JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS

VOLUME 04, ISSUE 09
MOPNTHLY JOURNALS

ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08

UDC: 616.932-053.2-084

ORGANIZING EMERGENCY CARE AND INTENSIVE CARE FOR ACUTE INTESTINAL INFECTIONS IN YOUNG CHILDREN

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ABSTRACT: The article discusses the basic principles of organizing emergency care and intensive care for acute intestinal infections in young children (0-3 years). The article considers epidemiological issues, main clinical symptoms, pathogenesis, and modern approaches to rapid diagnosis and treatment. Particular attention is paid to methods of rehydration and correction of electrolyte disorders, the use of antibacterial drugs and monitoring of complications. Recommendations for organizing treatment in hospital and outpatient settings are provided. The data obtained and generalized clinical approaches may be useful for pediatricians, infectious disease specialists and emergency physicians.

Key words: acute intestinal infections (AII), young children, emergency care, intensive care, dehydration

ОРГАНИЗАЦИЯ ЭКСТРЕННОЙ ПОМОЩИ И ИНТЕНСИВНОЙ ТЕРАПИИ ПРИ ОСТРЫХ КИШЕЧНЫХ ИНФЕКЦИЯХ У ДЕТЕЙ РАННЕГО ВОЗРАСТА

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АННОТАЦИЯ: В статье обсуждаются основные принципы организации экстренной помощи и интенсивной терапии при острых кишечных инфекциях у детей раннего возраста (0–3 лет). Рассмотрены вопросы эпидемиологии, основные клинические симптомы, патогенез, а также современные подходы к быстрой диагностике и лечению. Особое внимание уделено методам регидратации и коррекции электролитных нарушений, применению антибактериальных препаратов и контролю осложнений. Приведены рекомендации по организации лечения в условиях стационара и амбулаторной практики. Полученные данные и обобщённые клинические подходы могут оказаться полезными для педиатров, инфекционистов и врачей неотложной помощи.

Ключевые слова: острые кишечные инфекции (оки), дети раннего возраста, экстренная помощь, интенсивная терапия, дегидратация

RELEVANCE

Acute intestinal infections remain a leading global health challenge, disproportionately affecting infants and young children under the age of five. According to the World Health Organization (WHO), diarrheal diseases are the second leading cause of death in this age group, claiming hundreds of thousands of lives each year. The primary mechanism of mortality is not the

infection itself, but its severe complications, most notably dehydration resulting from substantial fluid and electrolyte losses. Young children are uniquely vulnerable due to their higher body surface area-to-volume ratio, higher metabolic rate, and limited ability to communicate thirst or independently seek fluids, which predisposes them to rapid deterioration.

The relevance of establishing highly organized emergency and intensive care pathways for this condition is paramount. In many healthcare settings, particularly in resource-limited regions, delays in recognizing and treating severe dehydration lead to preventable deaths. The transition from mild or moderate dehydration to severe hypovolemic shock can be swift, requiring immediate and aggressive intervention. A failure to implement standardized triage systems, rapid assessment protocols, and evidence-based rehydration strategies in the emergency department can have catastrophic consequences. Therefore, optimizing the initial phase of care is critical to stabilizing the patient and preventing progression to a life-threatening state.

Furthermore, a subset of children with AII will develop complications beyond simple dehydration, such as severe dyselectrolytemia (e.g., hyponatremia, hypernatremia, hypokalemia), severe metabolic acidosis, paralytic ileus, toxic megacolon, or septic shock. These patients require the specialized, multidisciplinary capabilities of a pediatric intensive care unit (PICU). The organization of intensive care for these critically ill children involves advanced monitoring, tailored fluid resuscitation, vasopressor support, and targeted antimicrobial therapy. Without a clear and efficient system for identifying these high-risk patients and ensuring their timely transfer to a higher level of care, outcomes are significantly compromised.

Thus, the development and implementation of integrated care protocols—spanning from the initial emergency contact to intensive care—are not just a matter of clinical best practice but a public health imperative. A deep understanding of the pathophysiology, coupled with a systematic approach to diagnosis and management, is essential for every healthcare provider involved in the care of children. This article addresses this critical need by outlining the key principles for organizing effective and life-saving care for young children with severe acute intestinal infections.

