

SIMPLY... Fluids

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Plan

- Maintenance vs Resuscitation
- Prescribing
- Common Errors ☹️
- Calculations 😊
- Drip rates



Case

54 yo presents with severe diarrhoea and vomiting.

- How would you proceed?



Assessment

- History
- Examination
- Investigation

- Management



Assessment

History



Case

54 yo presents with severe diarrhoea and vomiting.

HPC

Vomiting for 3 days, 2 days of diarrhoea

Unable to tolerate oral fluids for 24hrs

Ate dodgy kebab on Saturday. No recent travel.

Feeling unwell, thirsty, light-headed when standing

Weeing less

No feverish symptoms

No PMH

HISTORY
Input vs Output

?Limited intake

?High Losses

Symptoms

Urine

Co-morbidities

Assessment

Examination



Case

54 yo presents with severe diarrhoea and vomiting.

Examination

Alert

Accessory muscles of respiration

Cool peripheries

Dry mucus membranes

Observations:

See chart

T37.0 BP 95/60 HR 110 RR 24 98% OA

EXAMINATION

- A**
- B** Respiratory Rate >20/min
- C** Systolic Blood Pressure <100mmHg
Heart Rate >90 bpm
Cold peripherally
JVP
- D** Urine output < 0.5 ml/kg/hr
Temperature
AVPU
- E** Dry mucosae



Assessment

Investigation

Weight 100kg

Urine : 4+ ketones, nil else

Bloods:

U&E

FBC

INVESTIGATIONS

Bedside: Weight
Fluid Balance Chart
Urine dipstick

Bloods: Electrolytes

Imaging: Chest X-Ray

Management

- IV Access
- Fluid Challenge



Type of fluid and rate

- Crystalloids

Clear fluids- water+electrolytes

- 0.9% Normal Saline
- Dextrose
- Hartmann's

	0.9% Normal saline	Hartmann	5% glucose
Na	154 mmol	131 mmol	0
K	0	5 mmol	0
Cl	154 mmol	111 mmol	0
Osmol	303 mosm/l	279 mosm/l	253 mosm/l
Other	nil	Lactate 29 Calcium 2	Glucose 50g/l

