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Anxiolysis for laceration repair in children: a survey of pediatric emergency providers in Canada

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ORIGINAL RESEARCH

Anxiolysis for laceration repair in children: a survey of pediatric emergency providers in Canada

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Abstract

Objectives Intranasal dexmedetomidine is a potentially effective anxiolytic but its role in pediatric laceration repair is only emerging. Future trials and clinical adoption of intranasal dexmedetomidine depend on understanding pediatric emergency providers' practice patterns surrounding anxiolysis and perceived barriers to intranasal dexmedetomidine for anxiolysis during suture repair in children. Our objectives were to characterize these parameters to inform future research and facilitate clinical adoption.

Methods We conducted an online survey of pediatric emergency physician members of Pediatric Emergency Research Canada from September to December 2020. Questions pertained to perceptions of anxiolysis for suture repair, with a focus on intranasal dexmedetomidine. The primary outcome was anxiolysis for suture repair. Data were reported using descriptive statistics.

Results The response rate was 155/225 (68.9%). During suture repair, 127/148 (86%) believed that > 25% of young children experience distress requiring physical restraint. 116/148 (78%) would provide anxiolysis, mainly intranasal benzodiazepines (100/148, 68%). Only 6/148 (4%) would provide intranasal dexmedetomidine but 95/148 (64%) would consider it if there was evidence of benefit. The most common perceived barriers to intranasal dexmedetomidine included inadequate personal experience (114/145, 79%) and lack of access (60/145, 41%).

Conclusions Most Canadian pediatric emergency providers believe that laceration repair in a young child is distressing. Despite questionable efficacy, most would provide intranasal benzodiazepines, but would consider intranasal dexmedetomidine if there was evidence of benefit.

Keywords Laceration repair · Anxiolysis · Pediatrics · Procedural distress · Emergency department · Sedation · Dexmedetomidine

Résumé

Objectifs La dexmédétomidine intranasale est un anxiolytique potentiellement efficace mais son rôle dans la réparation des lacérations en pédiatrie n'est qu'émergent. Les futurs essais et l'adoption clinique de la dexmédétomidine intranasale dépendent de la compréhension des habitudes de pratique des urgentistes pédiatriques en matière d'anxiolyse et des obstacles perçus à la dexmédétomidine intranasale pour l'anxiolyse pendant la réparation des sutures chez les enfants. Nos objectifs étaient de caractériser ces paramètres pour éclairer les recherches futures et faciliter l'adoption clinique.

Prior presentations: Society of Academic Emergency Medicine (2021); Canadian Paediatric Society (2021); Pediatric Academic Societies (2021); Canadian Association of Emergency Physicians (2021)

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Méthodes Nous avons mené un sondage en ligne auprès des médecins urgentistes pédiatriques membres de Recherche en urgence pédiatrique Canada (Pediatric Emergency Research Canada) de septembre à décembre 2020. Les questions portaient sur les perceptions de l'anxiolyse pour la réparation des sutures, en mettant l'accent sur la dexmédétomidine intranasale. Le résultat principal était l'anxiolyse pour la réparation des sutures. Les données ont été rapportées à l'aide de statistiques descriptives.

Résultats Le taux de réponse était de 155/225 (68,9 %). Pendant la suture, 127/148 (86 %) ont estimé que > 25 % des jeunes enfants éprouvent une détresse nécessitant une contention physique. 116/148 (78 %) fourniraient une anxiolyse, principalement des benzodiazépines intranasales (100/148, 68 %). Seulement 6/148 (4 %) fourniraient de la dexmédétomidine intranasale, mais 95/148 (64 %) l'envisageraient s'il y avait une preuve de bénéfice. Les obstacles les plus fréquemment perçus à la dexmédétomidine intranasale étaient une expérience personnelle insuffisante (114/145, 79 %) et un manque d'accès (60/145, 41 %).

