
بسم الله الرحمن الرحيم

Deficit therapy

Chapter 56

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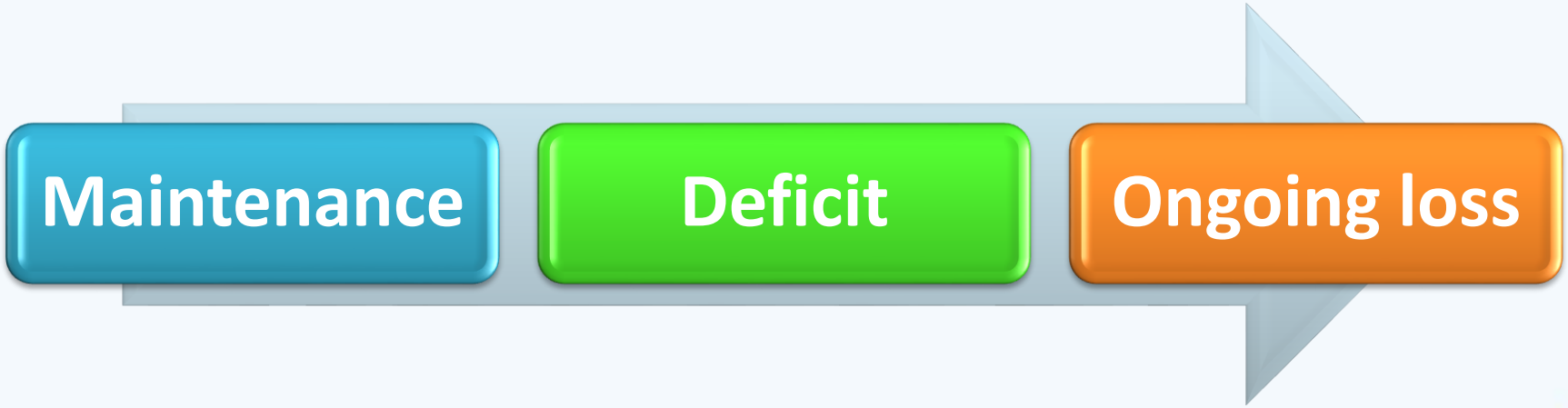
سوال ۱

در کودکی که قادر به آشامیدن و خوردن نیست کدامیک از سرم های جایگزین زیر را تجویز میکنید؟

1. Maintenance fluids
2. Deficit replacement
3. Replacement fluids (if they have continued excessive losses) NG, Urine, Fecal, Skin

Child who can not be fed enterally

1. Maintenance fluids
2. Deficit replacement
3. Replacement fluids (if they have continued excessive losses) NG, Urine, Fecal, Skin, …..



Infants become dehydrated more quickly than older children

- **Normal Child who is NPO:**

  D5 1/2NS + 20 mEq/L KCl

- **Volume depletion, hyponatremia and SIADH (Lung infection, Bronchiolitis, Pneumonia, CNS infection) :**

  D5 NS + 20 mEq/L KCl

- **Surgical patients (During surgery and 6-8 hr post Op):**

  NS or RL + Glucose (2/3 maintenance)

  Then D5 NS + 10-20 mEq/L KCL based on Serum K

- **Cont of Serum electrolytes daily**

Replacement therapy
AGE

Table 56-7	Replacement Fluid for Diarrhea

AVERAGE COMPOSITION OF DIARRHEA

Sodium: 55 mEq/L
Potassium: 25 mEq/L
Bicarbonate: 15 mEq/L

APPROACH TO REPLACEMENT OF ONGOING LOSSES

Solution: D5 ½NS + 30 mEq/L sodium bicarbonate + 20 mEq/L KCl
Replace stool mL/mL every 1-6 hr

