Squilibri Elettrolitici in PS: Differenze Età Correlate

Nuovi Indicatori di Performance in Medicina D'Urgenza

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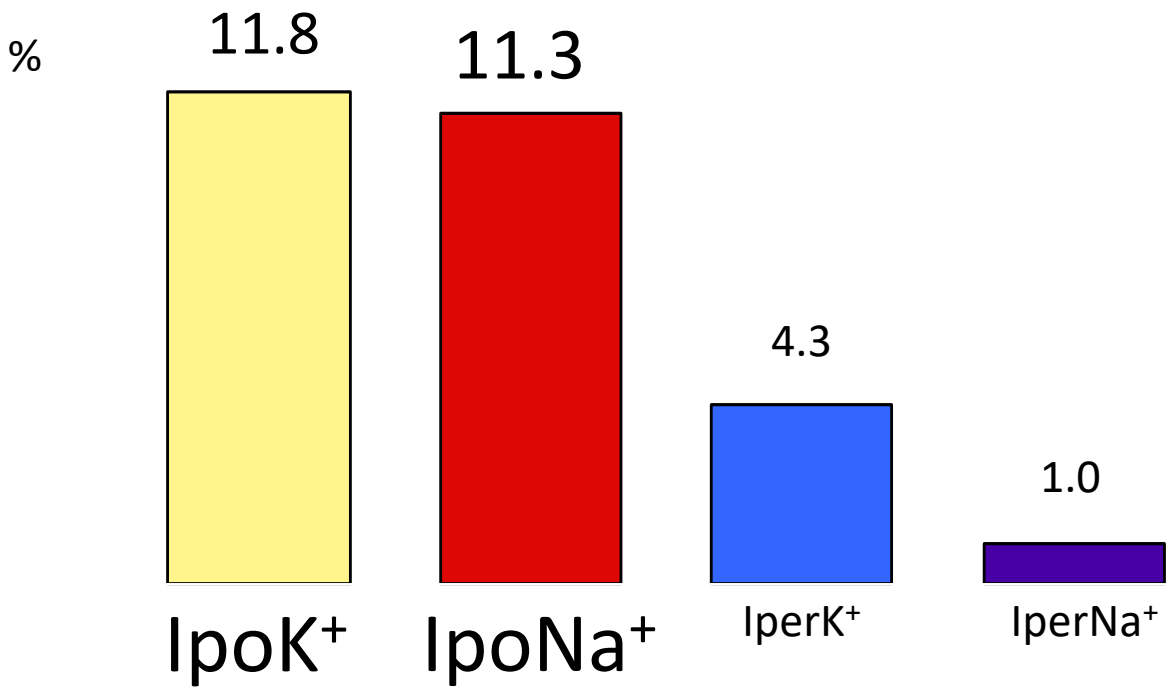
NAPOLI 19_11_2016

x congresso nazionale
simeu
NAPOLI 18-20 NOVEMBRE 2016

Prevalance of Electrolyte Disorders in Hospitalized Elderly



Arief, DeFronzo

Fluid, Electrolyte and Acid-base Disorders, Churchill Livingstone 1995

World J Emerg Med, Vol 4, No 2, 2013

Original Article

General characteristics of patients with electrolyte imbalance admitted to emergency department

Arif Kadri Balcı, Ozlem Koksal, Ataman Kose, Erol Armagan, Fatma Ozdemir, Taylan Inal, Nuran Oner

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Corresponding Author: *Ataman Kose, Email: ataberk76@yahoo.com.tr*

Table 1. Distribution of electrolyte imbalance

Electrolytes	Imbalance	Number of patients	%
Na^+	Hyponatremia	600	60
	Hypernatremia	52	5
K^+	Hypokalemia	152	15
	Hyperkalemia	80	8
Ca^{++}	Hypocalcemia	512	51
	Hypercalcemia	38	4
Mg^{++}	Hypomagnesemia	52	5
	Hypermagnesemia	10	1

Gerontology

Clinical Section / Short Communication

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Accepted: January 29, 2014
Published online: May 20, 2014

Age-Related Variety in Electrolyte Levels and Prevalence of Dysnatremias and Dyskalemias in Patients Presenting to the Emergency Department

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Georg M. Fiedler[b] Aristomenis K. Exadaktylos[a]

[a]Department of Emergency Medicine and [b]Center for Laboratory Medicine, Inselspital, University Hospital Bern, Bern, Switzerland

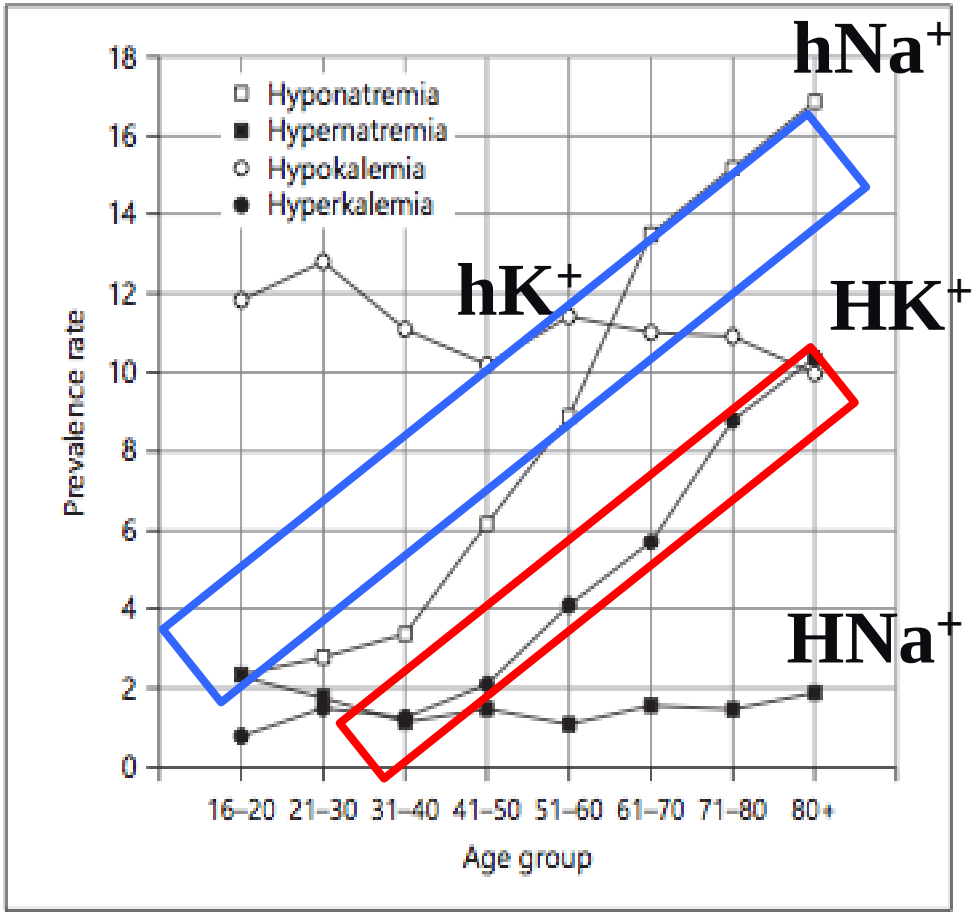
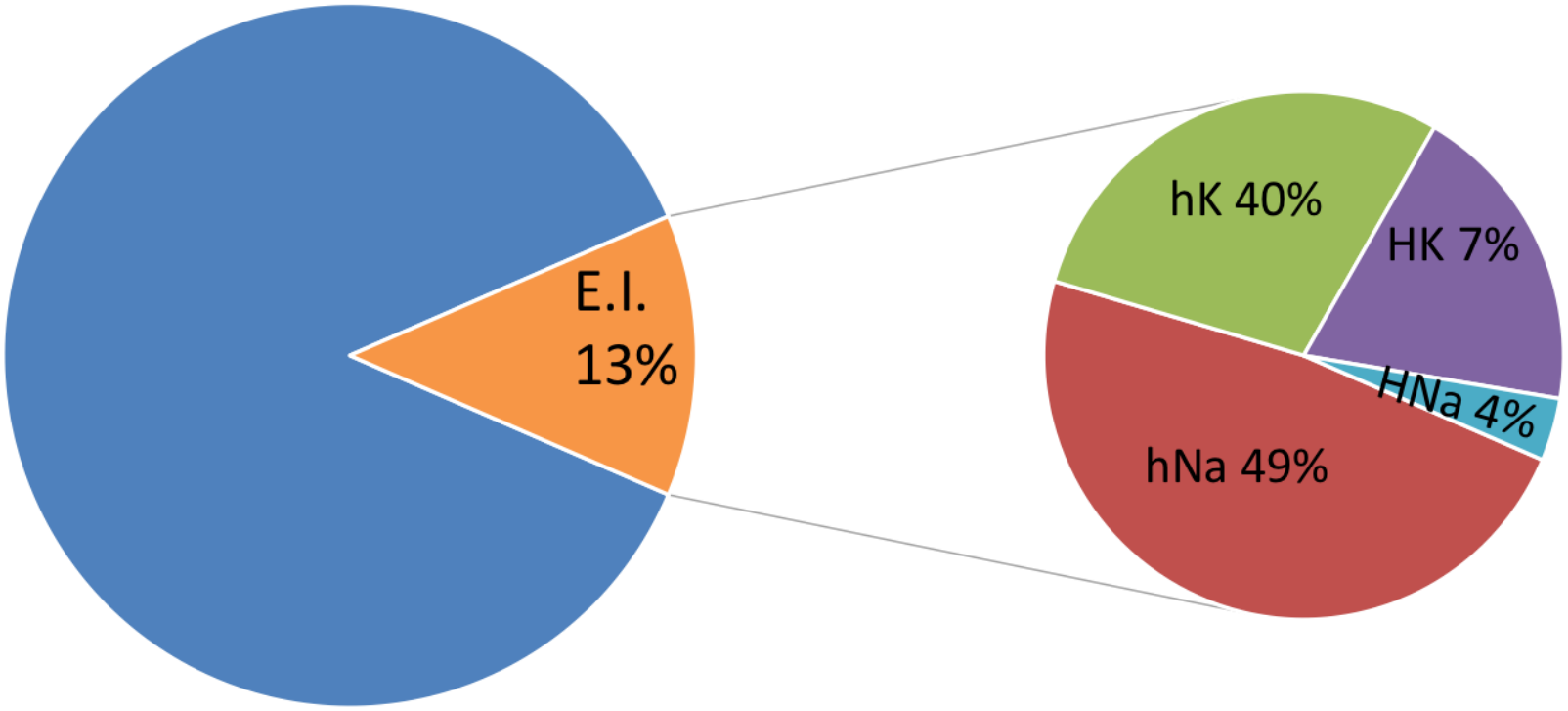


Fig. 1. Prevalence rates of dysnatremias and dyskalemias stratified for age group.

