

Adair, Jonathan

From: Briscoe, Maura
Sent: 28 April 2008 09:30
To: Neagle, Heather; Lawson, Elaine
Subject: FW: Hyponatraemia wallcharts
Attachments: hyponatraemia_wallchart.pdf; PAEDIATRIC PARENTERAL FLUID THERAPY (17 09 07) FINAL.pdf; hypno_wallchart.pdf

-----Original Message-----

From: McAloon, Jarlath [<mailto:Jarlath.McAloon@...>]
Sent: 25 April 2008 17:37
To: Julian Johnston
Cc: brian mccloskey; Brian Mullan; Clodagh.Loughrey; Heather Steen; Ian Young; McAloon, Jarlath; Briscoe, Maura; Peter Crean; Stevens, Tony (SEB)
Subject: Re: Hyponatraemia wallcharts

Hi Julian

my understanding is

- that the 2003 chart is complementary with the report "The management of hyponatremia in adults" i.e it is not a paediatric document
- that the 2007 guidance on paediatric parenteral fluid therapy supersedes the 2002 guidance chart and that the relevant DHSSPS circular has asked trusts to remove the 2002 charts.

With Best Wishes,
Jarlath

"Julian Johnston"

<julian.johnston

25/04/2008 16:34

To: "Heather Steen" <Heather.Steen@rediffmail.com>, "Peter Crean"

<Peter.Crean@...>, "Ian Young" <I.Young@...>

"McAloon, Jarlath"

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Mullan" <Brian.Mullan@redhat.com>, "brian mccloskey"

<brian.mccloskey [REDACTED]

cc: <maura.briscoe[REDACTED]>, "Stevens, Tony \ (SEB\)"

<tony.stevens@...>

Subject: Hyponatraemia wallcharts

HYPONATRAEMIA - A DISORDER OF WATER BALANCE WHICH IS POTENTIALLY FATAL

STEP 1 EVALUATE

1. Assess patient for signs & symptoms of hyponatraemia - record level of consciousness
2. Monitor closely
3. Is patient on drugs which might lead to hyponatraemia, eg diuretic, antidepressant especially SSRI, SNRI
4. Check fluid balance especially post operative patients

STEP 2 ASSESS VOLUME STATUS

Check (BP, pulse, orthostatic changes, JVP, oedema, ascites)

Hypovolaemic

CHECK

AT
ALL STAGES
ASK FOR HELP
IF UNCERTAIN

Extrarenal causes
(Urine Na < 15 mmol/l)

- ☐ GI-vomiting
- ☐ GI-diarrhoea
- ☐ Fluid shifts (burns, pancreatitis)
- ☐ Renal causes
- ☐ Diuretics
- ☐ Salt wasting Nephropathy (analgesics, polycystic disease, pyelonephritis)
- ☐ Adrenal insufficiency

Isovolaemic

CHECK

Urine Na > 25 mmol/l

- ☐ SIADH (urine osmolality >100mOsm/kg)
- ☐ H₂O intoxication (urine osmolality <100mOsm/kg)
- ☐ Renal failure
- ☐ Hypothyroidism
- ☐ Adrenal insufficiency

Hypervolaemic

CHECK

- ☐ Cirrhosis
- ☐ Congestive heart failure
- ☐ Nephrotic syndrome

Check Serum Osmolality

Normal / High
(275-290 mOsm/kg of water)

Exclude

- ☐ Hyperglycaemia
- ☐ Hypertonic infusions (glycerol/glycine/mannitol)
- ☐ Hyperlipidaemia
- ☐ Hyperproteinaemia

Low
(<275 mOsm/kg of water)

STEP 3 TREAT

Symptomatic

Restore volume with fluid challenge (1 litre Saline) over 2-4hrs
Repeat Na in 1hr and continue fluids if Na rising

Asymptomatic

Restore volume with Isotonic Saline

Symptomatic

Hypertonic saline
Furosemide diuresis

Asymptomatic

Water restriction

Symptomatic / Asymptomatic

Treat underlying disorder
Water restriction

Na⁺ could not increase by > 12mmol in 24 hours

PAEDIATRIC PARENTERAL FLUID THERAPY (1 month – 16 yrs)

Sept
2007

Initial management guideline

Monitoring & observations essential

ALL CHILDREN

Admission Weight, U&E (unless child is well & for elective surgery)

12 Hourly –

Assess In / Output, plasma glucose

Daily – Clinical reassessment. U&E (more often if abnormal); 4-6 hourly if $\text{Na}^+ < 130 \text{ mmol/L}$.

