

HYPONATREMIE AUX URGENCES



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Service de Réanimation

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Pas de conflit d'intérêt

HYPONATREMIE AUX URGENCES

Clinical practice guideline on diagnosis and treatment of hyponatraemia

Spasovski G et al, Intensive Care Med 2014; 40:320-31

Disorders of Plasma Sodium — Causes, Consequences, and Correction

Sterns RH, N Engl J Med 2015;372:55-65

Recent developments in the management of acute and chronic hyponatremia

Hoorn EW et al, Curr Opin Nephrol Hypertension 2019;28:424-32

Hyponatrémies en réanimation

Ichai C et al, EMC Anesthésie réanimation 2021; 36-860-A-05



OSMOLARITÉS ET TONICITÉS PLASM

1 - Osmolarité plasmatique (OsmP)

= [C] de subst osm/l de plasma

- . OsmP calculée = $(\text{Na}^+ \times 2) + \text{glyc} + \text{urée}$ (mmol/l)
= 280-295 mosm/l
- . mesurée = Δ cryoscopique

2 - Osmolalité plasmatique = [C] de subst osm/kg d'eau plasm

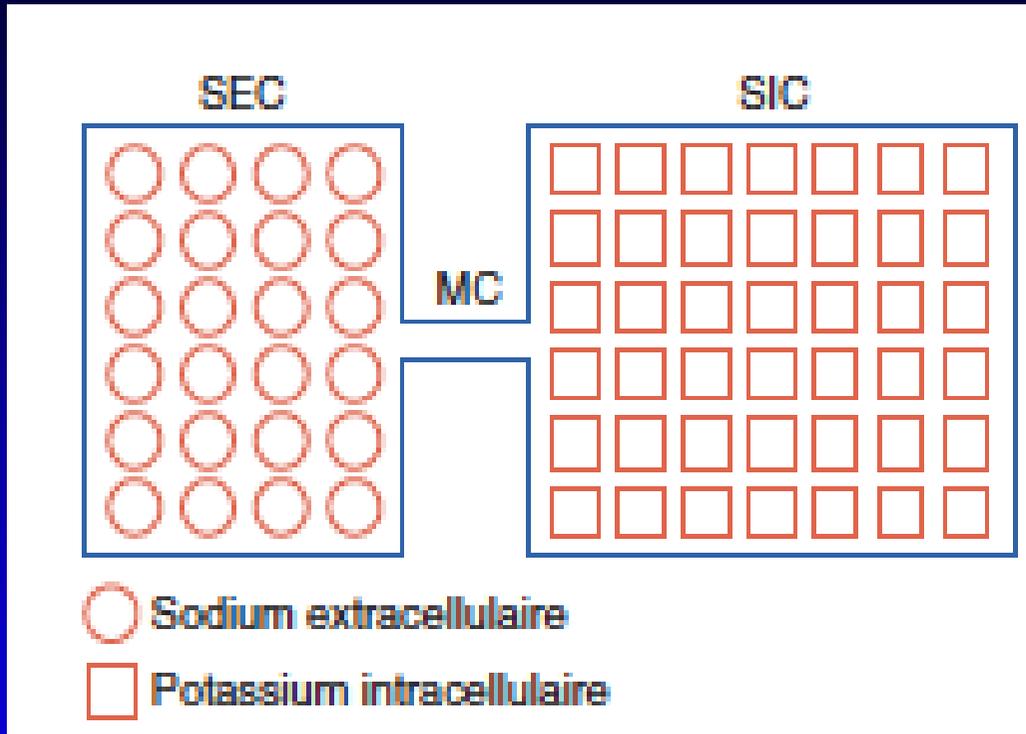
3 - Tonicité plasmatique

= [C] de subst osm actives/l de plasma

= Reflet de l'hydratation intracellulaire

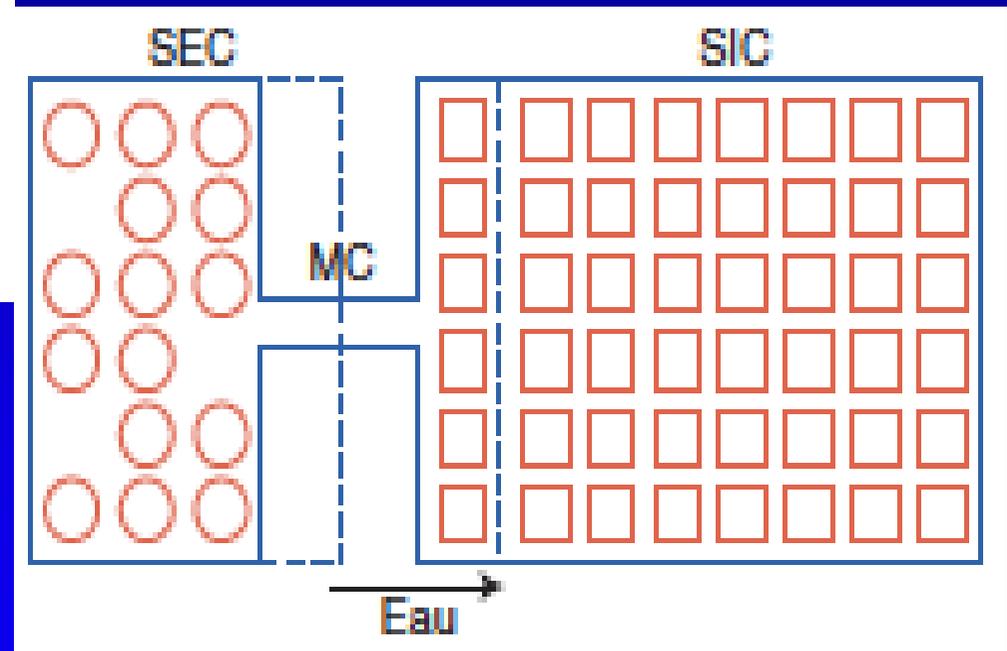
= $(\text{Na}^+ \times 2) + \text{glyc}$ (mmol/l) = 275-290 mosm/l

