Recently asked questions

• 1996: Discuss infantile GE under the following headings - prevention, aetiology and management

• 1999: Write short notes on the composition of oral rehydration solutions (SOROL and WHO)

• 3/2001: Discuss the diagnosis, treatment and prevention of cholera

• 9/2001: A 14 mo old child presents with a 3 day hx of diarrhoea and vomiting. Examination reveals a well nourished child of 10kg whom you estimate to be 5% dehydrated. The child is not shocked but is tachypnoeic. Blood results are as follows - Na 165, K 4.5, Urea 25 and Blood sugar 25. Discuss your management.

• 3/2004: Causes of infective bloody diarrhoea (dysentery) and its management in children

Thandi, an 18 mo old child, is brought by her mother to the clinic. She has had D&V for 3/7. She is restless and irritable, has a slow skin pinch and sunken eyes. She is visibly severely wasted. The nurse offers Thandi some ORS which she drinks eagerly. She decides to refer her to the district hospital where you are the MO.

1. How would you classify Thandi’s diarrhoea using the IMCI criteria?
2. Describe how you would make the assessment of a slow skin pinch.
3. Explain the mechanism whereby ORS corrects dehydration.
4. Offer an explanation as to why Thandi was referred to hospital using the IMCI guidelines.
Why is it Important?
(for those not sitting the DCH)

- **Morbidity:**
  - common, delays healing/exacerbates concomitant illness, precipitates kwashiorkor/marasmus

- **Mortality:**
  - one of the commonest causes of preventable/avoidable mortality in the developing world.
  - The second commonest cause of death in South African hospitals
How to successfully manage GE in kids?

• What do they die of?
• What are the complications of GE?
• Who must we worry about most?
• Get a feel for who can go home
Shock

- Shock refers to depleted INTRAVASCULAR volume
- Shock IS NOT THE SAME AS dehydration
- Do not leave a shocked child as they will die
- Look for signs of shock in every child
Is the child shocked?

- **Signs of shock include:**
  - tachycardia, slow capillary refill, cool peripheries, weak pulses, hypotension (this is a LATE sign)

- Give 20ml/kg iv bolus as fast as possible. Use either Modified Ringers Lactate (MRL) or Normal Saline
- Review after the bolus
- If still shocked, repeat the bolus of 20ml/kg
- Thereafter, use 5-10ml/kg boluses until there are signs of intravascular volume replenishment (liver becomes palpable), and ask for experienced assistance
- Consider PICU/Ventilation/Inotropes after 40-50mls/kg
Do not give $\frac{1}{2}$ DD as a volume expander. It contains glucose and you will cause an OSMOTIC DIURESIS, and the child will not get better. It also does not have the correct electrolyte content and will rapidly leave the intravascular space and make your little patient soggy.
Is the child dehydrated?

- Dehydration refers to depleted EXTRAVASCULAR volume. Even 10% dehydration IS NOT THE SAME AS shock.

- What are the signs of dehydration?
The IMCI Way

Does the child have diarrhoea?

IF YES, ASK: LOOK OR FEEL:
- For how long?
- If diarrhoea for 14 days or more, has the child lost weight?
- Is there blood in the stool?
- What treatment is the mother giving?

Classify all children with diarrhoea for dehydration:
- Look at the child's general condition.
- Is the child:
  - Lethargic or unconscious?
  - Restless and irritable?
- Look for sunken eyes
- Offer the child fluid.
- Is the child:
  - Not able to drink or drinking poorly?
  - Drinking eagerly, thirsty?
- Pinch the skin of the abdomen. Does it go back:
  - Slowly?
  - Or very slowly? (more than 2 seconds)

Classify diarrhoea:
- Two of the following signs:
  - Lethargic or unconscious
  - Sunken eyes
  - Not able to drink or drinking poorly
  - Skin pinch goes back very slowly.
- Two of the following signs:
  - Restless, irritable
  - Drinks eagerly, thirsty
  - Skin pinch goes back slowly.
- Not enough signs to classify as severe or some dehydration

And if diarrhoea 14 days or more classify:
- Dehydration present OR
- History of weight loss
- No dehydration and
- No history of weight loss

And if blood in stool classify:
- Blood in the stool

DIARRHOEA

DIARRHOEA WITH SEVERE DEHYDRATION
- Start treatment for severe dehydration
  (Plan C p.16)
- Refer urgently to hospital
- Give frequent signs of ORS on the way
- Advise the mother to continue breastfeeding
- Keep the child warm on the way to hospital

DIARRHOEA WITH SOME DEHYDRATION
- Give fluid and food to treat for some dehydration
  (Plan B p.15)
- Advise mother to continue breastfeeding
- Advise the mother when to return immediately (p.20)
- Follow-up in 2 days if not improving

NO VISIBLE DEHYDRATION
- Give fluid and food to treat for diarrhoea at home
  (Plan A p.15)
- Advise mother when to return immediately (p.20)
- Follow-up in 5 days if not improving