ILL CHILDREN

May need:

Hourly – HR, RR, BP, GCS, Fluid In/ Output (urine osmolality if volume cannot be assessed)

2-4 hourly – glucose, U&E, +/- blood gas.

Daily – weight if possible

Each shift

Handover and review of fluid management plan.

If plasma $\text{Na}^+ < 130 \text{ mmol/L}$ or $> 160 \text{ mmol/L}$ or plasma Na^+ changes $> 5 \text{ mmol/L}$ in 24 hours ask for senior advice

Is shock present?

YES

ADMINISTER RAPID FLUID BOLUS
Give 20 ml/kg sodium chloride 0.9% IV or Intravenous
[10 ml/kg if history of haemorrhage or in diabetic ketoacidosis]
Reassess. Repeat bolus if needed. Call for senior help.
(Up to 60 ml/kg may be needed. Use blood after 40 ml/kg if patient has haemorrhaged)

Can child be managed with oral fluids?

YES

PRESCRIBE ORAL REHYDRATION SOLUTION

ESTIMATE DEFICIT
FLUID DEFICIT = (% dehydration x kg x 10) as mls of:
sodium chloride 0.9%

The volume of fluid to be prescribed is: fluid deficit MINUS volume of any fluid bolus received

Prescribe this residual volume of deficit separately from the maintenance prescription.

Give over 24 hours (but over 48 hours if $\text{Na}^+ < 135$ or $> 145 \text{ mmol/L}$)

ONGOING LOSSES: calculate at least 4 hourly. Replace with an equal volume of:

sodium chloride 0.9% (with or without pre-added potassium)

Be prepared to change fluid type and volume according to clinical reassessment, electrolyte losses and test results

Is there a fluid deficit?

YES

NO

Prescribe Maintenance fluids

PRESCRIBE INITIAL IV MAINTENANCE FLUID AND TIME FOR REASSESSMENT

Patients particularly at risk of hyponatraemic complications:

peri-operative patients; patients with head injuries; gastric losses; CNS infection; severe sepsis; hypotension; intravascular volume depletion; bronchiolitis; gastroenteritis with dehydration; abnormal plasma sodium, particularly if less than 138 mmol/L but also when greater than 160 mmol/L; salt wasting syndromes.

Fluid choices: glucose containing fluid normally required if under 1 year old and may also be required by older children

sodium chloride 0.9% (with/ without pre-added glucose 5%)

or
Hartmann's Solution

or
Solution Corporately Approved at Trust Level

Other Patients:
sodium chloride 0.45% with pre-added glucose 2.5% or 5%

All Patients:

Alter fluid rate according to clinical assessment. Change electrolyte and glucose content of infusion fluid according to test results.

COMMENCE ORAL FLUIDS & DISCONTINUE IV FLUIDS AS SOON AS POSSIBLE

CALCULATION OF 100% MAINTENANCE RATE

(a) for first 10 kg:

100 ml/kg/ day \equiv 4ml/kg/hr

(b) for second 10 kg:

50 ml/kg/ day \equiv 2ml/kg/hr

(c) for each kg over 20 kg: 20 ml/kg/ day \equiv 1ml/kg/hr

[for 100% daily maintenance add together (a) + (b) + (c)]

MAXIMUM: in females 80 mls per hour; in males 100 mls per hour

If risk of hyponatraemia is high consider initially reducing maintenance volume to two thirds of maintenance

Hypokalaemia ($< 3.5 \text{ mmol/L}$): Check for initial deficit. Maintenance up to 40 mmol/L. IV potassium usually needed after 24 hrs using pre-prepared potassium infusions as far as possible. Consult Trust Policy on IV strong potassium.

Oral intake and Medications: volumes of intake, medications & drug infusions must be considered in the fluid prescription.

Hypoglycaemia ($< 3 \text{ mmol/L}$): **Medical Emergency: give 5 ml/kg bolus of glucose 10%.** Review maintenance fluid, consult with senior and recheck level after 15-30 mins. **INTRA-OPERATIVE PATIENTS:** consider monitoring plasma glucose.