MOUVEMENTS D'EAU ET HYPONa



Situation normale

Na = osmoles active
extraç donc hypoNa
hypotonique = mvts d'eau
transmb avec HIC



PEC D'UNE HYPONATREMIE

3 Étapes

Évaluer (le risque)
l'œdème cérébral

1. 1^{ère} Étape

= Eliminer les hypoNa
non hypotoniques

2. 2^{ème} Étape

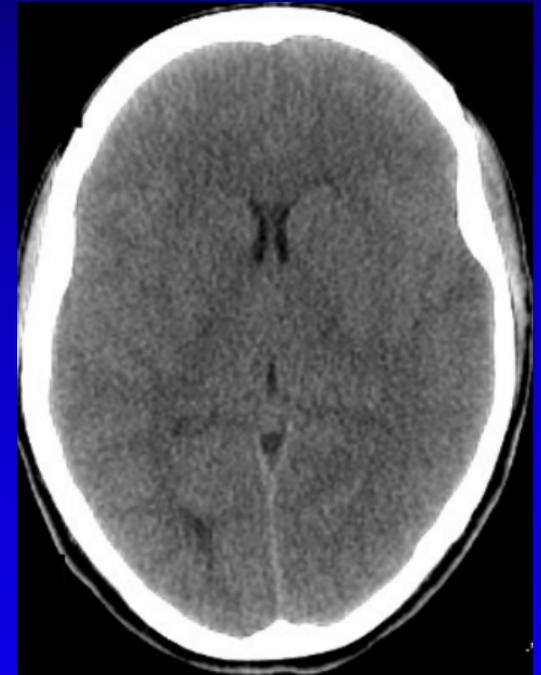
= identifier les hypoNa graves

3. 3^{ème} Étape résulte des 2 1^{ères}

= débiter le TRT en urgence

= chercher la cause de l'hypoNa

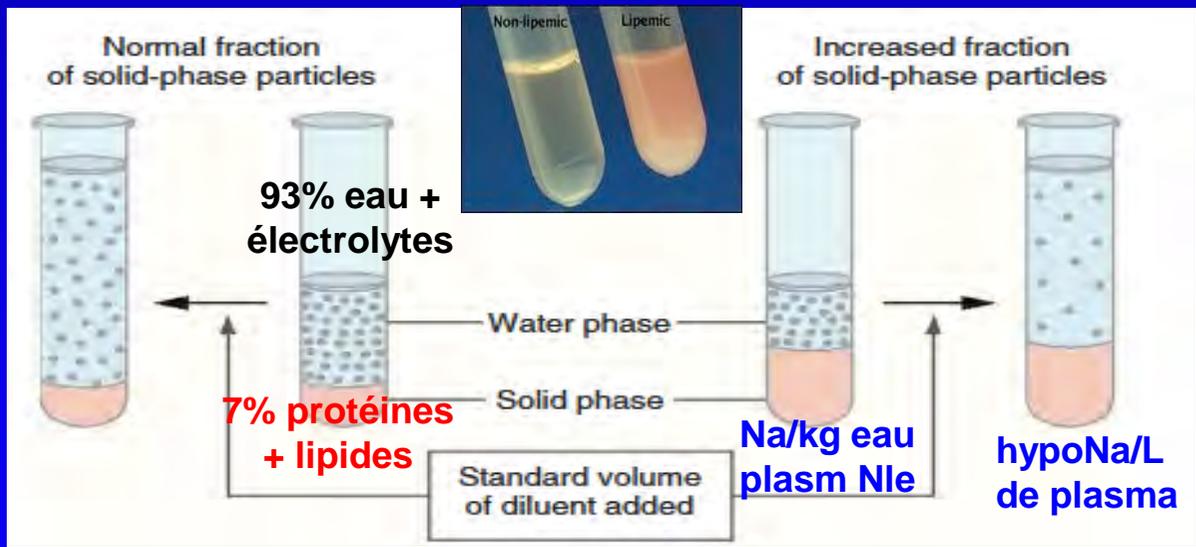
simultanément



HYPONa NON HYPOTONIQUE

pas de risque d'oedème cérébral

Setting	Serum osmolality	Examples
Presence of "effective" osmoles that raise serum osmolality and can cause hyponatraemia	Isotonic or hypertonic	Glucose [35] Mannitol [38] Hyperglycémie Glycine [39] Histidine-tryptophane-ketoglutarate [40] Hyperosmolar radiocontrast media [41] Maltose [42]
HypoNa hypertonique/hyperosmolaire	Fausse hypoNa	Urea [43] Alcohols [43] Ethylene-glycol [43]
Presence of "ineffective" osmoles that raise serum osmolality but do not cause hyponatraemia	Isotonic or hyperosmolar	Triglycerides [44] Cholesterol [44] Protein intravenous immunoglobulins [45] Monoclonal gammopathies [46]
Presence of endogenous solutes that cause pseudohyponatraemia (laboratory artifact)	Isotonic	
	PseudohypoNa	