Conclusions La plupart des fournisseurs canadiens de services d'urgence pédiatriques croient que la réparation des lacérations chez un jeune enfant est pénible. En dépit d'une efficacité douteuse, la plupart d'entre eux fourniraient des benzodiazépines intranasales, mais envisageraient la dexmédétomidine intranasale s'il était prouvé qu'elle était bénéfique.

Clinician's capsule

What is known about the topic?
Suture repair of lacerations is distressing for young children and intranasal benzodiazepines have not been shown to be consistently effective.

What did this study ask?
What are pediatric emergency clinicians' perceptions surrounding anxiolysis for suture repair of lacerations in children?

What did this study find?
Most pediatric emergency clinicians (68%) would use intranasal benzodiazepines rather than dexmedetomidine, citing lack of experience and access as barriers.

Why does this study matter to clinicians?
Adoption of newer agents, such as intranasal dexmedetomidine will depend on quality evidence, improved knowledge, and minimizing delays in management.

Introduction

Laceration repair accounts for almost half of procedures performed in the emergency department (ED) [1]. Although lidocaine–epinephrine–tetracaine is commonly used in children, behavioral distress remains common [2]. Societal bodies have recommended a combination of physical, psychological, and pharmacological approaches to reduce pain and distress for children undergoing brief diagnostic and therapeutic procedures [3, 4]. Managing behavioral distress with mild sedatives may reduce the need to physically restrain children to minimize movement, a tactic that has been discouraged by the Canadian Paediatric Society [3].

Intranasal midazolam is the most commonly used agent for procedural distress in children for laceration repair [5]. However, evidence of benefit is inconsistent [6–8] and its administration is poorly tolerated because it is noxious to the nasal mucosa [9]. Other agents such as inhaled nitrous oxide have shown benefit [10], but require a cooperative patient and a gas scavenging system. Nitrous oxide may also be challenging to use for certain facial lacerations. Dexmedetomidine is a selective alpha-2 receptor agonist that has been increasingly studied in children [11] likely due to its minimal deleterious cardiovascular and respiratory effects [11]. Intranasal dexmedetomidine (dexmedetomidine) is well tolerated and reportedly more effective than intranasal or oral midazolam in children undergoing intravenous insertion [12, 13] and dental procedures [14]. For laceration repair in children, a single study showed superior anxiolysis compared to intranasal midazolam, albeit only to facilitate initial positioning [2]. Exploring whether dexmedetomidine is superior to midazolam requires an understanding of providers' perceptions of the need for anxiolysis and perceived barriers to clinical adoption of dexmedetomidine.

With the growing interest in dexmedetomidine for children [6], our objectives were to characterize pediatric emergency clinicians' perceptions surrounding anxiolysis for suture repair of lacerations in children. Our findings may help inform the design of future trials of dexmedetomidine and facilitate clinical adoption of this agent.

Methods

Study design and participants

This was an online survey that included all independently practicing Canadian pediatric emergency physicians registered in the Pediatric Emergency Research Canada (PERC) database as of September 2020. PERC is a network of healthcare providers whose primary clinical, administrative,

and academic appointments are within Canadian tertiary care pediatric EDs.

Protocol

Potential respondents were contacted via email from October 1 to December 30, 2020. A Modified Dillman Tailored Design Method was used to optimize responses [15]. A pre-notification email was sent on day 0, followed by initial electronic survey dissemination on week 1, and subsequent dissemination on week 2, week 3, week 7 and week 9 (non-responders only). The survey was administered using Research Electronic Data Capture (REDCap) [16]. Consent to participate was implied by completion of any portion of the survey. Respondents were offered a $5 Starbucks card. To prevent duplicate entries, email addresses were assigned unique ID numbers in REDCap and corresponding surveys could be completed only once. The study received approval from Western University's Health Sciences Research Ethics Board.