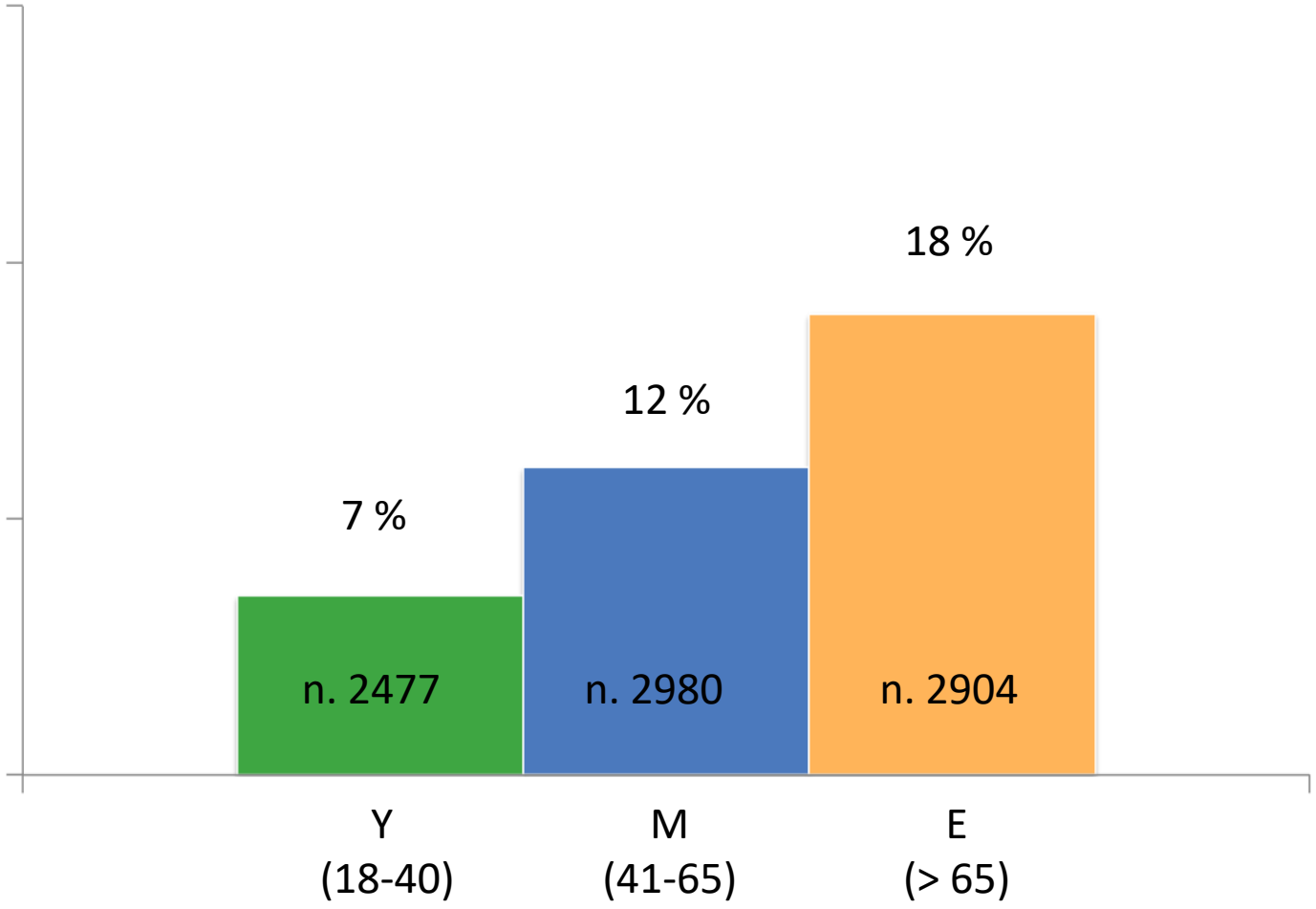
PREVALANCE
OF ELECTROLYTE IMBALANCE IN E.D.

n = 8631 (2015)

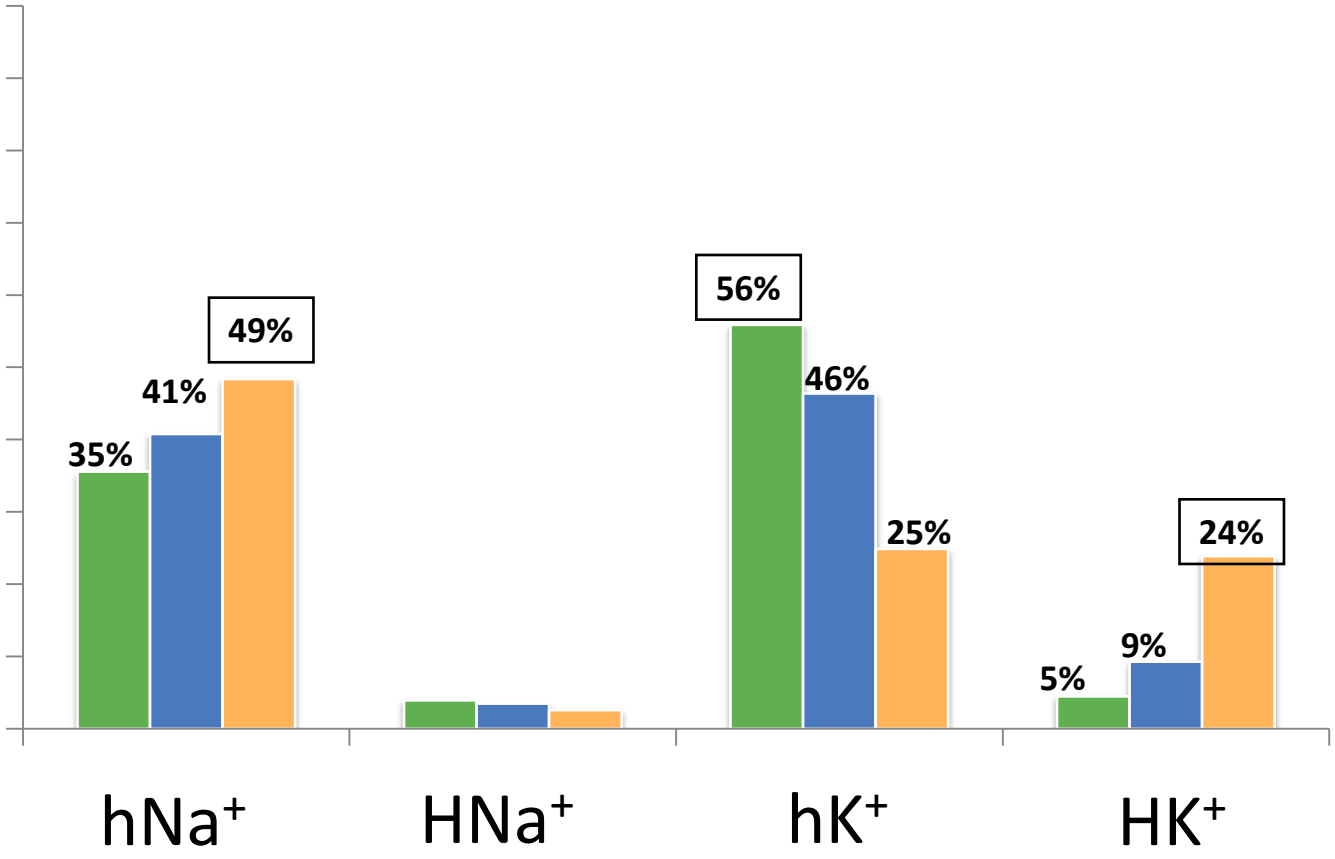


Giordano M. et al.; Am J Em Med 2016

AGE RELATED PREVALANCE OF ELECTROLYTE IMBALANCE IN E.D.



AGE RELATED PREVALANCE OF ELECTROLYTE IMBALANCE IN E.D.