Turchin A et al, New Engl J Med 2003;349:1465-9

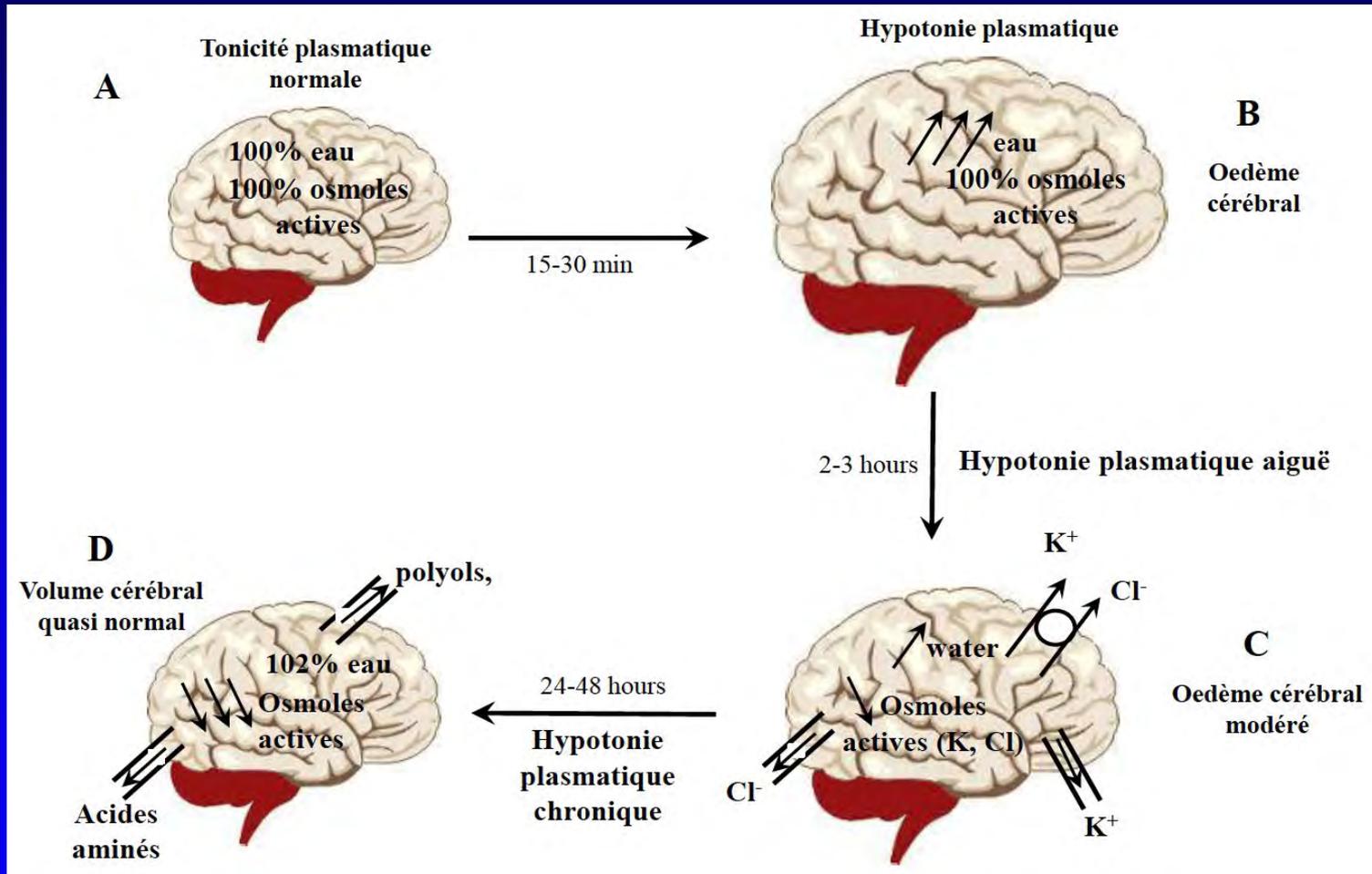
IDENTIFIER LES HYPONa GRAVES

L'encéphalopathie hyponatrémique

- Hyponatrémie aiguë < 48 h symptomatique ≠ hyponatrémie chronique asymptomatique
- corrélée à la sévérité de l'œdème cérébral
- pas de signe spécifique

