

# Acute diarrhea in children



Magdalena Okarska-Napierała



# Definition

A **decrease in the consistency** of stool leading to loose or liquid stools and/or an **increase in the frequency** of evacuations to three or more in 24 hour

- **Acute diarrhea  $\leq 7$  days**
- Prolonged diarrhea 8-13 days
- Chronic or persistent diarrhea  $\geq 14$  days





## Common causes

Viral enteritis

Bacterial enteritis

Extraintestinal  
infections:

- Sepsis
- Otitis media
- Urinary tract infection
- Pneumonia

## Dangerous causes

Sepsis

Toxic shock syndrome

Intussusception

HUS

Fulminant *C. difficile* colitis

Appendicitis



# Dangerous causes

## Sepsis

- *Salmonella* spp.
- Infants and immunosuppressed – risk groups
- High fever, diarrhea (commonly **bloody**), ill appearance

## Toxic shock syndrome

- *S. aureus*, *S. pyogenes*
- Severe watery diarrhea with hypotension unresponsive to fluid resuscitation
- Multiorgan damage

## Intussusception

- Almost exclusively in first 2 years of life
- Intermittent (15-20 min intervals), severe, crampy abdominal pain
- Possible **bloody** diarrhea
- Palpable mass in the right side of the abdomen

## Hemolytic uremic syndrome

- Shiga-toxin producing *E. coli*
- Most commonly in the first 5 years of life
- Usually within 5-10 days since **bloody** diarrhea onset
- Hemolytic anemia, thrombocytopenia, acute kidney injury

## Fulminant *C. difficile* colitis

- Overgrowth of *Clostridoides difficile*
- Acute watery diarrhea with lower abdominal pain, low-grade fever, and leukocytosis, starting during or shortly after antibiotic administration

## Appendicitis

- Periumbilical pain that subsequently migrates to the right lower quadrant
- Tenderness in the right lower quadrant
- Abdominal guarding and rebound



## Viruses (ca. 70%)

Rotavirus  
Norovirus  
Sapovirus  
Astrovirus  
Adenovirus  
other

- Watery diarrhea, vomiting, fever
- Abdominal pain not that prominent
- (Neurologic signs possible in rotaviral infection)
- Exposure to viral enteritis

## Bacteria (ca. 30%)

*Salmonella typhi/paratyphi*  
*Campylobacter jejuni*  
*Escherichia coli*  
*Yersinia enterocolica*

- Blood/mucous in the stool
- Very high fever
- Severe abdominal pain
- Painful passing of small volume stools
- Neurologic signs
- Exposures (raw food, travelling etc.)



## Acute gastroenteritis









**What is the most significant clinical consequence of diarrhea?**

How does dehydration present clinically?

**Dehydration!**





| No dehydration               | Clinical dehydration   |   | Hypovolemic shock                      |
|------------------------------|--|---|--|
| Alert and responsive         | Altered responsiveness<br>(e.g., irritable, lethargic)       |    | Decreased consciousness                |
| Appears well                 | <b>Unwell or deteriorating</b>                               |    | -                                      |
| Eyes not sunken              | <b>Sunken eyes</b>   |    | -                                      |
| Moist mucous membranes       | <b>Dry mucous membranes</b><br>(except for „mouth breather“) |   | -                                      |
| Normal BP                    | Normal BP  |   | Hypotension                            |
| Normal breathing pattern     | Tachypnoea   |    | Tachypnoea                             |
| Normal capillary refill time | Normal capillary refill time                                 |   | <b>Prolonged capillary refill time</b> |
| Normal HR                    | Tachycardia  |    | Tachycardia                            |
| Normal peripheral pulses     | Normal peripheral pulses                                     |   | Weak peripheral pulses                 |
| Normal skin turgor           | <b>Reduced skin turgor</b>                                   |  | -                                      |
| Normal urine output          | Decreased urine output                                       |   | -                                      |
| Skin colour unchanged        | Skin colour unchanged  |   | Pale or mottled skin                   |
| Warm extremities             | Warm extremities   |   | Cold extremities                       |



# CDS – clinical dehydration scale

|   | General appearance  | Eyes            | Tears     | Mucous membranes |
|---|---|-----------------|-----------|------------------|
| 0 | Normal  | Normal          | Present   | Moist            |
| 1 | Thirsty, restless or lethargic, but <b>irritable when touched</b> | Slightly sunken | Decreased | "Sticky"         |
| 2 | Drowsy, limp, cold, sweaty and/or comatose                        | Very sunken     | Absent    | Dry              |

|     |                                |
|-----|--------------------------------|
| 0   | No dehydration                 |
| 1-4 | Some dehydration               |
| 5-8 | Moderate or severe dehydration |





# Diagnostic workup

- In most cases, children with acute gastroenteritis **do not require any diagnostic workup**
  - In severe conditions and/or in the hospital setting, investigations may be appropriate in individual cases
- 
- Children presenting with uncomplicated acute gastroenteritis **do not require routine of microbiological investigation**