OMEOSTASI DEL SODIO

98 %

2 %

Kidney International, Vol. 31 (1987), pp. 1153–1159

Relationship between vascular disease and age–associated changes in the human kidney

BERTRAM L. KASISKE

Department of Medicine, Hennepin County Medical Center, University of Minnesota, Minneapolis, Minnesota, USA

____(Group I): **Mild** Atherosclerosis

----- (Group II): **Severe** Atherosclerosis

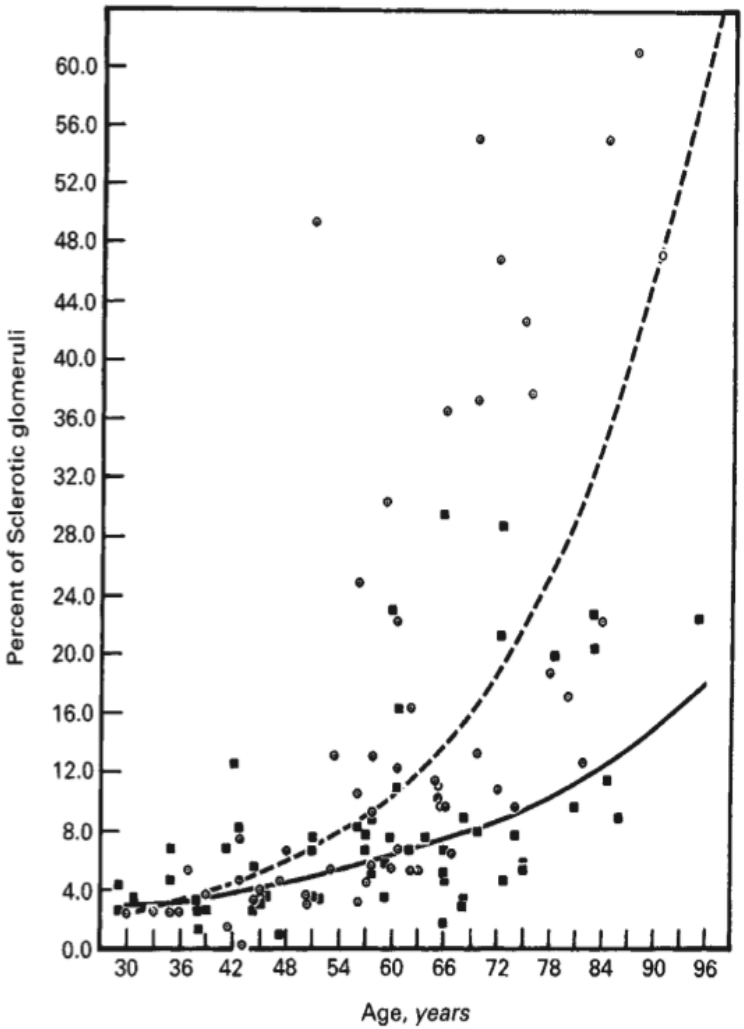


Fig. 1. *The influence of systemic atherosclerosis on the relationship between age and glomerulosclerosis.* Least squares best fit lines for logarithm of glomerulosclerosis (%) vs. age for group I (solid points and solid line) and group II (open circles and dashed line).

Nephron *17*: 270–278 (1976)

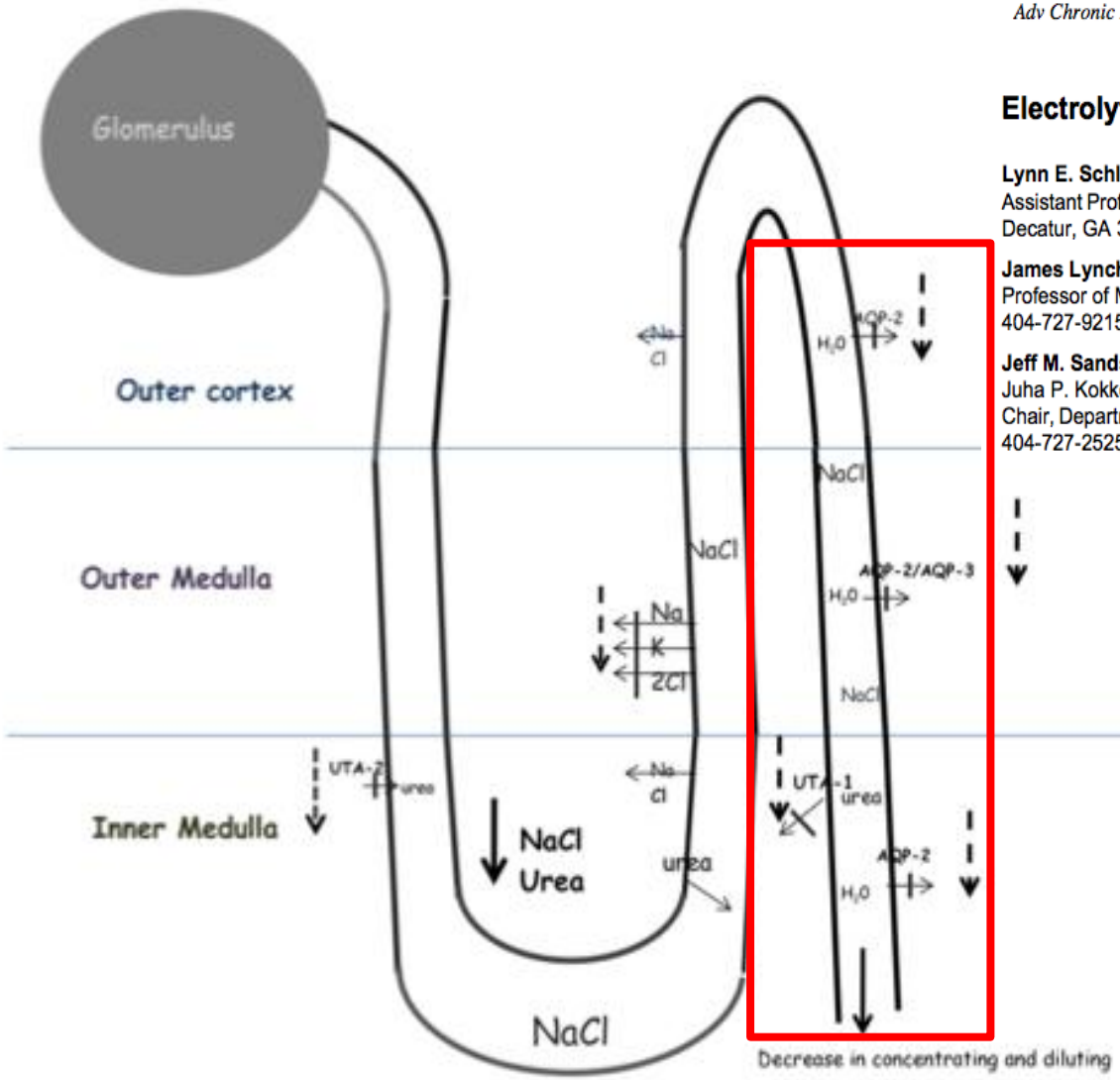
The Influence of Age on the Renal Response to Water Deprivation in Man

JOHN W. ROWE, NATHAN W. SHOCK and RALPH A. DEFRONZO

Clinical Physiology Branch, Gerontology Research Center, National Institute on Aging, National Institutes of Health, Baltimore, Md.

	Mean age, years	Urine osmolality, mosm/kg[1]		Urine flow, ml/min[1]	
		period 1	period 3	period 1	period 3
Young, 20–39 (n=31)	33	969 ±41	1,109 ±22	1.02 ±0.10	0.49 ±0.03
Middle, 40–59 (n=48)	49	949 ±39	1,051 ±19	0.99 ±0.10	0.63 ±0.03
Old, 60–79 (n=18)	68	852 ±64	882 ±49	1.05 ±0.15	1.03 ±0.13

Adv Chronic Kidney Dis. 2010 July ; 17(4): 308–319. doi:10.1053/j.ackd.2010.03.008.



Electrolytes in the Aging

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James Lynch Bailey, M.D., and
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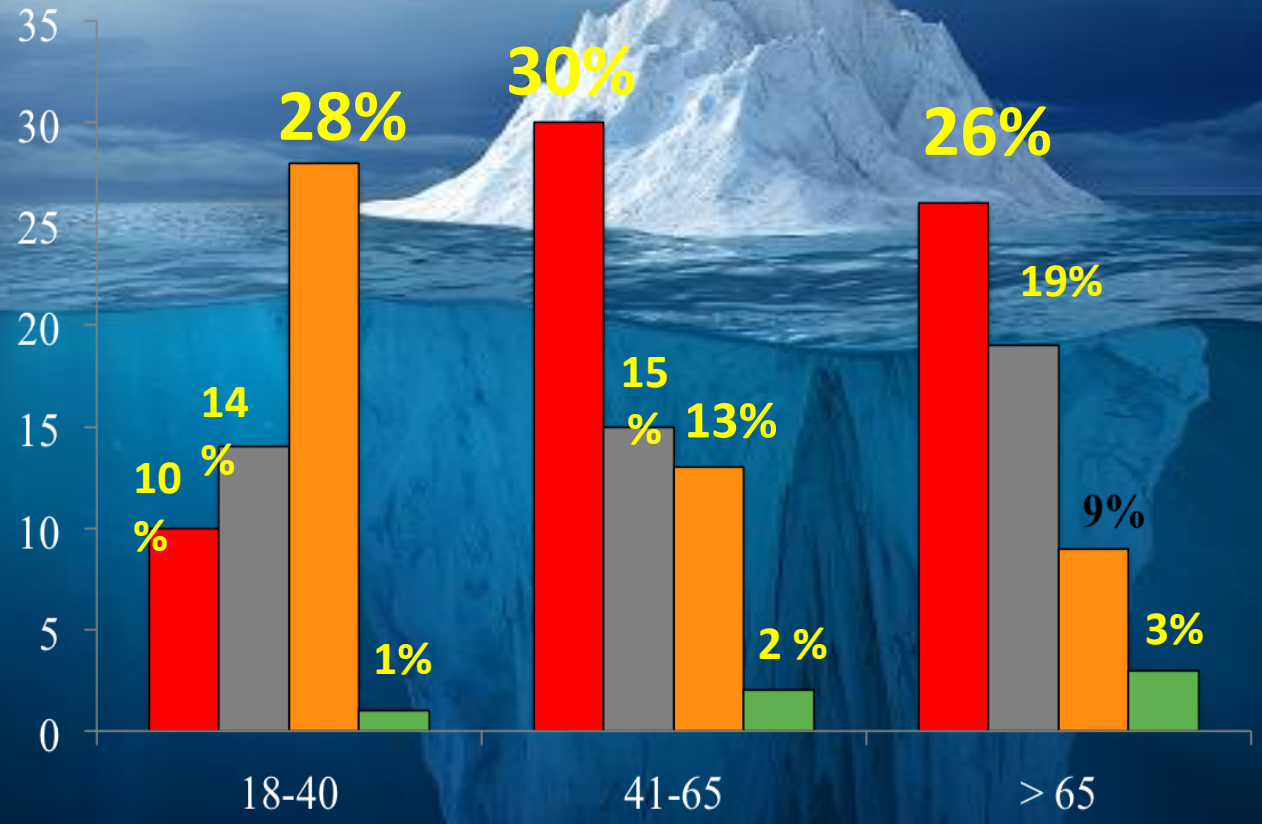
Jeff M. Sands, M.D.
Juha P. Kokko Professor of Medicine and Physiology, Director, Renal Division, Executive Vice-Chair, Department of Medicine, Associate Dean for Clinical and Translational Research, Telephone: 404-727-2525, Fax: 404-727-3425

Fig 2.

