

VAQ 2011.1.3 (Bloods)

An 87 year old man from a nursing home presents following a generalized seizure. Serum biochemistry is performed.

His observations are:

GCS	12	(M 5, V 3, E 4)	
HR	100	/min	
BP	120/70	mmHg	
Temperature	36.8	$^{\circ}\text{C}$	
O ₂ Saturation	97	%	on room air

His serum biochemical results are as follows:

			Reference Range
Na ⁺	183	mmol/L	(135-145)
K ⁺	4.9	mmol/L	(3.2-4.3)
Cl ⁻	137	mmol/L	(99-109)
HCO ₃ ⁻	25	mmol/L	(21-28)
Urea	23.5	mmol/L	(2.7-8.0)
Creat	105	micromol/L	(50-100)
Glu	6.9	mmol/L	(3.0-6.0)
PO ₄ ⁻	2.41	mmol/L	(0.65-1.45)
Ca ²⁺	2.39	mmol/L	(2.0-2.55)
Mg ²⁺	1.12	mmol/L	(0.70-0.95)

a. Describe and interpret his results (70%)

b. Outline your treatment priorities (30%)

Elderly nursing home resident with severely symptomatic marked hypernatraemia and likely hypovolaemia, likely to be multifactorial.

Needs immediate treatment to relieve severe symptoms by replacing water deficit and more gradual return to normal to avoid cerebral complications.

High morbidity / mortality expected and needs family discussion to establish treatment goals and ceilings. Underlying cause may need investigation as guided by history and examination.

severe hypernatraemia and hyperchloraemia
normotension (possibly relative hypotension) noted
mild hyperkalaemia
markedly high urea
marginally elevated creatinine, glucose, magnesium
elevated phosphate

hypernatraemia

hypovolaemic

salt < water loss

altered thirst mechanism – likely in elderly

lack of access to free water – age, debility – likely in elderly RH resident

burns – not suggested

third spacing – not suggested from history

hypotonic fluid loss – sweat, urine, diarrhoea – not suggested

diabetes insipidus – not suggested, check urinary salt/SG for inappropriate dilution

osmotic diuresis – as for DI

lithium – check meds

hypervolaemic – not suggested due to normotension

high salt intake

hypertonic fluid administration – not suggested

mineralocorticoid excess – not suggested by pattern (see below)

Hyperchloraemia

usually electrolyte shift to maintain electroneutrality
excess cations

hypernatraemia

loss of anions

bicarbonate losses (but normal bicarb)

loss of negatively charged plasma proteins (check albumin, urinary protein)

Hyperkalaemia

decreased excretion

renal impairment (suggested by inc urea:creat)

potassium sparing diuretics (check meds)

increased intake

oral potassium salts (check meds)

potassium infusions including potassium salts of other medications (check meds)

transcellular shift

acidosis (not suggested by bicarb)

High urea

decreased excretion

renal impairment / reduced GFR

most common

increased Urea:creatinine suggests hypovolaemia

increased protein metabolism

dietary protein load

includes upper GI bleed

not suggested by history, would expect unstable with significant bleed to raise urea this high

Osmolarity

$(1.86 \times 183) + 23 + 9 + 7 = 380$ (there are other formulae)

Lack of hypertension, hypokalaemia, alkalosis suggests against primary hyperaldosteronism

Normoglycaemia suggests against glycosuric osmotic diuresis

High urea:creatinine suggests reduced GFR most likely hypovolaemia

In an elderly nursing home resident lack of access to water, impaired thirst mechanisms are likely to contribute. Diuretic use is also commonplace.

Treatment priorities

manage airway as per clinical situation

may need support with adjuncts if repeated seizures or airway not maintained

guided by premorbid condition, family discussion, pre-existing advance directives (may also influence rest of care)

treat further seizures if required

titrated benzodiazepines 1-5mg IV repeated q5m

relieve significant symptoms (seizures, obtundation, hypoperfusion)

acute correction of sodium only to treat these

follow with slower correction to avoid complications of rapid correction

5% dextrose infusion (need hypotonic fluid – can use hypotonic saline with approp formula)

approx water deficit (assuming 70kg) = $43 \times 0.5 \times 70 = 10-11$ litres (there are other formulae)

max 10-15 mmol correction per 24h so will need at least 3-4 days of correction

also need to give maintenance fluid requirement

may also have sodium deficit in hyponatraemia (water > salt losses but both lost)

repeated 5% dextrose boluses 100-200 ml should be given until acute symptoms have abated, then calculate remaining fluid requirement from the approx 6L per 48h

oral fluid when tolerated

regular check of Na to monitor progress and adjust