

### Introduction

Current literature indicates dentists globally lack knowledge regarding local anesthetic dosages with many failing to identify the Maximum Recommended Dosage (MRD) for even their most frequently utilized local anesthetics (Malamed). To optimize patient safety and mitigate the risk of adverse outcomes, it is important that dental providers evaluate their current knowledge and identify areas where “further educational courses are recommended” (Khalil). Despite the access to educational resources, significant uncertainty persists within the profession. This lack of expertise may originate during the foundational dental school education process and suggests a systemic reliance on rote familiarity rather than consistent, objective protocols.

### Hypothesis

Dental providers will be able to accurately demonstrate local anesthetic knowledge.

### Purpose

The purpose of this research was to evaluate the accuracy of dental practitioners’ knowledge of commonly used local anesthetics (within a 20% standard deviation) as demonstrated via a voluntary questionnaire.

### Materials and Methods

Approval was obtained via the Institutional Review Board (Study Protocol 302250-UT). A nine-question survey was completed by dental healthcare providers at the 2025 American Academy of Pediatric Dentistry Annual Conference. A total of 76 participants completed the survey- 36 pediatric dentists, 31 pediatric dental residents, 4 general dentists, 4 dental students, and 1 hygienist. Data was also collected regarding the years of experience (None, 1-5, 6-10, 11-15, 15+). Due to the non-normal distribution of scores and significantly unequal group sizes, a Kruskal-Wallis H test was employed to compare performance across provider groups. Post-hoc analysis was conducted via pairwise comparisons with Bonferroni corrections to identify specific differences between pairs. Finally, a Spearman’s rank-order correlation was utilized to analyze the relationship between clinical experience and total scores.

#### References:

1. Malamed SF. Clinical Actions of specific agents, in Handbook of Local Anesthesia, Malamed SF 7th edition. Elsevier Mosby, St. Louis. 2020, pages 57-83.
2. Malamed SF. Maximum recommended doses of local anesthetics: The Academy of Pediatric Dentistry vs the United States Food and Drug Administration. Unpublished Manuscript.
3. Obiechina AE, Oji C. Evaluation of precautions adopted by dental surgeons using local anesthesia. Odontostomatol Trop 2001; 93:26-28.
4. Khalil H. Local anesthetic drug dosage still a problem for most dentists: a survey of current knowledge and awareness. Saudi J Dent Res 2014; 5(1):49-53

### Results

Provider\_Group ClinicalQuestions Crosstabulation (6)

		Correct Responses <sup>a</sup>						Total	
		mLs Lidcaine	mgs Lidocaine	2.5mL Mepivacaine	2.5mL Articaine	1.7mL Mepivacaine	1.7mL Articaine		
Provider_Group	Pediatric Dentist	Count	24	18	16	18	21	27	36
	% within Provider_Group		66.7%	50.0%	44.4%	50.0%	58.3%	75.0%	
Pediatric Dental Resident	Count	17	17	13	14	16	27	31	
	% within Provider_Group		54.8%	54.8%	41.9%	45.2%	51.6%	87.1%	
General Dentist	Count	0	0	1	0	1	1	4	
	% within Provider_Group		0.0%	0.0%	25.0%	0.0%	25.0%	25.0%	
Dental Student	Count	3	1	1	1	2	2	4	
	% within Provider_Group		75.0%	25.0%	25.0%	25.0%	50.0%	50.0%	
Hygienist	Count	0	0	0	0	0	0	1	
	% within Provider_Group		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
Total		Count	44	36	31	33	40	57	76

#### Local Anesthetic Questionnaire

1) Please circle your profession

- Dentist
- Pediatric Dentist
- Hygienist
- Pediatric Dental Resident
- Dental Student
- Other

2) How many years have you been in practice?

- 1-5 years
- 6-10 years
- 11-15 years
- 15+ years
- None (Resident/Resident)

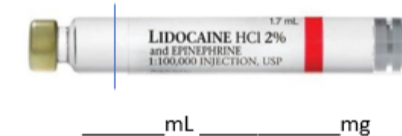
3) Please circle which anesthetic(s) you use in your office:

- Lidocaine
- Septocaine
- Prilocaine
- Mepivacaine
- Bupivacaine

4) What is the maximum amount of local anesthetic you can give an adult patient

- \_\_\_\_\_mg Septocaine
- \_\_\_\_\_mg Lidocaine
- \_\_\_\_\_mg Mepivacaine

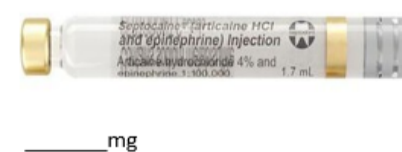
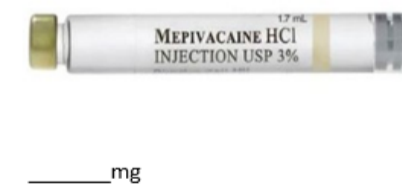
5) Pictured below is a standard carpule of 2% Lidocaine with 1:100,000 epinephrine. If the gray rubber plunger has moved to the blue line, how much anesthetic has been administered (milliliters and milligrams)?



6) How many milligrams of local anesthetic are in following:

- 2.5 mL 3% Mepivacaine \_\_\_\_\_mg
- 2.5 mL 4% Septocaine \_\_\_\_\_mg

7) How many milligrams of local anesthetic are in the following anesthetic cartridges:



### Results

A Kruskal-Wallis H test was conducted to assess differences in total questionnaire scores between: Pediatric Dentists (N=36), Residents (N=31), General Dentists (N=4), Dental Students (N=4), and Hygienists (N=1). The test showed no statistically significant difference between groups,  $\chi^2(4) = 9.34$ ,  $p = .053$ . Pediatric dentists and pediatric dental residents generally outperformed the other groups in the six clinical questions regarding anesthetic doses and volumes but still failed to reach high absolute scores. A question regarding milligrams of Articaine in a standard cartridge showed significant difference in provider group performance, Pediatric Dental Residents (87.1%), Pediatric Dentists (75.0%), General Dentists (25.0%) and Hygienists (0.0%);  $\chi^2=12.086$ ,  $p = .017$ . When asked about milligrams of the same Articaine anesthetic but in an arbitrary 2.5mL volume, accuracy dropped to 50% and below across all provider groups. A Spearman’s rank-order correlation was performed between years of experience and individual score, and results showed that clinical experience was not a predictor of success ( $p = .489$ ).

### Discussion

The disparity in performance across clinical questions suggests that while pediatric residency training provides an advantage in anesthetic knowledge, it does not guarantee universal mastery. The findings suggest that providers adopt a “cartridge-based” way of thinking due to the obvious difference in performance in questions regarding milligrams of anesthetic in a standard 1.7mL cartridge versus the same anesthetic with an arbitrary 2.5mL volume. These findings suggest that providers may rely more on “standard” dosages in a cartridge than on objective calculations necessary to prevent local anesthetic systemic toxicity (LAST). Performance worsened in questions regarding less commonly used anesthetics like Mepivacaine compared to the most commonly used, Lidocaine and Articaine. This suggests that providers may have relied on memory to answer questions instead of objective calculation. Additionally, more clinical experience did not equate to improved performance on the questionnaire. This suggests that there is a fundamental lack of rigorous education on the topic during formal dental education.

### Conclusion

- Professional designation appeared to be a more notable indicator of knowledge levels than years of experience.
- Pediatric-specialized providers still failed to achieve high absolute scores on the six and nine-point assessments.
- These results suggest that existing training in dental school may be lacking in regard to local anesthetic calculation mastery.