FOLLOW-UP RATES AND PREDICTORS FOR FOLLOW-UP OF PATIENTS SEEN IN THE EMERGENCY DEPARTMENT FOR DENTAL TRAUMA

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ABSTRACT

**Objective:** The purpose of this study was to look retrospectively, at hospital dental clinic records to determine the rate of follow-up care for patients seen after-hours in a hospital Emergency Department (ED) for dental trauma. A secondary aim was to survey the parents/guardians of the trauma patients to identify predictors and barriers for seeking follow-up care after receiving treatment in a hospital ED.

**Methods:** This retrospective study examined dental clinic records of patients who were treated at Nationwide Children’s Hospital (NCH) ED for dental trauma. A quality assurance survey was conducted with the parents of these patients to determine barriers and predictors for follow-up treatment.

**Results:** Seventy-five percent of patients treated in ED returned for at least one follow-up, 37.1% of patients received the recommended follow-up treatment at NCH. Patients averaged 2.5 follow-up visits at NCH and 87% of patients reported retention of the injured tooth.

**Conclusions:** Further research is needed to find ways to improve patient compliance of dental trauma follow-up.
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INTRODUCTION

Dental trauma in children is a serious dental public health issue. In a 10-year study of over 9500 cases of cranio-maxillofacial trauma, nearly 50% involved a dentoalveolar component (1). Studies have shown that up to one-half of children, ages 5-18, will incur some type of dental injury during their school years (2). According to Andreasen et al. (2007), when facial trauma occurs, dental injuries are the most common type of resultant injury (3). The morbidities associated with dental trauma can range from emotional distress for both the patient and guardian to serious physical injury and physiologic dysfunction.

Wilson et al. (1997) demonstrated a slight male predilection for dental injuries among school children. Trauma to the permanent dentition most commonly occurs outside the home. The most common types of dentoalveolar injuries are tooth fracture or subluxation (2). These two types of injuries account for more than 85% of all dentoalveolar injuries (1). In the same study, Wilson et al., showed that the majority of dental trauma in children occurs before the age of 12 (86%). The major causes noted for dentoalveolar trauma were: activity of daily life (38%), sports (31%), violence and traffic accidents (12% each) (2).
Injuries to teeth present unique physiologic considerations. When a muscle is sprained or a bone is fractured, it can often repair itself over time. Unlike these examples, when a tooth is fractured, it has very poor spontaneous self-regenerative properties and must be repaired. In addition to this, dental trauma may have an uncertain prognosis for several months following injury. Although damage can initially appear minimal, injuries such as luxations and intrusions can eventually result in pulpal and/or periodontal ligament necrosis (4). Even if a tooth receives the recommended initial/restorative treatment within the acceptable time span, the final outcome is unpredictable.

Dental injuries with the poorest prognosis are lateral luxation, intrusive luxation and avulsion. The incidence of pulpal necrosis in mature teeth with these injuries is reported to be as high as 100% (5). If a tooth does undergo necrosis, endodontic intervention is required. Progressive inflammatory root resorption can cause significant damage to the integrity of the tooth within days, ultimately leading to diminished long-term retainability of the tooth. Osteoclastic activity in the periradicular or pulpal tissues can ultimately lead to external or internal root resorption. Often, teeth can be clinically asymptomatic in the early stages of this process and resorption can only be detected radiographically (6). If a patient is noncompliant with recommended follow-up appointments, irreversible damage leading to eventual tooth loss can occur within a matter of months.

Substantial life-long costs are associated with the replacement of teeth lost to trauma in childhood. In 1998, Cohen and Cohen estimated that the lifetime cost to replace two teeth lost to dental trauma in adolescence with fixed prostheses could exceed $200,000 (7). Other research has shown the initial average cost of an implant to replace a
missing tooth to be nearly $3300 (8) with lifetime costs to replace a tooth lost in adolescence totaling as much as $20,000. Because of the provisional nature of dental prostheses, they may need to be replaced several times during the life of the patient.

As well as the lifetime cost to replace an injured tooth, there are also costs associated with follow-up care. In an assessment of the socioeconomic burden of treating dental avulsions Nguyen el al. estimated treatment cost and direct time (dentist) for the first-year post-trauma management was $1465 CAD and 7.2 hours of treatment time, respectively (9). Ninety per cent of patients and 86% of parents reported that school and work time was lost, as well.

Because of variable outcomes, all traumatic dental injuries need to be followed longitudinally over time (10,11). Proper diagnosis and treatment of traumatic injuries should include a clinical exam, a radiographic assessment, pulp vitality testing, and patient instructions (10,11). Accepted protocols for follow-up of different hard and soft tissue dental injuries vary according to severity and type of injury incurred (10-12).

Over the past 20 years, trauma follow-up guidelines have changed several times as new evidence has emerged concerning the best treatment modalities (3,10-17). Previous treatment guidelines recommended the placement of calcium hydroxide (CaOH) as an interim, intra-canal medicament for as long as 6 months to 1 year (14-17). This long-term use of CaOH often required the patient to return for monthly appointments to have the CaOH replaced in the canal (14,15,17). If root resorption was visible radiographically the CaOH could be recommended to stay in the canal indefinitely (14-16). This treatment regimen often required the patient to return at least every six months to have new CaOH placed. Recent research has shown that this long-term use of CaOH
can weaken the root structure of the injured tooth (18). Because of the significant burden placed on patients and families to return for numerous follow-up visits to replace the CaOH, the lack of evidence that this treatment improved the prognosis of the traumatized tooth, and the recent evidence showing long-term use of CaOH causing a weakening in the tooth, a shift was made in an attempt to minimize the number of follow-up visits recommended (10,11,13).

In an effort to improve the management of traumatic dental injuries, the International Association of Dental Traumatology (IADT) and American Association of Endodontists (AAE) updated guidelines for the treatment and follow-up care of traumatic dental injuries in 2007 and 2006 respectively (10,11,13). Researchers and clinicians from various specialties including endodontics, pediatric dentistry, and oral surgery were included in the group to help determine the best evidence-based treatment modalities for traumatic injuries. Recommendations were based on the consensus opinion of the IADT board members. The guidelines that were developed represent the best current evidence, based on published research, and professional opinion. Much of the data used as evidence, however, are from uncontrolled prospective studies, retrospective studies or extrapolated from animal experiments. These types of evidence are useful but have lower scientific value than prospective randomized clinical trials which are the gold-standard. Due to limitations of the evidence, disclaimers are included stating that, “these guidelines are intended as an aid to the dentist in the management and treatment of traumatized teeth;” “practitioners must always use their own professional judgment” and that they “cannot guarantee any positive results associated with the application of the guidelines” (10,11).
The most recent set of guidelines recommend that with luxation, intrusion, or avulsion injuries the patient should have at least three follow-up visits within the first two months following the trauma (10,11). They also recommend gutta percha obturation of the injured tooth as soon as an “intact” lamina dura can be seen circumferentially around the injured tooth. In 2006 the AAE also recommended obturation at 1 month post injury if an intact lamina dura could be visualized (13). In many cases of dental trauma, in order for treatment to be considered a success, follow-up care is a requirement. Dental researchers and clinicians have questioned follow-up compliance of patients suffering these types of traumatic injuries. This issue, however, is not unique to dental trauma.

