

How Effective is a Dental Workshop at Improving the Knowledge and Confidence of Medical Students in the Management of Dental Emergencies?

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ABSTRACT: The purpose of this study was to evaluate the effect of a three-hour hands-on workshop for medical students and residents on their pre- and postcourse knowledge and confidence in managing dental emergencies. A 1-hour lecture followed by four 20-minute “hands-on” skill stations on dental mannequins was administered to a group of 30 medical students and residents. Pre- and postworkshop questionnaire surveys were conducted. There was a significant increase in the percent of attendees who responded correctly to three of the four knowledge questions following the workshop (P -value < 0.005). Confidence, as expressed in various statements, about treating dental emergencies was significantly improved after the lecture for eight of the nine statements. These findings indicate that dental knowledge is generally not provided during medical training. Our interactive workshop appeared to be effective in increasing this knowledge and self-reported confidence in handling dental emergencies. These findings clearly indicate the need for additional dental education during medical school. The use of a hands-on workshop may be one model for achieving this goal.

KEYWORDS: dental emergencies, dental education, medical education, workshop-based learning

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Introduction

Millions of people participate in wilderness activities every year.¹ These activities range from wildlife photography to alpine expeditions. Many times, these expeditionary settings are fraught with danger and injury. Dental emergencies are among the most common that may require evacuation.² Dental emergencies also make up approximately 1% of all emergency room (ED) visits in the United States.³ These emergent dental situations are typically managed by physicians and first responders. However, physicians and medical students report rarely having had any education in this area.^{4–7} The purpose of this study was to evaluate the effect of a three-hour hands-on course for medical students and residents on their pre- and postcourse knowledge and confidence in managing dental emergencies. The study protocol was reviewed by the Virginia Commonwealth University Institutional Review Board, and found to be exempt from the requirement of obtaining full IRB approval. Participants gave their written, informed consent to take part in this research.

Subjects and Methods

A total of 30 practitioners participated in the program. The majority were fourth-year medical students ($n = 25$, 83%),

but there was also a third-year dental student and four residents from various specialties (family medicine, anesthesia, radiology). The participants were all attending an elective wilderness medicine course, sponsored by the Wilderness Medical Society, designed to expand their skills in managing emergencies in an austere environment.

The first hour of the course was a didactic lecture that briefly covered dental anatomy, innervations of the jaws, oral infections, dental trauma, administration of local anesthesia, and recognition and treatment of emergent conditions, as well as management of soft tissue lacerations (Table 1). After the lecture, the group was asked to split up into four equal-sized groups for the workshop-based portion of the course.

The “hands on”, or workshop portion of the course, was interactive and employed four stations with a five-minute demonstration of the skill by an instructor followed by 15 minutes for the participants to perform the skills and ask questions. These procedures were performed under instructor supervision on dental mannequins with instrumentation provided by the instructors (Fig. 1). The stations included: (1) head and neck examination and local anesthesia, (2) recementation of crowns and temporary dental fillings, (3) managing dental trauma and

**Table 1.** Didactic and interactive course content.

TOPICS	LECTURE	INTERACTIVE WORKSHOP
Oral and extraoral exam	Yes	Yes
Dental anatomy	Yes	Yes
Dental nomenclature	No	Yes
Inervation of teeth	Yes	No
Trauma to teeth	Yes	Yes
Management of avulsed teeth	Yes	Yes
Soft tissue trauma	Yes	No
Dentaoalveolar trauma	Yes	Yes
Dental and oral infections	Yes	No
Provisional restorative management	No	Yes
Principles and delivery of local anesthesia	Yes	Yes

tooth splinting, and (4) intraoral incision and drainage of an infection and dental extractions (Table 1). The local anesthesia station included instruction on maxillary local infiltration and mandibular nerve blocks. Mannequins with missing fillings and dislodged crowns were used for second station. Participants practiced recementing the crowns and placing temporary filling materials into the teeth. The dental trauma station included examples of luxated and avulsed teeth, and repositioning and suture stabilization were demonstrated and performed by all of the participants. The intraoral incision and drainage station included examples of both maxillary and mandibular vestibular abscesses and how to perform proper drainage. At the end of the workshop, participants were given time to return to any of the stations to review the material and ask any additional questions.