SEVERE PERSISTENT DIARRHEA
- Start treatment for dehydration (If present)
- Give Vitamin A unless a dose has been given in the last month (p.12)
- Consider symptomatic HIV (p.7)
- Give frequent signs of ORS on the way
- Refer to hospital

PERSISTENT DIARRHEA
- No dehydration
- No history of weight loss
- No dehydration and
- No history of weight loss

SEVERE DYSENTERY
- Start treatment for dehydration if present
- Refer urgently to hospital
- Give frequent signs of ORS on the way

DYSENTERY
- Treat for 5 days with neomycin or p.20
- Advise the mother when to return immediately (p.20)
- Follow-up in 2 days
Rehydration Fluids

- For 5% dehydration, give 50ml/kg/24 hours
- For 10% dehydration, give 100ml/kg/24 hours (do not give more than 100 ml/kg/24 hours)
- Give this IN ADDITION TO maintenance requirements (see below)
- Give as ORS if hydrating orally or via NGT or ½ DD if hydrating IVI
Does the child have ongoing losses?

- Ongoing losses refers to abnormal water loss in the stool, vomitus or urine (see above). 
  Normally a child loses about 10ml/kg/day of water in the stool. So start by giving more than this:
  - A good starting guess is to give 30 - 50ml/kg/24 hours
  - Give this IN ADDITION TO maintenance requirements (see below)
Maintenance Fluid requirements

- 1st year: 120mls/kg
- 2nd year: 100ml/kg
- 2-4 yrs: 85mls/kg
- 4-10 yrs: 70mls/kg

- 100ml/kg for 1st 10kg
- 50ml/kg for next 10kg
- 20ml/kg thereafter
What does this mean practically?

- First treat shock then
- Calculate and document your fluid plan.
- For example, a 5kg child, 5% dehydrated, having frequent watery stools:

  - Maintenance: ☐ = 100 ml/kg/24hrs
  - Rehydration: ◎ = 50 ml/kg/24hrs
  - Losses: ⦿ = 50 ml/kg/24hrs
Using the same example above...

- If taking orally:  
  - ▼ = 100 ml/kg/24hrs: breast ad lib or formula 85 ml 4 hourly
  - ◆ = 50 ml/kg/24hrs
  - ℓ = 50 ml/kg/24hrs

- ⇒ IV ½ DD 20 ml/hr
• If NPO:
  • Ⓡ = 80 ml/kg/24hrs
  • Ⓐ = 50 ml/kg/24hrs
  • ⒱ = 50 ml/kg/24hrs

  ⇒ IV $\frac{1}{2}$ DD 38 ml/hr
Feed ASAP

• Withhold food only if there is good reason: excessive vomits, ileus, shock.

• Re-introduce food as soon as possible.
IVACS help

- When giving a child intravenous fluids, especially when rehydration is required, use an electronic flow controller (like an IVAC pump) EVEN IN DISTRICT HOSPITALS.

- Use an intake/output chart as well (there is one in the Clinical Records Package).
After the initial assessment and plan, what is the ongoing fluid management?

- Review regularly
- If the child is not improving, then more fluid is going OUT than IN:
  - Check:
    - Drip tissued
    - Fluid not given as prescribed (see notes on infusion pump, and charting above)
    - Osmotic diuresis (check urine dipstix)
    - Bigger losses than you thought
If the child is getting oedematous, think of:

- Fluid is going in faster than requested
- Losses are smaller than guessed
- The child is HYPOALBUMINAEMIC: if this is the case, the child may be depleted intravascularly
- After considering and assessing these possibilities, adjust fluids accordingly
Metabolic Management...

And

What investigations?
Scenario 1

- Sipho is a 13 month old little boy who weighs 10 kg. He has had D and V for 5 days. He is lethargic and has cool hands and CRT is 4 s. Tachycardia 160. No BP cuff in casualty. RR 65/min. He has a very slow skin pinch and sunken eyes and a dry mouth.

- ABG: pH 7.1 pCO2 2.7 pO2 17 SBC 5 BE -16 Na 132 K 1.8

- Detail your initial management and fluid plan
Metabolic acidosis

- Five causes
- Acidotic breathing
- When did you last use bicarb?
If pH < 7.1 despite adequate fluid resuscitation...