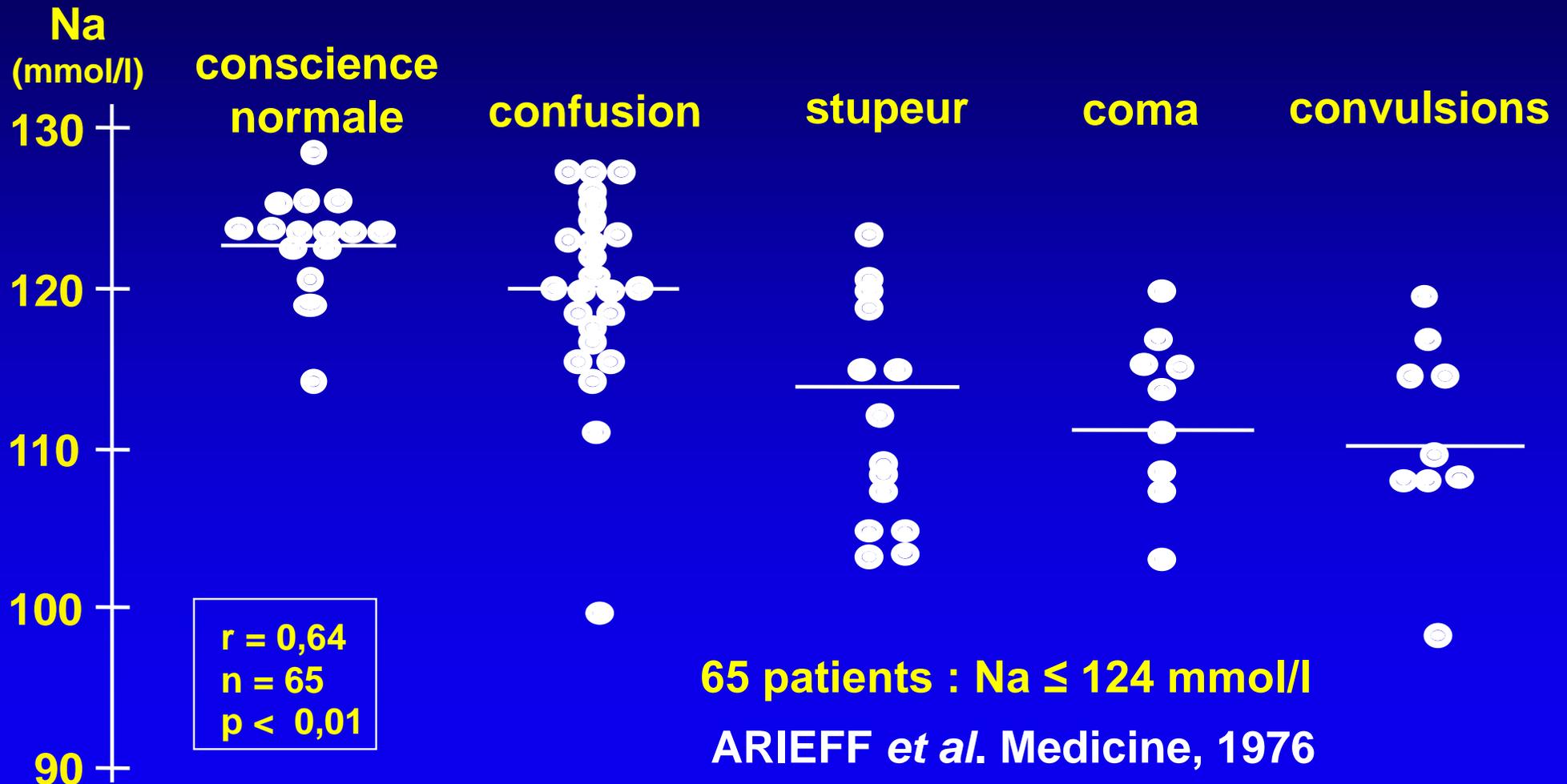
IDENTIFIER LES HYPONa GRAVES

Encéphalopathie hyponatrémique et oedème cérébral



IDENTIFIER LES HYPONa GRAVES

L'encéphalopathie hyponatrémique



IDENTIFIER LES HYPONa GRAVES

1. signes graves ou modérés

Clinical practice guideline on diagnosis and treatment of hyponatraemia



Definition of hyponatraemia based on symptoms

- 6.1.3.1. We define 'moderately symptomatic' hyponatraemia as any biochemical degree of hyponatraemia in the presence of moderately severe symptoms of hyponatraemia (Table 5).
- 6.1.3.2. We define 'severely symptomatic' hyponatraemia as any biochemical degree of hyponatraemia in the presence of severe symptoms of hyponatraemia (Table 5).

IDENTIFIER LES HYPONa GRAVES

1. signes graves ou modérés



Classification des principaux signes induits par une hyponatrémie hypotonique selon leur gravité.

Signes	Gravité
Grave (vital)	Vomissements Déresse cardiorespiratoire Somnolence anormale ou profonde Convulsions Coma (Glasgow coma score \leq 8)
Modérément grave	Confusion, délirium Céphalées Nausées sans vomissement
Léger (non vital)	Chute, perte de l'équilibre Fractures secondaires aux chutes Inattention, troubles cognitifs, cramp

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The guideline development group wants to underscore that these symptoms can also be induced by other conditions. Clinical and anamnestic data should be taken into account when assessing the causal relation between the hyponatraemia and a certain symptom (i.e. to assess whether the symptom has been caused by the hyponatraemia or the hyponatraemia by the underlying condition/symptom). The less pronounced (e.g. mild) the biochemical degree of hyponatraemia, the more caution should be taken when considering that the hyponatraemia is the cause of the symptoms. This list is not exhaustive, and all symptoms that can be signs of cerebral oedema should be considered as severe or moderate symptoms that can be caused by hyponatraemia

IDENTIFIER LES HYPONa GRAVES

2. aiguë vs chronique

Principaux médicaments et conditions associés à une hyponatrémie aiguë.

Médicaments	Conditions
Diurétiques	Période postopératoire
Anticancéreux	Polydipsie (potomanie psychotique)
Agents antidépresseurs	Hyponatrémie d'exercice
Agents antihypertenseurs	TURP syndrome (résection endoscopique prostatique, utérine, arthroscopie)
Agents antiépileptiques	
Agents antipsychotiques	
Inhibiteurs de pompe à protons	Préparation pour coloscopie



- 6.1.2.1. We define 'acute' hyponatraemia as hyponatraemia that is documented to exist <48 h.
- 6.1.2.2. We define 'chronic' hyponatraemia as hyponatraemia that is documented to exist for at least 48 h.
- 6.1.2.3. If hyponatraemia cannot be classified, we consider it being chronic, unless there is clinical or anamnestic evidence of the contrary (Table 8).

IDENTIFIER LES HYPONa GRAVES

3. Légère vs profonde

6.1.1. Definition of hyponatraemia based on biochemical severity

6.1.1.1. We define 'mild' hyponatraemia as a biochemical finding of a serum sodium concentration between 130 and 135 mmol/l as measured by ion-specific electrode.

6.1.1.2. We define 'moderate' hyponatraemia as a biochemical finding of a serum sodium concentration between 125 and 129 mmol/l as measured by ion-specific electrode.

