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Massachusetts emergency departments' resources and physicians' knowledge of management of traumatic dental injuries

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Abstract – *Background*: Hospital emergency departments (ED) are confronted with triaging and managing dental emergencies of both traumatic and non-traumatic origin. However, the literature suggests that there exists inadequate knowledge of the management of traumatic dental injuries (TDI) among medical professionals who must be knowledgeable and have the appropriate resources needed to triage or treat patients presenting with TDI. *Aim*: The aims of this study were to (i) evaluate the resources of Massachusetts emergency departments (MEDs) for TDI, (ii) determine the knowledge of management of TDI among MED physicians, and (iii) investigate potential factors that affect their knowledge. *Materials and methods*: Surveys were mailed to MED directors and their physicians. The director survey contained questions regarding institutional information for each emergency department (ED). The physician survey contained questions about physician characteristics and tested their knowledge of managing dental trauma. *Results*: A total of 72 surveys (16 MED directors and 56 physicians) were returned and included in the analysis. Only 50% of the MEDs had on-site dental coverage, 43.8% had 24-h off-site dental coverage, and none had a formal written dental trauma protocol. MED physician's knowledge of the appropriate management of luxations and avulsions was generally good, but poor for dental fractures. The MED physician's knowledge for the emergent nature of the various injuries was generally good with that of avulsions being the best. Physicians were more likely to have a better knowledge of managing dental trauma if they were specialists in pediatric emergency medicine ($P = 0.001$) or their hospitals had an academic affiliation ($P = 0.05$). *Conclusions*: Based on the findings from this study, educational campaigns must be undertaken to improve both the resources available to the ED, and the knowledge of physicians regarding emergency management of TDI. In addition, efforts should be made by local dental organizations to provide ED with lists of dentists who are knowledgeable and willing to be available 24 h day^{-1} to consult with and, if necessary, treat TDI. These efforts would enhance the long-term outcomes for patients sustaining dental trauma who present to hospital ED.

Key words: traumatic; dental injuries; physicians; emergency departments

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It is well documented that hospital emergency departments (ED) are confronted with triaging and managing dental emergencies of both traumatic (1–25) and non-traumatic (1–3, 8, 12, 13, 15, 18, 24, 26–37) in origin. In fact, it has been reported that up to 66% of all ED visits for dental issues are for the management of traumatic dental injuries (TDI) (21). In addition, the number of ED visits for pediatric dental care has been increasing in the last two decades (12, 15, 24, 25, 33, 36). Excellent comprehensive reviews and discussion of published studies investigating the knowledge and management of TDI among both lay and medical professionals have been published in 2009 by Glendor (38) and more recently in 2011 by Skapetis et al. (39).

During the time that private dental practices are actively delivering patient care, the parents of the children who sustain TDI generally seek care from their dentist if they in fact have a dental home. Those without dental homes usually seek advice from their children's physician. The physicians in turn often refer the family to ED of local hospitals or major medical centers that are generally further away from the family's home. Parents often go directly to hospital ED for first aid without consulting their physicians. During non-patient care hours such as evenings or weekends, those families with dental homes who seek care for dental injuries are often treated in ED, as many practitioners do not have emergency coverage during these 'off-hour' times.

It has been our impression at the Children's Hospital Boston that many of the children who seek treatment at our institution for injuries to their primary, mixed, or permanent dentitions might have been more promptly treated if appropriate treatment could be rendered locally. The Children's Hospital Boston is a major pediatric medical center in urban Boston serving a wide geographic area in New England. Many of the children who are ultimately treated by the hospital's resident and staff pediatric dentists have traveled a long distance. Also, many of the parents relate time delays in obtaining care owing to difficulty finding medical or dental practitioners willing to evaluate and treat the dental injury especially during off-hours. This often results in needless and time-consuming visits to numerous medical facilities before willing and competent healthcare providers are identified to treat the dental injury. Not all ED have dental professionals on staff and therefore rely on the expertise of the medical staff to provide appropriate evaluation, treatment, or triage. Glendor et al. report that transport time takes up to 30% of the total time spent on injuries to permanent teeth and 36% for injuries to primary teeth. In addition, they showed that a strong predictor of transport time was access to a dental clinic near the place of residency (40).

