ABSTRACTS IN URGENT CARE

- Employing Virtual Reality with Anxious Children
- Assessing for Elbow Fracture
- Epinephrine for Croup (?)
- The STANDING Algorithm for Vertigo
- Postconcussion Return to School
- Managing Epistaxis in the UC

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Immersive Virtual Reality Use in Reducing Pediatric Procedural Anxiety

Take-home point: Immersive virtual reality (IVR) use in pediatric patients significantly improved pain and anxiety compared with the control group.

Citation: Wong C, Choi K. Effects of an immersive virtual reality intervention on pain and anxiety among pediatric patients undergoing venipuncture: a randomized clinical trial. *JAMA Netw Open*. 2023;6(2):e230001.

Relevance: Poorly managed procedural pain and anxiety can have short- and long-term consequences for children. Procedural sedation with pharmacologic agents is generally not available in urgent care centers.

Study summary: This was a two-group randomized control trial conducted in a pediatric unit of a regional hospital in Hong Kong. Eligible participants were randomly assigned in a 1:1 ratio. Patients in the control group received standard procedural care, including explanation of the venipuncture procedure and comforting words. Patients in the intervention group wore IVR devices in addition to standard care. The primary outcome was child-reported pain. Secondary outcomes included child-reported anxiety, heart rate, salivary cortisol, length of procedure, and satisfaction of healthcare professionals with the procedure. Outcomes were assessed 10 minutes before, during, immediately after, and 30 minutes after the procedure.

The authors included 149 patients for the study. They found that the IVR intervention effectively mitigated pain and anxiety in children undergoing venipuncture. Subgroup analysis revealed a large effect on pain and a moderate effect on anxiety immediately after venipuncture in the younger age group only, indicating IVR had stronger effects on younger children. The IVR intervention shortened the length of procedures by an average of slightly more than 2 minutes and improved staff satisfaction.

Editor's comments: The nature of the study did not allow for blinding of participants. There are cultural aspects of pain perception and reporting that may limit generalizability. Nevertheless, the use of VR seems to be a win-win: patients and providers prefer it and it allowed for more rapid completion of venipuncture for children in this study. Especially in pediatric-specific urgent care centers, investing in a VR headset to be used with minor procedures may be worthwhile in avoiding referral of procedures that would be otherwise challenging without access to sedation. ■

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Clinical Evaluation of Elbow Fractures

Take-home point: Limited elbow extension with and without limited bruising and point tenderness is a sensitive physical exam finding that may help to exclude elbow fracture.

Citation: Long B, Gottlieb M. The brass tacks: concise reviews of published evidence—clinical tests to evaluate for elbow fracture. *Acad Emerg Med*. 2023;30:65–67.

Relevance: Understanding which clinical tests are adequately sensitive for excluding elbow fractures can help avoid unnecessary radiology studies, especially when many urgent care centers struggle to find radiology technicians.

Study summary: This was a systematic review of published studies on elbow fractures, which account for roughly 7% of all fractures. It included studies involving patients presenting with suspected elbow fracture and compared one or more clinical tests to x-ray as the gold standard. The authors identified 12 relevant studies which included 4,485

patients. They found that absence of restriction in elbow extension, bruising, and tenderness was highly sensitive, but not specific, in adults. Positive likelihood ratios (LR) were also calculated for restriction in elbow supination (14.3), pronation (2.6), extension, bruising, and tenderness (1.3) and elbow extension and point tenderness (1). The authors noted that while several clinical tests, including flexion, pronation, and supination appear to be specific, only one study evaluated supination and pronation, and only two studies evaluated flexion in adults, resulting in a high degree of variability.

Editor's comments: The systematic review of the paper depended on available data and quality of the original publications. Additionally, there was no standardized definition for each examination maneuver, leading to heterogeneity. The results noted in this paper may aid decision-making, specifically in patients without bruising, tenderness, and with full extension, given the lack of available validated clinical decision tools for elbow fracture. ■

Are Epinephrine Inhalers Safe for Croup?

Take-home point: Epinephrine administered by metered-dose inhaler (MDI) may be a safe and effective non–aerosol-generating, non-clinic-based alternative to traditional nebulized epinephrine delivery for the treatment of croup.

Citation: Meckler G, Alqurashi W, Eltorki M et al. Epinephrine metered-dose inhaler for pediatric croup. *Acad Emerg Med*. 2023;30(2):144-146.

Relevance: In the era of COVID, limiting aerosol-generating treatments helps ensure UC providers' safety while treating respiratory conditions. Additionally, many patients with croup require repeat dosing of inhaled epinephrine, which has historically required additional time in clinic or the emergency department.