The putative changes in the renal transport system in the elderly are shown. In animal studies there is a decrease in the abundance of AQP2, AQP3, NKCC2/BSC1 and UT-A1, A2, A3. The arrrows represent the transporters and water channels known to be downregulated in animal studies. These changes may be present in the elderly population affecting the diluting and concentrating capacity.

PATOLOGY ASSOCIATED WITH ELECTROLYTE DISORDERS IN E.D.



CV LD GI EI

Giordano et al.

VII Joint National Commettee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure: JAMA 03

Lifestyle Modifications in the Management of Hypertension†

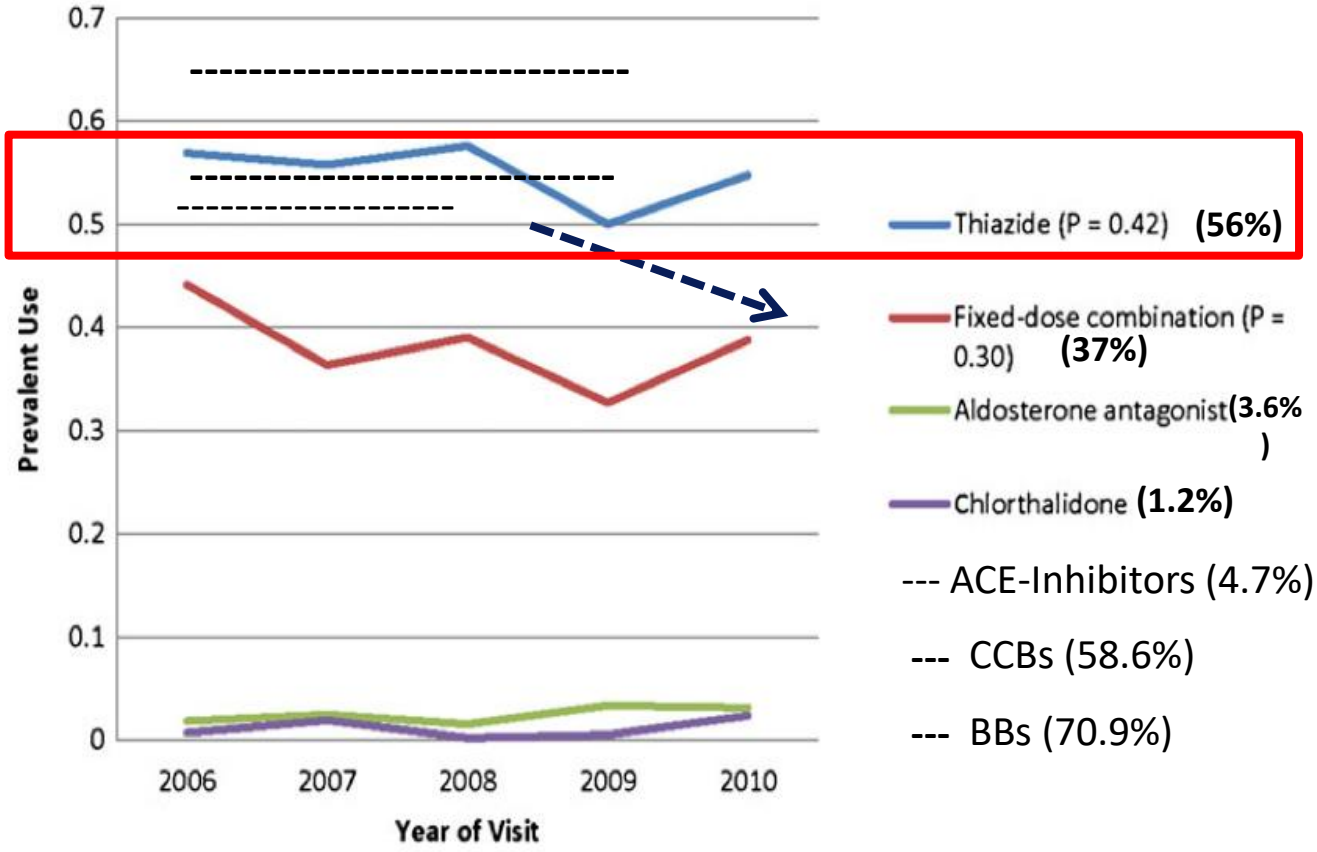
Modification	Recommendation	Approximate systolic BP reduction, range*
Weight reduction	Maintain normal body weight (BMI, 18.5 to 24.9 kg/m2	5-20 mmHg per 10-kg weight loss
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat	8 to 14 mmHg
Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 meq/day (2.4 g sodium or 6 g sodium chloride)	2 to 8 mmHg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week)	4 to 9 mmHg
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks per day in most men and no more than 1 drink per day in women and lighter-weight persons	2 to 4 mmHg

Iponatremia ed Ipertensione

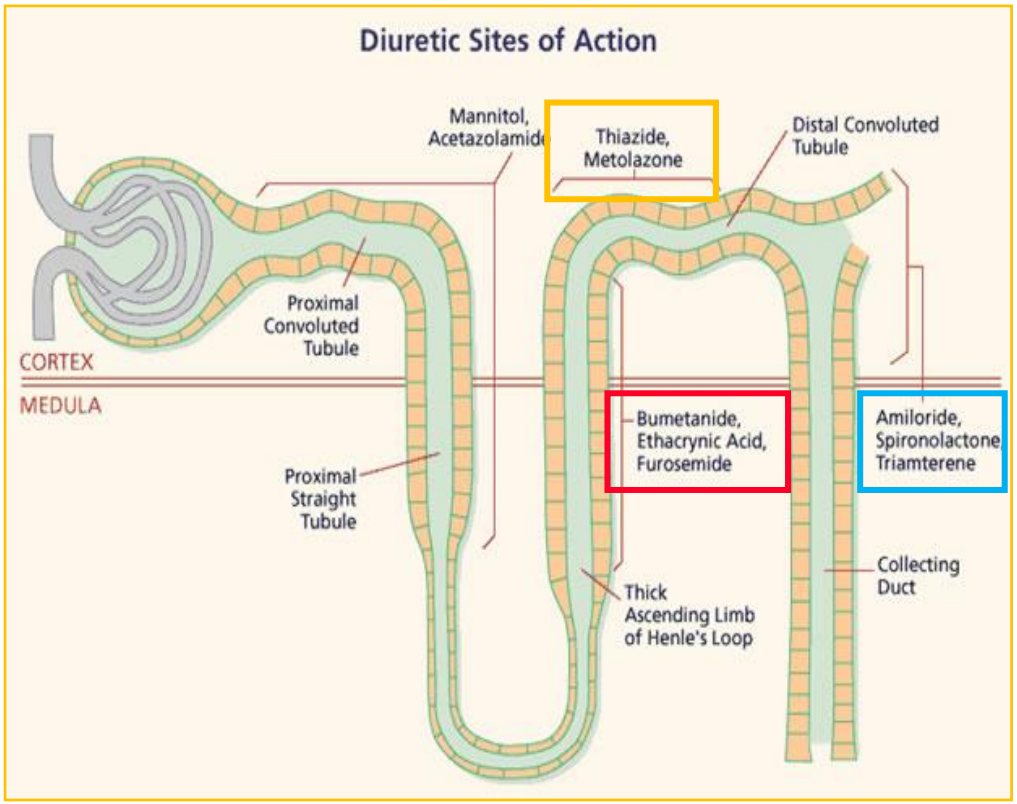
Vi è una correlazione?

In Italia si stima che circa 12 milioni di abitanti sono ipertesi, ben il 20% della popolazione!

USE OF DIURETICS IN USA



Fontil V; J Gen Int Med 2013



Nephron Segment	**Diuretic**	**Action**
Loop of Henle	Furosemide, Torasemide, Bumetanide	Na+ - K+ 2Cl- cotransport
Distal Tubule	Thiazides, Chlorthalidone, Indapamide	Na+ - Cl- cotransport
Collecting Ducts	Spironolactone, Amiloride, Triamterene	Na+ channels

