

CREST

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The Management of Hyponatraemia in Adults

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This booklet has been published by the Clinical Resource Efficiency Support Team (CREST), which is a small team of health care professionals established under the auspices of the Central Medical Advisory Committee in 1988. The aims of CREST are to promote clinical efficiency in the Health Service in Northern Ireland, while ensuring the highest possible standard of clinical practice is maintained.

These guidelines have been produced by a small sub-group of clinicians under the Chairmanship of Dr Clive Russell. CREST wishes to thank the sub-group and all those who contributed in any way to the development of these guidelines.

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CONTENTS

Introduction

Clinical Features

Diagnosis

Treatment Principles 1 (for asymptomatic patients)

Treatment Principles 2 (for symptomatic patients)

Infusion Guidelines

HYPONATRAEMIA

INTRODUCTION

Hyponatraemia is defined as a serum Na < 135mmol/l.
Commonest electrolyte abnormality in hospitalised patients.
Usually results from water retention secondary to an inability to excrete free water.

DIAGNOSIS

The process includes a comprehensive history, examination and laboratory investigations to determine the cause and guide therapy.

The history should focus on medicines, vomiting, diarrhoea and associated disease states.

The examination should focus on volume status including orthostatic assessment of pulse and blood pressure, jugular venous pressure and oedema.

The laboratory evaluation should include serum and urine osmolality, urine sodium, renal and liver function tests. Glucose, thyroid and adrenal function tests should be ordered if clinically indicated.

CLINICAL FEATURES

Gradation of symptoms from lethargy and anorexia to agitation, disorientation, seizures and coma. They are often initially non-specific.

Patients at risk include alcoholics, malnourished patients, elderly females taking thiazides, burns patients and hypovolaemic patients.

Symptoms depend critically on the

- rapidity of onset and
- severity of hyponatraemia.

Acute onset may cause cerebral oedema and requires prompt diagnosis and correction. Patients at risk include postoperative (especially post prostatectomy/endometrial ablation) menstruating females, elderly patients taking thiazides, psychiatric polydipsic patients and children.

An osmotic demyelination syndrome may occur with inappropriate fluid correction in either acute or chronic hyponatraemia.

TREATMENT PRINCIPLES 1

A: **For ASYMPTOMATIC patients**

Focus of therapy directed to identifying and treating the cause of hyponatraemia.

- In HYPOVOLAEMIC states (see flow diagram) restoring volume with normal saline will inhibit ADH secretion and facilitate correction of hyponatraemia.
- In HYPERVOLAEMIC states (see flow diagram) attention is directed towards treatment of the underlying condition.

SIADH patients are ISOVOLAEMIC in the absence of renal, thyroid, adrenal, pituitary disease or diuretic use. Laboratory evaluation shows a low serum osmolality with an inappropriately concentrated urine (>100 mOsmol/kg).

Clinical Clue: Low serum uric acid and urea.

TREATMENT PRINCIPLES 2

- B. For SYMPTOMATIC patients with ISOVOLAEMIA. This group is divided into two depending on the perceived rapidity of onset of Hyponatraemia.

ACUTE ONSET (<48 hrs)

- ☐ Fluid restrict and stop offending drugs/hypotonic fluids.
- ☐ Infuse HYPERTONIC saline (2.7% preferably) and 20mg Frusemide IV.

Use formulae on the following page to raise the serum sodium by 1 to 2 mmol/hr in the first 2-3 hours until symptoms abate. The serum sodium should not increase by more than 12-15 mmol/24hr.

CHRONIC ONSET (>48hrs)

- ☐ Stop offending drugs.
- ☐ Treat as for acute symptomatic hyponatraemia but raise the sodium levels more slowly by 0.5 to 1.0 mmol/l/hr to a maximum of 12mmol/24hr period. Discontinue Hypertonic saline when symptoms abate.

It is mandatory to measure the serum sodium every 2-4 hours to ensure compliance with the guidelines. Raising the sodium levels too rapidly may cause harm.