Several medical studies have shown that rates for follow-up care after being treated in a hospital emergency department (ED) for acute illnesses and injuries are poor (19-22). Barlas et al. reported that over 30% of patients instructed to obtain follow-up care after an ED visit failed to do so (20). In this 1999 prospective study, patients were instructed to seek follow-up care within 48 hours of being discharged from the ED. The options patients were given for follow-up care were: in the ED (for free), in a health clinic, or with a private physician. Those referred to the ED had a higher follow-up rate (82.7%) than those referred to clinics (59.6%) or private physicians (52.7%). The most common reasons cited by patients for not obtaining follow-up care after discharge from the ED were that the symptoms had diminished (37.4%), inability to obtain a follow-up appointment (34.3%), or they did not understand the instructions (9.1%) (20).

Zorc et al. (2005) conducted a study in an effort to improve patient follow-up after a pediatric emergency visit for asthma. They demonstrated that parental beliefs about asthma severity and the benefits of controlling future asthma attacks were very strong
predictors for seeking follow-up care (p=.02). They also showed that the main barriers impeding parents from complying with follow-up care were health system barriers to follow-up. This included a lack of appointments and long waits in the primary care physician’s office. Finding transportation, taking care of other children and missing work to attend follow-up appointments were all noted as barriers to seeking treatment (21).

A similar study done in 2005 showed that ED patients who made their outpatient follow-up appointments at discharge had a significantly greater probability of follow-up compliance compared with patients given standard discharge instructions (22). It was found that demographic characteristics such as age, race, gender, insurance status, and distance from home had no affect on the ED patient’s follow-up compliance (22).

Although several studies have been done to track follow-up care obtained by patients treated in an ED there are no known studies examining the follow-up rate of patients treated in a hospital ED for dental trauma. Lewis et al. (2003) showed that nearly 740,000 patients are treated annually across the nation in hospital emergency departments with a chief complaint of tooth pain or tooth injury (23). Often, these patients will be told to follow-up with their private dentist for any further concerns with the injury. How well these patients comply with follow-up instructions is unknown. It is also unknown if the dental patients have the same barriers encountered in seeking follow-up with a dentist as is reported with a primary care physician.

Identifying the predictors for dental trauma follow-up may assist public health programs, schools, after-school initiatives, and emergency departments develop interventions to improve compliance after an emergency visit for dental trauma. Due to the frequency of traumatic dental injuries and urgency for thorough follow-up care after
the injury, the primary objective of this study was to look, retrospectively, at hospital
dental clinic records to determine the rate of follow-up care for patients seen after-hours
in a hospital ED for dental trauma. A secondary aim was to survey the parents/guardians
(caregivers) of the trauma patients to identify predictors and barriers for seeking follow-
up care after receiving treatment in a hospital ED. This may help clinicians understand
better how to maximize compliance and complete effective and efficient care of these
patients.
MATERIALS AND METHODS

This retrospective quality assurance analysis examined charts of discharged Emergency Department (ED) patients at Nationwide Children’s Hospital (NCH) who were instructed to obtain follow-up care within two weeks at the NCH dental clinic or at a private dental practice. Caregivers contacted for this survey had children who were initially seen in the ED at NCH for trauma to the permanent dentition between September 2003 and December 2007.

Following triage and registration, medically stable patients with isolated oral trauma were examined and treated by a pediatric dental resident. Patients requiring care for head and other injuries were first screened by a pediatric emergency medical physician. Dental and other injuries were then treated in order of priority. Dental treatment was rendered in accordance with NCH’s Dental Trauma Recommendations (24).

Upon completion of treatment of the traumatized permanent teeth, the resident completed a standardized data collection form used for quality control and treatment review (see Appendix A). The form provided a concise way of recording information such as; biographical data, date and time of injury, pertinent medical history, injury etiology, patient behavior, classification/severity of the injury, occlusal analysis, and
emergency treatment provided. This data form was reviewed by a single attending dentist on staff at NCH.

Data from the trauma collection forms were entered into a Microsoft Access® for Windows 2000 (v8.0, Microsoft Corp., Redmond, WA) database. This database provided four main functions: record a patient’s initial visit, open/review an existing patient visit, create new or used pre-programmed queries to search for specific factors, and create graphical reports to review clinical information (32). This information was entered by trained research assistants and the study coordinator. The progression of forms for new patient entry is illustrated in the attached progression diagram (see Appendix B).

Inclusion criteria for this quality assurance survey were that the patient had:
(1) a permanent tooth injury including avulsion, luxation, or intrusion; (2) completed root development of the involved tooth; and (3) initial treatment rendered in the ED of NCH. Patients meeting these criteria comprised the study’s qualifying cohort (QC175).

Clinic dental records of the QC175 were reviewed to determine: i) if a patient did follow-up with the dental clinic at NCH following initial injury; ii) how many times they followed up; and iii) the treatment rendered at each visit. Completion of endodontic root canal therapy (gutta percha obturation) within six months from the time of injury was the outcome measure designated as treatment completion and success. Whether the patient received a pulpectomy and calcium hydroxide fill within 21 days was also recorded. The dental clinic records allowed access to information in determining the type of dental insurance the patient had at the time of injury and contact information for the parent/guardian of the patient to conduct the phone survey. Patient reports were processed by a member of the dental staff for quality assurance purposes.
A standardized phone survey and protocol algorithm (see Appendix D) was used. These were developed to interview the parent/guardian of the patient about the quality of follow-up care they received, as well as factors that may have affected patient follow-up rates. During October 2008 and January 2009 an attempt was made to contact, via phone, the parent/caregiver of the QC175. If the parent/guardian that accompanied the patient to NCH ED was unavailable, another parent or guardian was administered the survey. If the parent/guardian could not be reached after three phone calls, the patient was excluded from the study. If the phone number was disconnected, or the parent/guardian had moved they were excluded from the study. The parent/guardian could also choose to be excluded from the survey. Before the survey was administered it was reviewed and edited by staff of the Health Literacy Department at NCH to ensure a proper language level below an 8th grade reading level. The study coordinator and a trained research assistant conducted all phone surveys.

Prior to conducting phone surveys, a pilot study was conducted to assess the validity of the survey instrument, as well as inter-rater reliability of the resident and research assistant. In this pilot study, the study coordinator conducted the survey in a face-to-face interview with the parent or guardian of twenty patients that were treated for trauma follow-up in the NCH dental clinic. Between two and four weeks later the research assistant called each person that was originally surveyed and conducted the same interview over the phone.