# Diagnostic workup

**Microbiological investigations** should be considered in the following circumstances:

1. Underlying **chronic conditions** (e.g., oncologic diseases, inflammatory bowel disease, immunodeficiency)
2. Extremely **severe clinical conditions** (e.g., sepsis)
3. Prolonged symptoms (**>7 days**)
4. During **outbreaks** (childcare, school, hospital)
5. Children with **severe bloody diarrhea and high fever**
6. History of **travel to at-risk areas**





# ORT – Oral rehydration therapy

- Preferred method
- ORS – oral rehydration solution  
(50-60 mmol/l Na<sup>+</sup>)

**50-100 ml/kg over 3-4 hours**

- Then covering maintenance needs  
and ongoing losses



# Maintenance needs

| Maintenance /24 h |  |
|-------------------|--|
| < 10 kg           | 100 ml/kg  |
| 10-20 kg          | 1000 ml + 50 ml/(kg > 10 kg)                     |
| > 20 kg           | 1500 ml + 20 ml/(kg > 20 kg)<br>Max 2400 ml/24 h |



What if the child is in **shock**?

**20 ml/kg**  
**Balanced crystalloid i.v.**  
**10 min**



What if the child is **NOT** in shock?

**20 ml/kg/h**

**Balanced crystalloid i.v.**

**for 2-4 hours 😊**



# Nutrition

## Normal diet

- Infants < 6 months should neither interrupt breast-feeding nor introduce diluted or modified formula
- Where there is not the possibility to breast-feed, routine dilution of milk and routine use of lactose-free milk formula are not usually necessary
- **Children should be re-fed early:** regular oral feeding should be reintroduced no later than 4 to 6 hours after the onset of rehydration
- **Lactose-restricted** diets may be considered **in hospitalized** children and in children with **prolonged diarrhea** (>7 days); lactose-free formula should be recommended in children with chronic diarrhea (>14 days)
- **Elimination diet is usually not indicated** for children with acute gastroenteritis, and it may further impair the child's nutritional status



# Active diarrhea treatment

- **Administration of any product should not replace oral rehydration therapy**
- Selected **probiotic strains** (including *Lactobacillus rhamnosus* GG, *Saccharomyces boulardii*, *L. reuteri* DSM 17938) can be considered
- **Loperamide** and other antimotility drugs are **not recommended**
- **Ondansetron** administered either *p.o.* or *i.v.* is effective in reducing vomiting and may avoid hospital admission
- **Routine use of antibiotics is not recommended**



# Antimicrobial treatment

- **Routine use of antibiotics is not recommended**
- **Indications to use antibiotic:**
  - Infants younger than 3 months
  - Children with underlying **chronic conditions**, including those with sickle cell anemia or immunodeficiency and those at risk for developing severe or extraintestinal dissemination
  - Isolation of specific pathogens such as ***Shigella***, enterotoxigenic (but not Shiga-like toxin-producing) ***Escherichia coli***, ***Yersinia enterocolitica***
  - Campylobacter colitis can be treated with antibiotics, but treatment is effective only if administered within the first 2 days from the onset of symptoms



# Antimicrobial treatment

| Pathogen                                    | Indications                     | First choice                | Second choice                                       |
|---|---------------------------------|-----------------------------|---|
| <b><i>Shigella</i></b>                      | Proven or suspected shigellosis | Azithromycin OR ceftriaxone | Cefixime OR TMP/SMX (for proven susceptibility)     |
| <b><i>Salmonella</i></b>                    | Only high-risk children         | Ceftriaxone                 | Azithromycin OR TMP/SMX (for proven susceptibility) |
| <b><i>Campylobacter</i></b>                 | Selected cases                  | Azithromycin                | Doxycycline (>8 years)                              |
| <b>Shiga toxin-producing <i>E. coli</i></b> | NOT RECOMMENDED                 | -                           | -   |
| <b>Enterotoxigenic <i>E. coli</i></b>       | Mainly for traveler diarrhea    | Azithromycin                | Cefixime, TMP/SMX OR rifaximin (12 years)           |
| <b><i>V. cholerae</i></b>                   | Proven or suspected cholera     | Azithromycin                | Doxycycline (>8 years)                              |
| <b><i>C. difficile</i></b>                  | Moderate and severe cases       | Metronidazole               | Vancomycin p.o.                                     |



## 5 essential steps

1

Assessment of  
dehydration

2

Prompt rehydration  
with reduced osmolality  
ORS

3

Avoidance of elimination diets  
and continuing of breast-feeding  
and/or regular diet

4

Limiting laboratory investigations  
to selected circumstances and  
increased risk for bacterial  
infection

5

Active treatment of diarrhea  
with products supported by  
compelling clinical evidence in  
children.