It has been well documented that the prognosis for traumatized teeth depends largely on both timely and appropriate emergency management (41). Fractures of teeth affecting the pulp, luxation injuries, and especially avulsions require prompt evaluation and treatment to obtain the best possible outcomes. Delays in treatment may result in poorer prognoses of the child's tooth/teeth that have sustained these time-sensitive dental injuries. It is essential that dental homes, medical homes, and ED of local hospitals have the appropriate knowledge to evaluate and treat dental trauma.

The literature suggests that there exists inadequate knowledge of the management of TDI among education (42–52), medical (51, 53–59), and even dental professionals (51, 54, 60–63). Medical personnel, especially those staffing hospital ED, must be knowledgeable and have the appropriate resources needed to treat and, if necessary, triage patients presenting with TDI.

The aims of this study were to (i) evaluate the resources of Massachusetts emergency departments (MEDs) for managing TDI, (ii) determine the knowledge of management of TDI among MED physicians, and (iii) investigate potential factors that affect their knowledge.

Materials and methods

A list of MEDs and their directors were obtained from the Massachusetts College of Emergency Physicians. A total of 74 hospitals with associated ED directors were included in this study. An estimation of the number of physicians working in each emergency department was made using information available on the Web site for the Commonwealth of Massachusetts Board of Registration in Medicine (www.mass.gov). A total of 574 surveys were sent to the hospitals: 74 to ED directors and 500 to ED physicians with a modest but realistic goal of a 40% response rate. The survey along with a cover letting explaining the purpose of the study was sent to each of the physicians. Return of the survey implied consent to participate in the study. The study was approved by the Children's Hospital, Boston Committee on Clinical Investigation (IRB approval X08-10-0496).

The director survey was designed to gather institutional data, obtain consent for participation in the study, and provide instructions for distribution of the physician surveys to the physicians working in their ED. The physician survey was designed to assess the characteristics of individual physicians and investigate their knowledge of managing TDI. The multiple-choice or yes/no questions included sixteen paired questions (one for primary teeth and one for permanent teeth) regarding proper treatment for uncomplicated crown fractures, complicated crown fractures, luxations, and avulsions, as well as the emergent nature of each of these injuries. The guidelines for managing TDI as published at that time by the International Association of Dental Traumatology (IADT) (64) were used to determine the correct choice for each trauma question in the survey. Attending and resident dentists at Children's Hospital Boston completed the physician's trauma questions, and their answers served as validation of correct answers.

The surveys were precoded and programmed into an IBM SPSS (Armonk, NY, USA) data entry builder database with built-in range checks. The responses from the returned surveys were entered into the database, which could be read into SAS directly. A logistic regression analysis using eight repeated measures per respondent (SAS version 9.3; Proc Genmod Cary, NY, USA) was used to test for effects of tooth type (two levels: primary vs permanent) and type of TDI (four levels: uncomplicated fracture, complicated fracture, luxation, avulsion) on response (correct vs incorrect) to questions about the proper management of TDI. A 'tooth type × type of TDI interaction term' was included to allow estimates of the effect of tooth type to vary by type of TDI. A similar logistic model was also used to test for effects of tooth type and type of TDI on response (correct vs incorrect) to questions about whether the trauma was of an emergent nature. Again, a tooth type × type of TDI interaction term was included to allow estimates for the effect of tooth type to vary by type of TDI.

Results

A total of 72 surveys were returned and had sufficient data to be included in the data analysis: 22% (16/74) of the ED directors' surveys and 12% (56/500) of the ED physicians' surveys. The mean years in operation for MED was 52.5 years (range 2–119), and the mean number of annual ED visits was 46 812 (range 13 000–100 000). Of these ED visits, a mean of 22.2% was reported to be pediatric (range 5.9–94.1%). The MEDs were staffed mostly with attending physicians with a mean of 14.4 full-time employees per department. The MEDs are also staffed to a lesser degree by full-time

fellows, residents, and miscellaneous employees. On average, the MEDs were staffed by 34.4 full-time physicians (SD 74; median 15; range 7–300). The majority (63%, 10/16) of hospitals had academic affiliations.