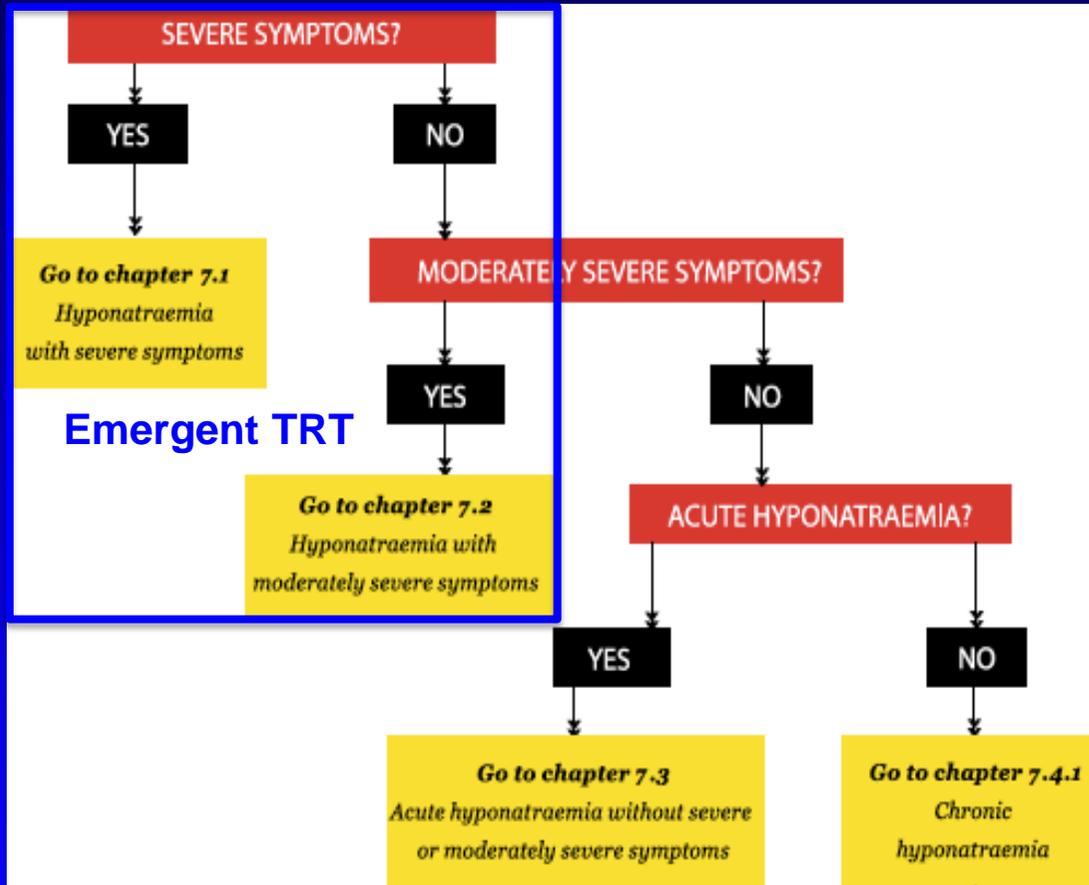
6.1.1.3. We define 'profound' hyponatraemia as a biochemical finding of a serum sodium concentration <125 mmol/l as measured by ion-specific electrode.

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TRT EN URGENCE

Si 1) symptomatique ou 2) hypoNa aiguë



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PRINCIPES DU TRAITEMENT

	Hyponatrémie symptomatique grave ou modérément grave (indépendamment du caractère aigu ou chronique)	Hyponatrémie chronique pauci- ou asymptomatique
Principes	Bolus immédiat de sérum salé hypertonique <i>Si possible arrêt de la cause et traitement de la cause</i>	Pas de sérum salé hypertonique
Objectifs	Éviter et prévenir l'œdème cérébral Augmenter la natrémie de 4-6 mmol l ⁻¹ et améliorer les signes neurologiques dans les 1 à 2 heures	Éviter et prévenir la démyélinisation osmotique Augmenter la natrémie de 4-6 mmol l ⁻¹ dans les 24 heures pour les hyponatrémies profondes (< 125 mmol l ⁻¹)
Limites	Ne pas excéder une augmentation de 6-10 mmol l ⁻¹ dans les 24 premières heures et 8 mmol l ⁻¹ par jour dans les jours suivants Toujours stopper les sérums salés hypertoniques quand la natrémie atteint 130 mmol l ⁻¹	Ne pas excéder une augmentation de 8-10 mmol l ⁻¹ dans les 24 premières heures et 8 mmol l ⁻¹ par jour dans les jours suivants Discuter de la possibilité de rebaisser la natrémie si la correction est trop rapide (surcorrection) (desmopressine/soluté hypotonique) avec un expert
Prise en charge pratique	150 ml de NaCl 3 % en intraveineuse sur 15-20 min complété par 1 ou 2 boli additionnels si objectifs non atteints Prise en charge en soins critiques ou structure permettant une surveillance clinico-biologique étroite Établir le diagnostic étiologique	Stopper tout facteur qui induit ou contribue à l'hyponatrémie (diurétiques si possible) Administrier le traitement spécifique étiologique Hyponatrémie hypovolémique : remplissage vasculaire Hyponatrémie normo- et hypervolémique : restriction hydrique ± diurétiques de l'anse ou urée ou vaptans

TRT EN URGENCE

Amélioration

7.1.2. Follow-up management in case of improvement of symptoms after a 5 mmol/l increase in serum sodium concentration in the first hour, regardless of whether hyponatraemia is acute or chronic

- 7.1.2.1. We recommend stopping the infusion of hypertonic saline (1D).
- 7.1.2.2. We recommend keeping the i.v. line open by infusing the smallest feasible volume of 0.9% saline until cause-specific treatment is started (1D).
- 7.1.2.3. We recommend starting a diagnosis-specific treatment if available, aiming at least to stabilise sodium concentration (1D).
- 7.1.2.4. We recommend limiting the increase in serum sodium concentration to a total of 10 mmol/l during the first 24 h and an additional 8 mmol/l during every 24 h thereafter until the serum sodium concentration reaches 130 mmol/l (1D).
- 7.1.2.5. We suggest checking the serum sodium concentration after 6 and 12 h and daily afterwards until the serum sodium concentration has stabilised under stable treatment (2D).

Pas d'amélioration

7.1.3. Follow-up management in case of no improvement of symptoms after a 5 mmol/l increase in serum sodium concentration in the first hour, regardless of whether hyponatraemia is acute or chronic

- 7.1.3.1. We recommend continuing an i.v. infusion of 3% hypertonic saline or equivalent aiming for an additional 1 mmol/l per h increase in serum sodium concentration (1D).
- 7.1.3.2. We recommend stopping the infusion of 3% hypertonic saline or equivalent when the symptoms improve, the serum sodium concentration increases 10 mmol/l in total or the serum sodium concentration reaches 130 mmol/l, whichever occurs first (1D).
- 7.1.3.3. We recommend additional diagnostic exploration for other causes of the symptoms than hyponatraemia (1D).
- 7.1.3.4. We suggest checking the serum sodium concentration every 4 h as long as an i.v. infusion of 3% hypertonic saline or equivalent is continued (2D).