INFUSION GUIDELINES

Formulae:

$$\text{Change in serum Na} = \frac{\text{Infusate Na} - \text{Serum Na}}{\text{Total body water} + 1}$$

$$\text{Change in serum Na} = \frac{\text{Infusate Na} + \text{K} - \text{Serum Na}}{\text{Total body water} + 1}$$

Clinical Use

To estimate effect of 1 litre of infusate on serum Na

To estimate effect of 1 litre of infusate containing Na and K on serum Na

Total body water is 0.6 and 0.5 of body weight (kg) in non-elderly males and females and 0.5 and 0.45 in elderly males and females respectively

2.7% sodium chloride	=	462mmol	Na
0.9% sodium chloride	=	154mmol	Na
0.45% sodium chloride	=	77mmol	Na
5% dextrose	=	0 mmol	

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HYPONATRAEMIA - A disorder of water balance which is potentially fatal

INTRODUCTION

Hyponatraemia is a disorder of sodium and water metabolism and is the most common electrolyte abnormality in hospitalised patients.

Hyponatraemia is defined as a Serum Sodium Concentration below 135mmol/l. Water balance is regulated by Antidiuretic Hormone, Renal Medullary Concentrating Ability and Thirst.

Hyponatraemia usually results from retention of water secondary to impairment in free water excretion.

Hyponatraemia can cause morbidity and mortality and incorrect treatment can add to the problem.

PATIENTS AT GREATER RISK

- Women
- Postoperative patients
- Psychiatric polydipsic patients
- Children
- Alcoholics
- Malnourished patients
- Burns patients

The risk of Hyponatraemia among elderly people is compounded by chronic disease and the concurrent use of long-term medications. Recent attention has focused on Thiazide diuretics and the new antidepressants SSRIs, but many other drugs have been implicated.

SIGNS AND SYMPTOMS

Signs and symptoms of Hyponatraemia are primarily related to the central nervous system. Cerebral oedema can occur and early manifestations of Hyponatraemia include; anorexia, nausea, lethargy and apathy.

More advanced signs and symptoms include; disorientation, agitation, seizures, depressed reflexes, focal neurological deficits, Cheyne-Stokes respiration and coma. Clinical manifestations of Hyponatraemia correlate with the Serum Sodium Concentration and more importantly with **how rapidly the condition develops.**

Symptoms depend critically on rapidity of onset and the severity of Hyponatraemia.

Acute symptomatic Hyponatraemia can cause cerebral oedema and usually requires rapid correction.

Chronic Hyponatraemia, if corrected too quickly may cause osmotic demyelination!

DIAGNOSIS

Diagnosis involves careful history taking and a comprehensive clinical and physical examination. Obtaining laboratory values of: Serum osmolality; Urine osmolality; Urine sodium.

Check blood pressure; pulse; weigh patient if possible; commence patient on C.N.S. observations. Commence strict fluid balance chart.

This information is used to determine the cause of Hyponatraemia and to help guide therapy.

TREATMENT

TREATMENT OF HYPONATRAEMIA VARIES AND DEPENDS ON WHETHER THE PATIENT IS SYMPTOMATIC OR ASYMPTOMATIC.

MONITOR

During treatment monitor:

Clinical state

C.N.S. observations

Fluid balance (this should be reviewed regularly by an experienced member of medical staff)

Regular U+E; in general the Serum Sodium Concentration should be reassessed every two to four hours during active treatment.

When treating Hyponatraemia always seek advice from a more experienced member of Medical staff.

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

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 2 ASSESS VOLUME STATUS

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

AT ALL STAGES ASK FOR HELP IF UNCERTAIN

Hypovolaemic

CHECK

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

TREATMENT

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

Isovolaemic

CHECK

Urine Na > 25 mmol/l

- ☐ H₂O intoxication (urine osmolality <100mOsm/kg)

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

TREATMENT

Symptomatic

Hypertonic saline
Furosemide diuresis

Asymptomatic

Water restriction

Hypervolaemic

CHECK

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

TREATMENT

Symptomatic / Asymptomatic

Treat underlying disorder
Water restriction

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