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Selected as a 2023 Doodys Core Title! Widely acclaimed for its outstanding step-by-step illustrations, comprehensive coverage, and reader-friendly format, Textbook of Pediatric Emergency Procedures is now in its thoroughly updated Second Edition. In 137 chapters, the book provides clear, complete instructions on every emergency medicine procedure performed on infants, children, and adolescents. More than 1,000 detailed drawings, most in two-color, show how to perform each procedure. This edition includes a new chapter on new technologies and techniques for managing the difficult airway. Other new topics include use of tissue adhesives in laceration repair, focused abdominal sonography for trauma (FAST), management of priapism, reimplanting an avulsed permanent tooth, use of automatic external defibrillators, and procedures related to bioterrorism. Find all Resident 360 study plans on AMBOSS A brief refresher with useful tables, figures, and research summariesThe emergency department (ED) provides many opportunities to learn about and participate in performing bedside procedures. Some of the procedures most commonly encountered in the pediatric ED are discussed in this section. Preparation for procedures: It is important to prepare both the child and the parents for procedures in the ED. This includes explaining the procedure and its risks to both parent and child, obtaining parental consent for all legal minors, and obtaining assent in older children and adolescents. Child life specialists (or other team members) can help explain the process to children in a developmentally appropriate way, provide calming and distraction techniques throughout the procedure (reducing the need for procedural sedation), and assess the need for medical anxiolysis. (See NEJM Videos in Clinical Medicine on Managing Procedural Anxiety in Children.)Lacerations account for 30% to 40% of injury presentations to the pediatric ED. The most common mechanisms of laceration among children include blunt trauma, contact with a sharp object, and bites (both animal and human). Because lacerations are so common among injured children, EM providers must be comfortable with optimal methods for laceration repair focusing on achieving hemostasis, preventing infection, and optimizing cosmesis. Often, these goals may prove difficult to accomplish on an active, mobile, or crying pediatric patient. (See NEJM Videos in Clinical Medicine on Basic Laceration Repair and the CHOP Emergency Department Clinical Pathway for Evaluation/Treatment of Children with a Laceration .)During lumbar puncture (LP), cerebrospinal fluid (CSF) is extracted from a patients spinal canal through a hollow-bore needle. The procedure can be both diagnostic (e.g., for meningitis), and therapeutic (e.g., for idiopathic intracranial hypertension). In the ED, lumbar punctures can help with diagnosis and dictate patient disposition. (See NEJM Videos in Clinical Medicine on Lumbar Puncture.)LP is performed under sterile conditions. In addition to sterile gown, gloves, drapes, and dressings, the procedure requires the following:chlorhexidine or povidone-iodine antiseptic solution with applicator swabstopical 4% lidocaine cream1% lidocaine without epinephrine with needle and 3-mL syringefour plastic test tubesthree-way stopcockCSF manometer22-gauge spinal needleage 1 year through school age: use 2.5-inch needleadolescent or larger habitus: use 3.5-inch needleApply 4% lidocaine cream to the intended LP site 45-60 minutes prior to the procedure.Position the patient in the left lateral decubitus or upright position and maximally flex the spine.Locate the intervertebral spaces between either L3 and L4 or between L4 and L5 using the iliac crest as a guide. Data have demonstrated the utility of ultrasound guidance in locating intervertebral spaces.Don a sterile gown and gloves and clean a large area around the targeted vertebral space three times with antiseptic solution.Anesthetize the area with 1% injectable lidocaine and allow time for it to take effect (1-2 minutes).Insert the spinal needle into the skin with the bevel facing toward the ceiling.Advance the needle slowly, angled slightly toward the umbilicus, until a decrease in resistance is felt; this pop is rarely felt in neonates and young infants.Remove the stylet from the spinal needle, and if CSF flows out, attach the manometer to the end of the spinal needle using the three-way stopcock and record the opening pressure. If CSF does not flow, reinsert the stylet and advance or reposition the needle carefully until it is obtained.Collect approximately 1 mL in each of the four tubes.Reinsert the stylet prior to removing the needle from the patient.Place a bandage over the puncture site and clean the surrounding area.Common complications from LP include headache and localized back pain. Less common complications include infection, hematoma, and epidural CSF leak. In neonates, positioning can cause hypoventilation and occasionally apnea. LP should be performed with caution in infants with preexisting respiratory compromise.Some procedures in the pediatric ED require the child to remain motionless (e.g., laceration repair across the vermilion border), while other procedures are particularly painful (e.g., closed-fracture reduction). Procedural sedation is a common method for alleviating the pain and stress associated with these procedures for both children and caregivers. Therefore, learning to provide safe and effective procedural sedation is an integral part of pediatric emergency training.The American College of Emergency Physicians (ACEP) defines procedural sedation as a technique of administering sedatives or dissociative agents with or without analgesia to induce a state that allows the patient to tolerate unpleasant procedures while maintaining cardiorespiratory function. (See NEJM Videos in Clinical