Symptomatic Hyponatraemia: check U&E if patient develops nausea, vomiting, headache, irritability, altered level of consciousness, seizures or apnoea. **This is a Medical Emergency and must be corrected.**

Commence infusion of sodium chloride 2.7% at 2 ml/kg/hour initially and get senior advice immediately.

Commence infusion of sodium chloride 2.7% at 2 ml/kg/hour initially and get senior advice immediately.

any CHILD RECEIVING PRESCRIBED FLUIDS is AT RISK OF HYPONATRAEMIA

INTRODUCTION

- Any child on IV fluids or oral rehydration is potentially at risk of hyponatraemia.
- Hyponatraemia is potentially extremely serious, a rapid fall in sodium leading to cerebral oedema, seizures and death. Warning signs of hyponatraemia may be non-specific and include nausea, malaise and headache.
- Hyponatraemia most often reflects failure to excrete water. Stress, pain and nausea are all potent stimulators of anti-diuretic hormone (ADH), which inhibits water excretion.
- Complications of hyponatraemia most often occur due to the administration of excess or inappropriate fluid to a sick child, usually intravenously.
- Hyponatraemia may also occur in a child receiving excess or inappropriate oral rehydration fluids.
- Hyponatraemia can occur in a variety of clinical situations, even in a child who is not overtly "sick". Particular risks include:
 - Post-operative patients
 - CNS injuries
 - Bronchiolitis
 - Burns
 - Vomiting

BASELINE ASSESSMENT

- Before starting IV fluids, the following must be measured and recorded:
- **Weight:** accurately in kg. [In a bed-bound child use best estimate.] Plot on centile chart or refer to normal range.
 - **U&E:** take serum sodium into consideration.

FLUID REQUIREMENTS

Fluid needs should be assessed by a doctor competent in determining a child's fluid requirement. Accurate calculation is essential and includes:

Maintenance Fluid

- 100mls/kg for first 10kg body wt, plus
 - 50mls/kg for the next 10kg, plus
 - 20mls/kg for each kg thereafter, up to max of 70kg.
- [This provides the total 24 hr calculation; divide by 24 to get the mls/hr.]

Replacement Fluid

- Must always be considered and prescribed separately.
- Must reflect fluid loss in both volume and composition (lab analysis of the sodium content of fluid loss may be helpful).

CHOICE OF FLUID

- **Maintenance fluids** must in all instances be dictated by the anticipated sodium and potassium requirements. The glucose requirements, particularly of very young children, must also be met.
- **Replacement fluids** must reflect fluid lost. In most situations this implies a minimum sodium content of 130mmol/l.
- **When resuscitating** a child with clinical signs of shock, if a decision is made to administer a crystalloid, normal (0.9%) saline is an appropriate choice, while awaiting the serum sodium.
- The composition of oral rehydration fluids should also be carefully considered in light of the U&E analysis.

Hyponatraemia may occur in any child receiving any IV fluids or oral rehydration. Vigilance is needed for all children receiving fluids.

MONITOR

- **Clinical state:** including hydration status. Pain, vomiting and general well-being should be documented.
- **Fluid balance:** must be assessed at least every 12 hours by an experienced member of clinical staff.

Intake: All oral fluids (including medicines) must be recorded and IV intake reduced by equivalent amount.

Output: Measure and record all losses (urine, vomiting, diarrhoea, etc.) as accurately as possible.

If a child still needs prescribed fluids after 12 hours of starting, their requirements should be reassessed by a senior member of medical staff.

- **Biochemistry:** Blood sampling for U&E is essential at least once a day - more often if there are significant fluid losses or if clinical course is not as expected.

The rate at which sodium falls is as important as the plasma level. A sodium that falls quickly may be accompanied by rapid fluid shifts with major clinical consequences.

Consider using an indwelling heparinised cannula to facilitate repeat U&Es.

Do not take samples from the same limb as the IV infusion.

Capillary samples are adequate if venous sampling is not practical.

Urine osmolality/sodium: Very useful in hyponatraemia. Compare to plasma osmolality and consult a senior Paediatrician or a Chemical Pathologist in interpreting results.

SEEK ADVICE

Advice and clinical input should be obtained from a senior member of medical staff, for example a Consultant Paediatrician, Consultant Anaesthetist or Consultant Chemical Pathologist

- In the event of problems that cannot be resolved locally, help should be sought from Consultant Paediatricians/Anaesthetists at the PICU, RBHSC.