Fifty percent (8/16) of surveyed MEDs reported the availability of on-site dental consultation. Of those with on-site dental consultation, the types of consultants available were oral and maxillofacial surgeons (62.5%, 5/8), general dentists (50%, 4/8), and pediatric dentists (12.5%, 1/8). A dental consultation from an off-site dentist was available 24 h day^{-1} at 43.8% (7/16) of the hospitals. None of responding ED had a formal written TDI protocol. Referral lists for the management of TDI were available in varying degrees, with 68.8% (11/16) of the MEDs having referral lists for general dentists followed by 56.2% (9/16) for oral and maxillofacial surgeons, 37.5% (6/16) for other hospitals, and 12.5% (2/16) pediatric dentists.

Of the physicians who returned surveys, 91.1% (51/56) were senior staff attendings. Eighty percent (45/56) of the physicians were certified in emergency medicine, with the others in pediatric emergency medicine (12.5%, 7/56) and internal medicine (7.1%, 4/56). Almost half of the physicians fell into the age range of 30–39 years (46.4%, 26/56), and 44.7% (25/56) had 10 years or less of medical experience. Most physicians (80.4%, 45/56) reported receiving formal training in TDI most often during their residency (48.2%, 27/56).

Table 1 contains the percentage of physicians' correct responses to each of the sixteen TDI questions. These are segregated and graphically depicted in Figs 1and 2. Knowledge of the appropriate treatment for dental fractures, both uncomplicated and complicated, was poor as indicated by their correct response rates at 55.4% or below. There were higher correct response rates for the management of luxations and avulsions, which ranged between 61% and 89%. Figure 1 illustrates the correct responses concerning management of TDI as a function of the type of injury (uncomplicated fracture, complicated fracture, luxation and avulsion) and by tooth type (primary vs permanent). Luxation and avulsion questions were answered correctly more often than questions concerning fractures ($P < 0.001$). For luxation injuries and uncomplicated fractures, questions about permanent teeth were more often answered correctly than were questions for those injuries to primary teeth ($P < 0.001$). There were no primary/permanent tooth differences in the proportion of correct responses about the management of avulsion and complicated fracture.

Figure 2 illustrates the percent of correct responses concerning whether or not one of the four types of

Table 1. Percent of physicians' correct response to each dental trauma question ($N = 56$)

	Management		Emergent nature	
Dentition	Primary	Permanent	Primary	Permanent
Uncomplicated fractures	17.9	55.4	96.4	75.0
Complicated fractures	39.3	48.2	57.1	94.6
Luxations	60.7	87.5	73.2	58.9
Avulsions	89.3	82.1	85.7	94.6

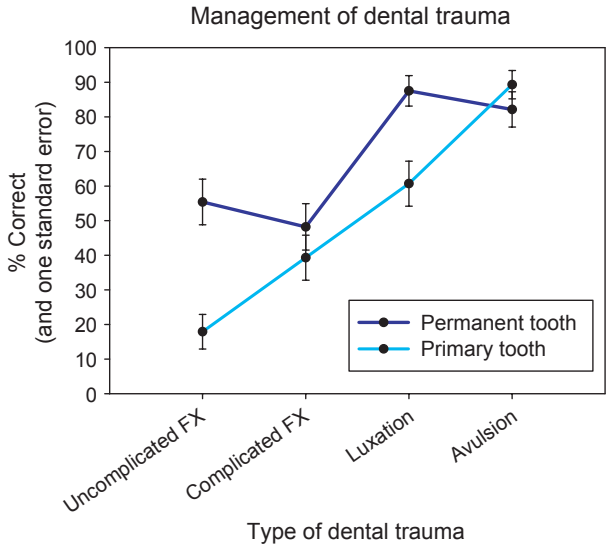

Fig. 1. Percent correct responses to questions concerning the management of each dental injury by tooth type.