Instrument

The survey was available in both English and French (Supplementary Appendix). It included demographic questions and a vignette depicting a 3-year-old male with a 3 cm forehead laceration requiring suture repair. Related to the vignette, respondents were asked: (i) whether they would offer analgesia and anxiolysis, (ii) type of analgesic and anxiolytic, (iii) perceptions surrounding analgesia and anxiolysis, (iv) degree to which analgesia and anxiolysis improved patient experience using a 100 mm Visual Analog Scale (VAS) from 0 = "does not improve" to 100 = "very much improves", and (v) experience with and perceptions surrounding intranasal dexmedetomidine to facilitate laceration repair. Response options were in the form of multiple choice, sliding scales, and free text. Free-text data were coded independently by two co-investigators (KK, NP). Survey respondents were permitted to edit and skip questions.

The survey was developed using the approach outlined by Burns et al. [17] using a five-member focus group, expert opinion, and literature review. To ensure content validity, a table of specifications was created to ensure each question fell into at least one domain of interest and each domain contained a sufficient number of items. Focus group members then ranked the questions by relevance to the research question. The survey was translated into French and checked for domains of equivalence (conceptual, item, semantic, operational, and measurement). Finally, the survey was piloted among three pediatric ED physicians who rated each question using a 5-item Likert scale for face validity, clarity, length, comprehensiveness, and bias.

Statistical analysis

All surveys were analyzed whether completed or not. The primary outcome was the proportion of respondents who would administer anxiolysis for suture repair of the laceration depicted in the vignette. Secondary outcomes included perceived barriers to dexmedetomidine, types of anxiolytic strategies, and perceptions of anxiolysis. Categorical data were summarized using percentages and frequencies. Continuous data were summarized using means and standard deviations (SD). Data were analyzed using Excel (version 16.5, Microsoft).

Results

Respondents

The response rate was 155/225 (68.9%). Demographic data are summarized in Table 1.

Analgesia

In the context of the vignette, 152/152 (100%) of respondents indicated they would provide analgesia. Topical anesthetic gels and subcutaneous local anesthetics were reported by 148/151 (98.0%) and 74/151 (49.0%) of respondents, respectively (Table 2). In general, respondents ($n = 148$) believed that analgesia improved patient care experience to large degree, with a mean of 93 mm (SD = 11) on the VAS.

Anxiolysis

116/148 (78%) of respondents stated they would provide anxiolysis or sedation for the child in the vignette. Most [100/148 (68%)] endorsed intranasal benzodiazepines, with nitrous oxide and intravenous ketamine endorsed by 27/148 (18%) and 21/148 (14%), respectively. Only 4/148 (3%) endorsed dexmedetomidine (Table 3).

Respondents generally believed that anxiolysis improved the patient care experience to a large degree, with a mean of 83 mm (SD = 20) on the VAS. 127/148 (86%) reported that greater than 25% of children experienced distress significant enough to require physical restraint during laceration repair. 101/145 (70%) and 89/145 (61%) believed that a caregiver or certified child life specialist, respectively, was usually insufficient to alleviate distress. 114/144 (79%) disagreed that "laceration repair using sutures would not cause significant enough distress to warrant anxiolysis". The most common barriers to providing anxiolysis, where respondents indicated "somewhat" or "strong agreement", included delayed discharge (72/147, 49%) and management (56/147, 38%) (Table 4). The most common perceived benefits of