Attendees were given an identical questionnaire prior to the initial lecture and after completion of the workshop

**Figure 1.** A student and instructor performing procedures at the dental extraction station.

to determine the effect of the course on their knowledge of the various topics and their confidence in managing these emergencies (see Appendix for survey). The questionnaire was developed by the authors and reviewed by three other dental faculties with the goal of asking basic questions regarding dental knowledge that they would expect any dental student to know.

Statistical Methods

To test for increase in knowledge, McNemar's chi-squared test was used to compare the percent responding correctly at each time point. Bowker's test of symmetry was used to test for differences in the distribution of confidence in treating dental emergencies.⁸ A 0.05 level of significance and SAS EG v6.1 were used for all analyses.⁹

Results

Over 75% of attendees reported having one to two hours or less of lectures on oral anatomy and health ($n = 23$, 76%), and no hours on dental emergencies ($n = 23$, 77%). Following the completion of the course, there was a significant increase in the percent of lecture attendees who responded correctly to three of the four knowledge questions (P -value < 0.005 ; Table 2). The only question that did not result in a statistically significant increase in the percent of correct answers was in regard to the portion of the tooth where the nerve resides (P -value = 0.1573). This question yielded a high percent responding correctly at baseline (93%), and the answer was 100% correct at follow-up. Full results are given in Table 2.

Confidence in treating dental emergencies was significantly increased after the course for eight of the nine statements (Table 3, Fig. 2). The one area in which the participants' confidence did not increase significantly was in knowing how to manage a localized dental infection and being comfortable in draining it if necessary, although this statement did show a trend toward improvement (P -value = 0.0609).

Discussion

Wilderness medicine, by definition, refers to providing care to patients in an environment that is more than one hour away from definitive medical care.¹⁰ Dental emergencies are common occurrences in remote locations and frequently present to medical providers in the absence of a dentist.^{2,3,10} In a wilderness setting, it is critical that a provider can assess, diagnose, and manage care in an environment, where resources such as medical equipment and other supportive structures are absent. A recent survey by the American Dental Association of ED physicians in tertiary health-care settings showed that these providers were generally dissatisfied with the referral process to dentists and felt there was a disconnection between their ability to provide oral health care and general health care.¹¹ Such medical providers should be familiar with a diverse range of medical conditions including diagnoses and management of dental infections and traumatic injuries.

**Table 2.** Percent of attendees responding correctly to knowledge questions.

QUESTION:	% RESPONDING CORRECTLY		P-VALUE*
	PRE	POST	
How many adult teeth does the average person have?	57%	100%	0.0003
If a tooth gets knocked out, what is the best course of action?	50%	87%	0.0009
What nerve supplies sensation to the lower teeth?	47%	80%	0.0016
In which portion of the tooth does the nerve reside?	93%	100%	0.1573

Note: *McNemar's chi-squared test for agreement.

However, these topics are not covered in the current medical school curriculum, and many ED physicians do not feel comfortable managing common dentofacial emergencies.¹²

Our findings on previous exposure to lectures on oral anatomy, oral health, and management of dental emergencies confirm that dental education is minimal during undergraduate and graduate medical training. The results of this

study are consistent with self-reports as well as previously published findings.^{6,12-14} It is of interest that internationally some countries report greater proficiency among medical doctors in treating dental emergencies than reports from USA and Australia.¹⁵

Some of our findings relied on self-reported knowledge, while other objective measures of existing knowledge were

