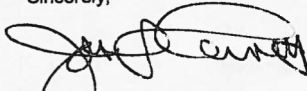
[www.umanitoba.ca/faculties/medicine/ethics](http://www.umanitoba.ca/faculties/medicine/ethics)

The University of Manitoba Research Quality Management Office may request to review research documentation from this research study/project to demonstrate compliance with this approved protocol and the University of Manitoba Policy on the Ethics of Research Involving Humans.

**CONDITIONS OF APPROVAL:**

1. The study is acceptable on scientific and ethical grounds for the ethics of human use only. *For logistics of performing the study, approval must be sought from the relevant institution(s).*
2. This research study/project is to be conducted by the local principal investigator listed on this certificate of approval.
3. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to the research study/project, and for ensuring that the authorized research is carried out according to governing law.
4. **This approval is valid until the expiry date noted on this certificate of approval.** A Bannatyne Campus Annual Study Status Report must be submitted to the HREB within 15-30 days of this expiry date.
5. Any changes of the protocol (including recruitment procedures, etc.), informed consent form(s) or documents must be reported to the HREB for consideration in advance of implementation of such changes on the **Bannatyne Campus Research Amendment Form.**
6. Adverse events and unanticipated problems must be reported to the HREB as per Bannatyne Campus Research Boards Standard Operating procedures.
7. The UM HREB must be notified regarding discontinuation or study/project closure on the **Bannatyne Campus Final Study Status Report.**

Sincerely,



John Arnett, PhD. C. Psych.  
Chair, Health Research Ethics Board  
Bannatyne Campus

- 2 -

Please quote the above Human Ethics Number on all correspondence.  
Inquiries should be directed to the REB Secretary Telephone: (204) 789-3255/ Fax: (204) 789-3414

## **Appendix 4- Disclosure Statement**

*Comparison of the knowledge and comfort zone of the Manitoban general and pediatric dentists in treating dental trauma.*

*By: Shima Amel-Gharib Pediatric Dental Resident, University of Manitoba*

*Pediatric Dentistry (Department of preventive Dental Science)*

*Supervisor: Dr. Charles Lekic*

Thank you for accessing the Comparison of the knowledge and comfort zone of the Manitoban general and pediatric dentists in treating dental trauma survey through the survey Monkey.

I (shima Amel-Gharib Second year pediatric dental resident) and my supervisor Dr. Charles Lekic will be conducting this research as part of my thesis research project.

A survey of the Manitoban pediatric and general dentists will help to assess the knowledge and comfort zone of the mentioned practitioners in treating trauma to primary and permanent dentition. This information will be applicable to the University of Manitoba's undergraduate and graduate pediatric programs. Knowing the results of this survey, would help the graduate and undergraduate programs to better understand their level of strength and perhaps improve in the aspects which the survey will reveal practitioners needs more training in that area.

Your feedback will be collected through an online survey which will ask you a series of questions and should take about 2-3 minutes to complete.



Your participation on this online survey is completely voluntary. You are not required to provide any personal information such as your name, address or telephone number, and you don't have to answer any questions you don't want to. The survey system will not record your e-mail address or IP (Internet protocol) address.

The risks of participating are low as we will not be collecting personal information and you will remain anonymous.

If you agree to participate in the survey, please note that you must complete the survey in one sitting (in other words, the system won't let you save your survey responses and return to complete them later).

Also, please note that when you submit your response. You will **not** be able to withdraw them as we cannot link the survey responses back to you.

Your participation is important to us and will help to assess the knowledge and comfort zone of the Manitoban Pediatric and general dentists in treating trauma to primary and permanent dentition

If you have any questions please do not hesitate to contact me (Shima Amel-Gharib, Pediatric dental resident) at [umamelgh@umanitoca.ca](mailto:umamelgh@umanitoca.ca).

The study is funded by the Graduate Pediatric Dental Program at the University of Manitoba.

This study has been approved by the University of Manitoba Health Research Ethics Board.

By continuing on and completing the on-line survey you are consenting to participate in the on-line survey.

## Appendix 5- Survey Results

ID	Q1	Q2	Q3	Q4	Q5-1	Q5-2
					1	2
8		2014 Manitoba			0	0
9	NA	Manitoba			0	1
10		2006 Manitoba			0	0
11		2009 Manitoba			0	0
12		2009 Manitoba			0	0
13		2005 Queens			0	0
14		2000 Jordan			0	0
15		2011 Manitoba			0	0
16		2011 Manitoba			0	0
17		2009 Manitoba			0	0
18		2001 Manitoba			0	0
19		2015 Manitoba			0	1
20		2015 Manitoba			0	1
22		2012 Manitoba			0	0
23		2011 Manitoba			0	0
24		2012 Manitoba			0	0
25		2013 Manitoba			0	0
26		2011 Manitoba			0	0
27		1991 Manitoba			1	0
28		2013 Manitoba			0	0
29		2016 Manitoba			0	0
30		2011 Manitoba			0	0
31		2012 Manitoba			1	0
32		2015 Manitoba			0	0
33		2010 Manitoba			0	1
34		2015 Manitoba			0	0
35		2015 Manitoba			0	0
36		2015 Manitoba			0	0
37		2013 Manitoba			0	0
38		2012 Manitoba			0	0
39		2012 Manitoba			0	0
40		2006 Manitoba			0	0
41		2014 Manitoba			0	0
42		2008 Manitoba			0	0
43		2009 Manitoba			0	1
44		2011 Manitoba			0	0
45		2010 Manitoba			0	0
46		1987 Manitoba			0	0
47		1980 Manitoba			0	0
48		1986 Manitoba			0	0
49		1947 Manitoba			0	0
50		1978 Manitoba			0	0
51		2008 Manitoba			0	0

ID	Q1	Q2	Q3	Q4	Q5-1	Q5-2
					1	2
1		1990 Manitoba			0	1
2		1980 Connecticut			0	1
3		2006 Minnesota			1	0
4		1968 Tennessee			0	1
5		2003 Manitoba			1	0
6		1999 Manitoba			1	0
7		2015 Manitoba			0	1
8		2000 Manitoba	06-30-2006	Manitoba	0	1
9		2003 Manitoba			0	1
10		2011 Manitoba			0	1