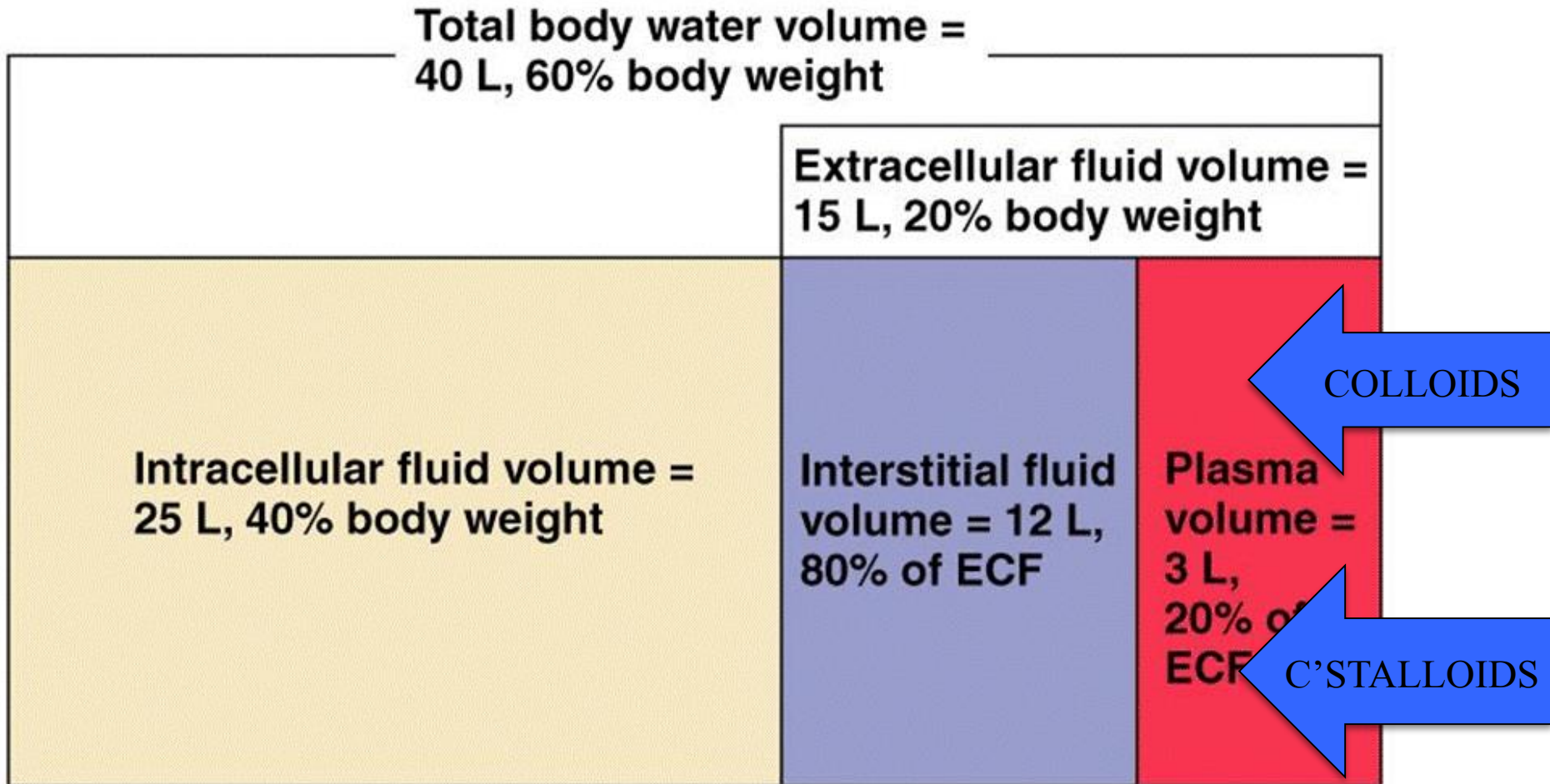
- Colloids

Gelatinous- particles suspended in solution

- Volplex
- Gelofusion
- Blood



Fluid compartments



Resuscitation

Assess-ABCDE

IF NO OVERLOAD SIGNS...

*** FLUID CHALLENGE ***

250-500mls Crystalloid

Reassess

Further 250-500mls bolus until 2L given

REASSESS



Case 2... quickly

- 35yo
- Post emergency caesarean section (for sepsis and fetal distress)
- Blood loss 1300mls

- Obs

T37.0 BP 95/60 HR 110 RR 24 98% OA

- Fluid challenge...



Resuscitation

Assess- ABCDE

IF NO OVERLOAD SIGNS...

*** FLUID CHALLENGE ***

250-500mls Crystalloid

Reassess

Further 250-500mls bolus until 2L given

REASSESS

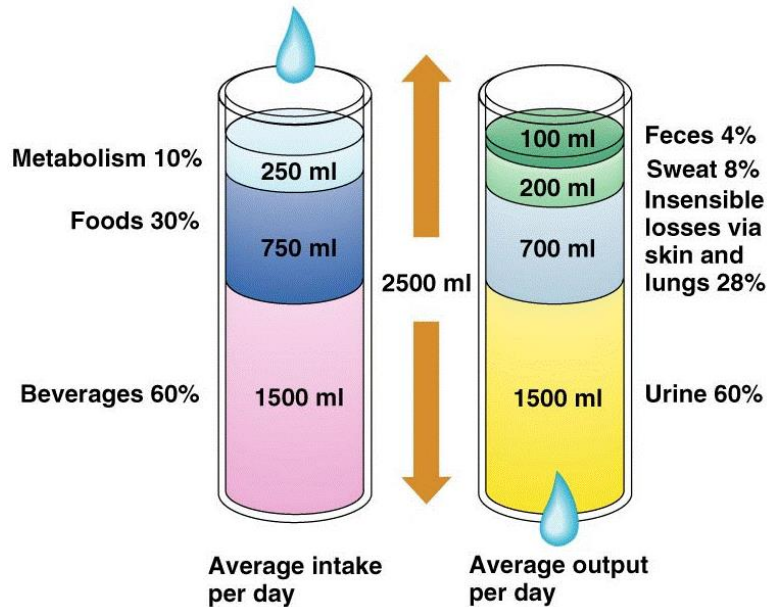
- If improves... likely hypovolaemia
- If does not improve... Likely something else



Fluid balance



The patient was placed on a fluid balance chart.



1 24 Hour Fluid Balance Chart The Leeds Teaching Hospitals NHS NHS Trust WPG562

01:00hrs - 24:00hrs

Patient's Name JAMES JONES
Ward 83
Consultant BIRT
Date of Birth 01/01/78 Unit No. 666661

Date/Time	Intake (in mls.)					Output (in mls.)				
	Oral	Enteral Feed/NG Feed	Parenteral IV	Blood Product	Running Total	Urine	Aspirate/Suction	Other	Running Total	
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15						(RETURNED FROM THEATRE)				
16					83	35				
17					83	20				
18						20				
19						15				
20						10				
21						15				
22						12				
23						15				
00										
Total										

Total Intake mls. Total Output mls.