• half correct the acidosis as a slow bolus:

  - calculation: ml 8.5% NaHCO$_3$ = $\frac{1}{2} \times 0.3 \times$ body weight in kg $\times$ Base deficit

  - NB. Exercise caution in patients with $K^+ < 3.4$ mmol/l or $Na^+ > 145$ mmol/l AND if the patient is hypoventilating
Hypokalaemia (K⁺<3.5)

- Clinically, hypokalaemia manifests as weakness, floppiness and ileus.
  - If K⁺ < 3.4:
    - Give oral Rx: 0.5ml – 1ml/kg/dose MIST POT CHLOR 8 hourly for 2 days
  - 1ml KCl (mist pot chlor) = 74.5mg KCl = 1mmol K⁺

- If K⁺ < 2.0 mmol/l or < 3.0mm/l but NPO
  - 1ml 15% KCl = 2 mmol K
  - maximum safe concentration in a paediatric ward setting is 40mmol/litre
Hyperkalaemia ($K^+ > 5.5$)

- Establish cause: e.g. renal failure; excess supplementation; tissue necrosis
If $K^+ > 6.0$ mmol/l:

- stop all $K^+$ intake - check both prescription and fluid therapy charts

- check acid-base status; correct acidosis by TREATING THE FLUID DEFICITS

- monitor urine output

- preferably monitor ECG (peaked tall T waves, broad QRS, ventricular fibrillation)

- 6 hourly serum $K^+$, acid-base, urea, creatinine
If $K^+ > 7.0 \text{ mmol/l}$:

- *This is life threatening.* Manage as above, and commence stepwise treatment:
  
  - nebulised salbutamol 1 ml in 2 ml saline; repeat 3 hrly PRN (fenoterol is also used for this purpose)
  
  - IV 10% calcium gluconate 0.5 ml/kg over 10 minutes (use cardiac monitor and stop immediately if bradycardia occurs)
  
  - Kayexalate 0.5-1 g/kg/dose per os or as retention enema; repeat 6 hourly if necessary
  
  - 8.4% NaBic 2ml/kg IV over 10 minutes
  
  - NOTIFY CONSULTANT (insulin infusion and/or dialysis may be needed)
Scenario 2

- Emma is a 7 month old little girl who has had diarrhoea and vomiting for 3 days. She had a generalised seizure this morning. Her weight is 8.5 kg. She is well perfused and has good volume pulses and warm peripheries. Her skin turgor is normal but her mouth is dry. Her eyes may be a bit sunken. She is breathing rapidly and deeply. She is awake and irritable. She is no longer vomiting much and her abdomen is not distended.

- ABG: pH 7.15 pCO2 3.2 pO2 14 SBC 13 BE -9  Na 162 K 3.2

- Detail your initial management and fluid plan
Hypernatraemia (Na⁺ > 150mmol/l)

- Because dehydration will have been under-estimated clinically, do not change the initial fluid plan
  - Use ½ DD for rehydration
  - Ensure that normovolaemia is attained and maintained
  - Half correct metabolic acidosis only if pH < 7.1 and not improving on adequate fluid management
- Failure of serum Na⁺ to drop is usually due to inadequate fluid replacement
  - Monitor Na 6 hourly. Aim to decrease serum Na⁺ by 1 mmol/hour
  - Aim to correct dehydration over 24 hours
Scenario 3

- Amy is a 2 year old child who has had diarrhoea for a week. She weighs 12kg. She is lethargic and floppy. She has sunken eyes and a very slow skin pinch. She also has cold hands and feet and a thready pulse. The pulse rate is 170. Her respiratory rate is 22/min.

- ABG: pH 7.13 pCO2 6 pO2 10 SBC 13 BE -10 Na 120 K 2.0

- Detail her initial management and fluid plan
Hyponatraemia (Na\(^+\) < 130 mmol/l)

- Clinically, hyponatraemia manifests as lethargy, altered level of consciousness, and seizures
  
  - If on oral fluids, repeat serum Na\(^+\) in 4 hours
  
  - If on IV fluids, and Na\(^+\) <125 mmol/l, or the child is symptomatic, change \(\frac{1}{2}\) DD to a Normal Saline (NS) cocktail: add 2ml 15% KCl and 20 ml 50% Dextrose to 200ml NS.
    
    - This cocktail contains Na\(^+\) 154 mmol/l, Cl\(^-\) 154 mmol/l, K\(^+\) 20 mmol/l, and 5% dextrose
      
      • calculation: ml NS = 4 x body weight in kg x (140 - serum Na\(^+\))
      • Monitor serum Na\(^+\) 12 - 24 hourly - aim to correct over 24 hours.
      • Change back to \(\frac{1}{2}\) DD once serum Na\(^+\) > 130 mmol/l
When to give antibiotics?

• The very young
• Immunocompromised
• Malnourished
• Dysentery
• Septicaemia
• Isolate specific pathogen
Vitamin A and zinc

• Won’t hurt
ORS Questions


• 1999: Write short notes on the composition of oral rehydration solutions (SOROL and WHO)

• Explain the mechanism whereby ORS corrects dehydration
ORS

- Coupled active transport of Na and Glucose in the small bowel results in passive absorption of water and other electrolytes even in the face of a secretory diarrhoea.

- Provides a balanced electrolyte solution that replaces expected electrolyte losses in the form of Na and K, corrects to some extent the acid base disturbances through the addition of citrate and provides a 2 - 2.5% glucose solution to enhance the active transport of Na (and water by solvent drag).

- Different formulations available.
### Composition of ORS

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<th>SOROL</th>
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