TRT EN URGENCE

- 7.2.1.1. We recommend starting prompt diagnostic assessment (1D).
- 7.2.1.2. Stop, if possible, medications and other factors that can contribute to or provoke hyponatraemia (not graded).
- 7.2.1.3. We recommend cause-specific treatment (1D).
- 7.2.1.4. We suggest immediate treatment with a single i.v. infusion of 150 ml 3% hypertonic saline or equivalent over 20 min (2D).
- 7.2.1.5. We suggest aiming for a 5 mmol/l per 24-h increase in serum sodium concentration (2D).
- 7.2.1.6. We suggest limiting the increase in serum sodium concentration to 10 mmol/l in the first 24 h and 8 mmol/l during every 24 h thereafter, until a serum sodium concentration of 130 mmol/l is reached (2D).
- 7.2.1.7. We suggest checking the serum sodium concentration after 1, 6 and 12 h (2D).
- 7.2.1.8. We suggest additional diagnostic exploration for other causes of the symptoms if the symptoms do not improve with an increase in serum sodium concentration (2D).
- 7.2.1.9. We suggest considering to manage the patient as in severely symptomatic hyponatraemia if

HypoNa avec signes modérés



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**Intensive Care Med
2014; 40:320-31**

the serum sodium concentration further decreases despite treating the underlying diagnosis (2D).

TRT NON URGENT

- 7.3.1.1. Make sure that the serum sodium concentration has been measured using the same technique used for the previous measurement and that **no administrative errors** in sample handling have occurred (not graded).
- 7.3.1.2. If possible, **stop fluids, medications and other factors** that can contribute to or provoke hyponatraemia (not graded).
- 7.3.1.3. We recommend **starting prompt diagnostic assessment** (1D).
- 7.3.1.4. We recommend **cause-specific treatment** (1D).
- 7.3.1.5. If the acute decrease in serum sodium concentration exceeds 10 mmol/l, we suggest a single i.v. infusion of 150 ml 3% hypertonic saline or equivalent over 20 min (2D).
- 7.3.1.6. We suggest checking the serum sodium concentration after 4 h, using the same technique as used for the previous measurement (2D).

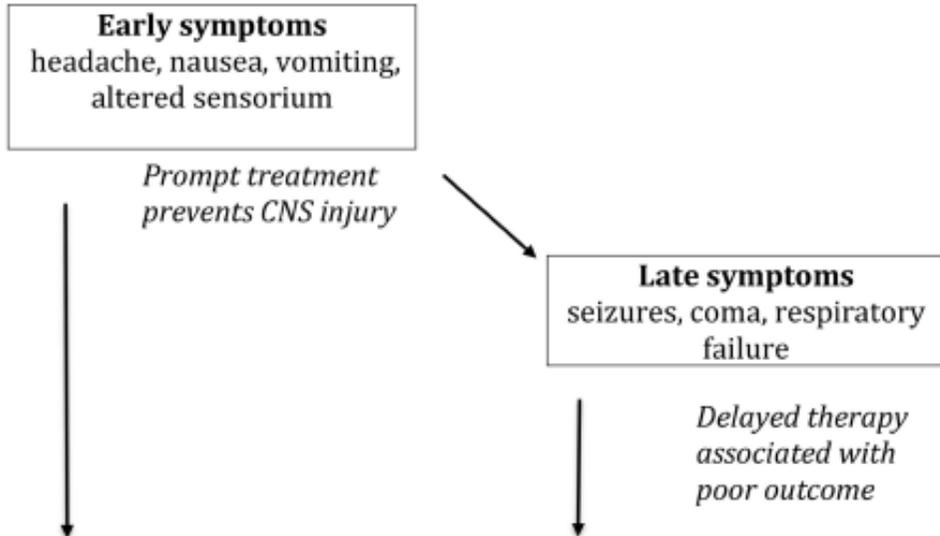
HypoNa asymptomatique chronique



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**Intensive Care Med
2014; 40:320-31**

TRT EN URGENCE



Treatment of acute or chronic hyponatremic encephalopathy

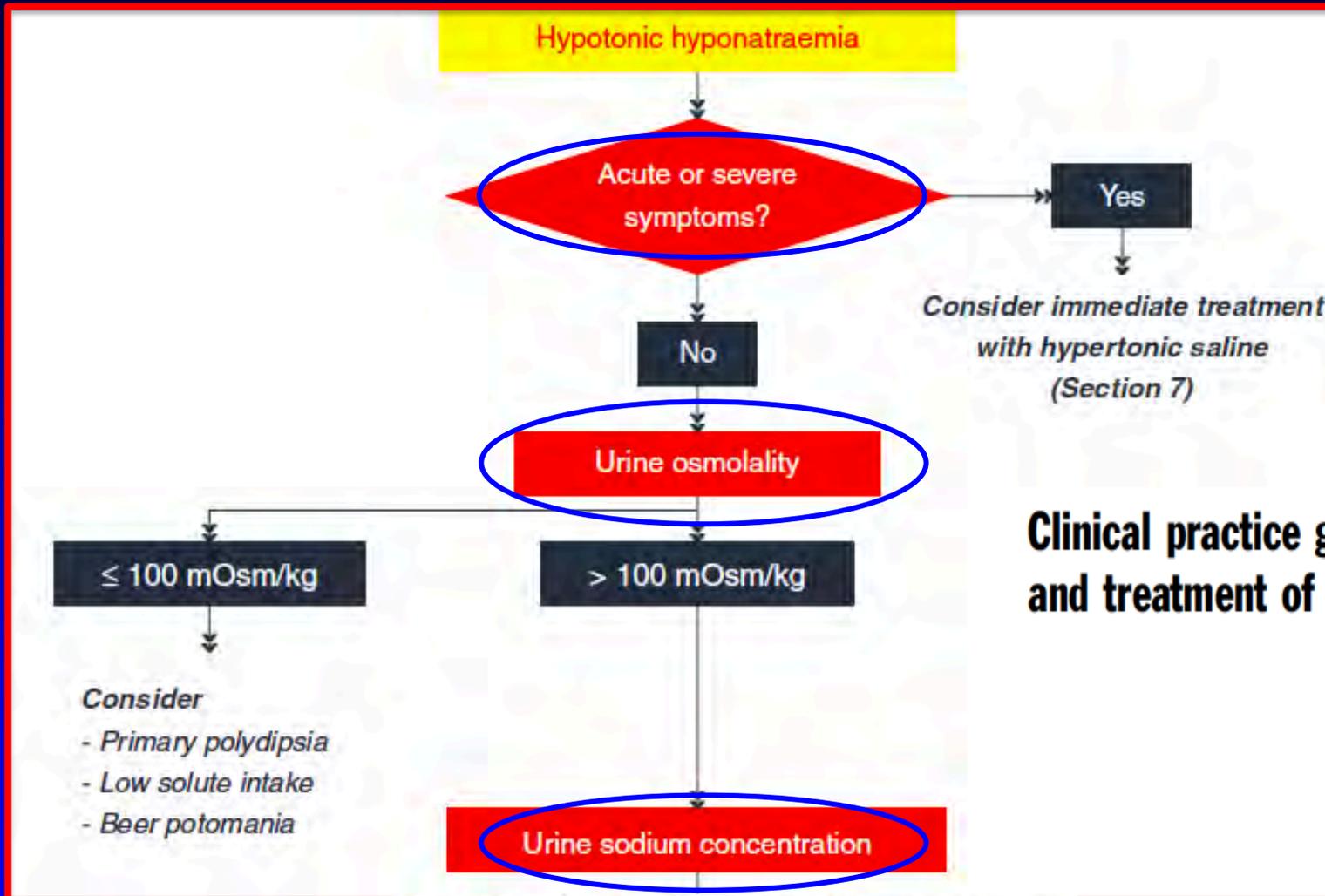
- 1) 100 ml bolus of 3% NaCl over 10 min. May repeat until clinical response achieved with a goal of 5 – 6 mEq/L in the first 1 – 2 hours.
- 2) Serum sodium should be checked after each second or third bolus or Q 2 hours.
- 3) Stop further therapy with 3% saline when either:
 - a. Symptoms improve with patient being awake, alert, responsive with improved headache and nausea
 - b. Increase in sodium of 10 mEq/L in the first 5 hours.
- 4) Correction in the first 48 hours should not exceed 15 – 20 mEq/L.
- 5) Monitor urine output for signs of a free water diuresis and consider desmopressin to prevent or therapeutically re-lower overcorrection.