Maintenance Requirements

Fluid: 25-30 ml/kg/day
Sodium: 1-2mmol /kg/day
K⁺: 0.5-1mmol /kg/day
(approx. max 10mmol/hr)

+ Replacements

Example... 70kg per day

- Fluid: 1750-2100ml
- Sodium: 70-140mmol
- Potassium: 35-70mmol

DOES PATIENT NEED IV FLUID???

	0.9% Normal saline	Hartmanns	5% glucose
Na	154 mmol	131 mmol	0
K	0	5 mmol	0
Cl	154 mmol	111 mmol	0
Osmol	303 mosm/l	279 mosm/l	253 mosm/l
Other	nil	Lactate 29 Calcium 2	Glucose 50g/l



Fluid prescription

NEWHAM HEALTHCARE & NEWHAM COMMUNITY NHS TRUSTS

INTRAVENOUS INFUSION PRESCRIPTION AND USE
For prescription, not for fluid balance

[Use label where available]

Hospital Number: _____

Patient's Name: _____

Date of Birth: _____

Sex: M F

Weight: _____

PRESCRIPTION

WARD _____

CONSULTANT _____

PREVIOUS ADVERSE REACTIONS

Tick if Patient on Enteral or Parenteral Feeds

ADMINISTRATION

Date	Central or Peripheral Line	Type of Infusion Fluid	Volume of Infusion Fluid (ml)	Name of Drug to be Added	Total Dose in Bag	Infusion Rate (Units)	Doctor's Signature	Bleep No.	Batch No. of Infusion Fluid	Drug Addition Time	Added By	Time Started	Set Up By	Time Finished	Total Volume Given ml	Pha Cor

INTRAVENOUS FLUID THERAPY SHOULD BE REVIEWED EVERY 24 HOURS AND ALL PREVIOUS REGIMES CANCELLED. INFUSION RATES: 40 drops per minute is 600 ml in 4 hours and 1 litre in 6 hours 16 drops are in 1 ml. 500 ml in 4 hours = 30-35 drops per minute. 1 litre in 6 hours = 40-45 drops/minute. 500 ml in 6 hours = 20-25 drops per minute. 1 litre in 8 hours = 30-35 drops/minute. 1928



Prescribing maintenance fluids

HISTORY

Input vs Output

?Limited intake

?High Losses

Symptoms

Urine

Co-morbidities

EXAMINATION

A

B

Respiratory Rate >20/min

C

Systolic Blood Pressure <100mmHg

Heart Rate >90 bpm

Cold peripherally

JVP

D

Urine output < 0.5 ml/kg/hr

Temperature

AVPU

E

Dry mucosae

INVESTIGATIONS

Bedside:

Weight

balance

dipstick

Fluid

Urine

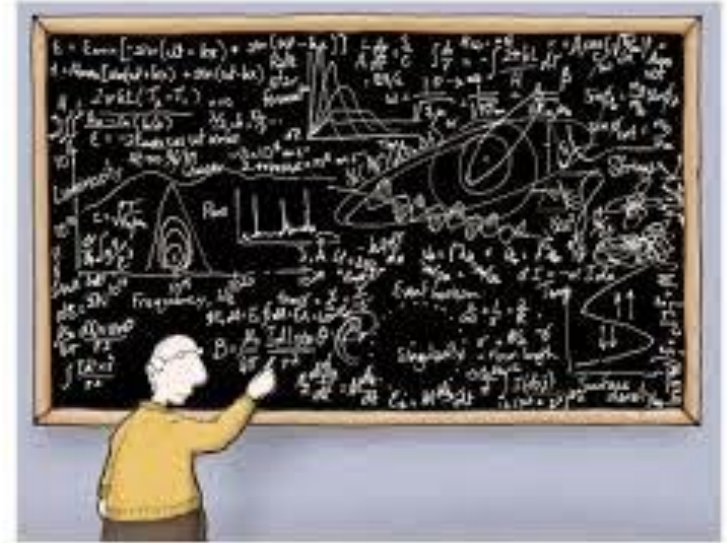
Bloods:

Electrolytes

Imaging: Chest X-Ray

Depends on the case: e.g. ?NBM

Calculations



Calculating Drip Rate

What is the drip rate (drops/minute) required for a unit of blood to run over 4 hours using giving set with drop factor of 20 drops/ml?