Table 1 Demographic characteristics of respondents

Demographic characteristic	*n* (%)
Level of certification ($n=141$)	
Royal College/Board Certified/Board Eligible pediatric emergency medicine	98 (70)
Royal College/Board Certified/Board Eligible emergency medicine	17 (12)
Family medicine	3 (2)
General Pediatrics	16 (11)
Canadian College of Family Physicians—Emergency Medicine	6 (4)
American Board of Pediatrics—Pediatric Emergency Medicine	1 (0.7)
Type of ED ($n=144$)	
Pediatric-only emergency department	135 (94)
General (adult and paediatric) tertiary care emergency department	13 (9)
General (adult and pediatric) community emergency department	5 (3)
General (adult and pediatric) urgent care clinic	4 (3)
Pediatric patients treated (less than 19 years of age) out of the patient population that participants routinely treated ($n=147$)	
Less than 20%	3 (2)
21–40%	9 (6)
41–60%	5 (3)
61–80%	1 (0.7)
80–100%	129 (88)
Years of experience as attending physician ($n=146$)	
> 20 years	39 (27)
16–20 years	24 (16)
11–15 years	30 (21)
6–10 years	30 (21)
Up to 5 years	23 (16)
Gender ($n=146$)	
Female	78 (53)
Male	66 (45)
Prefer not to answer	2 (1)
Number of laceration repairs performed/month ($n=146$)	
1–3	20 (14)
4–6	39 (27)
7–10	38 (26)
More than 10	49 (34)
I never perform laceration repairs	0 (0)
Province of Practice ($n=146$)	
Alberta	24 (16)
Ontario	53 (36)
Quebec	33 (23)
Manitoba	7 (5)
British Columbia	9 (6)
Nova Scotia	9 (6)
Newfoundland and Labrador	5 (3)
Saskatchewan	6 (4)
New Brunswick	0 (0)
Northwest Territories	0 (0)
Nunavut	0 (0)
Yukon	0 (0)
Prince Edward Island	0 (0)

Table 2 Practice patterns surrounding analgesia for laceration repair in the 3-year-old male featured in the vignette ($n = 148$)

Analgesic choices	*n* (%)
Local anesthetics	
Topical anesthetic gel (e.g., lidocaine–epinephrine–tetracaine or LET)	148 (100)
Subcutaneous/injected local anesthetic (e.g., lidocaine, bupivacaine)	74 (50)
Regional anesthesia (e.g., nerve block)	2 (1)
Topical anesthetic cream (e.g., EMLA™, Ametop™, Maxilene™)	4 (3)
Oral analgesics	
Oral non-opioid analgesic (e.g., acetaminophen and/or ibuprofen)	63 (44)
Oral ketorolac	0 (0)
Oral opioid analgesic	0 (0)
Intravenous analgesics	
Intravenous non-opioid analgesic (e.g., ketorolac)	2 (1)
Intravenous opioid analgesic (e.g., morphine, fentanyl)	0 (0)
Intravenous ketamine	9 (6)
Intranasal analgesics	
Intranasal opioid analgesic (e.g., fentanyl)	43 (29)

EMLA eutectic mixture of local anesthetics

Table 3 Practice patterns surrounding anxiolysis for laceration repair in the 3-year-old male featured in the vignette ($n = 148$)

Anxiolytic choices	*n* (%)
Oral	
Benzodiazepine (e.g., midazolam)	9 (6)
Dexmedetomidine	0 (0)
Intranasal anxiolytics	
Intranasal benzodiazepine	100 (68)
Intranasal dexmedetomidine	4 (3)
Intranasal ketamine	8 (5)
Intranasal fentanyl	1 (0.7)
Inhaled anxiolytics	
Inhaled nitrous oxide	27 (18)
Inhaled methoxyflurane	1 (0.7)
Intravenous	
Ketamine	21 (14)
Benzodiazepine (e.g., midazolam)	1 (0.7)
Propofol	4 (3)

anxiolysis included improved patient (127/148, 86%) and caregiver (132/148, 89%) satisfaction, a more cooperative child with future medical procedures (121/148, 82%), and improved provider morale and satisfaction (111/148, 75%).

Intranasal dexmedetomidine

Most respondents had limited experience with dexmedetomidine, with 90/146 (62%) never having witnessed its use in any practice setting. The mean comfort level with dexmedetomidine by any route was 22 mm (SD = 28) on the VAS ($n = 146$). However, 95/148 (64%) of respondents would consider dexmedetomidine if evidence suggested it was effective at least 80% of the time. Important perceived barriers to dexmedetomidine included inadequate personal (114/145, 79%) and nursing (109/145, 75%) experience, lack of access (60/145, 41%), prolonged time to sedation (53/145, 37%) and recovery (44/145, 30%) (Table 5). Lack of evidence was identified as a barrier by 24/145 (17%) of respondents and 16/145 (11%) believed dexmedetomidine to be cost-prohibitive.