Study summary: This was a quality assurance study to monitor the safety and efficacy of using epinephrine MDI for the off-label treatment of croup in nine pediatric EDs in Canada. The algorithm studied examined the administration of five puffs (125 µg/puff) of epinephrine delivered via MDI with a valved holding chamber (VHC), followed by an assessment 10 minutes later for clinical improvement using the Westley croup score (WCS). Additional administration of five puffs was recommended up to a total of 15 puffs if there was not significant improvement (<2 points) in WCS and no adverse effects were documented. The primary outcome measure was improvement in the WCS assessed within 60 minutes of medication administration. Secondary outcome measures were adverse effects including extreme tachycardia (>200 beats/min), arrhythmia, tremor, and agitation.

The authors evaluated data on 210 children who were treated with epinephrine MDI. Pretreatment WCS was mild (score range 0–2) in 27 children (12.9%), moderate (3–4) in 118 (56.2%), severe (5–7) in 60 (28.6%), and impending respiratory failure (≥8) in five (2.4%) children. The vast majority (82%) of children treated with epinephrine using MDI and VHC with facemask had clinically significant improvement in respiratory distress within 1 hour of treatment. A single treatment of five puffs was administered in 165/210 (78.6%) children, two doses in 33/210 (15.7%), and three doses or more in 12/210 (5.7%). The only adverse effects observed were agitation and the continuation of preexisting extreme tachycardia in <1% of epinephrine administration.

Editor's comments: Inhaled epinephrine via MDI seemed to be largely effective and safe in this multicenter Canadian ED trial. The severity of croup diagnosed in the UC setting is generally milder, and current practice standards still suggest that patients administered inhaled epinephrine be observed for a longer period of time than may be feasible in many UC centers. ■

Predicting Central Causes of Vertigo with the STANDING Algorithm

Take-home point: The STANDING algorithm was relatively accurate for ruling out central causes of vertigo in both experienced and novice emergency providers, but not sufficiently sensitive to be used in isolation in cases of high concern for central etiologies.

Citation: Grelier C, Fels A, Vitaux H, et al. Effectiveness and reliability of the four-step STANDING algorithm performed by interns and senior emergency physicians for predicting central causes of vertigo. *Acad Emerg Med*. Epub ahead of print January 11, 2023. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/acem.14659 . Accessed May 3, 2023.

Relevance: The ability to use clinical examination to reliably predict patients who have peripheral rather than central causes for vertigo is highly useful in the UC setting where expert consultation and advanced imaging is not readily available.

Study summary: This was an investigator-initiated, single-center, prospective assessment of the effectiveness and reliability of the four-step STANDING algorithm in an ED in Paris, France. The algorithm involved:

1. Identification of spontaneous nystagmus with and without Frenzel glasses
2. Assessment of spontaneous nystagmus direction as gaze-evoked, vertical, or multidirectional nystagmus (indicating a potentially worrisome etiology)
3. Assessment of vestibulo-ocular reflex through head impulse test (HIT), with a bilaterally normal HIT indicating a potentially worrisome etiology and a positive HIT (ie, overt or covert catch-up corrective saccades) indicating an acute peripheral vestibulopathy
4. A systematical review for abnormal standing position as such as ataxic gait, imbalance, or inability to stand (all indicating a potentially worrisome etiology)

The primary outcome was the diagnostic accuracy (sensitivity and specificity) of the STANDING algorithm performed by junior residents for diagnosing central causes of vertigo.

The authors analyzed a cohort of 312 patients who all underwent brain MRI as well as clinical evaluation. Based on imaging, 59 patients had central causes for vertigo and 253 had peripheral diagnoses. They found that the algorithm showed sensitivities of 84.8% (95% CI 75.6%–93.9%) and 89.8% (95% CI 82.1%–97.5%), negative predictive values of 96.2% (95% CI 93.7%–98.6%) and 97.5% (95% CI 95.5%–99.5%), specificities of 88.9% (95% CI 85.1%–92.8%) and 91.3% (95% CI 87.8%–94.8%), and positive predictive values of 64.1% (95% CI 53.5%–74.8%) and 70.7% (95% CI 60.4%–81.0%), respectively. The agreement between interns and senior EPs was strong overall (B-statistic coefficient: 0.77) and for each step individually: (1) 0.87, (2) 0.98, (3) 0.95, and (4) 0.99.