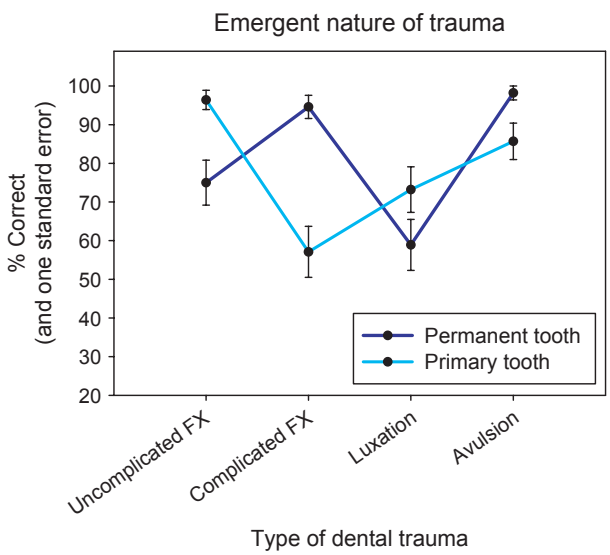

Fig. 2. Percent correct responses to questions concerning the emergent nature of each dental injury by tooth type.

TDI was of an emergent nature as a function of the type of injury (uncomplicated fracture, complicated fracture, luxation and avulsion) and by tooth type (primary vs permanent). Questions about whether avulsion was of emergent nature was answered correctly more often than questions about luxation ($P < 0.001$). Questions about complicated fractures were more likely to be answered correctly for permanent than for primary teeth ($P < 0.001$). However, for uncomplicated fractures, the question regarding whether the injury was of an emergent nature was more often answered correctly for primary than for permanent teeth ($P < 0.005$).

Table 2 contains the analyses of the association between various MED physician characteristics and their knowledge of TDI as measured by the mean

Table 2. Analyses of the association between the various MED physician characteristics and their knowledge of management of dental trauma as measured by the mean number of correct responses to 17 survey questions ($N = 56$ physicians)

Physician/Institution characteristic	% of physicians	Mean # correct of 17 survey questions	*P* value
Professional level			
Attending	91.1	11.8	0.98
Other	8.9	11.8	
Age			
20-39	48.2	11.8	NS
40-49	25.0	11.2	
50-69	26.8	12.4	
Years of experience			
0–5	14.3	11.6	NS
6–10	30.4	11.8	
11–15	16.1	11.6	
16–20	17.9	11.6	
21+	21.5	12.4	
Medical specialty			
Emergency medicine	80.4	11.5	**0.004**
Pediatric emergency medicine	12.5	13.9	
Internal medicine	7.14	11.8	
Academic affiliation			
Yes	66.0	12.1	NS
No	33.9	11.4	
Formal dental training			
Yes	80.4	12.0	0.38
No	19.6	11.3	
Institutional academic affiliation			
Yes	73.1	12.4	**0.05**
No	26.9	10.6	
On-site dental consultation			
Yes	53.9	12.1	0.70
No	46.2	11.8	
Off-site dental consultation			
Yes	42.3	11.3	0.16
No	57.7	12.4	

P values in bold ≤ 0.05.

number of correct responses to the study questions. There were no statistically significant associations between the MED physicians' professional level, age, or years of experience, and their knowledge of managing TDI. However, MED physicians who were specialists in pediatric emergency medicine were more likely to answer questions correctly when compared to both emergency medicine physicians ($P = 0.001$) and internal medicine physicians ($P = 0.05$). Physicians having an academic appointment and having had formal dental training did not have a statistically significant effect on TDI knowledge. However, when the institution as a whole was considered, physicians at hospitals with academic affiliation scored significantly better than those at non-affiliated hospitals ($P = 0.05$). The presence of on-site and off-site dental consultation did not significantly influence the physicians' knowledge of TDI.