Misconceptions and Barriers to the Use of Hypertonic Saline to Treat Hyponatremic Encephalopathy

Ayus JC et al, Front Med
2019;6:47

ETABLIR UN Δ ETIOLOGIQUE

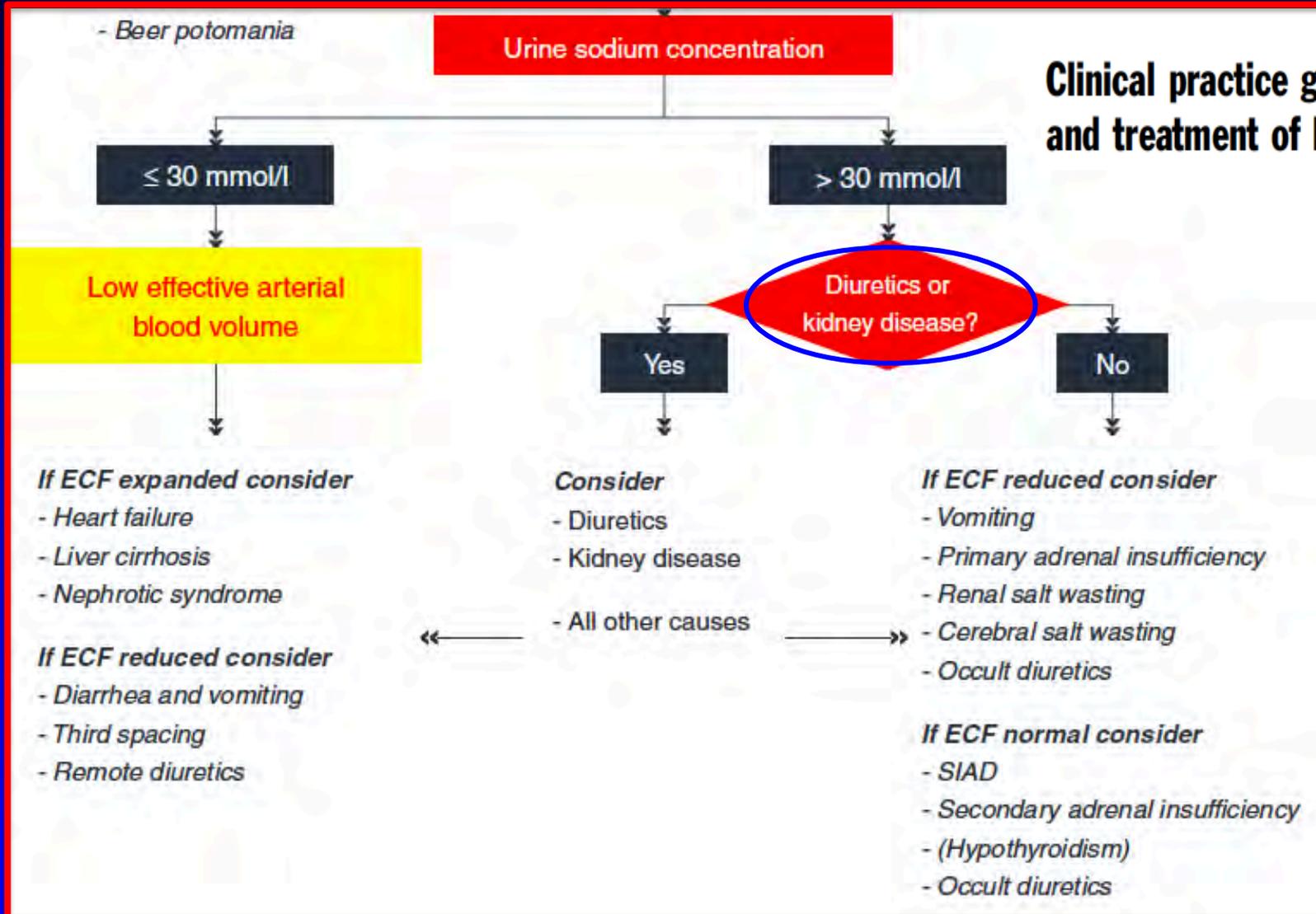


Clinical practice guideline on diagnosis and treatment of hyponatraemia

Algorithm for the diagnosis of hyponatraemia.