Replacement therapy
NG tube

Table 56-8	Replacement Fluid for Emesis or Nasogastric Losses

AVERAGE COMPOSITION OF GASTRIC FLUID

Sodium: 60 mEq/L
Potassium: 10 mEq/L
Chloride: 90 mEq/L

APPROACH TO REPLACEMENT OF ONGOING LOSSES

Solution: normal saline + 10 mEq/L KCl
Replace output mL/mL every 1-6 hr

Replacement therapy
oliguria / polyuria
IWL + Urine out put

Table 56-9	Adjusting Fluid Therapy for Altered Renal Output

OLIGURIA/ANURIA

Replacement of insensible fluid losses (25-40% of maintenance) with D5 ½NS

Replace urine output mL/mL with D5 ½NS ± KCl

POLYURIA

Replacement of insensible fluid losses (25-40% of maintenance) with D5 ½NS ± KCl

Measure urine electrolytes

Replace urine output mL/mL with solution based on measured urine electrolytes

Third space losses and chest tube output are isotonic; thus, they usually require replacement with an isotonic fluid, such as **NS or LR.**

Protein losses from chest tube drainage can be significant, occasionally necessitating that 5% albumin be used as a replacement solution.

Deficit therapy

- Dehydration, most often due to gastroenteritis, is a common problem in children.
- Most cases can be managed with:

  oral rehydration

- Mild to mod. hyponatremic or hypernatremic dehydration can be managed with oral rehydration

مایع درمانی خوراکی

- Mild Dehydration:

  <10 kg 60-120 mL ORS for each diarrheal.

  > 10 kg initial hydration,120-240 mL ORS for each diarrheal

- Mod Dehydration: ORS 50-100 ml/Kg 3-4 hr

Table 57-1 Clinical Evaluation of Dehydration

Mild dehydration (<5% in an infant; <3% in an older child or adult): Normal or increased pulse; decreased urine output; thirsty; normal physical findings

Moderate dehydration (5-10% in an infant; 3-6% in an older child or adult): Tachycardia; little or no urine output; irritable/lethargic; sunken eyes and fontanel; decreased tears; dry mucous membranes; mild delay in elasticity (skin turgor); delayed capillary refill (>1.5 sec); cool and pale

Severe dehydration (>10% in an infant; >6% in an older child or adult): Peripheral pulses either rapid and weak or absent; decreased blood pressure; no urine output; very sunken eyes and fontanel; no tears; parched mucous membranes; delayed elasticity (poor skin turgor); very delayed capillary refill (>3 sec); cold and mottled; limp, depressed consciousness

- Clinical assessment of dehydration is only an **estimate;** thus, the patient must be continually **reevaluated** during therapy.
- The degree of dehydration is underestimated in **hypernatremic dehydration** because the movement of water from the intracellular space to the extracellular space helps preserve the intravascular volume

A child who weighs 10 kg and
is 10%
dehydrated
has a fluid deficit of
1 L.

Deficit therapy

Dehydration

- **5% …… 50 cc/kg**
- **7% …… 70 cc/kg**
- **10% …… 100 cc/kg**

D5% NS + 20 mEq/L KCL

Treatment of shock

- A fluid bolus, usually 20 mL/kg of the isotonic fluid, over approximately 20 min.
- The child with severe dehydration may require
- multiple fluid boluses and may need to receive the boluses as fast as possible.
- In a child with a known or probable metabolic alkalosis
- (the child with isolated vomiting), LR should not be used because the lactate would worsen the alkalosis.

- In isonatremic or hyponatremic dehydration, the entire fluid deficit is corrected over 24 hr
- A slower approach is used for hypernatremic dehydration

Table 57-2 Fluid Management of Dehydration

Restore intravascular volume:
- Normal saline: 20 mL/kg over 20 min
- Repeat as needed

Calculate 24-hr fluid needs: maintenance + deficit volume

Subtract isotonic fluid already administered from 24 hr fluid needs

Administer remaining volume over 24 hr using 5% dextrose NS + 20 mEq/L KCl

Replace ongoing losses as they occur

1. 20 ml/kg NS/ 20 min

2. 20 ml/kg NS/ 2 hr

3. Deficit + M – received Fluid / 24 hr

D: (100 ml/Kg NS for 10% Def.) M :½ NS

4. Ongoing Loss

5. Potassium 20 mEq/L

after urination

Table 57-3 | Monitoring Therapy

Vital signs:

- Pulse
- Blood pressure & CR

Intake and output:

- Fluid balance
- Urine output

Physical examination:

- Weight
- Clinical signs of depletion or overload

Electrolytes

Monitoring

Clinical improvement

PR: Lower heart rate

BP: Normalization of blood pressure

CF: Improved perfusion (normal CF)