1 unit of blood = approx 400mls

Calculating Drip Rate

- Drip rate (drops per minute)
- Volume (ml)
- Time (*minute*)
- Drop Factor (drops per ml) or (gtt per ml)

Three different methods... use the one you're most comfortable with



1. Know the Equation

What is the drip rate (drops/minute) required for a unit of blood to run over 4 hours using giving set with drop factor of 20 drops/ml?

$$\text{Drip rate} = \frac{\text{Volume}}{\text{Time}} \times \text{Drop Factor}$$

$$\text{Drip Rate} = \frac{400\text{mls}}{240\text{mins}} \times 20 \text{ gtt/ml}$$

$$= 33 \text{ drops / min}$$

$$= 32 \text{ drops / min} \quad \text{OR} \quad 8 \text{ drops / 15 sec}$$



2. Think about the problem

- Drip rate is DROPS PER MINUTE
- This is TOTAL DROPS DIVIDED BY TIME
- TOTAL DROPS same as VOLUME \times DROP FACTOR (as this is drops per ml)

What is the drip rate (drops/minute) required for a unit of blood to run over 4 hours using giving set with drop factor of 20 drops/ml?

$$\text{TOTAL DROPS} = \text{VOLUME} \times \text{DROP FACTOR} = 400 \times 20 = 8000$$

$$\text{DRIP RATE} = \text{TOTAL DROPS} / \text{TIME} = 8000 / 240 = 33 \text{ drops/min}$$



3. Look at the units

Drip rate (drops per minute)

- Volume (ml)
- Time (minute)
- Drop Factor (drops per ml)

$$\text{Drip rate} \left(\frac{\text{Drops}}{\text{min}} \right) = \frac{\text{Volume} \left(\frac{\text{ml}}{\text{mins}} \right)}{\text{Time}} \times \text{Drop Factor} \left(\frac{\text{Drops}}{\text{ml}} \right)$$

$$\begin{aligned} \text{Drip Rate} &= \frac{400\text{mls}}{240\text{mins}} \times 20 \text{ gtt/ml} \\ &= 33 \text{ drops / min} \end{aligned}$$

Converting drip rate to ml/hour

What is the transfusion rate in ml/hour of a blood transfusion being run at 40 drops/minute through a giving set with drop factor of 20 drops/ml?

Transfusion Rate	(Ml/hr)
Drip rate	(Drops/minute)
Drop Factor	(Drops/ml)

1. Know the Equation

$$\text{Transfusion Rate} = \frac{\text{Drip Rate}}{\text{Drop Factor}}$$

What is the transfusion rate in ml/hour of a blood transfusion being run at 40 drops/minute through a giving set with drop factor of 20gtt/ml?

$$\begin{aligned}\text{Transfusion Rate} &= \frac{40 \times 60}{20} \\ &= 120 \text{ ml/hr}\end{aligned}$$

2. Think about the problem

What is the transfusion rate in ml/hour of a blood transfusion being run at 40 drops/minute through a giving set with drop factor of 20 drops/ml?

- 20 drops per ml
- Therefore 40 drops = 2ml
- Therefore 2ml per minute

- Therefore $2 \times 60 = 120$ ml per hour

3. Look at the units

What is the transfusion rate in ml/hour of a blood transfusion being run at 40 drops/minute through a giving set with drop factor of 20 drops/ml?

Transfusion Rate	(ml/hr)
Drip rate	(Drops/ minute)
Drop Factor	(Drops/ml)

$$\text{ml/hr} = \frac{\text{drops}}{\text{hr}} \text{ divided by } \frac{\text{drops}}{\text{ml}} = \frac{\cancel{\text{drops}}}{\text{hr}} \times \frac{\text{ml}}{\cancel{\text{drops}}}$$

$$= 40 \times 60 \text{ divided by } 20$$

$$= 120 \text{ ml per hour}$$



Try these later...

What is the drip rate (drops/minute) required for a 1 litre bag of saline to run over 5 hours using giving set with drop factor of 10 drops/ml?

$$\text{Drip rate} = \frac{\text{Volume}}{\text{Time}} \times \text{Drop Factor}$$

$$\text{Drip rate} = \frac{1000}{60 \times 5} \times 10 = 33 \text{ gtt/min}$$

What is the transfusion rate in ml/hour of a blood transfusion being run at 20 drops/minute through a giving set with drop factor of 15 drops/ml?

$$\text{Transfusion Rate} = \frac{\text{Drip Rate}}{\text{Drop Factor}} = \frac{20 \times 60}{15} = 80 \text{ ml/hr}$$



Summary

- IV only if not PO
- Calculations...
 - Take your time!
 - Is your answer sensible?
- Practice!