Table 3. Distribution of confidence before and after lecture.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	P-VALUE*
Q1: I can confidently describe a dental emergency to a dentist						
Pre	23%	47%	17%	17%	0%	0.0037†
Post	0%	0%	17%	76%	7%	
Q2: I feel comfortable assessing the urgency of a dental emergency						
Pre	20%	50%	27%	3%	0%	0.0037†
Post	0%	3%	34%	52%	10%	
Q3: I can provide adequate local anesthesia within the mouth						
Pre	30%	27%	23%	20%	0%	0.0107†
Post	0%	3%	24%	62%	10%	
Q4: I know how to control intraoral bleeding						
Pre	7%	53%	23%	17%	0%	0.0120†
Post	0%	0%	24%	66%	10%	
Q5: I feel comfortable suturing lacerations within the mouth						
Pre	23%	43%	23%	10%	0%	0.0151†
Post	0%	14%	41%	45%	0%	
Q6: I know how to manage a displaced adult tooth						
Pre	10%	43%	20%	23%	3%	0.0151†
Post	0%	0%	3%	79%	17%	
Q7: I know how to manage a displaced baby tooth						
Pre	13%	33%	27%	13%	13%	0.0107†
Post	0%	3%	10%	52%	34%	
Q8: I know how to manage a localized dental infection and would feel comfortable draining one if necessary						
Pre	23%	37%	23%	17%	0%	0.0609
Post	0%	11%	29%	57%	4%	
Q9: I know the different types of dental trauma and would feel comfortable managing dental trauma on an emergency basis						
Pre	23%	67%	10%	0%	0%	0.0026†
Post	0%	7%	31%	59%	3%	

Notes: *P-value from Bowker's test of symmetry between Pre/Post response; †statistically significant ($P < 0.05$) change in confidence between Pre/Post evaluations.

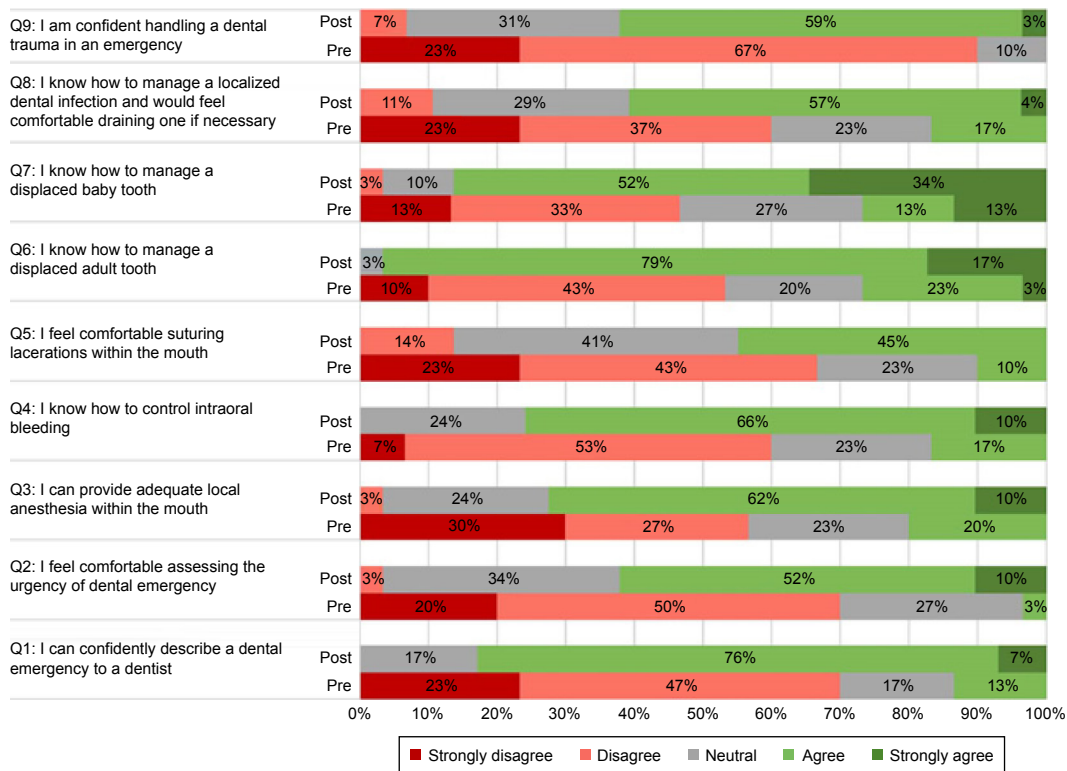


Figure 2. Summary of responses to each question for both the pre and post intervention.

evaluated through targeted questions on dental topics. It was interesting to discover that many of the medical students and doctors (43%) were unfamiliar with the number of teeth in an adult or pediatric patient and have not been taught the numbering systems used for identifying teeth. Identifying and assessing a dental emergency is only the first step in the wilderness environment. Relaying the information from the time of emergency to the next provider can be difficult when the referring provider lacks knowledge in nomenclature and the regionally used tooth numbering system. Following the workshop, participants' confidence levels and knowledge significantly improved.