Discussion

The first aim of this study was to evaluate the resources of MEDs for managing TDI. Responses of 16 of the 72 MEDs to the survey suggest that these responding MEDs had inadequate resources to allow for timely and appropriate management to TDI injuries. Similar to the 48% (11/23) of Israeli hospitals with in-house dental services as reported by Holan and Shmueli (53), half of the current study's MEDs also had on-site dental consultations. These evaluations were primarily available from oral/maxillofacial surgeons and general dentists, and only a small minority of the MEDs had any pediatric dentists available on-site. While oral/maxillofacial surgeons are well trained in major facial trauma, their ability to manage specific and more minor injuries to individual teeth is often limited. Similarly, general dentists may not be aware of the most up-to-date care based on the current IADT guidelines (65–67).

Less than half of the MEDs had off-site dental consultations available 24 h day^{-1}. Referral lists to outside dentists were not available in many of the MEDs, and none had a formal written protocol available within their departments. In contrast, Holan and Shmueli reported that 22% (5/23) of the Israeli hospitals they surveyed had written protocols (56). Absence of guidelines can be a significant problem for the MEDs and the patients they serve. It is not uncommon for victims of orofacial trauma to require a hospital ED setting rather than medical or dental outpatient office for treatment. Reasons can include (i) emergency dental insurance coverage, (ii) uncontrolled or complex medical problems, (iii) behavioral management issues requiring sedation, and/or (iv) concomitant serious maxillofacial trauma.

The second aim of this study was to determine the knowledge of management of traumatic dental injuries among MED physicians. Numerous studies have reported on physicians' knowledge of either TDI in general or specifically of the management of avulsions (51, 53–59). All of these studies reveal that physicians have inadequate understanding of how to provide appropriate first aid when confronted with TDI. The first study investigating this issue was published by Holan and Shmueli in 2003, who reported on the knowledge of the management of avulsions among 335 Israeli emergency department physicians in 23 hospitals (53). Fifty-five percent of the physicians reported never receiving information regarding TDI. Fifty percent of the physicians believed an avulsed tooth should never be replanted, and only 4% would render treatment that could save an avulsed tooth. They found that the knowledge of management of avulsed teeth was significantly related to being married to a dentist, but not correlated with specialty in medicine, years of experience, previous training in TDI, or gender.

In 2006, Lin et al. questioned 24 Israeli military physicians regarding TDI (55). Only 6% of physicians had received education regarding TDI. Overall, their responses to the questions indicated that they had poor knowledge regarding diagnosis of and treatment for TDI in spite of the fact that they had a high rate of experiencing or witnessing such events.

In 2007, Abu-Dawoud et al. sent a questionnaire regarding avulsions to 30 physicians primarily

practicing in Kuwait (54). Almost all (93%) of the physicians reported that the 'first-aid' course they had taken did not cover management of TDI. The majority of the physicians (83%) reported that they did not receive any information on what to do if a tooth were avulsed. In addition, 97% of the physicians did not have any dental health education course during their study. Seventy-three percent of the responding physicians had some TDI knowledge, while 27% were low and none rated as high.

In 2009, three separate studies reported on physicians' knowledge of TDI. Subhashraj reported on the responses of 200 physicians from medical colleges or advance training programs in India to a 10-item questionnaire regarding avulsions (57). Only 5.5% knew about reimplantation of avulsed teeth, and 90% accepted that they had no knowledge of TDI management. Qazi and Nasir reported on the results of one open-ended question regarding the first-aid management of avulsions to 35 Pakistani physicians and other professional and non-professional individuals (51). Only 3% of the physicians suggested immediate reimplantation as the treatment of choice. Diaz et al. interviewed 82 medical personnel including 26 physicians in hospital emergency rooms in Chile using a questionnaire regarding TDI (56). Ninety percent had not received formal training, and they concluded that the overall TDI knowledge was relatively poor.