Medicine on Procedural Sedation and Analgesia in Children and the CHOP Emergency Department Clinical Pathway for Procedural Sedation.)Four Depths of Procedural SedationLevelPurposeful ResponseMaintains AirwayMaintains Cardiovascular FunctionMinimalVerbal commandsYesYesModerateVerbal commands +/- light tactile stimulationYesYesDeepPainful stimulationPotentially noYesAnesthesiaNoneNoPotentially noCommon indications of procedural sedation include fracture reductions, incision and drainage of abscesses in sensitive areas, wound care, prolonged diagnostic imaging (e.g., MRI), lumbar punctures, any procedure requiring complete stillness from a patient who is not developmentally able to remain motionless on command.Obtain history and perform physical assessment, looking for any contraindications (habitus, sleep apnea, chronic respiratory illness, airway anomalies, allergies).Determine fasting time.clear liquid: 2 hoursbreastmilk: 4 hoursinfant formula:6 hourssolids: 6-8 hoursChoose route of administration.commonly delivered intravenously (IV)can be delivered intranasally (IN), intramuscularly (IM), or subcutaneously (SQ)Explain the procedure to the caregiver and child and obtain consent and assent when appropriate.Gather equipment needed for monitoring:vital signs: cardiorespiratory monitor, blood-pressure cuff, pulse oximetry, end-tidal carbon dioxide (CO2) monitorairway: flow-inflating bag and mask, artificial-airway supplies readymedications: reversal drugs, rapid-sequence intubation medications, in case an advanced airway becomes necessaryCommonly Used Drugs for Procedural Sedation in ChildrenMedicationOnsetDurationOnsetKetamine30 seconds5-10 minutesSedative and analgesicVital signs changes: hypertension and bradycardiaAdverse effects: agitation, emesis, hypersalivationOther: preserves airway reflexes, long recovery timePropofol30 seconds3-10 minutesSedative and amnesticVital signs changes: hypotension and bradycardiaAdverse effects: respiration depressionOther: narrow therapeutic rangeMidazolam1-5 minutes20-30 minutesAnxiolytic and amnesticAdverse effects: respiratory depressionOther: short-actingmonitor until patient returns to age-appropriate baseline mental statuspatient has stable vital signsconsider ability to tolerate fluids prior to discharge homeEndotracheal intubation is indicated in any clinical scenario wherein a child is at risk of impending respiratory failure or is otherwise unable to maintain their own natural airway. In the pediatric population, this scenario is often the result of neurological failure (e.g., status epilepticus or intracranial injury). The primary goal of intubation is the prompt and accurate placement of an artificial airway while maintaining hemodynamic stability. In the ED, this is usually accomplished using rapid-sequence induction.cardiorespiratory monitor with capnography capabilitybag-valve mask and oxygen sourcesuction systemIV accessendotracheal tube (ETT) and styletage-based formula for choosing ETT size: 4+ (age in years/4)have available tubes a half size smaller (in case of difficulty passing ETT) and larger (in case of large air leak)laryngoscope with appropriately sized bladedirect visualizationindirect visualization (e.g., fiber-optic laryngoscopy)blade sizing:newborn to young infant: sizes 0-1, straight bladeinfant to toddler: size 1, straight bladesmall to school-aged child: size 2, straight or curved bladelarge child or teen: sizes 2-3, straight or curved bladeconsent from caregiver (not required if emergent and no caregiver present)emergency plan and materials in case of difficulty passing ETT:oral and nasal airways availablelaryngeal mask airway availableback-up provider experienced with intubation (i.e., anesthesiologist, critical care physician, neonatologist) availableSedatives: Sedatives are used to induce unconsciousness prior to intubation. Ideally, they are rapid in onset and have little effect on hemodynamics.Sedative Medications for Intubation in ChildrenAgentEffectsClinical CommentsKetamineAnalgesic and dissociative propertiesIncreases HR and BPBronchodilator effectsGood for hypotension/shock andasthmaticsAvoid if concerned for increasedintracranial pressure (a theoretical risk)EtomidateRapid onset and short durationMinimal hemodynamic effectsGood for head traumaAvoid if concerned for septic shock (maycause adrenal suppression)MidazolamAnticonvulsive and amnesic propertiesVariable dosing needed for inductionGood for status epilepticus andhypertensive patientsNeuromuscular Blockade: Neuromuscular blocking agents are used to induce paralysis in order to optimize passage of the endotracheal tube. Paralytic agents should only be administered after a sedative agent has already been given.Depolarizing agents cause muscle fasciculations prior to paralysis, which can lead to muscle pain, hyperkalemia, and a higher risk of malignant hypertension.Nondepolarizing agents do not cause fasciculations prior to paralysis and thus cause none of the side effects mentioned above.Drugs for Neuromuscular BlockadeDepolarizing AgentEffectsClinical ConsiderationsSuccinylcholineRapid onset(30 to 60 seconds)Short duration(3 to 8 minutes)Transient bradycardiaAvoid in patients withhyperkalemia orrisk of neuromusculardiseaseNondepolarizing AgentEffectsClinical ConsiderationsRocuroniumOnset: 1 to 3 minutesDuration: 30 to 45 minutesLarger doses: quicker onsetbut longer durationNo contraindicationsVecuroniumLonger onset thanrocuroniumLarger doses: quicker onsetbut longer durationNo contraindicationsOther Medications: Although data are limited on the benefit of administering the following adjunct medications during endotracheal intubation, they are still used in select clinical scenarios. Both are used for premedication prior to intubation.Adjunct Medications for Endotracheal IntubationAgentEffectsClinical IndicationAtropineVagolytic; may reduce reflexbradycardia during laryngoscopy;reduces oral secretionsAge