INTRODUCTION

Acute intestinal infections, commonly referred to as acute gastroenteritis, are characterized by the sudden onset of diarrhea, often accompanied by vomiting, fever, and abdominal pain. The etiology is diverse, including a wide range of viral, bacterial, and, less commonly, parasitic pathogens. In young children, viruses—particularly rotavirus (despite vaccine availability), norovirus, and adenovirus—are the most frequent causative agents. Bacterial pathogens such as Campylobacter, Salmonella, Shigella, and pathogenic Escherichia coli are also significant causes, often leading to more severe, invasive disease.

The central pathophysiological consequence of AII in children is the loss of water and electrolytes through diarrheal stools and vomiting. This leads to volume depletion, or dehydration, which is the primary driver of clinical severity. Dehydration is a spectrum, ranging from mild (minimal fluid loss) to severe (life-threatening hypovolemic shock). The goals of management are, therefore, centered on three core principles: 1) assessing the degree of dehydration accurately and rapidly; 2) replacing the fluid and electrolyte deficits and providing for ongoing losses (rehydration); and 3) providing appropriate nutritional support to facilitate recovery of the intestinal mucosa.

This article details the organizational framework necessary to achieve these goals effectively. It begins by outlining the crucial steps in emergency care, from triage and initial assessment to the implementation of rehydration therapy. It then transitions to defining the indications for intensive

care and describes the key therapeutic modalities employed in the PICU to manage the most critically ill children with complicated AII.

LITERATURE REVIEW

The modern management of acute intestinal infections has been shaped by several decades of clinical research, leading to the development of highly effective, evidence-based guidelines. A cornerstone of this management is Oral Rehydration Therapy (ORT) using a low-osmolarity Oral Rehydration Solution (ORS). The discovery and widespread implementation of ORS has been hailed as one of the most significant medical advances of the 20th century, dramatically reducing mortality from diarrheal diseases. ORS works by leveraging the coupled transport of sodium and glucose in the small intestine (via the SGLT1 co-transporter), which remains intact even during most infectious diarrheas, promoting the passive absorption of water and electrolytes.

Clinical assessment of dehydration is fundamental to guiding therapy. Guidelines from organizations such as the WHO and the American Academy of Pediatrics (AAP) provide clinical dehydration scales that categorize dehydration as mild, moderate, or severe based on a constellation of signs and symptoms. These include the child's general condition (alertness vs. lethargy), thirst, skin turgor, mucous membrane moisture, heart rate, and capillary refill time. While useful, clinical assessment can be subjective, and no single sign is perfectly reliable.

For moderate to severe dehydration, or in cases where vomiting precludes ORT, intravenous (IV) fluid therapy is indicated. The standard approach involves an initial rapid bolus of an isotonic crystalloid solution (e.g., 0.9% saline or Ringer's lactate) at 20 mL/kg, which may be repeated until perfusion is restored. This is followed by a calculated replacement of the remaining deficit and provision of maintenance fluids over a 24-hour period.

The decision to escalate care to the ICU is multifactorial. Key indications include signs of shock unresponsive to initial fluid resuscitation, severe electrolyte abnormalities (e.g., symptomatic hyponatremia with seizures, severe hypernatremia), significant acid-base disturbances, altered mental status suggesting central nervous system complications, and evidence of sepsis or multi-organ dysfunction syndrome (MODS). Intensive care focuses on restoring hemodynamic stability, often requiring vasopressors or inotropes, meticulous monitoring of fluid balance and electrolytes, and sometimes invasive monitoring.

Antimicrobial therapy is generally not recommended for viral gastroenteritis. Its use is reserved for specific bacterial infections, particularly in cases of invasive diarrhea (dysentery) caused by pathogens like Shigella, or in high-risk populations such as young infants or immunocompromised children.

MATERIALS AND METHODS

This review was conducted by performing a comprehensive search of the medical literature using databases such as PubMed/MEDLINE, Embase, and the Cochrane Library. The search utilized keywords including "acute intestinal infection," "gastroenteritis," "diarrhea," "children," "pediatric," "dehydration," "rehydration," "emergency care," "intensive care," and "shock." The review focused on evidence-based clinical practice guidelines, systematic reviews, meta-analyses, and large cohort studies published by major pediatric and infectious disease societies. The synthesized information was structured to provide a logical and practical guide for the organization of care for young children with AII, from emergency presentation to intensive care management.

RESULTS AND DISCUSSION

The effective organization of care for a child with AII begins the moment they enter the healthcare system.