Editor's comments: The study was not randomized and was a single-centered study. While negative predictive value was strong, the sensitivity of the STANDING algorithm is not sufficient to use in patients with high pre-test probability for central causes of vertigo. ■

Timing Postconcussion Return to School

Take-home point: Prolonged absence from school after a concussion is associated with a greater symptom burden and may be detrimental to recovery.

Citation: Vaughan C, Ledoux A, Sady M, et al. Association between early return to school following acute concussion and symptom burden at 2 weeks postinjury. *JAMA Network Open*. 2023;6(1): e2251839.

Relevance: Concussion presentations are extremely common in urgent care. Among the most common questions parents ask concerns return to normal daily activities, which most notably includes school.

Study summary: This was a secondary analysis of a prospective, multicenter observational cohort study. Participants were pediatric patients 5-18 years old presenting with an acute (<48 hours) concussion in nine Canadian pediatric emergency departments. At 7, 14, and 28 days postinjury, participants were contacted via web survey or telephone and asked to provide information, including their return to school (RTS) date and current symptom burden. Parents responded for children between 5 and 7 years of age, while participants over 8 years old responded to the questions themselves. The primary outcome was symptom burden measured by the Post-Concussion Symptom Inventory (PCSI) score.

The authors analyzed 1,630 participants across three age groups (5.0-7.9 years, 283 [17.4%], 8.0-12.9 years, 700 [42.9%], and 13.0-17.9 years, 647 [39.7%]). They found the mean number of school days missed due to concussion was 3 to 5 days. Younger children returned to school after concussion more quickly than older children. Earlier RTS (ie, in 2 days or fewer) was associated with lower symptom levels at day 14. Additionally, earlier RTS was associated with lower symptom levels at day 14 among those with higher initial symptoms.

Editor's comments: RTS timing was not randomly assigned prospectively during the initial study, and thus, causality cannot be determined. It is possible that there is actually reverse causality (ie, the patients returning to school earlier did so because they had fewer symptoms). These results, while not definitive, do suggest that delaying RTS may be harmful and it seems reasonable to allow children who feel ready to return to school to do so. ■

Managing Epistaxis

Take-home point: A stepwise approach toward addressing epistaxis can achieve reliable control in the majority of patients, beginning with a presumption that bleeding is coming from an anterior source.

Citation: Gottlieb M, Long B. Managing epistaxis. *Ann Emerg Med*. 2023;81(2):234-240.

Relevance: Knowledge of the various approaches to treatment of epistaxis can increase UC provider confidence and competence and avoid unnecessary ED visits.

Study summary: This was an educational feature on the management of epistaxis. Epistaxis accounts for approx-

imately one out of every 200 ED visits in the U.S. Initial assessment includes assessing for airway compromise, respiratory distress, and hemodynamic instability. The use of personal protective equipment (eg, face mask, eye protection, gloves) is recommended as part of the assessment process. Application of direct pressure is the initial treatment of choice in both the clinical setting and for patients at home. This involves having the patient sit upright and lean forward to reduce the risk for aspiration. Pressure can be applied with nasal clips or even two tongue depressors taped together. This may be more effective than manual compression using fingers, especially because patients have difficulty maintaining constant pressure for sufficiently long periods of time. If bleeding continues despite adequate compression, topical vasoconstrictors may be necessary. These can be applied by spray or by soaking cotton pledgets. Patients should blow clots from their nose prior to vasoconstrictor application. Cauterization should be considered if the bleeding site is visualized and excessive bleeding is not present. Chemical cautery with silver nitrate has higher efficacy in controlling epistaxis and lower pain scores than nasal packing.

Various thrombogenic resorbable foams and gels that promote thrombogenesis and tamponade of bleeding are available. Fibrin sealants provide rapid hemostasis with greater reduction in edema, mucosal atrophy, and nasal discharge compared with electrocautery, chemical cautery, and non-resorbable packing. Tamponade devices are useful in refractory cases of epistaxis and are effective in 90% to 95% of cases failing other treatments. Common devices include the Rapid Rhino and Merocel. Rapid Rhino is a balloon catheter that is coated in a procoagulant and inflated to create a tamponade effect on the nasal mucosa. Merocel is an absorbent nasal tampon consisting of a synthetic polymer. If posterior bleeding is identified or there is suspicion for a posterior etiology (eg, refractory high-volume bleeding), posterior packing may be necessary.

Editor's comments: This educational series provided a useful look at present methods and equipment available for treatment of epistaxis. UC providers should approach these cases based on their own level of experience, training, and comfort in managing epistaxis. It is often impractical and unsafe to deal with complex epistaxis in UC and in cases of suspected posterior epistaxis, early EMS activation is advisable. ■