Water Load and Tiazide-Induced Hyponatremia

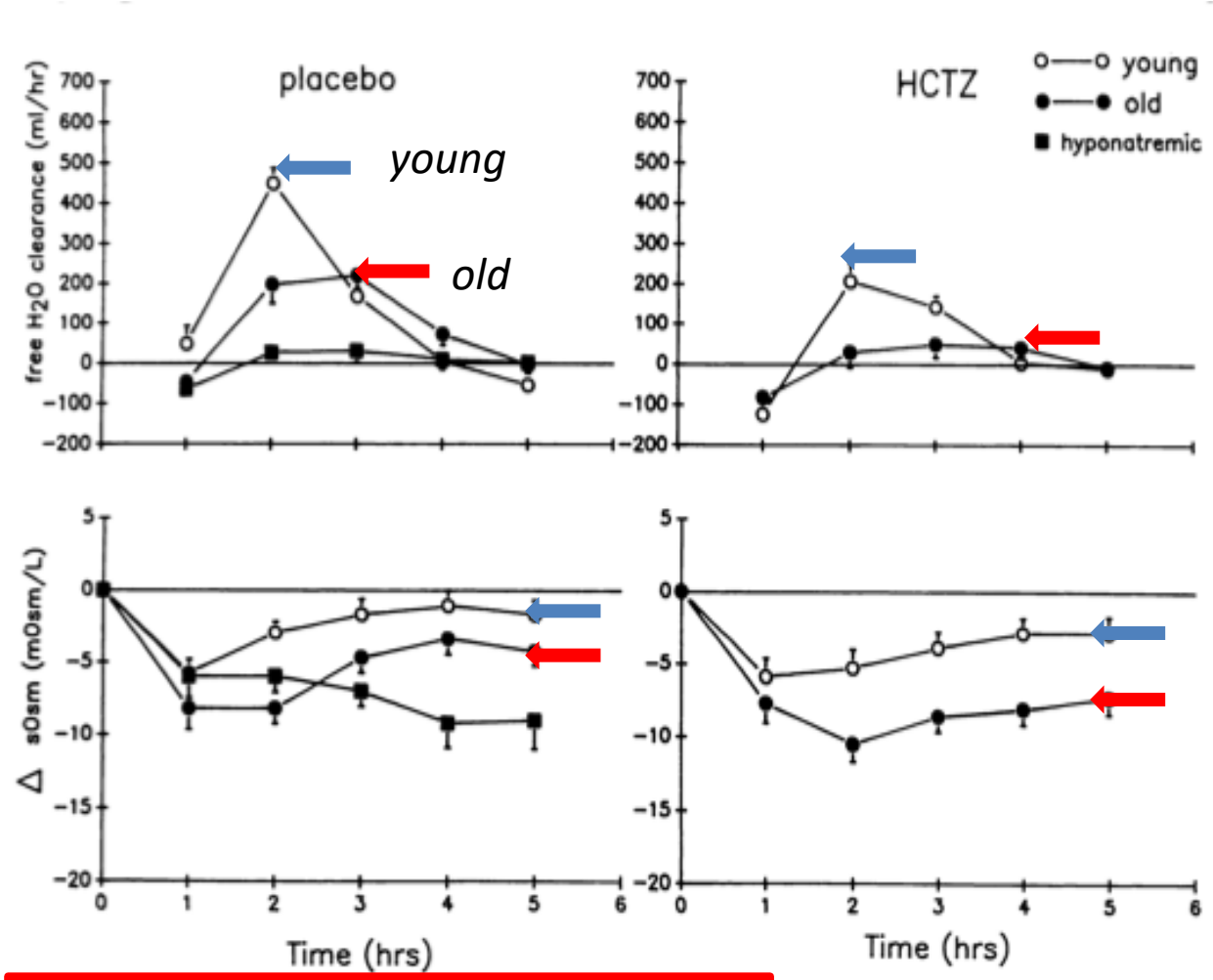
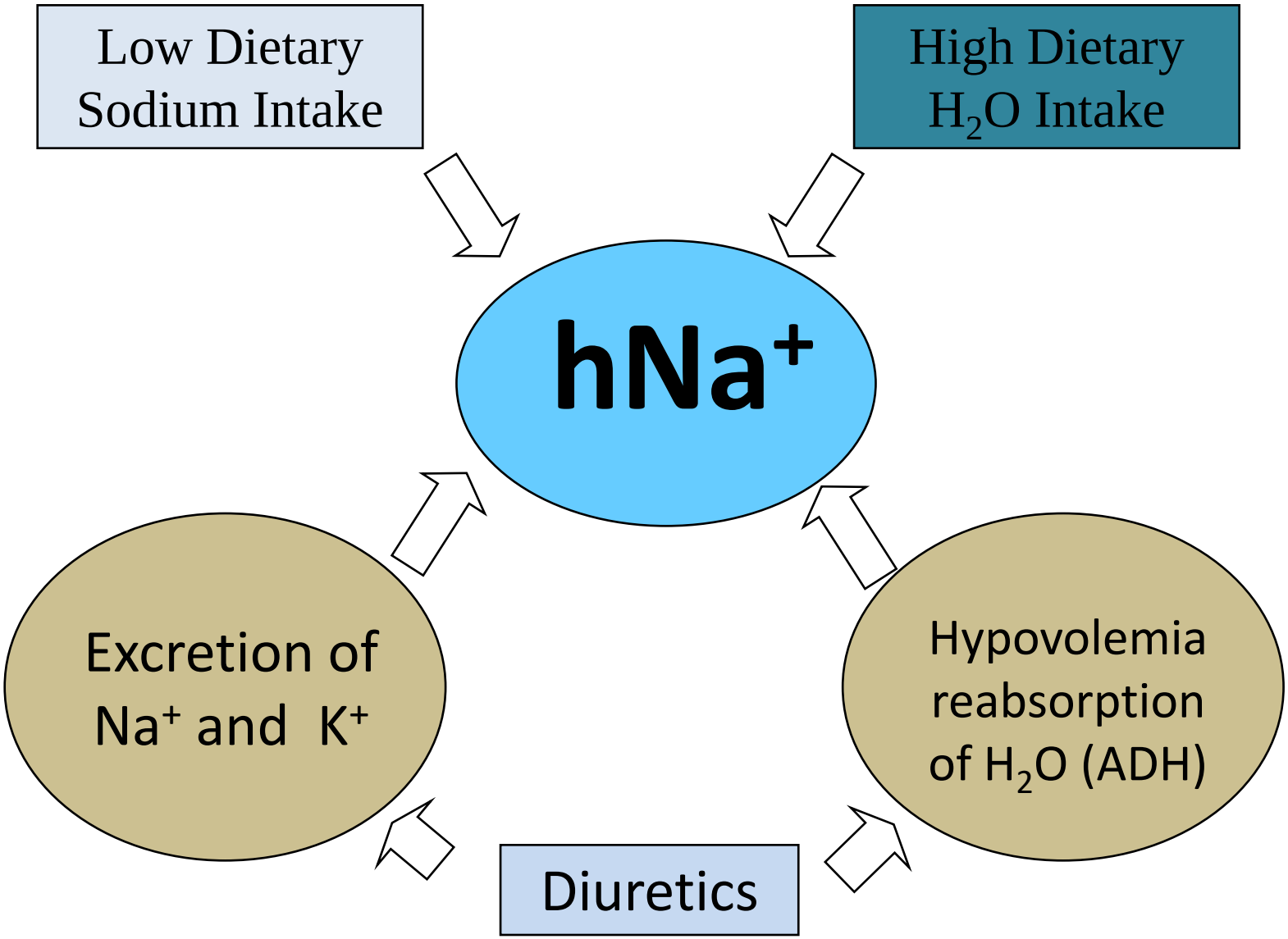


Figure 1. Free water clearance (CH_2O) and change in serum osmolality (Δsosm, mosm/kg H_2O) after a water load with placebo versus HCTZ in young, old, and old with a prior history of thiazide-induced hyponatremia. CH_2O and decline in sosm were significantly lower in the old than in the young ($P < 0.05$, ANOVA). This difference was magnified after the use of HCTZ. Those with a history of hyponatremia had lower CH_2O and decline in sosm than did the healthy elderly ($P < 0.05$, ANOVA).