Data from the phone surveys were collected and organized. Results gathered allowed us to determine relative success (as defined by pulpectomy within 21 days and obturation within 6 months) of follow-up care received and parent perception of
treatment rendered. Descriptive statistics (means, medians, standard deviations) were obtained for all explanatory and outcome variables. Due to a normal distribution, the mean, in conjunction with the standard deviation was determined to be the best central measure of tendency for mileage traveled and number of follow-up visits. Categorical variables (pulpectomy or obturation completed within pre-determined time spans) were analyzed using Fisher’s Exact Test. Ordinal variables (means, number of follow-up visits) were analyzed using two-tailed t-tests. A multiple regression model was employed to assess the relationship of predictor variables (insurance status, age of patient at time of injury, number of follow-up visits) to outcomes (answers to questions 1-7 on phone survey i.e. the potential barriers to follow-up). Comparisons were considered significant at $p < .05$. 

RESULTS

Patient Selection

There were 856 patients treated in the ED for permanent tooth trauma during the study period and 175 patients fulfilled the inclusion criteria (20.4%). This qualifying cohort (QC175) of 175 patients was used as our original study sample (see Appendix C). Of the QC175, 98 (56%) caregivers were contacted by phone for permission to participate in the quality assurance program as well as to inquire about further follow-up needs. The remaining 77 (44%) patients from the QC175 were not able to complete the phone survey because of disconnected phone numbers (51), parent/guardian unable to be reached after attempting to contact ≥3 times (24) and parent/caregiver having moved (2). Of the 98 parents/guardians contacted via phone, two declined to participate leaving a contacted cohort (CC96) of 96 patients that completed the quality assurance survey. This process is outlined in Appendix C.

Prior to calling the parents/caregivers of the QC175, a pilot study was completed to assess the validity of the survey instrument, as well as inter-rater reliability of the resident and research assistant. The survey instrument was used to interview 20 parents/caregivers of patients who were treated in the dental traumatology clinic at NCH. Initial analysis demonstrated the two interviewers had an inter-rater reliability (kappa) of 0.94.
Demographic Information – Qualifying Cohort of 175

The mean age of the QC 175 children was 13.8 y (sd 3) at the time of injury, and their injuries were as follows; 99 (56.6%) suffered luxation injuries, 66 (37.7%) avulsions, and 10 (5.7%) intrusive injuries. Eighty-three patients (47.4%) were on some form of public insurance, 77 (44.2%) on private insurance, 11 (6.2%) had no insurance and the insurance status of the remaining 4 (2.2%) was unknown (see Table 1 Appendix E).

Treatment variables – Qualifying Cohort of 175

All treatment figures reported pertain to patients who received follow-up care for dental injuries at NCH dental clinic. Type and frequency of follow-up care received by these patients outside NCH is unknown. The mean number of follow-up visits for this cohort was 2.5 (sd 2.3). Forty-four (25%) patients did not return for follow-up care. Forty-nine (28%) returned for 1-2 follow-up visits, 51(29%) returned between 3-4 times, and 31 patients returned between 5-12 times (see Figure 1 Appendix E). Patients with intrusive injuries had the highest average rate of follow-up at 4.0 visits. Although patients with public insurance had a higher average follow-up rate (3.04 visits) than private insurance (2.22), the type of insurance was not a significant predictor for trauma follow-up (p=.611) (see Figure 2 Appendix E).

From the QC 175, 45.1% (79 patients) had a pulpectomy within 21 days of injury at NCH, which is our normal standard of care. A total of 82 patients (46.9%) did not have the pulpectomy completed at NCH and the remaining 14 patients had a pulpectomy completed at NCH but after 21 days following the initial injury. Sixty-five patients
(37.1%) had the gutta percha obturation within 6 months of initial injury at NCH, 104 (59.4%) did not and 6 (3.4%) had the obturation at NCH but beyond 6 months of the initial injury. The mean mileage traveled by these patients for treatment, based on a computerized zip code map analysis, was 16.1 miles (sd 18.9) (Table 2 Appendix E).

Sixty-three percent of patients with avulsion injuries received a pulpectomy within 21 days of injury at NCH, while only 35.4% of luxations and 20% of intrusive injuries received the pulpectomy within 21 days. Patients with avulsion injuries were more likely than patients with luxation or intrusion injuries to receive a pulpectomy within 21 days (p=.0004) and gutta percha obturation within six months (45.5%) (p=.102) (see Table 2 Appendix E).

Demographic Information – Contacted Cohort of 96

Of the 98 parents/guardians contacted via the phone, two declined to participate – leaving the CC96 that completed the quality assurance survey. This process is outlined in Appendix C. The CC96 whose parents were contacted for completion of the quality assurance survey had a mean age of 13.7 years (sd 1.3) at the time of injury. Their injury breakdown is as follows: 57 (59%) suffered luxation injuries, 35 (36.4%) avulsions, and 4 (4.2%) intrusive injuries. Their financial support breakdown was as follows; 46 (47.9%) were public insurance, 46 (47.9%) were private insurance, 3 (3.2%) had no insurance and 1 (1%) had an unknown insurance status (see Tables 3,4 Appendix E).

Caregivers were contacted a mean of 2 years 6 months after the traumatic injury occurred. The ethnicity of the CC96 was 57% Caucasian, 26% African American and Hispanic, Asian, American Indian and Other made up the remaining 17%. Race was not a significant predictor for trauma follow-up or root canal treatment completion in this
study (p=.543). Demographic values from the QC175 and CC96 are very similar illustrating that the CC96 is a well distributed sample of the QC175. There was no significant difference between the demographic information of the QC175 and CC96.

Treatment Variables – Contacted Cohort of 96

All of the treatment figures reported pertain to patients who received follow-up care for dental injuries at NCH dental clinic. Type and frequency of follow-up care received by these patients outside NCH is unknown. The children in the CC96 had a mean number of 2.7 follow-up visits (sd 2.2), and drove a mean of 16.5 miles (sd 19) for treatment at NCH. In this cohort, 38% and 36% of patients completed the pulpectomy within 21 days and gutta percha obturation within 6 months at NCH respectively. A total of 87.5% of the CC96 retained the injured tooth/teeth. In the group that received a pulpectomy within 21 days – 85.4% retained the traumatized tooth, compared to 90% in the group that did not receive a pulpectomy within 21 days at NCH. Ninety percent of all respondents reported that, to their knowledge, all treatment had been completed, and yet only 23% of the group that did not receive the pulpectomy at NCH reported following up with another dentist.

The most common barriers reported by parents to obtaining follow-up care were: the patient or siblings having to miss school (21.8%), the parent having to take time off of work (17.2%) and the costs associated with the dental care (12.6%). Only 9.6% of parents reported the fear or anxiety of their child made it difficult and 8% reported a difficulty in obtaining an appointment (see Table 5 Appendix E).
Data Analysis

The number of follow-up visits was evaluated by regression/correlation analysis. There were no significant relationships between caregiver’s responses to follow-up barriers and the number of follow-up visits (Table 5). To further evaluate responses, the CC96 was broken down into pulpectomy completed/not completed within 21 days groups. The results of these two groups and their caregivers’ responses to questions are presented in Table 5. The only question/potential barrier to which the responses were significantly different, as revealed by Fisher’s Exact test, was whether the caregiver had other children to care for (p=.031). All other associations were not significant. Analyzing the number of visits and relationship to tooth present at time of contact, the association was also determined not significant (p=.22).
DISCUSSION

This retrospective study examined hospital dental clinic records to determine the rate of follow-up care for patients seen after hours in an urban hospital ED for dental trauma. A secondary aim was to survey the caregivers of the trauma patients in an attempt to identify predictors and barriers for seeking follow-up care. Follow-up success was defined by whether or not the patient received: i.) a pulpectomy within 21 days; and ii.) a gutta percha (GP) obturation within 6 months of the trauma. From the QC175, 65 (37.1%) patients had the gutta percha obturation within 6 months of initial injury. What is unknown is whether the remaining 62.9% of the patients initially treated in the ED (NCH-ED) either sought their follow-up care with another dental professional or were seen in the NCH dental clinic but root canal therapy was either not completed or not indicated. Another possibility could have been that the patient did not seek follow-up care at any location for the dental injury.