Discussion

Interpretation

Our national survey found that most Canadian pediatric emergency providers believed that at least a quarter of young children require physical restraint for suture repair and would provide anxiolysis. Most would provide intranasal benzodiazepines. However, given the lack of consistent efficacy of intranasal midazolam [6–8], our results suggest that future research should explore more effective anxiolytic strategies for children undergoing laceration repair and address barriers such as lack of provider experience, formulary access, and delayed management.

Previous studies

Most respondents (78%) indicated they would use pharmacologic anxiolysis, most commonly (67%) intranasal benzodiazepines such as midazolam. This is consistent with evidence that midazolam is the most frequently used anxiolytic for distressing procedures in children [7], including

Table 4 Perceived barriers surrounding anxiolysis for laceration repair in the 3-year-old male featured in the vignette, $n = 147$ (%)

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
The time to produce effective anxiolysis/sedation will delay management of the laceration repair	6	32	9	29	23
The time to recover from anxiolysis/sedation will delay discharge of this patient	10	39	12	23	14
The route of administration (oral, intranasal, or intravenous) of an anxiolytic/sedative may cause more discomfort than the laceration repair alone	0	12	12	40	37
The monitoring requirements are difficult in your practice setting	0.7	4	3	25	67
The risks of providing an anxiolytic/sedative exceed the benefit in laceration repair	2	10	7	28	54
Anxiolysis/sedation is not particularly effective for children in this age group undergoing suture repair of a laceration	0	6	5	28	62
Non-pharmacologic approaches (e.g., comfort measures) are sufficient for children in this age group undergoing suture repair of a laceration	4	16	15	31	34
You are unfamiliar with anxiolysis/sedation options for children in this age group undergoing suture repair of laceration	2	1	1	15	80
Your practice setting does not support providing anxiolysis/sedation for laceration repair in this age group	0	1	4	14	81
Laceration repair using sutures will not cause significant enough distress to warrant anxiolysis/sedation	3 (2)	11 (8)	16 (11)	36 (25)	78 (54)

laceration repair [18]. Intranasal midazolam administered via a mucosal atomizer device has a rapid onset of action; achieving 90% of its maximum concentration in 5–17 min [19], has a small intranasal volume requirement, and is widely available. Intranasal midazolam has also been studied extensively in children [7, 8, 18], and all these factors may have influenced respondents' willingness to use it. Notably, trials have found conflicting results for oral or intranasal midazolam to facilitate suture repair in children [20–22]. A systematic review of 30 trials concluded there was insufficient high-quality evidence to determine whether midazolam produces more effective sedation than chloral hydrate and diazepam for therapeutic and diagnostic medical procedures [7]. In addition, intranasal midazolam is often noxious to the nasal mucosa and many children report a bitter taste in the mouth [9, 23]. Not surprisingly, only 5% of respondents endorsed intranasal ketamine. Although it has an emerging role for analgesia in pediatric musculoskeletal injuries [24], there is little evidence of benefit in painful procedures [25] and effective doses often require large intranasal volumes. Nevertheless, intranasal drugs potentially offer a less distressing approach to medication delivery (compared to intravenous) and are suitable for children unable or unwilling to tolerate oral or inhaled therapy.

Almost two thirds of respondents had no experience with dexmedetomidine and indicated their comfort level was low, not entirely surprising given that dexmedetomidine is not standard practice in Canadian pediatric EDs. Data for dexmedetomidine in painful medical procedures in children are limited to a few trials [14, 26] and one study on initial positioning for suture repair [2]. Although dexmedetomidine appears to provide superior anxiolysis and is better tolerated than chloral hydrate, and midazolam for intravenous insertion [13, 26, 27] and dental procedures [14], uncertainty remains as to whether it facilitates suture repair [6]. Even though 64% of respondents would consider dexmedetomidine if there was evidence of benefit, 17% cited lack of evidence as a barrier. Prolonged time to effective sedation and recovery were reported by 37% and 30% of respondents, respectively. These are potentially important barriers because dexmedetomidine's onset and duration of sedation can be up to 31 and 92 min, respectively [6], considerably longer than intranasal midazolam. Many sedative agents including oral and intranasal benzodiazepines, chloral hydrate, and dexmedetomidine are associated with length of stays ranging from 50 to 144 min [2, 21, 22, 28–30]. Lidocaine–epinephrine–tetracaine has an onset of action of 20–30 min [31], during which time, an anxiolytic can theoretically be administered, possibly reducing delays