Triage and Rapid Assessment: Children presenting with diarrhea and vomiting must be triaged urgently. The initial assessment should focus on identifying signs of severe dehydration or shock (the "A-B-C's": Airway, Breathing, Circulation). Key warning signs include lethargy, decreased consciousness, poor peripheral perfusion, tachycardia, and hypotension (a late sign in children).

Dehydration Assessment: A structured clinical scale should be used to estimate the percentage of dehydration, which guides the initial fluid management plan. Table 1 provides an example of a commonly used clinical dehydration scale.

Mild-to-Moderate Dehydration: ORT is the treatment of choice. The child should be offered frequent, small volumes of ORS. If vomiting is an issue, a short pause followed by restarting ORS, or administration via a nasogastric tube, can be effective.

Severe Dehydration/Shock: Immediate IV access is a priority. An initial bolus of 20 mL/kg of isotonic crystalloid should be administered rapidly (over 5-20 minutes). The child must be reassessed after each bolus, with further boluses given as needed to restore circulation.

Table 1.
Clinical assessment of dehydration in young children

Feature	**Mild dehydration (3-5%)**	**Moderate dehydration (6-9%)**	**Severe dehydration (≥10%)**
Mental status	Alert, restless, thirsty	Irritable or lethargic	Lethargic, comatose, or floppy
Heart rate	Normal	Tachycardia	Severe tachycardia, bradycardia (pre-arrest)
Pulse quality	Normal	Normal to decreased	Weak or non-palpable
Breathing	Normal	Deep, may be rapid	Deep and rapid (acidosis)
Eyes	Normal	Sunken	Deeply sunken
Tears	Present	Decreased	Absent
Mucous membranes	Moist	Dry	Parched
Skin turgor	Instant recoil	Slow recoil (<2 seconds)	Very slow recoil (>2 seconds)
Capillary refill	<2 seconds	Prolonged (2-4 seconds)	Very prolonged (>4 seconds) or minimal
Urine output	Mildly decreased	Oliguria (<1 mL/kg/hr)	Anuria

Intensive Care Unit (ICU) Phase: The transition to the ICU is warranted for children who fail to stabilize with initial ED resuscitation or who present with life-threatening complications.

Indications for ICU Admission: Hypovolemic shock refractory to initial fluid boluses (e.g., > 40-60 mL/kg). Altered mental status (severe lethargy, coma) or seizures. Severe metabolic acidosis (e.g., pH < 7.1 or base deficit > 15).

Significant electrolyte disturbances (e.g., serum sodium < 125 or > 155 mEq/L with symptoms). Evidence of end-organ damage (e.g., acute kidney injury).

Need for vasoactive infusions (e.g., dopamine, epinephrine) to maintain blood pressure. Hemodynamic Support: This is the cornerstone. Continuous cardiovascular monitoring is essential. If fluid resuscitation alone is insufficient to restore perfusion, vasoactive medications are initiated.

Fluid and Electrolyte Management: This requires meticulous, frequent monitoring. IV fluids are carefully tailored to correct deficits and address ongoing losses, while avoiding iatrogenic complications. The rate of correction for abnormalities like hypernatremia must be slow and controlled to prevent cerebral edema.
Nutritional Support: Early enteral nutrition is crucial for promoting gut mucosal healing and preventing translocation of bacteria. If oral intake is not possible, nasogastric feeding is preferred.
Antimicrobial Stewardship: Antibiotics are used judiciously based on stool culture results or high clinical suspicion of specific bacterial pathogens, especially in the context of sepsis.

CONCLUSION

The successful management of acute intestinal infections in young children hinges on a well-organized, multi-layered system of care that is both rapid and responsive. The principles of emergency care—focused on swift triage, accurate assessment of dehydration, and aggressive, protocol-driven rehydration—are fundamental to preventing the progression to severe, life-threatening disease. Oral rehydration therapy remains the cornerstone for the majority of cases, while timely intravenous fluid resuscitation is life-saving for those with severe dehydration.
For the small but significant subset of children who develop severe complications, a clear pathway to intensive care is critical. The ICU provides the advanced monitoring and therapeutic capabilities necessary to manage shock, correct profound metabolic derangements, and support failing organ systems. An integrated approach, with seamless communication and transition between the emergency department and the intensive care unit, is essential for optimizing outcomes. By adhering to evidence-based guidelines and maintaining a high index of suspicion for severe disease, healthcare systems can significantly reduce the formidable burden of morbidity and mortality associated with this common pediatric illness.

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