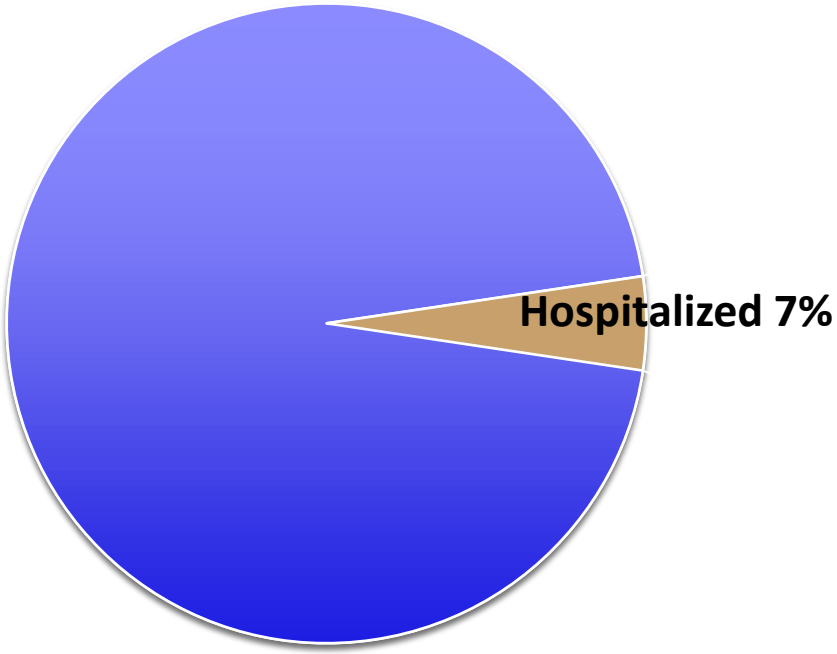
Clark BA; J Am Soc Nephrol 1994

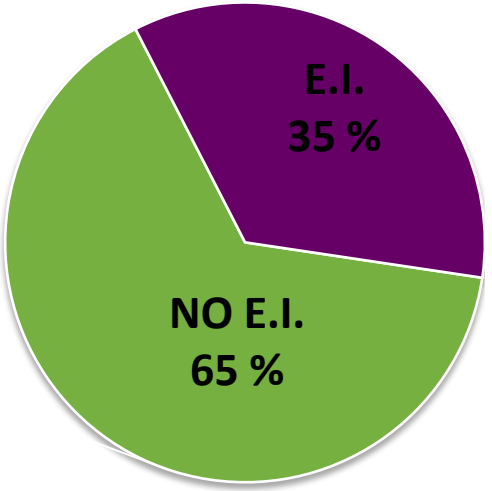
GENESIS OF HYPONATREMIA



Ashraf N, Am J Med 1981

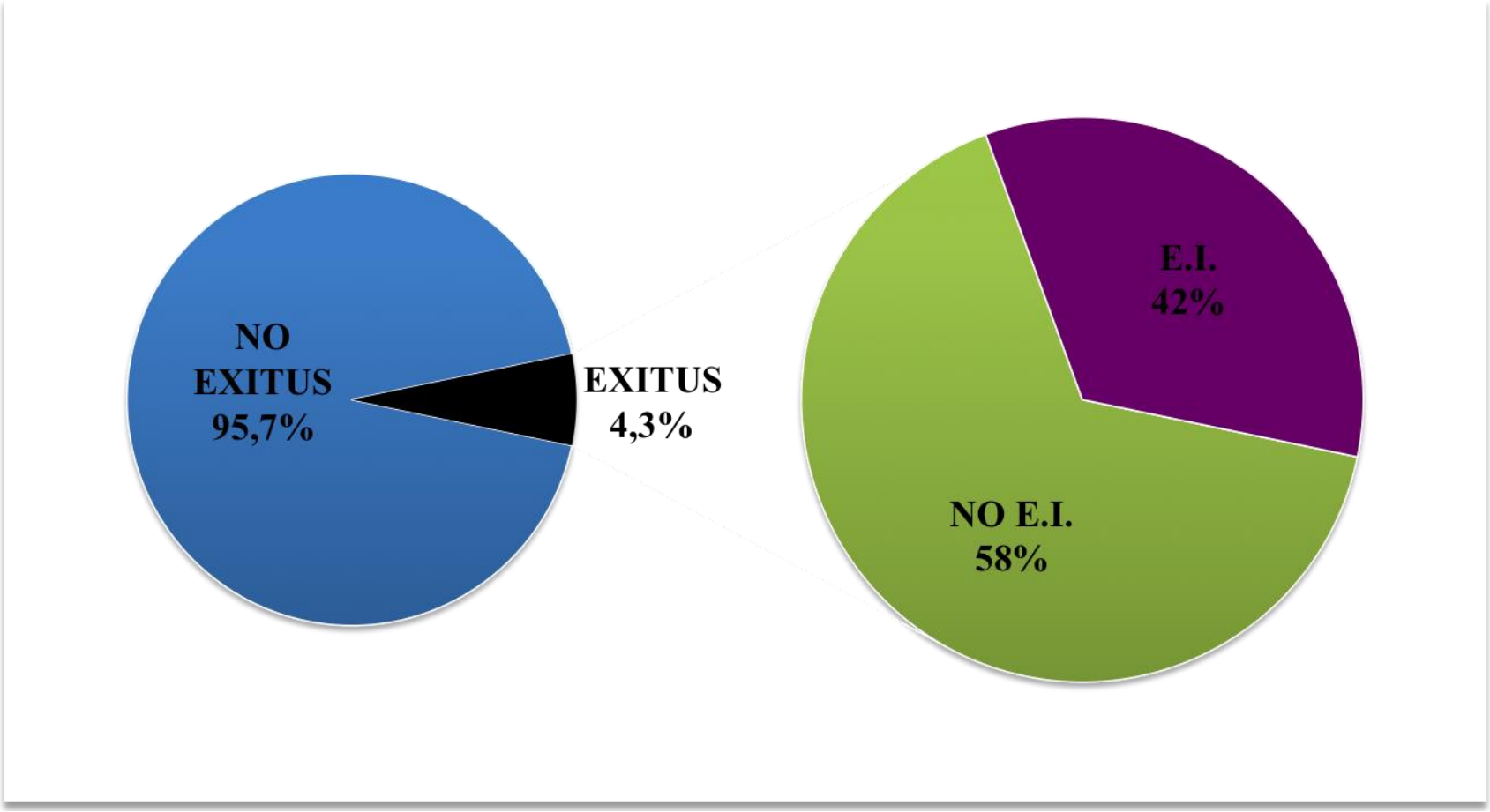
PREVALANCE OF ELECTROLYTE IMBALANCE IN HOSPITALIZED PATIENTS



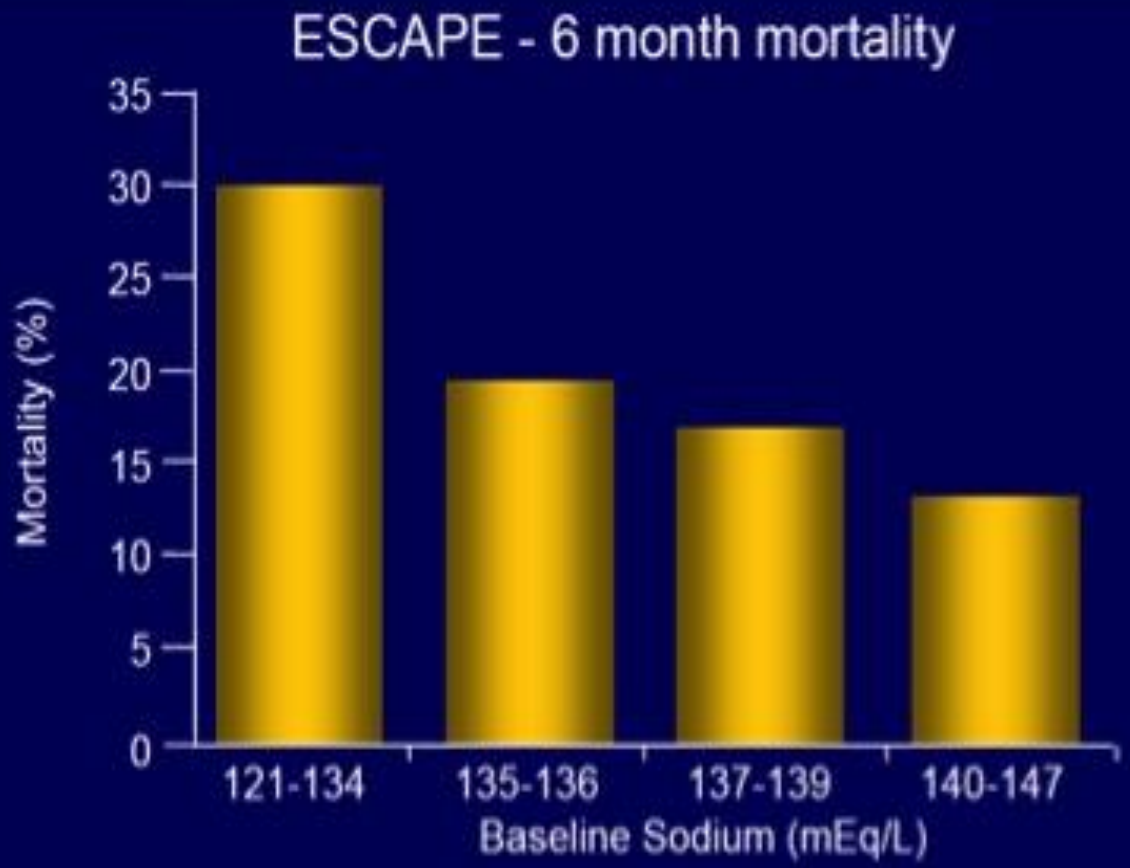


Giordano M. et al.; Am J Em Med 2016

PREVALANCE OF ELECTROLYTE IMBALANCE IN EXITUS



Correlation Between Hyponatremia and Mortality Risk in Heart Failure Patients



ESCAPE=Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness

Gheorghiade M, et al. Arch Intern Med. 2007;167:1998-2005.

Journal of Cardiology 63 (2014) 182–188

Contents lists available at ScienceDirect

Journal of Cardiology

journal homepage: www.elsevier.com/locate/jjcc

Original article

Hyponatremia is an independent predictor of adverse clinical outcomes in hospitalized patients due to worsening heart failure

Sanae Hamaguchi (MD, PhD)[a,b,1], Shintaro Kinugawa (MD, PhD)[a,1], Miyuki Tsuchihashi-Makaya (RN, PhD)[c,1], Shouji Matsushima (MD, PhD)[a,1], Mamoru Sakakibara (MD, PhD)[a,1], Naoki Ishimori (MD, PhD)[a,1], Daisuke Goto (MD, PhD)[a,1], Hiroyuki Tsutsui (MD, PhD, FJCC)[a,*,1]

[a] Department of Cardiovascular Medicine, Hokkaido University Graduate School of Medicine, Sapporo 060-8638, Japan
[b] Department of Cardiovascular Medicine, Social Welfare Corporation Hokkaido Social Work Association Obihiro Hospital, Obihiro 080-0805, Japan
[c] School of Nursing, Kitasato University, Sagamihara 252-0329, Japan