Having a solid knowledge of dental nomenclature and normal anatomy can facilitate appropriate diagnosis and treatment for onsite emergent situations. This is particularly true for infections or traumatic displacement of teeth, where prognosis and outcome largely depend on appropriate early intervention. Participants in our workshop noted that they were interested in further expanding their skills because they felt that even when provided with dental emergency equipment, they lacked the knowledge and experience of its use.

Most participants were also unfamiliar with techniques to deliver local anesthesia to different regions in the oral cavity, making treatment in the presence of pain impossible. Participants significantly improved their knowledge of innervation of teeth and oral tissues as well as local anesthetic techniques following the interactive workshop.

Following the workshop, there was a shift in self-reported confidence on how to handle tooth trauma and delivery of

local anesthesia, as well as assessing the urgency of a dental emergency.

Interestingly, confidence in laceration management, which we did not teach in simulation, also increased following the workshop.

It is important that didactically obtained knowledge is translated into "hands-on" skills to increase retention and applicability of this information. We were able to accomplish this by the interactive workshop with simulations incorporated into the course. Hands-on and simulation training in the education of health professionals is associated with large effects for outcomes of knowledge and skills.¹⁶

There were several limitations to the current study. Ideally, there should have been more time allocated to the didactic aspect of the course. Also, a further follow-up at a longer interval to measure retention of the information would be of interest. The study included four residents and one dental student, which may have slightly skewed the findings due to different experiences and knowledge bases. However, despite these limitations, it is clear, based on the findings, that there is a need for additional dental education during medical school, especially in oral anatomy, dental nomenclature, dental anesthesia, and managing common dental emergencies.

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Author Contributions

Study concept and design: GRD and JGD. Acquisition of the data: AJ and MB. Analysis of the data: CC. Drafting of the manuscript: JGD and GRD. Critical revision of the manuscript: DL. Approval of the manuscript: GRD. All authors reviewed and approved of the final manuscript.

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Appendix

Survey questions assessing background and dental knowledge of participants. The following questionnaire has two sections. The first is to be completed before today's seminar and the second should be completed after. Your responses will be kept anonymous. There is no benefit for participating and you can stop at any time.

Thank you!

Age: _____

Gender: Male _____ Female _____

Medical Field:

Family Medicine _____

Emergency Medicine _____

EMT _____

Medical Student _____

Dental Student _____

None of the above _____

If you selected "None of the above," please describe your role: _____

How many hours of lectures have you previously received on oral anatomy and oral health?

None

1-2

3-4

>4 hours

How many hours of lectures have you received on dental emergencies?

None

1-2

3-4

>4 hours

How many adult teeth does the average person have?

20

24

26

32

If a tooth gets knocked out, what is the best course of action?

Rinse it and put it back in _____

Scrub it with a tooth brush to clean it and put it back in _____

Soak it in water and have the patient take it to a dentist as soon as possible _____

Soak it in peroxide and have the patient take it to a dentist as soon as possible _____

What nerve supplies sensation to the lower teeth?

Mental nerve _____

Inferior alveolar nerve _____

Lingual nerve _____

Facial nerve _____

In which portion of the tooth does the nerve reside?

Enamel _____

Pulp _____

Cementum _____

Please indicate your agreement with the following statements: (Strongly Disagree/Disagree/Neutral/Agree)

I can confidently describe a dental emergency to a dentist _____

I feel comfortable assessing the urgency of a dental emergency _____

I can provide adequate local anesthesia within the mouth _____

I know how to control intraoral bleeding _____

I feel comfortable suturing lacerations within the mouth _____

I know how to manage a displaced adult tooth _____

I know how to manage a displaced baby tooth _____

I know how to manage a localized dental infection and feel comfortable draining one if necessary _____

I know the different types of dental trauma and would feel comfortable managing dental trauma on an emergency basis _____