FLUID MANAGEMENT

Introduction

- Maintaining perfusion & normotension
- Excretion of solute load
- Maintain whole body homeostasis

Fluid Balance

INPUT :

- Water intake :1500ml
- Solid food :600ml
- Endogenous :400ml

- Total ~~2500ml

OUTPUT :

- Urine: 1500ml
- Respiration: 500ml
- Feces :100ml
- Insensible :400ml

- Total ~~2500ml

Maintenance of Fluid Balance

- Osmoreceptors
- Hormonal regulation :.

ADH
RAAS
ANP etc.

Fluid Distribution

- 60% of body weight is water.
- Intracellular(400-450 ml/kg)—70%

- Extracellular
  - -Interstitial(150-200ml/kg)—20%
  - -Intravascular(50-60ml/kg)—10%
- 3rd space fluid (Shires,1960).

Fluid Distribution Maintenance

- Osmolality ~~~270-280 mosmol/kg
  $2x[Na^+ + K^+]$ +Glucose/18 +BUN/2.8
- Colloid Osmotic Pressure (COP) (Oncotic Pressure)

  Plasma COP --25mmHg

  Interstitial COP—20mmHg

Maintenance of Fluid (contd.)

- Na-K ATPase Pump
- Capillary Permeability

- STARLING EQUATION

$$Q = K.[(P_c - P_i) - k(\Pi_c - \Pi_l)$$

Monitoring

- Clinical :Normal parameters
  CVP~~5 to10 cm H_2O
  Urine output
- Laboratory : Electrolyte balance
  Acid –Base balance
  Osmolality

TYPES OF FLUIDS

Crystalloids

- Clear & Transparent
- Low molecular weight
- Short plasma ½ life
- 1:3 distribution
- Increase interstitial edema
- Well tolerated in Renal Failure
- Less costly

Colloids

- Translucent
- Larger molecular weight
- Longer plasma ½ life
- 1:1 distribution
- Lesser interstitial edema
- Relative C/I in renal failure
- Costlier
- :anaphylaxis, coagulopathy,

Crystalloids(contd.)

- 5% D (250 mosmol/kg)
- 10%D(510 mosmol/kg)
- Ringer lactate (270 to 280 mosmol/kg)
- 0.9% NS(300 mosmol/kg)
- 3%NS (~1000 mosmol/kg)

Colloids (contd.)

- Hemaccel
- Hetastarch
- Albumin
- Blood &components

Albumin

- Maintains COP
- Drug binding
- Acid base balance
- Free radical scavenging

Albumin controversies

- Initially used as “magic fluid”
- Cochrane study(1998) doubted the validity of albumin use.*
- NO outcome improvement in critically ill
- Role similar to other colloids

*(BMJ1998;317:235-240)

Crystalloids vs. Colloids

WHY COLLOIDS ?

- Lesser volume
- Lesser interstitial edema
- Better tissue oxygenation
- Better wound healing.

CONTROVERSIES

- Capillary permeability altered in critically ill patients.
- NO improved outcome with colloids.

- Colloids more effective in nonseptic & non traumatic patients.*

*(.Surgery1989;105:65-71.)

Fluid Therapy

- Maintenance
- Deficit
- Replacement
- Compensatory volume expansion
  (5 to 7 ml/kg)

Maintenance

- **4:2:1** formula

  upto 10 kg – 4ml/kg/hr
  11—20kg -- 2ml/kg/hr
  > 20 kg -- 1ml/kg/hr

- Adults usual req. is 2ml/kg/hr.

Fluid Therapy(contd.)

- DEFICIT : due to fasting.Replace over 3hr
- REPLACEMENT: due to loss. To be replaced at the earliest.
- COMPENSATORY VOLUME EXPANSION: due to IPPV & vasodilation. To be replaced in the first hr.

Fluid Therapy (contd.)

- Total Fluid Requirement = Maintenance + Deficit + Replacement + Compensatory volume expansion

GI loss replacement guidelines(per L lost)

Fluid	NS	5%D	KCl	Sod.Bi
Saliva	250ml	750ml	20mEq	45mEq
Gastric	250	750	20	---
S I	750	250	5	22
Pancr.	500	500	5	90
Biliary	750	250	5	45

FLUID RESUSCITATION

- Which fluid?
  - <15% loss – Crystalloids 1:3
  - 15-30% loss – Crystalloids (+colloids)
  - > 30% loss -- Colloids+ Blood

(Am. College of Surgeons ATLS manual 1992)

Fluid Challenge("7-3 Rule")

PAWP/CVP(cmH_2O)	Fluid infusion
<10	200ml/10min
10-15	100ml/10min
> 15	50ml/10min

Response	Therapy
>7 increase	Stop
3-7 increase	Wait for 10 min
<3 increase	Continue

50 kg adult with intestinal obstruction for 24 hrs. admitted for emergency surgery. Pt came in shock with no urine output for 12 hrs,38^0C tachycardia,BP80mmHg systolic & CVP of 1 cm H_2O.Gastric aspirate~1 litre.Pt resuscitat- tated for 2hrs &underwent surgery for 2hrs.Blood loss was 600ml.&peritoneal fluid loss of 2litres. There was no dys-electrolytemia.Write fluid prescription for the patient for the initial 4hrs.

All the best..