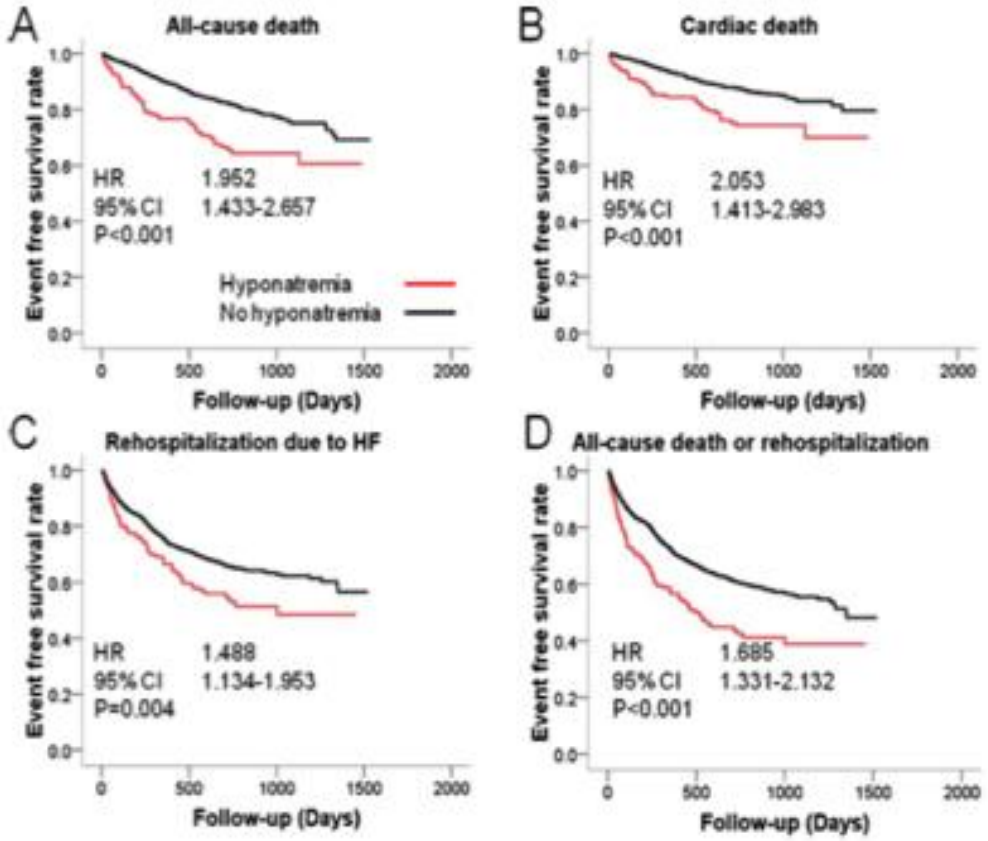
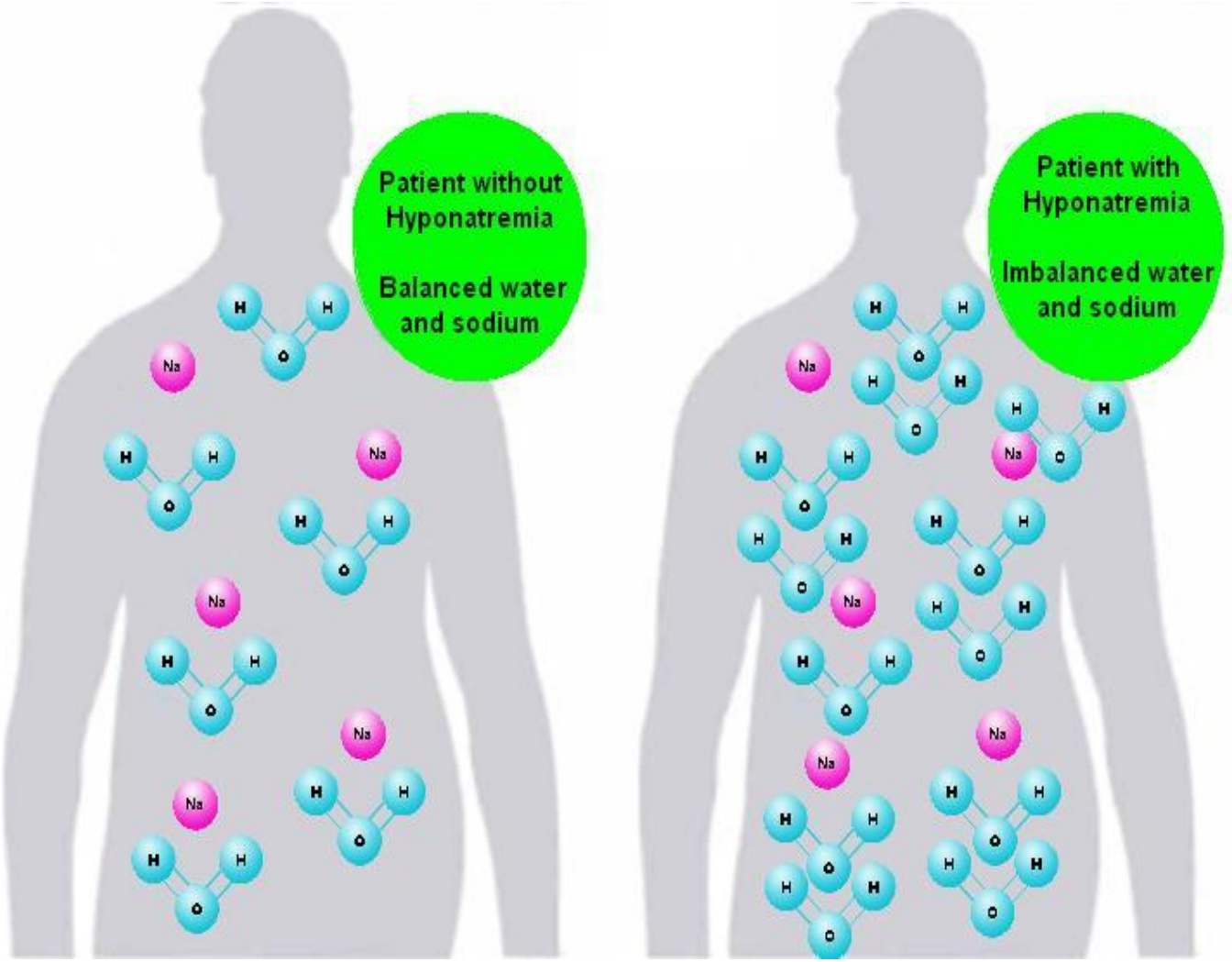


Fig. 2. Kaplan–Meier survival curves free from all-cause death (A), cardiac death (B), rehospitalization due to worsening heart failure (HF) (C), and all-cause death or rehospitalization (D) according to the presence or absence of hyponatremia.

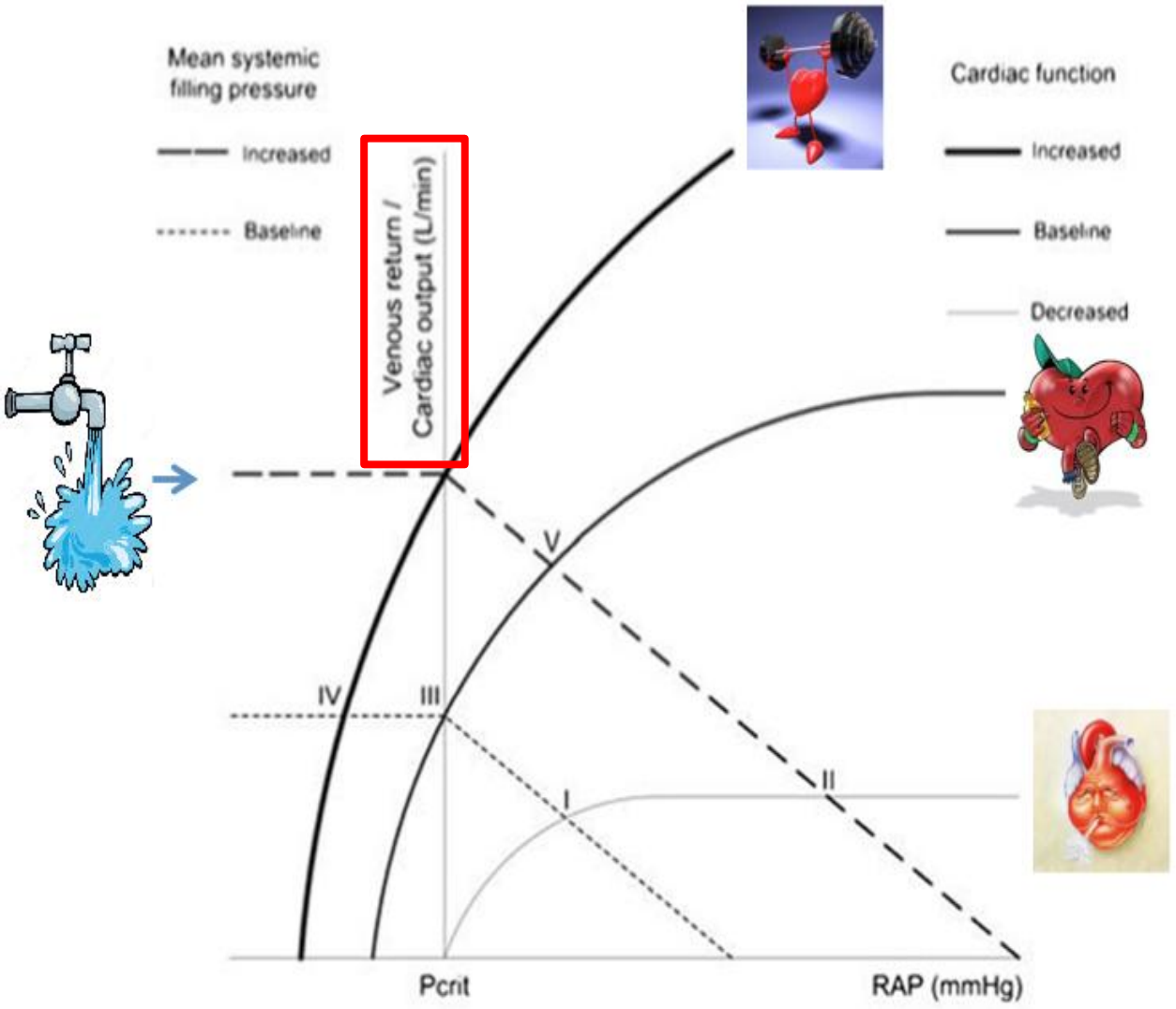
Hyponatremia

< 60% water

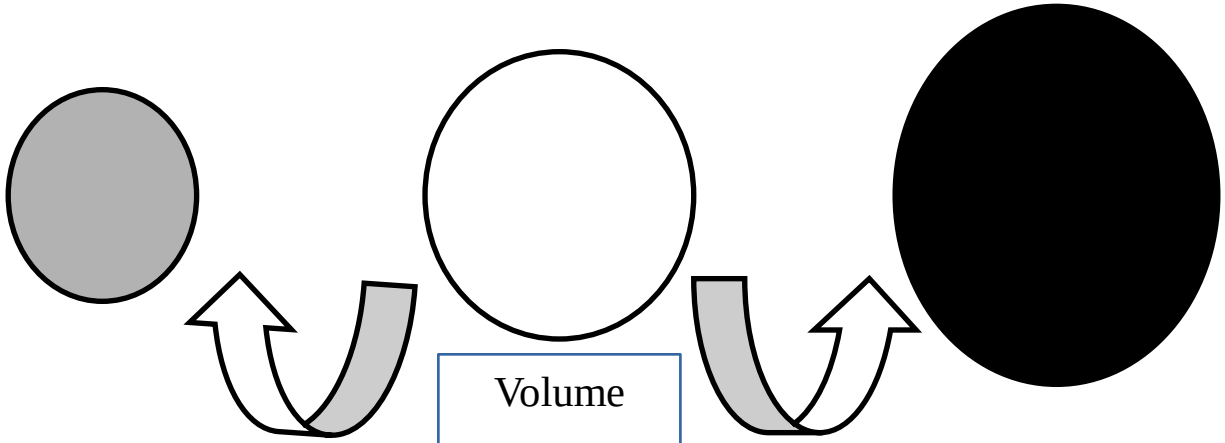
> 60% water



Cardiac Function and Water



Stress Osmotico della Cellula Cerebrale



Volume Normale

Ipernatremia (shrinking)