In 2011, Trivedy et al. reported on their survey of emergency department physicians in the United Kingdom (59). They found that the majority (88%) of these physicians did not receive any formal training in TDI, and they were not confident in managing dentofacial emergencies. In the same year, Ulusoy et al. reported on the results of a 15-item questionnaire regarding avulsions administered to physicians in 11 hospitals in Turkey (58). Forty-one percent of the respondents assessed their knowledge as insufficient, and the majority (78%) stated that they would like further education.

Unlike most of the previously cited studies, which primarily queried physicians about avulsions, our study queried them specifically about both the management and emergent nature of four types of TDI – uncomplicated fractures, complicated fractures, luxations, and avulsions. The knowledge of the MED physicians managing TDI as demonstrated by their responses to these questions varied depending on the type of injury and type of tooth (primary or permanent) and was often found to be inadequate. Their knowledge of the appropriate treatment for dental fractures, both uncomplicated and complicated, was poor, while their responses to the luxation and avulsions was generally good, especially for avulsions. Clearly, management of dental avulsions is the most time-sensitive TDI injury, and those physicians responding correctly must have learned about reimplantation either formally or informally through the lay media or colleagues. Knowledge of the management of trauma to permanent teeth was better than that of primary teeth. It is possible that their medical training and experience may have emphasized the management of TDI to permanent teeth and more severe injuries such as avulsions.

We found that the MED physicians' knowledge for the emergent nature of the various injuries was variable for both primary and permanent teeth. Knowledge of the emergent nature of avulsions was the highest. However, the emergent nature of managing complicated fractures to the permanent teeth was more often answered correctly than for the same injury to the primary teeth. Conversely, when queried about the emergent nature of managing uncomplicated fractures, the MED physicians more often answered the questions correctly for the primary teeth than for the permanent teeth. The MED physician's understanding of how emergent the various types of fractures are and how they may differ between primary and permanent teeth is lacking.

The third and final goal of this study was to identify whether any physician characteristics affected their knowledge of TDI. We found that their knowledge was affected significantly by specialty training and site of practice. Specialists in pediatric emergency medicine were found to have significantly better knowledge of managing TDI when compared to physicians certified in general emergency medicine or internal medicine. This is likely due to the fact that children more often sustain dental injuries than adults given their learning process of ambulation, their level of curiosity beyond the level of understanding danger, and their lack of full-time supervision. Thus, exposure to TDI for healthcare providers for children may be associated with increased knowledge. Additionally, physicians who work at hospitals with academic affiliation were more likely to have a better knowledge of managing many types of TDI. This may be due to the fact that this association encourages more seminars and training.

In the studies cited previously, appropriate knowledge of avulsion management ranged from a low of 3% (51) to a high of 50% (53). The poor TDI knowledge base of physicians may be due to the fact that not all traumatic dental injuries require treatment and that these injuries are not life-threatening. In comparison, the physicians in our study had excellent knowledge of both the management and the emergent nature of both primary and permanent avulsions, with correct responses ranging between 82 and 95%. This is likely due to the fact that 80% of our responding physicians reported receiving formal training in managing TDI and 93% were certified in emergency medicine. This is a high percent having formal training when compared to the previous studies (51, 53–59), which ranged from a low of 6% (58) to a high of 12% (59). Physicians who specifically work in emergency treatment facilities, especially those certified in that field, are more likely exposed to and trained in managing TDI, especially avulsions. Perhaps the reports published over the last decade indicating the lack of adequate physician's knowledge of TDI have resulted in more recent training programs of TDI.

The management of TDI is not generally included in medical texts or first-aid manuals. In 2007, Zadik evaluated TDI guidelines present in first-aid textbooks and manuals (68). Of the nine texts examined, only one

contained comprehensive and accurate information needed for managing oral trauma and dental emergencies. Similarly, Emerich and Gazda reviewed the recommendations for the management of dental trauma presented in first-aid textbooks and manuals published between 1969 and 2007 (69). Their literature review found that among 45 first-aid textbooks and manuals, only 19 mention procedures for use in case of TDI. Of those texts, only 13 detail the storage media for an avulsed tooth until replantation. They also conclude that the guidance on procedures contained in the reviewed texts was misleading.