UOP: Better urine output

General Appearance: Alert affect

Laboratory monitoring

- Na (look at trends)
- K
- Acid base
- BUN, Creatinine

Summary

Maintenance Fluid Therapy

1. **Kind of solution?** D5%NS or D5% ½ NS

2. **How much?**

0-10 kg	100 mL/kg
11-20 kg	1,000 mL + 50 mL/kg for each kg >10
>20 kg	1,500 mL + 20 mL/kg for each kg >20

Deficit Therapy

1. Kind of solution?
2. How much?

Acute phase:

20 cc/kg/20 min ..... NS/ RL

Deficit therapy:

50-100 cc/kg based on dehydration

D5% NS + 20 mEq/L Kcl

Ongoing loss

1. Kind of solution?
2. How much?

AGE

APPROACH TO REPLACEMENT OF ONGOING LOSSES

Solution: D5 ½NS + 30 mEq/L sodium bicarbonate + 20 mEq/L KCl

Replace stool mL/mL every 1-6 hr

NG Tube

APPROACH TO REPLACEMENT OF ONGOING LOSSES

Solution: normal saline + 10 mEq/L KCl

Replace output mL/mL every 1-6 hr

Oliguria

OLIGURIA/ANURIA

Replacement of insensible fluid losses (25-40% of maintenance) with D5 ½NS

Replace urine output mL/mL with D5 ½NS ± KCl

Polyuria

POLYURIA

Replacement of insensible fluid losses (25-40% of maintenance) with D5 ½NS ± KCl

Measure urine electrolytes

Replace urine output mL/mL with solution based on measured urine electrolytes

Fluid therapy cases

Case 1

شیرخوار پسر ۸ ماهه با اسهال حاد را به اورژانس آورده اند. به گفته مادر حجم ادرار وی کم شده است. در معاینه ضربان قلب ۱۱۰ در دقیقه دارد و فشار خون ۸۵/۶۰ میلی متر جیوه است و زمان بازگشت وریدی ۱ ثانیه است. در صورتیکه وزن بیمار ۸ کیلوگرم باشد دستورات سرم تراپی بیمار را مرقوم فرمایید.

مایع درمانی خوراکی

- Mild Dehydration:30-50cc/kg

<10 kg 60-120 mL ORS for each diarrheal.

> 10 kg initial hydration,120-240 mL ORS for each diarrheal

- Mod Dehydration: ORS 50-100 ml/Kg 3-4 hr

Case 2

شیرخوار دختر ۸ ماهه با اسهال حاد را به اورژانس آورده اند. به گفته مادر حجم ادرار وی کم شده است. در معاینه ضربان قلب ۱۲۰ در دقیقه دارد و فشار خون ۶۰ میلی متر جیوه روی پالس دارد و زمان بازگشت وریدی بیمار ۵ ثانیه است. در صورتیکه وزن بیمار ۸ کیلوگرم باشد دستورات سرم تراپی بیمار را مرقوم فرمایید.

1. 20 ml/kg NS/ 20 min

2. 20 ml/kg NS/ 2 hr

3. Deficit + M – received Fluid / 24 hr

D: (100 ml/Kg NS for 10% Def.) M :½ NS

4. Ongoing Loss

5. Potassium 20 mEq/L

after urination

Case 3

دختر ۱۲ ساله ای به دلیل تب و پنومونی در بخش عفونی بستری شده است. از ۳ روز قبل به دلیل امپیم چرکی چست تیوب دو طرفه دارد. ترشحات روزانه چست تیوب در هر طرف ۴۵۰ میلی لیتر است. دستورات سرم تراپی ۲۴ ساعته بیمار را مرقوم فرمایید.

Chest tube

- Replacement with an isotonic fluid ml/ml

NS / RL / Albumin 5%

Case 3

پسر ۱۲ ماهه ای با وزن ۱۰ کیلوگرم را به دلیل اسهال آبکی شدید و مکرر NPO کرده اید. بیمار کم آبی ۱۰% دارد و حجم مدفوع هر نوبت حدود ۵۰ سی سی است. سرم ۲۴ ساعته بیمار را تعیین نمایید.

- نوع سرم؟
- مقدار سرم؟

Thank you