Demographic Information-Qualifying Cohort of 175

The average age of the patients who qualified for this study was 13.8 years. Seventy-two percent of patients treated for permanent tooth trauma at NCH ED between 2003-2009 were between the ages of 7-13. The slight age discrepancy in our study could be attributed to the inclusion criteria of only allowing teeth with closed apices to be
included. Maxillary lateral incisors often do not complete root development until age 11 (25). In this study, luxation (lateral and extrusive) was the most common type of injury at 56.6% followed by avulsion at 37.7%, and intrusive injury at 5.7%. These injury ratios are consistent with other current dental trauma studies (2).

Previous non-trauma studies conducted at NCH dental clinic have revealed a population that is typically enrolled in public health insurance (80-85%). Of the patients in the QC\textsubscript{175}, only 47.4% had public insurance, 44.2% had private insurance and 6.3% had no dental insurance. This dramatic difference in the number of patients with public health insurance could be attributed to the fact that patients seen in the ED may be referred by private dental professionals in the community. It is possible that a practicing dentist may not feel comfortable treating trauma in their office, especially when the trauma occurs after the regular operating hours of the dental practice. The trauma collection form (see Appendix A) used to record patients’ trauma information was only completed when the patient was seen in the ED after the regular operating hours (after 1700 hrs) of the dental clinic at NCH. At this time in the evening most private dental practitioners have closed their offices or are not able to handle immediate treatment of the patient in their office. Upon receiving treatment in the ED, many patients have reported the after hours emergency contact number of their private dentist instructed them to call NCH in the case of a dental emergency.

Treatment Variables

For luxation and avulsion injuries the International Association of Dental Traumatology (IADT) recommends at least 5 follow-up visits during the first year following the injury (10,11). For both the QC\textsubscript{175} and CC\textsubscript{96} the mean number of follow-
up visits at NCH was determined to be 2.5 and 2.7, respectively. From the QC_{175}, 44 (25%) did not return to NCH for follow-up care. The 131 (75%) patients who presented for at least one trauma follow-up visit at NCH were seen an average of 3.3 times (see Figure 1 Appendix E). In a study by Barlas et al. it was shown that over 30% of patients instructed to obtain follow-up care after an ED visit failed to do so (20). Barlas’ follow-up rate of 70% is very similar to our rate of 75% of patients attending at least one follow-up appointment. Although not statistically significant, it is worth noting that private insurance patients had a lower average follow-up rate (2.22 visits) than public insurance patients (3.04 visits) (p=.611) (Figure 2 Appendix E). This could illustrate that private insurance patients are required to pay the difference for dental treatment rendered while public insurance patients are not required to pay for treatment. It is also possible that the private insurance patients could have been seen somewhere else for their regular dental care. The patients with private insurance could have returned to their own dentist to receive the needed follow-up care. Patients without any insurance at the time of injury reported the lowest average number of follow-up visits at 1.00. It is possible that the economic burden of having to return for several appointments without any reimbursement from insurance may have discouraged the “no insurance” group from returning for follow-up appointments.

Studies from just 10 years ago have demonstrated follow-up rates for complicated dental trauma involving damage to the periodontal ligament as high as 16 visits over a 3-year period (26,27). These studies were both conducted in Europe under a socialized healthcare system. Under this type of system, reimbursement by the responsible party is covered through the health plan. If a physician tells a patient to return for follow-up care
there is usually no financial burden placed on the patient/parent. Financial barriers to receiving care would not have as great effect on follow-up rates as with a privatized insurance system. One explanation for the relatively low number of follow-up visits in our study could be the change in trauma treatment guidelines that limit the amount of time CaOH is recommended to stay in the canal after pulpectomy (10,11,13). Because of the retrospective nature of this study, the amount of time between injury and evaluation of the patients’ charts also had some variance. These patient records were evaluated between 6 months and 3.5 years post-injury. It is possible that a patient with a shorter treatment span from their date of injury to when the record was evaluated would have fewer follow-up visits. This could have given us a lower over-all average for patient follow-ups. The mean number of 2.5 follow-up visits is indicative only of the number of times the patient specifically visited the “Trauma Clinic”. Generally, once a patient had completed root canal treatment (gutta percha obturation) they would be transferred to routine recall in the “hygiene clinic” where trauma follow-up may have been done as part of the patient’s periodic recall appointments. It is not unreasonable to assume that if all patients who had returned for routine care (but with a history of trauma) were entered into the database, the number of ‘follow-up’ visits may have been higher. This questions the utility of having pure ‘follow-up visits’ in which a tooth is monitored, post-obturation, rather than within the scope of comprehensive oral health care delivery.

Because of variation in private insurance plans, the different providers may not cover the cost of repeated follow-up visits. Patients without any insurance coverage would be 100% responsible for monetary costs of the appointments. The lower follow-up rates with the private and no insurance group could be attributed to the fees they are required to pay
for each visit (Figure 2). This issue could also lead to follow-up evaluations being incorporated into other dental treatment procedures to avoid the patient from being charged for a single follow-up visit.

To obtain initial and follow-up care at NCH, patients traveled an average of 16.2 miles. In an unpublished data from NCH in 2008, it was found that patients traveled an average of 40 miles to receive treatment for odontogenic facial swellings (28). The difference in miles traveled for these two emergencies could be attributed to private dentists in the distant communities treating traumatic injuries. If an odontogenic infection is severe, often a dentist or rural hospital might refer the patient to an institution that can best treat the patient’s needs.

Of the patients from the QC175, 45.1% had a pulpectomy completed on the traumatized tooth within 21 days at NCH. Thirty-seven percent had the gutta percha obturation within 6 months and nearly 63% did not. Using the pulpectomy and gutta percha obturation as measures for follow-up treatment success has some limitations. In mature teeth, the frequency of pulpal necrosis with avulsion or intrusion is near 100%. Andreasen and Pedersen reported a rate of pulpal necrosis in mature, luxated teeth at a rate of 58% (29). It is possible that patients with luxation injuries could have received the needed follow-up care, and because the tooth remained vital, pulp therapy was never indicated. This could have contributed to the relatively low rates of “follow-up treatment success.”