Resources outlining guidelines for the management of TDI are readily available to both the medical and dental communities. In 2012, the IADT updated their guidelines for the management of fractures and luxations of permanent teeth, avulsion of permanent teeth, and primary teeth trauma (65–67). Online resources such as the Dental Trauma Guide, which is sponsored by multiple dental organizations, are also readily available to both the public and healthcare professionals (www.dentaltraumaguide.org) (70).

Our study had several significant limitations. The physicians who responded to trauma questions were primarily attending physicians certified in emergency medicine, which is not representative of all physicians. These emergency-based physicians are likely to have better knowledge of issues relating to TDI. Also, it is important to note that a bias probably exists given the disappointingly low response rate of 22% for the institutional directors and 12% for the physicians. As the respondents were promised anonymity, follow-up phone calls or mailings were not feasible and would probably have not resulted in reaching our goal of a 40% response rate. The low response rate also should be taken into consideration when comparing our results with those of other studies of physicians. It is likely that the institution directors were not motivated to distribute the questionnaires to their staff resulting in an even lower physician response rate. Both of these response rates are low when compared to the 54% mean physicians' response rate to mailed surveys as reported by Asch et al. (71). This may have been due to a subject that was not of interest or important to the recipients of the surveys. A larger sample size would have resulted in less bias, and more findings may have reached nominal statistical significance. Hovland et al. reported that non-response bias to mail survey questionnaires within a professional population becomes an issue when response rates are below 43% (72), as clearly was the case in our study.

The completion of this study's survey was unsupervised, and supplementary material may have been used that would result in an artificially higher correct response rate. This methodology was similar to the other physician surveys previously sited except for Ulusoy (61), who directly supervised survey completions. As this was a voluntary self-reporting study, the results may be biased and those who had more interest and/or were more knowledgeable were probably more likely to respond. Therefore, the results of the dentist's knowledge of TDI reported here may be an overestimate, that is, 'a best-case scenario'.

It is difficult and unwise to make specific comparison and conclusions of our results to those of similar studies previously cited, given the limitations of the current study. In addition, all these studies had varied populations, differing years of inquiry and number and type of responders, and vastly different methodologies. However, one can draw the general conclusion that our physician respondents had better overall knowledge of TDI management and specifically for avulsions than previous surveys.

ED physicians are often the first to provide emergency treatment for TDI. Many of these cases can be handled by the MED physician. Unfortunately, this study shows that although many physicians indicate that they have received TDI training, their overall knowledge level is inadequate in many situations. Furthermore, not one MED had a formal written TDI protocol.

Individuals with TDI who seek care in ED deserve the best treatment possible. This is especially important considering that pediatric emergency visits for dental care are on the rise (12, 15, 24, 25, 36, 39). Based on the findings from this study and others, we recommend that educational campaigns be undertaken at least in Massachusetts, if not throughout all medical schools and hospitals worldwide, to improve both the resources available to the ED and the knowledge of physicians regarding emergency management of TDI. Curriculum on emergency dental care must, at minimum, include material on the management of the more serious and urgent types of TDI such as avulsions. ED should have available current formally written TDI protocols and online resources such as the current IADT guidelines (68–70) (www.iadt-dentaltrauma.org) and the Dental Trauma Guide (www.DentalTraumaGuide.org) (71). In addition, efforts by local dental organizations should provide ED with lists of dentists who are knowledgeable and willing to be available 24 h day^{-1} to consult with and, if necessary, provide timely management to the individuals sustaining TDI. These efforts would enhance the long-term outcomes for patient sustaining dental trauma who present to hospital ED.

Conclusions

Based on the findings from this study, educational campaigns must be undertaken to improve both the resources available to the ED and the knowledge of physicians regarding emergency management of TDI. In addition, efforts should be made by local dental organizations to provide ED with lists of dentists who are knowledgeable and willing to be available 24 h day^{-1} to consult with and, if necessary, treat TDI. These efforts would enhance the long-term outcomes for patients sustaining dental trauma who present to hospital ED.

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