Table 5 Perceived barriers to using intranasal dexmedetomidine ($n = 145$)

Barrier[1]	*n* (%)
Inadequate personal experience with intranasal dexmedetomidine	114 (79)
Inadequate nursing experience with intranasal dexmedetomidine	109 (75)
Inadequate patient monitoring equipment	10 (7)
Inadequate physical space to provide anxiolysis/sedation	11 (8)
Lack of evidence supporting its effectiveness	24 (17)
Prolonged time to effective sedation	53 (37)
Prolonged time to recovery	44 (30)
Adverse effect profile	28 (19)
Patient unwillingness to receive anxiolysis/sedation	7 (5)
Caregiver unwillingness to receive anxiolysis/sedation	13 (9)
Nursing unwillingness to provide anxiolysis/sedation	12 (8)
Clinician unwillingness to provide anxiolysis/sedation	18 (12)
Inadequate access to intranasal atomizer devices	9 (6)
Inadequate access to dexmedetomidine in your practice setting	60 (41)
Cost prohibitive	16 (11)
Other sedative agents have a more rapid onset/offset of action	36 (25)
Other sedative agents have a superior safety profile	11 (8)
No perceived barriers	6 (4)

[1]The response options were presented from a drop-down list

in management. In centers that apply lidocaine–epinephrine–tetracaine at triage, anxiolytic administration in the ED can indeed contribute to delays in care. However, strategies employing best-evidence approaches to distress management have also been shown to decrease procedure time [32]. Nurse initiated protocols for drug administration have been used successfully to administer timely topical analgesia to manage needle-related pain in children [33]. Using a similar approach, future work should explore the feasibility of administering anxiolysis coincident with lidocaine–epinephrine–tetracaine to optimize timing of wound repair. Including intranasal midazolam as a trial arm may inspire practice change if dexmedetomidine is found to be superior. Only 11% of respondents cited cost as a barrier to dexmedetomidine, but this may reflect unfamiliarity. Even with the recent availability of a generic option, dexmedetomidine is much more expensive than midazolam. A 2 mL (100 mcg/mL) single-use vial of dexmedetomidine costs $45.20 CDN versus $5.80 CDN for a 10 mL (5 mg/mL) single-use vial of midazolam [34].

Strengths and limitations

All respondents worked in tertiary care pediatric EDs, limiting the generalizability of our results. However, we may have also selected respondents who had more opportunities to be exposed to dexmedetomidine and therefore, greater ability to identify barriers. Social desirability bias is inherent to survey research [35] and may have led to over-reporting of willingness to provide anxiolysis. A medical record review may have provided more unbiased data related for practice patterns surrounding anxiolysis. We used only one vignette depicting a young child. Although younger children are more likely to display more distress than older children [36], practice patterns surrounding anxiolysis likely vary across age groups.

Clinical implications

Most pediatric ED clinicians believe that young children experience distress associated with laceration repair. However, very few have experience with intranasal dexmedetomidine for anxiolysis. Clinical adoption of intranasal dexmedetomidine will depend on rigorous evidence of benefit compared to the more frequently used benzodiazepines, comprehensive knowledge translation, and the exploration of strategies to minimize delays in care given its long duration of effect.

Research implications

Our findings suggest a need for studies exploring more effective strategies to reduce distress during laceration repair in children. Future research should incorporate protocols that minimize delays in management of lacerations.

Conclusions

This national survey found that most Canadian pediatric physicians believe that at least a quarter of young children require physical restraint for suture repair and would provide anxiolysis using intranasal benzodiazepines, despite inconsistent evidence of benefit. However, pediatric ED clinicians would be willing to use intranasal dexmedetomidine if research findings are favorable.

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