Patients with avulsion injuries in both the QC175 and CC96, were more likely to than those who suffered a luxation or intrusion to receive a pulpectomy with 21 days (p=.0004) (Tables 2,4). As discussed previously, this may have to do with the objective
nature of avulsed teeth undergoing pulpal necrosis and needing root canal therapy. In the case of luxations, a practitioner may wait a longer period of time to see if pulpal necrosis occurs. This ‘wait and watch approach’ is less likely to be used with avulsions. One other point of interest from the QC175 group was that patients with intrusive injuries had the highest average number of follow-up visits with 4. Yet patients with intrusive injuries had the lowest average percent who received a pulpectomy within 21 days at 20%. The sample size of the intrusion group (n= 10) was much smaller than the avulsion and luxation groups which should be considered when looking at this treatment discrepancy. Although, the high mean number of follow-up visits may be indicative of monitoring the re-eruptive status of the intruded tooth before any pulpectomy was completed. Since intrusive injuries on mature teeth nearly always undergo necrosis concern should be given to this group because of 80% of them not receiving the recommended therapy.

Demographic Information Contacted Cohort of 96

Both “demographic” and “treatment variable” information between the QC175 and the CC96 were very similar with no statistically significant difference. This suggests that the CC96 had a fairly normal distribution and could be used as a representative sample for the QC175 (Tables 1-4).

Although 45% of patients’ caregivers were not contacted to complete the survey, the 55% who did and were included in the CC96 produced very similar demographic information to the QC175. On average, patients’ caregivers/parents were contacted to complete the quality assurance survey 2.5 years (range 1-3.5 years) after the date of initial trauma. Because parents were responding to these questions during a phone survey and trying to recall what occurred between 1 and 3.5 years previously, their responses
may have been subject to recall bias. Research has shown that 20% of critical details of a recognized event are irretrievable after one year from its occurrence and up to 50% are irretrievable after 5 years (30). It has also been concluded that recall bias in humans significantly depends on the time interval between the event and the time of its assessment: the longer the interval, the more likely the possibility for incorrect recalls (31). Opinions and impressions of the dental trauma and the follow-up care that ensued could have been skewed or forgotten and replaced by recall bias or recent feelings and experiences.

*Treatment Variables and Data Analysis – Contacted Cohort of 96*

The treatment variables reported on these patients are solely from individuals treated in the dental traumatology clinic at NCH for follow-up care. If the patient never returned to NCH for dental follow-up, it remained unknown what type or frequency of follow-up care those patients received. Nearly all (90%) of parents/caregivers who responded to the survey, however, reported that “to their knowledge” all needed dental treatment had been completed. Yet, of the patients who did not receive a pulpectomy at NCH, only 23% reported following-up with another dental professional. Social desirability response bias, which is the tendency for people to present a favorable image of themselves on questionnaires, may have contributed to the 90% of parents responding they felt as though all the treatment had been completed. Respondents would not want the interviewer to think that the parent/caregiver would not have completed all the recommended treatment for their child. Recall bias may also have been an issue in this case. Parents may not clearly remember the post-operative instructions given to them.
nearly 2.5 years earlier. It is also possible that all required treatment needed was not effectively communicated to the parent/caregiver.

Over 87% of parents/caregivers reported the child still had the injured tooth/teeth. It is worth noting as well that 85.4% of patients who received a pulpectomy within 21 days of the trauma at NCH reported still having the traumatized tooth. The other group of patients who did not have the pulpectomy done within 21 days reported that 90% of patients still had the injured tooth. The number of clinic follow-up visits at NCH and the relationship to “tooth present at time of contact” was determined not significant (p=.22). If clinic records and parent reports are accurate, the question should be asked, ‘Why are so many teeth being retained and asymptomatic for such a long period of time with a “treatment success” rates (gutta-percha obturation at 6 months) of 37.1%?’ Fifty-seven (59.3%) of the CC96 were originally treated for a luxation injury. As mentioned previously, because of varying degrees and severity of luxation injuries, it is plausible to assume a certain percent of luxation injuries treated may not have needed root canal therapy. With nearly 60% of patients treated in this study for luxation injuries, it could explain, to some extent, the low rates of “treatment completion” and the high rates of tooth retention. One other reason to explain this could be that the tooth was asymptomatic. If the patient was not having any symptoms involved with the tooth, the parent may have not seen a reason to return for follow-up care.

Although our study was carried out over a period of 6 months we examined patient trauma information as far back as 3.5 years. During this time, more than 30 pediatric dental residents performed treatment, made diagnoses of the injuries, and gave parents instructions for post-op care and need for follow-up. Although the residents were
all given the same protocol to follow and had similar oversight by faculty, some
variability in diagnosis and treatment is expected as well as the ability to communicate
effectively with the parents and explain the need for follow-up treatment. The diagnosis
of avulsion and intrusion is more objective than that of luxation. One practitioner may
have felt the tooth had been displaced while another may determine the injury to be of
less significance. Because of this discrepancy it would be expected that some of the
initial luxation injuries never received a pulpectomy or root canal treatment because they
were never treatment planned to do so.

Parents reported the most commonly perceived barriers to follow-up care as; (i)
the patient or siblings having to miss school (21.8%), (ii) parents having to take time off
of work (17.2%), and (iii) costs associated with dental treatment (12.6%). However,
none of these barriers were associated with the number of follow-up visits made by the
QC175 of patients. (Table 5). These findings are similar to that of Kyriacou et al., in that,
sociodemographic characteristics such as race, age, insurance status, and distance
traveled did not affect ED patients’ follow-up compliance (22). In this study race was not
a significant predictor for trauma follow-up (p=.543). In both the QC175 and CC96 neither
insurance status (p=.611, p=.788) or distance traveled (p=.291, p=.226) were found to be
significant predictors for trauma follow-up.

Our results are also similar to those found in a study examining barriers to
obtaining follow-up care after receiving emergency treatment in the ED for asthma (19).
Zorc et al. reported that the most common barriers parents reported to follow-up care
with a physician were; missing school or work (23%) and caring for other children (9%)
(19). From the CC96, the pulpectomy (+) and (-) groups had only one statistically
significant difference between them which was “other children to care for.” The respondent parents who said they “had other children to care” for were more likely to have a pulpectomy done within 21 days. This data presents itself as conflicting; one would think there would be less of a chance of these patients meeting the 21 day limit with having other children to care for. Because “other children to care for” was one of the most mentioned barriers to treatment, it would seem that the more children to care for the more complicated seeking follow-up care would be.

Follow-up Visits and Quality Assurance

It is of interest to note that of the QC$_{175}$, 25% (44 patients) of patients never returned to the NCH dental clinic for any type of follow-up. Of the 131 patients treated for follow-up, 57% were seen between 1-4 times and the remaining 43% were seen five or more times. From a quality assurance standpoint it would appear that there is a significant loss of patients between ED treatment and follow-up dental care. From the CC$_{96}$, 86.5% of patients reported having at least one follow-up visit with either NCH or a private dentist. Although this rate is high, we cannot assume the needed treatment was completed. With an average follow-up rate of 2.5 visits per patient, special attention should be made in an effort to complete all needed pulp therapy within those visits.

