Care of the Critically Unwell Patient…

fluids

Are we made of water?

YES!

Humans are like cucumbers

Water content

- at least half of body weight in healty adults (60%)
- blood volume
  - 7% bw males
  - 6% bw females

Composition

- male 80kg

- 80 x 0,6 = 48 liter body fluids
- 80 x 0,07 = 5,6 liters of blood

- 2/3 (32 liters) in cells
- 1/3 (16 liters) around cells

How we lose fluids

Normal

urine
breathing
sweating
stool

Abnormal

bleeding
stool (diarrhoea)
sequestration
breathing
sweating

Signs of shock?

- confusion / reduced conscious level
- fast pulse
- weak pulse
- slow capillary refill time (>2s)
- low blood pressure
- narrow pulse pressure
  - a small difference between the systolic and diastolic blood pressure
- fast breathing
- poor urine output

Practical blood pressure

- When a patient becomes shocked, there is a usual pattern to observations:
  1. Pulse rate rises, and urine output falls
  2. “Pulse pressure” drops
  3. Blood pressure drops
  4. Patient dies!
- Note the earliest change is a rise in pulse rate

Pulse pressure

- Difference between systolic and diastolic

- ie Systolic *minus* diastolic

- 100/50 = pulse pressure 50
- 140/70 = pulse pressure 70
- 100/90 = pulse pressure 10

- Normal pulse pressure = 30 or more
- Less than 30 is an early sign of shock

How do we treat shock?

1. Stop bleeding
2. Positioning the patient
3. IV fluids

Frusemide?

NO! - makes the kidneys “leak”

Mannitol?

NO! - fluid leaves the body

Hydrocortisone?

NO! - Does not raise blood pressure in the short term

Adrenaline/Dopamine? Sometimes…

In shock, the body tries to

- Make the heart working harder
  - pumping harder
  - pumping faster
- Increase the blood volume
  - patient becomes thirsty
  - kidneys produce less urine
- Reduce blood to non-vital organs
  - skin becomes cold

Treatment of shock?

- 20ml/kg *flush*

Reassess circulation for signs of shock

Repeat 20ml/kg

After shock is treated:

- Calculating the ammount of fluid that a patient needs can be difficult
- But very important, life and organ saving treatment

Why are fluids done badly

- We prescribe fluids, then do not review the patient afterwards
- We underestimate fluid loss
- We are afraid of fluid overload
  (does it happen?)

- We do not calculate fluid requirements
  - the maths is complicated

Severe Dehydration

- Severe dehydration is 10% of body weight (or 100ml/kg)
  - 20kg child with severe dehydration has lost 2 kg of water = 2 litres
  - (or 100ml/kg = 2000ml)

  - So, give shock treatment 20ml/kg = 400ml flush, then 80ml/kg = 1600ml over 4-6 hours

Examples of dehydration 1

- 10kg child who is severely dehydrated and in shock.
- How much fluid to give flush?
- How much to give next?
- Over how many hours?

Examples of dehydration 2

- 20kg child who is severely dehydrated and in shock.
- How much fluid to give?

Examples of dehydration 3

- 50kg adult with diarrhoea.
- dry skin, dry mouth, thirsty, pulse 120/min BP 140/85
- How much fluid to give?

- WILL NEED TO GIVE 5L!

Fluid requirements

Fluids required = Treat Shock

+

Previous Losses
(eg dehydration)

+

Estimated ongoing losses

+

Normal requirements

Previous losses

General rule is to give the same as has been lost.

- eg. blood loss in theatre of 1 litre requires at least 2 units of blood

Ongoing losses

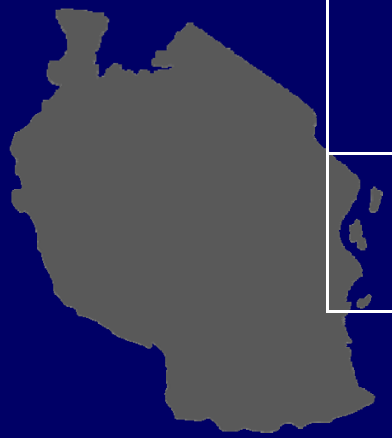
- Try and estimate how much a patient will lose. Eg vomits 10 times, each time 100ml = 1000ml

In a normal day

- Fluid requirements depend on body weight
- 30 ml/kg

Daily requirements – a guide

Body weight (kg)	Daily fluid required
<10	100ml/kg
10-15	1000ml
15-30	1500ml
30-50	2000ml
50 +	3000ml



Normal requirements - calculations

for a 3kg child

For the first 10kg	100ml/kg/day
For the next 10kg	50ml/kg/day
Then for every kg	20ml/kg/day

100 x 3 = 300

total of 300ml per day

Normal requirements - calculations

for a 15kg child

For the first 10kg	100ml/kg/day	**100 x 10 = 1000**
For the next 10kg	50ml/kg/day	**50 x 5 = 250**
Then for every kg	20ml/kg/day	

total of 1000+250= 1250ml per day

Normal requirements - calculations

for a 90kg adult

For the first 10kg	100ml/kg/day	**100 x 10 = 1000**
For the next 10kg	50ml/kg/day	**50 x 10 = 500**
Then for every kg	20ml/kg/day	**20 x 70 = 1400**

total of 2900ml per day

Oral or Iv replacement

- Iv fluids should be given to:
  - unconscious patients
  - those with severe dehydration
  - those who cannot take oral fluids

- If there is no shock:
  - the patient might be OK with oral fluids
  - reassess the patient if you are worried

What fluid should be used?

- A mixture of salt solutions and glucose is often a good choice
- You should replace whatever the patient is losing, for example
  - replace bleeding with blood
  - replace diarrhoea with salt water (normal saline, ringers lactate)

Salt solutions

- Spreads intravascular and interstitial – stays outside the cell

- *Ringers lactate*
- *Normal saline (NaCl)*

Glucose

- Spreads eavenly in the body – goes inside cells

Colloids

- Large molecules – stays mainly inside the vessels
- *Gelatine, albumin, blood*

Asessement

- Need to reevaluate often
- Check for signs of respons
  - Pulse rate（↓）
  - Blod pressure（↑）
  - Capillary refill time（↓）
  - Urine output （↑）
  - Conscious level （↑）

Normal Urine output

- 30ml/kg or
- > ½ ml / kg body weight / hour

- 60kg man?
- 30kg girl?
- 10kg baby?

- How often should it be checked?
- Hourly in very sick patients / twice a day for all ICU patients

Why urine output falls

- low blood pressure (common)
- blocked catheter (common)
- kidney failure (rare or late)
  - requires careful fluid management

Kidneys

Save functions!!!!!!

- Fluids
- MAP > 65
- Vasoconstrictors

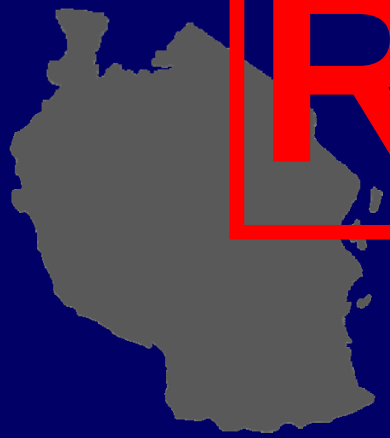
- **NO Furosemide!**

Asessement

Observe

Document

React !!!



Summary

- What to give after shock is treated
- How much fluid to give to a critically ill patient:
  - Shock
  - Previous losses / dehydration
  - Ongoing losses
  - Maintenance Need
- Severe dehydration = 10% body weight lost (=100ml/kg)