

EMERGENCY MEDICAL CARE FOR URGENT CONDITIONS IN CHILDREN: MODERN APPROACHES AND CHALLENGES

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Abstract

Emergency medical care for urgent conditions in children remains one of the most important and challenging areas of paediatrics. Children are a unique category of patients, as their physiological and anatomical characteristics, as well as their limited communication abilities, significantly complicate diagnosis and treatment in time-limited situations. Emergency conditions such as acute respiratory disorders, convulsive syndromes, trauma, infectious complications and anaphylaxis require a rapid and accurate response, which highlights the importance of developing and implementing modern approaches to care. Despite growing recognition of these needs, many children still receive emergency care in general emergency departments (GEDs) rather than in specialised paediatric emergency departments (SPEDs), often leading to poor outcomes due to a lack of specialised paediatric resources and training. This review describes the specific pathologies which are common in this area, diagnostic challenges encountered in newborns, infants, school-aged children, and adolescents, and evaluates existing patient triage systems and decision.

Keywords: Pediatric emergency care, resuscitation, acute illness, emergency medicine, children, recommendations, poisoning, sepsis, anaphylaxis.

Introduction

Review methods: This review synthesizes literature from peer-reviewed sources published last 10 years, sourced from databases such as PubMed, Cyberleninka and Scopus. Search terms included "pediatric emergency care," "urgent conditions in children," "triage methods," and "severe pediatric conditions." Inclusion criteria encompassed studies on pediatric emergency protocols, triage systems, and management of critical conditions, with a focus on global perspectives. Data were extracted to assess diagnostic tools, treatment strategies, and systemic challenges

Introduction. Pediatric Emergency Medical Services (PEMS) represent a specialized branch of emergency care that provides out-of-hospital medical assistance for a wide range of critical and life-threatening conditions. These include severe allergic reactions, poisoning from drugs or chemicals, envenomation by venomous snakes, accidents resulting in bone or skull fractures, traumatic brain injuries, respiratory failure, cardiopulmonary arrest, cardiac arrest, febrile seizures, drug overdoses, burns, shock, and cases of child abuse, as well as the transport of patients to specialized medical facilities. Evidence from the literature indicates that conventional Emergency Medical Services





(EMS) are primarily designed to address acute conditions in adults, while the distinct needs of pediatric patients often remain insufficiently addressed. [5]. Traditionally, emergency medicine has focused primarily on identifying critically ill children, while less attention has been given to recognizing those who are clearly well. However, efforts to create structured assessment methods for evaluating pediatric illness often demonstrate limited sensitivity and specificity.[3].

Overcrowding in pediatric emergency departments continues to represent a significant public health concern. Although, unlike adult emergency units, pediatric patients generally do not experience increased rates of hospitalization or post-discharge mortality from overcrowded settings, the impact on quality of care remains substantial. Excessive patient load can lead to treatment delays, including postponed administration of antibiotics for febrile neonates, inadequate timing of analgesia in sickle cell crises, and slower initiation of therapy for acute asthma exacerbations.[4]. Before addressing the underlying causes, it is essential to accurately assess the degree of overcrowding. Traditionally, researchers have relied on retrospective indicators such as waiting time to be seen by a physician, total length of stay in the emergency department, or the proportion of patients leaving without being examined. In addition to these one-dimensional measures, two multidimensional scoring systems- PEDOCS and SOTU-PED-have been developed to provide real-time data on pediatric emergency department operations and to alert staff and administrators when overcrowding occurs. Both tools were critically evaluated in a recently published review and were found to demonstrate comparable accuracy. The PEDOCS score is calculated according to Equation (1) and ranges from 0 to 200, where 0 indicates “not busy,” 40-“busy,” 80-“extremely busy but not overcrowded,” 120-“overcrowded,” 160-“severely overcrowded,” and 200-“dangerously overcrowded.”

$$\text{PEDOCS} = 33,3 \times 0,11 + 0,07 \times (\text{patients in the waiting room}) + 0,04 \times (\text{total number of registered patients})$$

Once the level of overcrowding has been determined, an ‘in-through-out’ model of patient flow in the emergency department can help identify gaps for improvement. The most promising way to reduce the burden on paediatric patients at the intake stage remains the diversion of non-urgent patients at the triage stage (i.e. levels 4 and 5 in all commonly used triage systems) to nearby alternative locations. Sorting systems typically rely on an experienced sorting nurse to perform the sorting. The argument for replacing triage nurses with doctors lacks evidence suggesting that doctors are better or more cost-effective at triage than experienced nurses.[4] Sorting systems can operate more smoothly when combined with artificial intelligence. Based on previously collected data, artificial intelligence learns to predict the value of any target parameter with a certain level of accuracy. For example, the timeliness of contact with a doctor at the sorting level can be accompanied by real-time waiting time predictions based on the current level of workload. Artificial intelligence can match patients with medical triage levels more accurately than emergency medical specialists can.[6]

Pediatric emergencies are high-stakes situations where quick action can make all the difference in saving a child’s life. Getting triage and initial stabilization right is crucial, but those steps are only as effective as our understanding of what’s really going on inside the patient. Conditions like septic shock, severe breathing problems, traumatic injuries, or neurological emergencies like prolonged seizures each bring their own challenges, shaped by a child’s age, the cause of the issue, and how bad it is.