Any Questions?



Calculations

1. 0.01% Adrenaline. How many grams of adrenaline are in 1 litre of saline?

- Same as 1:10,000 adrenaline
- So 1 unit adrenaline in 10,000 units saline
- Or 1g Adrenaline in 10,000ml saline
- So 0.1g in 1 litre
- (one decimal place to the right)

2. What should the urine output for a 80kg patient over 4 hours be?

- $UO > 0.5 \text{ ml / kg / hr}$
- So at least $0.5 \times 80 \times 4 = 160\text{ml}$



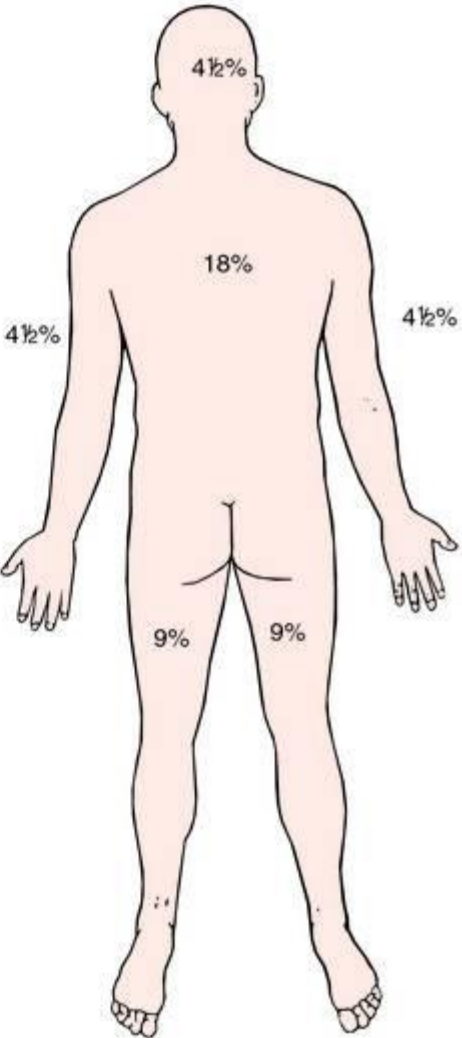
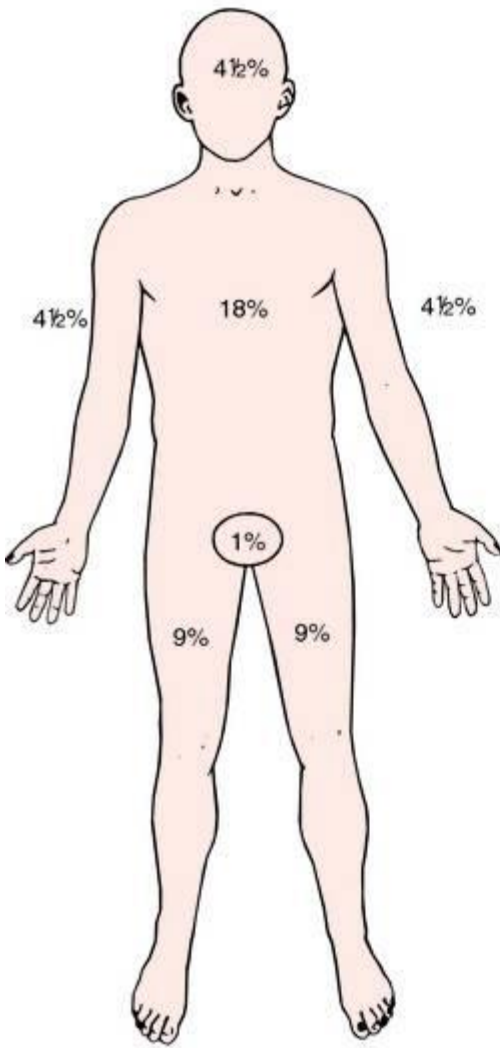
Burns

A patient presents with burns from fire. The burns are affecting both his arms, his face and head.

- What percentage body area has been effected?



Herndon Rule of 9s



Arm	9%
Head	9%
Neck	1%
Leg	18%
Anterior trunk	18%
Posterior trunk	18%