The “Guidelines for the management of traumatic dental injuries” formulated in 2007 by the IADT, were made, in part, to reduce the number of follow-up visits recommended for successful treatment (10,11). Previous guidelines as recent as 15 years ago had recommended CaOH interim fill material to be placed from anywhere between 6-24 months before gutta percha obturation was considered (14-17). Interim follow-up visits to change intra pulpal medicaments and assess for the presence of resorption could
be as common as on a monthly basis during the first year post injury (14-16). The new guidelines recommend between 3-5 visits within the first six months depending on the injury (10-13). In the case of avulsion, intrusion, and severe luxation on teeth with closed apices, the current guidelines recommend pulp extripation and calcium hydroxide within 7-10 days and root canal filling with an acceptable material within 1 month of pulp extripation. Our research has suggested that patients reach a point where follow-up appointment attrition begins to occur. From Figure 1 it is evident in both the QC₁₇₅ and CC₉₆ that this attrition begins after the third follow-up appointment. This illustrates the importance of completing the definitive endodontic treatment within the first three follow-up visits. The high rate of patient attrition and low rates of patient compliance with completing the recommended treatment tend to confirm the need for reducing the number of appointments and time allowed between appointments. Achieving the recommended pulp therapy within a limited amount of time could also reduce the risk of future morbidities involved with pulpal necrosis and odontogenic infections.

Kyriacou et al. demonstrated that patients who had their outpatient follow-up appointment made at discharge had a significantly greater probability of follow-up compliance compared with patients given standard discharge instructions (22). A similar study by Zorc et al. showed 22% increase in parent compliance with follow-up visits when a follow-up appointment was scheduled at the time of the ED treatment (21). Scheduling an appointment for the patients we treat in the ED could be one way to improve our patient follow-up compliance.
Summary

This retrospective quality assurance analysis examined charts of discharged Emergency Department (ED) patients at Nationwide Children’s Hospital (NCH) who were instructed to obtain follow-up care within two weeks at the NCH dental clinic or at a private dental practice. Our study has shown that 75% of the patients treated in the ED completed at least one follow-up visit at NCH, yet, only 37.1% of patients in this study received the recommended root canal therapy completed at NCH. The combination of low follow-up rates as well as low treatment completion warrants further study to examine ways to improve patient compliance for receiving follow-up care after a traumatic dental injury. With patients averaging <3 follow-up visits it would seem important to complete the recommended pulpal therapy before patient loss to follow-up occurs. This study reaffirms the current IADT and AAE treatment recommendations and need to complete definitive pulpal treatment in an efficient and systematic manner.

Future research should focus on improving links between ED and dental clinics, as well as private dentists, to make this intervention more feasible for patients. It should also assess other ED-based interventions that may serve to improve ongoing care for dental trauma.
CONCLUSIONS

1. Reported retention of the injured tooth was not dependent on the patient receiving the recommended root canal therapy.

2. Over 62% of patients in this study never received the recommended pulp therapy at NCH.

3. Socioeconomic factors such as cost of treatment, taking time off work, other children to care for, missing school, race, insurance type, distance traveled, cost of treatment, and ability to obtain transportation did not have a significant effect on patient follow-up or treatment completion.

4. There was no significant difference between patients with private insurance or public insurance to determine number of follow-up visits or whether treatment was completed.

5. Further research is needed to find ways to improve patient compliance for dental trauma follow-up.
APPENDIX A

OSU/NCH DENTAL TRAUMA FORM AND HELP SHEET
INSTRUCTIONS FOR DENTAL TRAUMA FORM

Form: DENTAL TRAUMA FORM

Purpose: To attain and keep accurate and complete information concerning the initial presentation, pulpal status, treatment rendered and success of treatment of traumatized teeth.

Sequence: Patients presenting with a history of recent trauma resulting in injury to the teeth should have the trauma form completed and placed in their chart.

Method: The form provides space for recording information obtained from the parent/child interview and from the clinical and radiographic examination.

Address and note responses to all items on the form. If an item is not applicable, write “N/A”.

A graphical representation of the incisors is included on the right side of the form. Use this to clearly draw the approximate size, position and angulation of any fracture or displacement injury. In the table beneath the graph identify the injured teeth and check the appropriate diagnosis and clinical findings. Check all that are applicable.

Complete the “Summary & Diagnosis” portion succinctly.

Check all applicable items in the “Treatment” section. This is done in addition to the usual treatment progress notes.

Finally, indicate the appropriate “Recall Follow-up” period and be certain that the parent obtains an appointment for this follow-up exam.
DENTAL TRAUMA FORM

1. Significant medical history/meds/allergies?
   a. NO
   b. YES (list)

2. Tetanus status (circle one): current booster needed

3. Accident Etiology/History:

4. Time from injury to evaluation at Children's (circle one): <30 min. 30-60 min. 1-3 h 3-6 h 6-12 h 12-24 h 24+ h

5. Concomitant Facial Fracture (circle one): none maxilla mandibular other (list) (other than alveolar fracture)

6. Horizontal Overjet (circle one): -6 to -4 mm / -3 to -1 mm / 0 mm / 1 to 3 mm / 4 to 6 mm / 6+ mm

6. Vertical Occlusion Type (circle one): deep normal open

3. Patient Behavior (circle one): 1 2 3 4
   * see legend

5. Post-operative systemic antibiotics prescribed (circle one): no
   yes (list type)

5. Post-operative topical antibiotics prescribed (circle one): no
   yes (list type)

Resident:

Patient gender (circle one): Male Female

PATIENT STICKER
# DIAGNOSES & TOOTH SPECIFIC FACTORS

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**Apical development (see legend)**

- complete for each tooth #
- # in section above

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**Associated gingival lac**

- yes / no

**Alveolar fracture**

- yes / no

**Percussion +**

**Cold/ice +**

**Previous trauma to tooth**

(if yes, describe)

**Caries and/or restoration**

(if yes, describe)
### PERIODONTAL INJURIES

**Concussion**

* no other information needed

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<td>repos/splint</td>
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<td>repos/splint</td>
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**Avulsion**

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<table>
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<th>2</th>
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</thead>
<tbody>
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<td>cleansing of tooth prior to reimplantation</td>
<td>water rinse scrubbed none</td>
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<td>water rinse scrubbed none</td>
<td>water rinse scrubbed none</td>
<td>water rinse scrubbed none</td>
<td>water rinse scrubbed none</td>
<td>water rinse scrubbed none</td>
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<td>splint type</td>
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<td>non-rigid rigid suture none</td>
<td>non-rigid rigid suture none</td>
<td>non-rigid rigid suture none</td>
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</table>
# CROWN & CROWN/ROOT FRACTURES