Anaphylactic shock

Anaphylactic shock is a life-threatening allergic reaction characterized by cardiovascular collapse. It can develop rapidly or be preceded by symptoms such as itching, wheezing, shortness of breath, hives, pallor, gastrointestinal distress, and weakness. Common triggers include food allergens, injectable medications, and insect stings. This condition demands immediate emergency intervention, with ambulance teams fully equipped to handle unpredictable complications.

Intramuscular administration of epinephrine into the anterolateral aspect of the thigh is the cornerstone of anaphylaxis management. Its alpha-1 adrenergic vasoconstrictive effect counteracts shock and reduces airway edema; its stabilizing action on mast cells decreases histamine release; and its beta-2 adrenergic activity promotes bronchodilation. Epinephrine should always be used as the first-line treatment for anaphylaxis, a recommendation supported by epidemiological data, animal studies, mechanistic evidence, and expert consensus derived from years of clinical experience. Delayed administration of epinephrine is associated with an increased risk of fatal anaphylaxis.[15] The dose of adrenaline for anaphylaxis is 0.01 mg/kg intramuscularly at a concentration of 1:1000. [4] It can be drawn up with a syringe or administered using an adrenaline auto-injector (AI). Intravenous administration of adrenaline should be avoided due to the risk of arrhythmia, except in cases where continuous infusion is required for refractory severe cardiorespiratory disease.[16].

Poisoning

Poisoning represents a significant challenge in pediatric healthcare across all age groups. The majority of emergency medical service calls involve accidental poisonings in children aged 5 years and younger. Poisonings in the first six months of life are most often caused by parents, while in other cases they occur accidentally. However, in adolescents, poisonings are often part of suicidal behaviour and can lead to death or cause long-term consequences. [13]. Among various etiologies, medications are the leading cause of unintentional poisonings. The burden is particularly pronounced in younger children due to single exposures to household detergents, antimicrobial agents, topical medications, acetaminophen, and dental plaque removers. In adolescents, poisonings tend to be more severe, often involving acetaminophen, methylphenidate, nonsteroidal anti-inflammatory drugs (NSAIDs), atropine, and ethanol. Moderate to severe intoxications are commonly linked to organophosphates, alkalis, ethanol, and neuroleptics.

Febrile seizures

Seizures triggered by fever are known as febrile seizures (FS). FS represent the most common form of epilepsy and neurological disorder in infants and young children. They occur most frequently between 12 and 18 months of age and typically affect children aged 6 months to 5 years. Febrile seizures are generally benign and rarely cause any brain damage. These episodes are associated with the release of inflammatory mediators such as interleukin (IL)-1, IL-6, and tumor necrosis factor (TNF), all of which are known to play key roles in the induction of fever.[12]. The decision to use anticonvulsant drugs such as midazolam or diazepam to stop seizures depends on several factors, including the type and duration of the seizure, the presence and length of the postictal phase, any recent fever or infection, antibiotic use within the past few weeks, accompanying symptoms, and





the child's immunization history. Other factors to consider include a history of previous febrile seizures or epilepsy, the severity of the convulsion, the use of antipyretic medications, and a family history of febrile seizures, epilepsy, or other neurological disorders. The child's condition should be stabilized immediately using the ABCDE approach (Airway, Breathing, Circulation, Disability, Exposure). Blood glucose levels should be checked if the seizure continues. The seizure must be stopped as soon as possible with antiepileptic drugs. After stabilization, close monitoring of vital signs-such as blood glucose, capillary refill time, temperature, heart rate, respiratory rate, and other clinical indicators-is essential to ensure patient safety and guide further management.

Acute respiratory failure in children

Acute respiratory failure (ARF) refers to the sudden inability of the respiratory system to maintain adequate gas exchange. A variety of clinical conditions can lead to ARF, including pneumonia, obstructive airway diseases such as asthma, restrictive disorders like neuromuscular diseases (for example, spinal muscular atrophy or muscular dystrophy), and, less commonly, interstitial lung diseases. Children-particularly infants-are more susceptible to ARF than adults because of the anatomical and physiological characteristics of their respiratory systems. Evaluating respiratory distress in pediatric patients is often challenging, as children may have difficulty describing their symptoms and may not always cooperate during diagnostic procedures. Clinical assessment and a detailed medical history remain the foundation for diagnosing ARF. Initial investigations, such as arterial blood gas analysis, are used to confirm the diagnosis and determine its severity, while more advanced tests are performed to identify the underlying cause.[14,15,16]

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