ETABLIR UN Δ ETIOLOGIQUE

Clinical practice guideline on diagnosis and treatment of hyponatraemia



TRAITEMENT ET COMPLICATIONS

FDR de survenue de complications neurologiques
au cours des hypoNa hypotoniques

Oedème cérébral aigu

Femme en période d'activité génitale
et/ou en période postopératoire

Femme âgée sous thiazidiques

Enfant

Patients psychiatriques polydipsiques

Hypoxie

Myélinolyse centropontine

Alcoolisme

Dénutrition

Patients brûlés

Hypokaliémie

Ichai C et al, EMC Anesthésie
réanimation 2021; 36-860-A-05

PREVENTION DES COMPLICATIONS

7.5. What to do if hyponatraemia is corrected too rapidly?

- 7.5.1.1. We recommend prompt intervention for re-lowering the serum sodium concentration if it increases >10 mmol/l during the first 24 h or >8 mmol/l in any 24 h thereafter (1D).
- 7.5.1.2. We recommend discontinuing the ongoing active treatment (1D).
- 7.5.1.3. We recommend consulting an expert to discuss if it is appropriate to start an infusion of 10 ml/kg body weight of electrolyte-free water (e.g. glucose solutions) over 1 h under strict monitoring of urine output and fluid balance (1D).
- 7.5.1.4. We recommend consulting an expert to discuss if it is appropriate to add i.v. desmopressin 2 µg, with the understanding that this should not be repeated more frequently than every 8 h (1D).



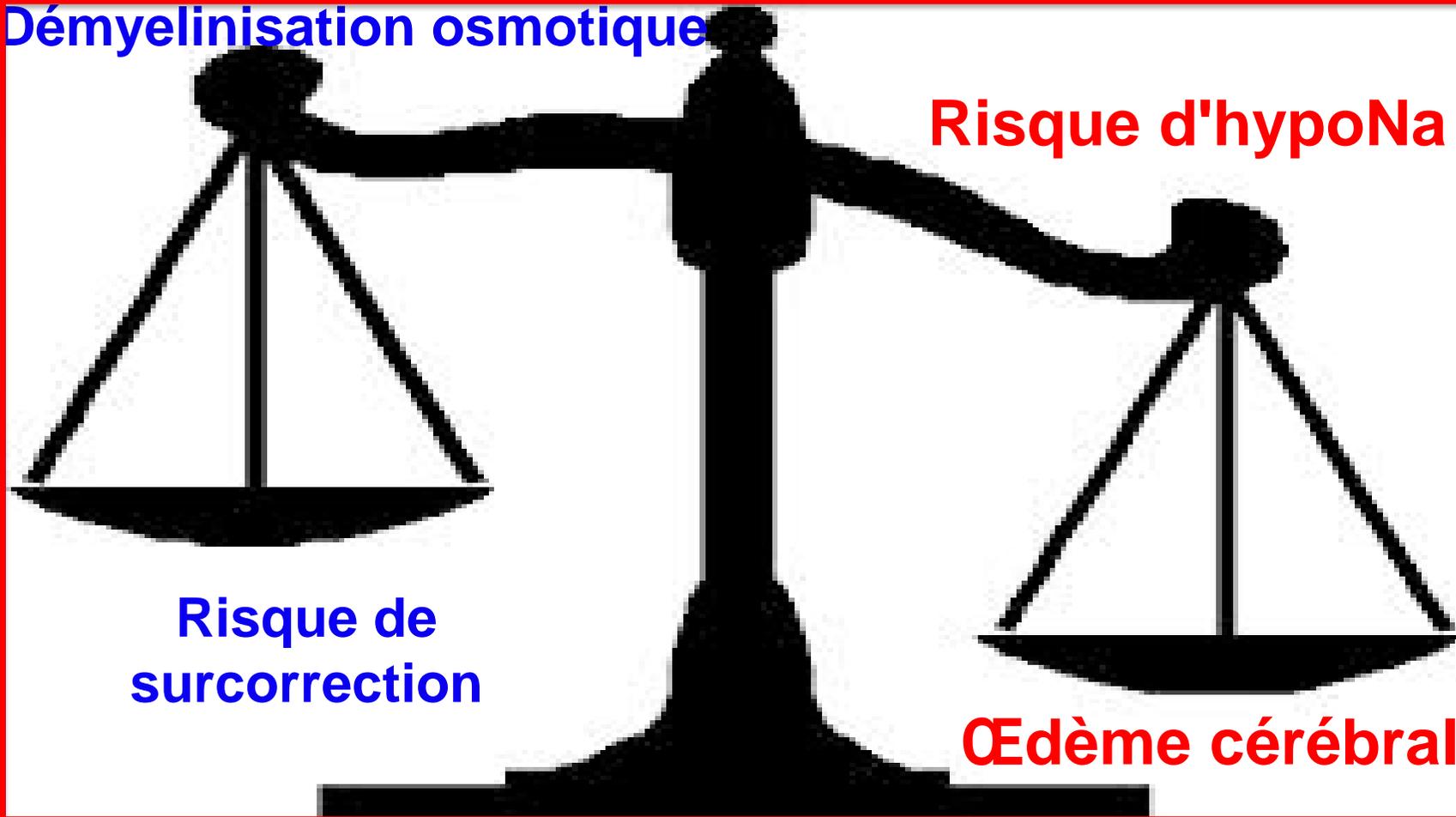
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**Spasowski G et al Intensive Care Med 2014; 40:320-31;
Aching SG et al, Crit Care Med 2017;45:1762-71**

HYPONATREMIE AUX URGENCES

aigu / symptomatique mais ≠ profond

Démyélinisation osmotique



aigu / symptomatique = TRT urgent