<table>
<thead>
<tr>
<th>Tooth #</th>
<th>Fracture Type</th>
<th>Enamel Only (Ellis Class I)</th>
<th>Enamel &amp; Dentin (Ellis Class II)</th>
<th>Enamel, Dentin, Cementum - No Pulp (Ellis Class IV)</th>
<th>Enamel, Dentin, Pulp (Ellis Class IV)</th>
<th>Enamel, Dentin, Cementum and Pulp (Ellis Class IV with Pulp)</th>
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</thead>
<tbody>
<tr>
<td>discoloration</td>
<td>yes/no</td>
<td>yes/no</td>
<td>yes/no</td>
<td>yes/no</td>
<td>yes/no</td>
<td>yes/no</td>
</tr>
<tr>
<td>treatment</td>
<td>band-aid build-up</td>
<td>none</td>
<td>band-aid build-up</td>
<td>none</td>
<td>band-aid build-up</td>
<td>none</td>
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</table>

Fracture:
- Enamel only (Ellis Class I)
- Enamel & Dentin (Ellis Class II)
- Enamel, Dentin, Cementum - No Pulp (Ellis Class IV)
- Enamel, Dentin, Pulp (Ellis Class IV)
- Enamel, Dentin, Cementum and Pulp (Ellis Class IV with Pulp)
<table>
<thead>
<tr>
<th>Tooth #</th>
<th>Location of fx</th>
<th>Root Fracture</th>
<th>Tooth Mobility</th>
<th>Crown Discoloration</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>coronal ½ %</td>
<td>coronal ½ %</td>
<td>coronal ½ %</td>
<td>coronal ½ %</td>
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<td></td>
<td>middle ½ %</td>
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<td>middle ½ %</td>
<td>middle ½ %</td>
<td>middle ½ %</td>
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<tr>
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<td>apical ½ %</td>
<td>apical ½ %</td>
<td>apical ½ %</td>
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<td>0 mm</td>
<td>0 mm</td>
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<td>1-3 mm</td>
<td>1-3 mm</td>
<td>1-3 mm</td>
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<td>4-6 mm</td>
<td>4-6 mm</td>
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<td>avulsed/lost</td>
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<td>0 1 2 3</td>
<td>0 1 2 3</td>
<td>0 1 2 3</td>
<td>0 1 2 3</td>
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<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
<td>yes no</td>
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<td>treatment</td>
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<td>splint pulpectomy extraction none</td>
<td>splint pulpectomy extraction none</td>
<td>splint pulpectomy extraction none</td>
<td>splint pulpectomy extraction none</td>
</tr>
<tr>
<td>root fracture</td>
<td>avulsed/lost</td>
<td>avulsed/lost</td>
<td>avulsed/lost</td>
<td>avulsed/lost</td>
<td>avulsed/lost</td>
</tr>
</tbody>
</table>
Trauma Form Legend

Behavior Scale (modified Frankl):

RATING 1 – DEFINITELY NEGATIVE
Refuses treatment, cries forcefully, is fearful, or portrays any other overt evidence of extreme negativism.

RATING 2 – NEGATIVE
Is reluctant to accept treatment, is uncooperative, portrays some evidence of negative attitude but not pronounced, that is, sullen or withdrawn.

RATING 3 – POSITIVE
Accepts treatment; at times is cautious, is willing to comply with the dentist, at times with reservation but follows the dentist’s directions cooperatively.

RATING 4 – DEFINITELY POSITIVE
Has good rapport with the dentist, interested in the dental procedures, laughs and enjoys the situation.

Apical Development Scale (Moorees):

Stage 1 - ¼ anticipated root length formed
Stage 2 - ½ anticipated root length formed
Stage 3 - ¾ anticipated root length formed
Stage 4 - full anticipated root length, no apical closure
Stage 5 - full anticipated root length, apical foramen ½ closed
Stage 6 - full anticipated root length, apical foramen constricted

Tooth Mobility

Grade 0 – no more than physiologic mobility
Grade 1 – slightly more than physiologic mobility (in a lateral direction only)
Grade 2 – grossly more than physiologic mobility (in a lateral direction only)
Grade 3 – severe mobility in a lateral and axial direction
APPENDIX B

DATABASE RELATIONSHIP DIAGRAM
APPENDIX C

PATIENT SELECTION CRITERIA ALGORITHM
Patient Selection Criteria Algorithm

856 patients treated in NCH ED for acute dental trauma to the permanent dentition from September 2003-December 2007.

Qualifying Cohort (QC) of 175 Patients by criteria:
1. Tooth injury of avulsion, intrusion, luxation
2. Completed root development on involved teeth
3. Initial treatment in ED at NCH

98 Parents/caregivers contacted via phone

77 patients unable to contact via phone.
1. Disconnected
2. No contact after ≥3 calls
3. Parent/caregiver moved

2 parents/caregivers refused to complete survey

Contacted Cohort (CC) of 96 Patients by criteria:
1. Parent/Caregiver completed the quality assurance survey
APPENDIX D

TELEPHONE SURVEY AND SURVEY ALGORITHM
"Hi my name is __caller's name__. I am calling on behalf of the Dental Clinic at Nationwide Children’s Hospital to follow-up on __Pt.'s name__ tooth injury that was treated on __date of initial tx__. Is a parent or guardian of __Pt.'s name__ available at this time? If no, tell them you’ll call back at another time and finish the call. If the parent/guardian is not the one that initially answers the phone then repeat the above dialogue when they get on the phone.

"In an effort to improve our patient care at the hospital I just have a few questions about the treatment __Pt. Name__ received. Could I please speak to the parent that brought __Pt.'s name__ to the Emergency room on __date__? If the ED parent is not available conduct interview with available parent.

"Do you recall the visit?” Yes/No

1. "Did __Pt.'s Name__ receive any follow-up care at a dental office other than NCH?" If "No" skip to question #3.

2. "Was the dentist you visited for follow-up care a(n):"
   a. General dentist
   b. Pediatric dentist
   c. Endodontist (root canal) dentist
   d. Oral Surgeon

3. "From what you know, did __Pt. Name__ finish all the needed treatment to fix the injured teeth?” Yes/No/Not sure

4. Does __Pt. Name__ still have the injured tooth? Yes/No

5. "We are also interested in what makes it difficult to see a dentist for follow-up care. For each of the following questions that I ask please let me know if it was a problem for you by saying either ‘yes or no’."
   a. Costs associated with dental treatment Yes/No
   b. Language spoken at the clinic Yes/No
   c. Taking time off of work Yes/No
   d. Other children to care for Yes/No If Yes how many? ___
   e. Ability to schedule an appointment with this clinic Yes/No
   f. Costs or availability of transportation to and from this clinic Yes/No
   g. __Pt.'s Name__ or any siblings having to miss school Yes/No
   h. The number of times you had to return to the dental clinic to complete the treatment Yes/No
   i. The fear or anxiety of your child to return Yes/No
   j. Were there any other problems you had in receiving follow-up care? If yes, please let me know what they were.

6. Which of the following best describes __Pt.'s Name__ race or ethnicity?

7. Would you be interested in scheduling a follow-up visit for __Pt. Name__ at this time?

"Thank you very much for your time. Your answers will be very helpful in improving the quality of care we provide to our patients. Have a great day."
<table>
<thead>
<tr>
<th>INSURANCE</th>
<th>N</th>
<th>Pctmy 21</th>
<th>% of Ins</th>
<th>GP 6m</th>
<th>% of Ins</th>
<th>#FU visits</th>
<th>#FU(sd)</th>
<th>Mileage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDICAID</td>
<td>83</td>
<td>43</td>
<td>52</td>
<td>35</td>
<td>42</td>
<td>3.04</td>
<td>2.45</td>
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<td>32</td>
<td>42</td>
<td>27</td>
<td>35</td>
<td>2.22</td>
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<td>17.8</td>
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<tr>
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<td>3</td>
<td>27</td>
<td>2</td>
<td>18</td>
<td>1</td>
<td>1.55</td>
<td>15.5</td>
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<td>1</td>
<td>25</td>
<td>1.5</td>
<td>2.38</td>
<td>4.5</td>
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<td><strong>79</strong></td>
<td><strong>65</strong></td>
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<td></td>
<td><strong>2.52</strong></td>
<td><strong>2.12</strong></td>
<td><strong>16.1</strong></td>
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Table 1. Insurance Breakdown of Qualifying Cohort (QC$_{175}$) (N=175)
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<th></th>
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<th>Age(yrs)</th>
<th>Pctmy 21days</th>
<th>% YES</th>
<th>GP 6m</th>
<th>% YES</th>
<th>#F/U's</th>
<th>(sd)</th>
<th>Mileage Traveled</th>
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<td>35</td>
<td>35.4</td>
<td>32</td>
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<td>2.3</td>
<td>14.6</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>AVULSION</td>
<td>14.1</td>
<td>42</td>
<td>63.6</td>
<td>30</td>
<td>45.5</td>
<td>2.7</td>
<td>2.3</td>
<td>18.6</td>
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<td>10</td>
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<td>20</td>
<td>3</td>
<td>30</td>
<td>4.0</td>
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<td>14.1</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td><strong>175</strong></td>
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Table 2. Pulpectomy Status of Qualifying Cohort (QC\textsubscript{175}) (N=175)
Figure 1: Compares QC$_{175}$ and CC$_{96}$ percentage of patients that returned by number of follow-up visits.
Figure 2: Mean number of follow up visits of QC175 by type of insurance.
<table>
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<tr>
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<th>N</th>
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<th>% of Ins</th>
<th>GP 6m</th>
<th>% of Ins</th>
<th>#FU visits</th>
<th>#FU(sd)</th>
<th>Mileage</th>
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<tr>
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<td>22</td>
<td>47.8</td>
<td>16</td>
<td>34.8</td>
<td>2.76</td>
<td>2.46</td>
<td>15.0</td>
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<tr>
<td>PRIVATE</td>
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<td>24</td>
<td>52.2</td>
<td>19</td>
<td>41.3</td>
<td>2.63</td>
<td>2.15</td>
<td>17.5</td>
</tr>
<tr>
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<td>33.3</td>
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<td>66.7</td>
<td>2.00</td>
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<td>13.0</td>
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<td>2.70</td>
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</table>

Table 3. Insurance Breakdown of Contacted Cohort (CC96) (N=96)
<table>
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<tr>
<th>N</th>
<th>INJ</th>
<th>Age (yrs)</th>
<th>Pctmy 21</th>
<th>% YES</th>
<th>YES GP 6m</th>
<th>% YES</th>
<th>#F/U's (sd)</th>
<th>Mileage</th>
</tr>
</thead>
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<td>57</td>
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<td>21</td>
<td>36.8</td>
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<td>31.6</td>
<td>2.4</td>
<td>2.4</td>
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<tr>
<td>35</td>
<td>AVULSION</td>
<td>13.9</td>
<td>27</td>
<td>77.1</td>
<td>18</td>
<td>51.4</td>
<td>2.9</td>
<td>1.8</td>
</tr>
<tr>
<td>4</td>
<td>INTRUSION</td>
<td>13.4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>25.0</td>
<td>4.5</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>96</strong></td>
<td><strong>13.7</strong></td>
<td><strong>48</strong></td>
<td><strong>50.0</strong></td>
<td><strong>37</strong></td>
<td><strong>38.5</strong></td>
<td><strong>2.7</strong></td>
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</table>

Table 4. Pulpectomy Status of Contacted Cohort (CC₉₆) (N=96)
<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Answer to question of pts who had pulpectomy done within 21 days (out of 48 patients)</th>
<th>Answer to question of pts who did NOT complete pulpectomy within 21 days (out of 48 patients)</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did pt receive any f/u care at dental office other than NCH?</td>
<td>YES-12 NO-36</td>
<td>YES-11 NO-37</td>
<td>1.00</td>
</tr>
<tr>
<td>3. From what you know, did pt finish all needed tx to fix teeth?</td>
<td>YES-43 NO-0</td>
<td>YES-43 NO-0</td>
<td>1.00</td>
</tr>
<tr>
<td>4. Does pt. still have injured teeth?</td>
<td>YES-41 NO-7</td>
<td>YES-46 NO-2</td>
<td>0.16</td>
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<tr>
<td>5. Did any of the following items make it difficult to see a dentist for follow-up care?</td>
<td></td>
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<tr>
<td>5a. Costs associated with dental treatment?</td>
<td>YES-7 NO-41</td>
<td>YES-6 NO-42</td>
<td>1.00</td>
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<tr>
<td>5b. Language spoken at the clinic?</td>
<td>YES-0 NO-48</td>
<td>YES-1 NO-47</td>
<td>1.00</td>
</tr>
<tr>
<td>5c. Taking time off of work?</td>
<td>YES-10 NO-38</td>
<td>YES-7 NO-41</td>
<td>0.59</td>
</tr>
<tr>
<td>5d. Other children to care for?</td>
<td>YES-8 NO-40</td>
<td>YES-1 NO-47</td>
<td>0.031</td>
</tr>
<tr>
<td>5e. Ability to schedule an appointment with this clinic?</td>
<td>YES-3 NO-45</td>
<td>YES-5 NO-43</td>
<td>0.72</td>
</tr>
<tr>
<td>5f. Costs or availability of transportation to and from this clinic?</td>
<td>YES-2 NO-46</td>
<td>YES-0 NO-48</td>
<td>0.49</td>
</tr>
<tr>
<td>5g. Patient or siblings having to miss school?</td>
<td>YES-12 NO-36</td>
<td>YES-9 NO-39</td>
<td>0.62</td>
</tr>
<tr>
<td>5h. The number of times you had to return to complete treatment?</td>
<td>YES-3 NO-45</td>
<td>YES-2 NO-46</td>
<td>1.00</td>
</tr>
<tr>
<td>5i. Any other problems with receiving follow-up care?</td>
<td>YES-4 NO-44</td>
<td>YES-5 NO-43</td>
<td>1.00</td>
</tr>
<tr>
<td>7. Would you be interested in scheduling a f/u visit at this time?</td>
<td>YES-4 NO-44</td>
<td>YES-1 NO-47</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Table 5: Differences in treatment predictors of patients who completed pulpectomy w/in 21 days and those patients who did not.
REFERENCES