Iponatremia (swelling)

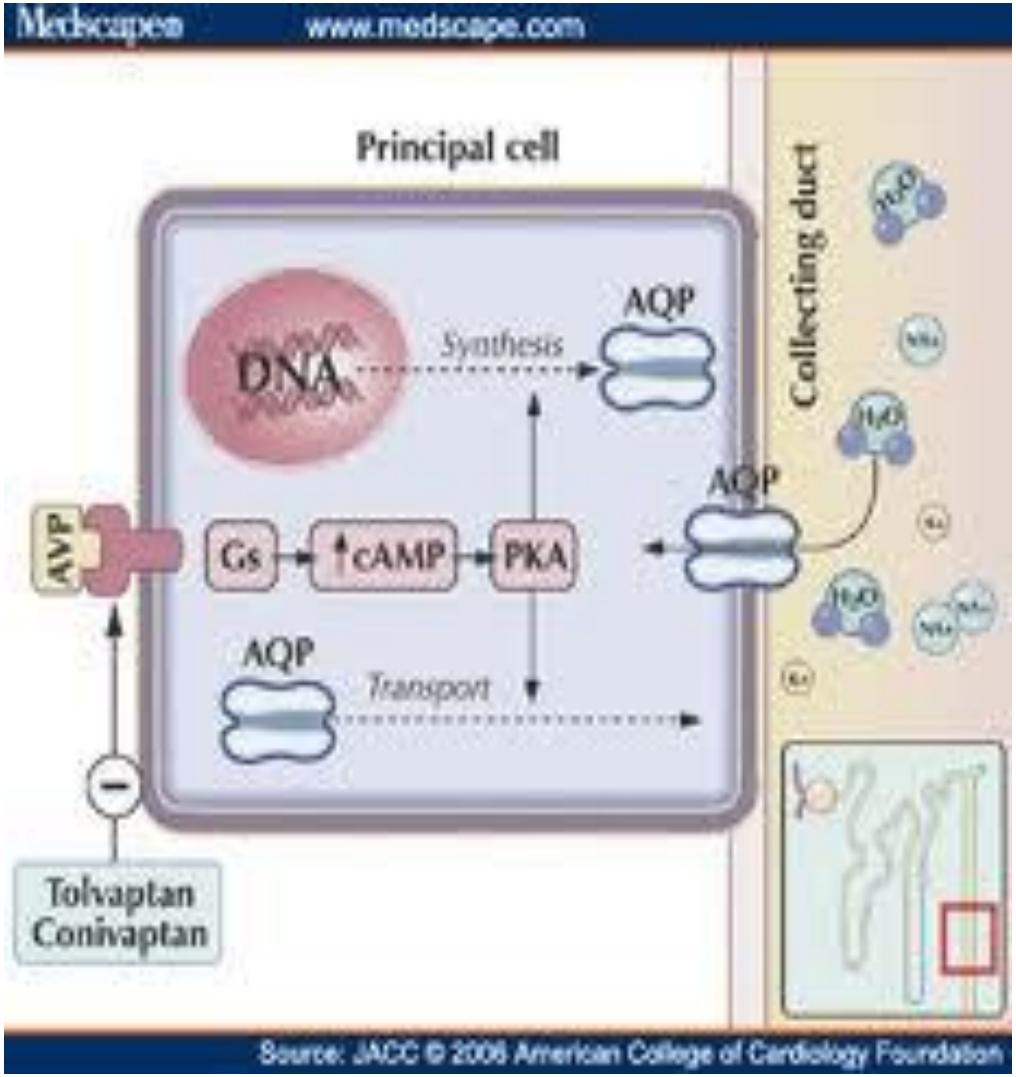
The Vicious Cycle of Water

HypoNa+

DIURETICS

HypoK+

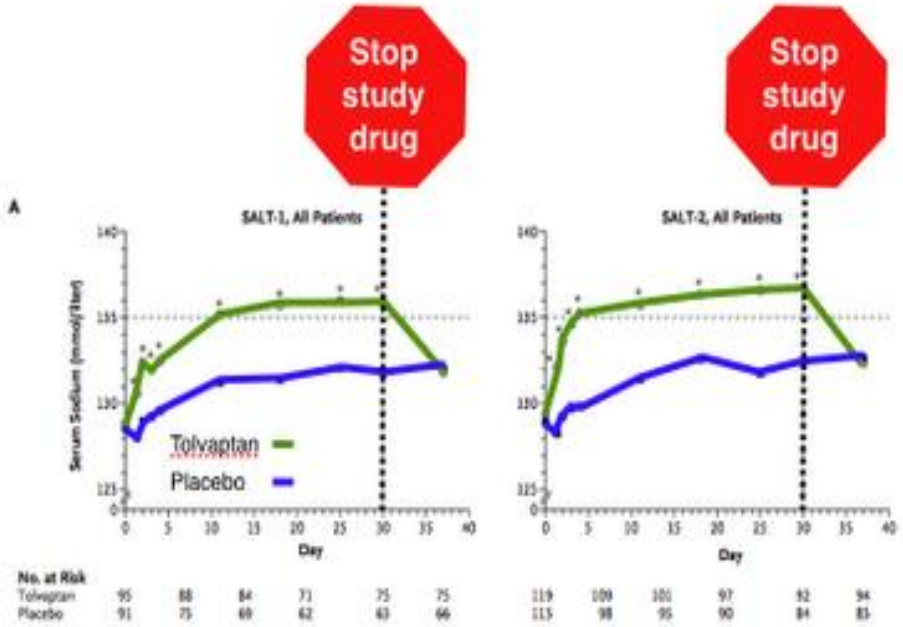
UNA NUOVA CLASSE DI DIURETICI: I VAPTANI



Tolvaptan a Selective Oral Vasopressin V2-Receptor Antagonist for Hyponatremia

Robert W. Schrier, M.D for the SALT Investigators

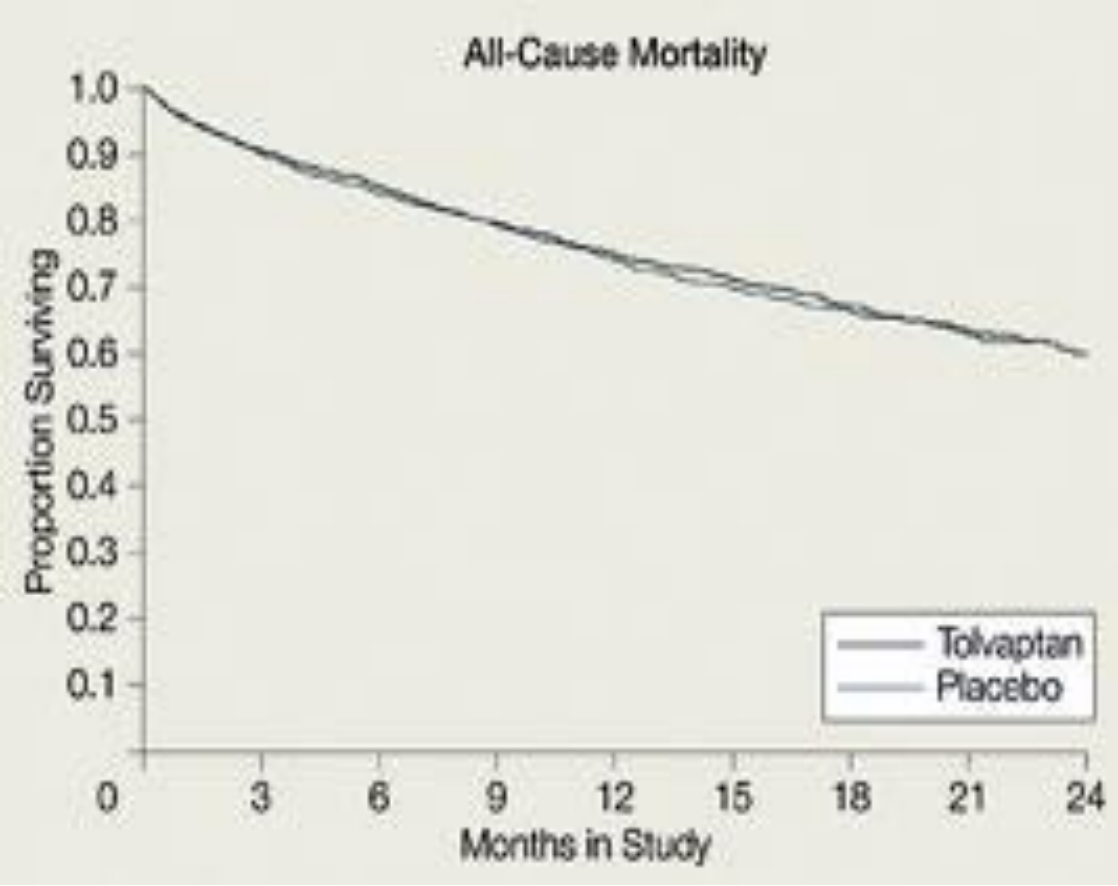
Tolvaptan 15, 30, 60 mg orally OD



R. W. Schrier, nejm 2006

Effects of Oral Tolvaptan in Patients Hospitalized for Worsening Heart Failure

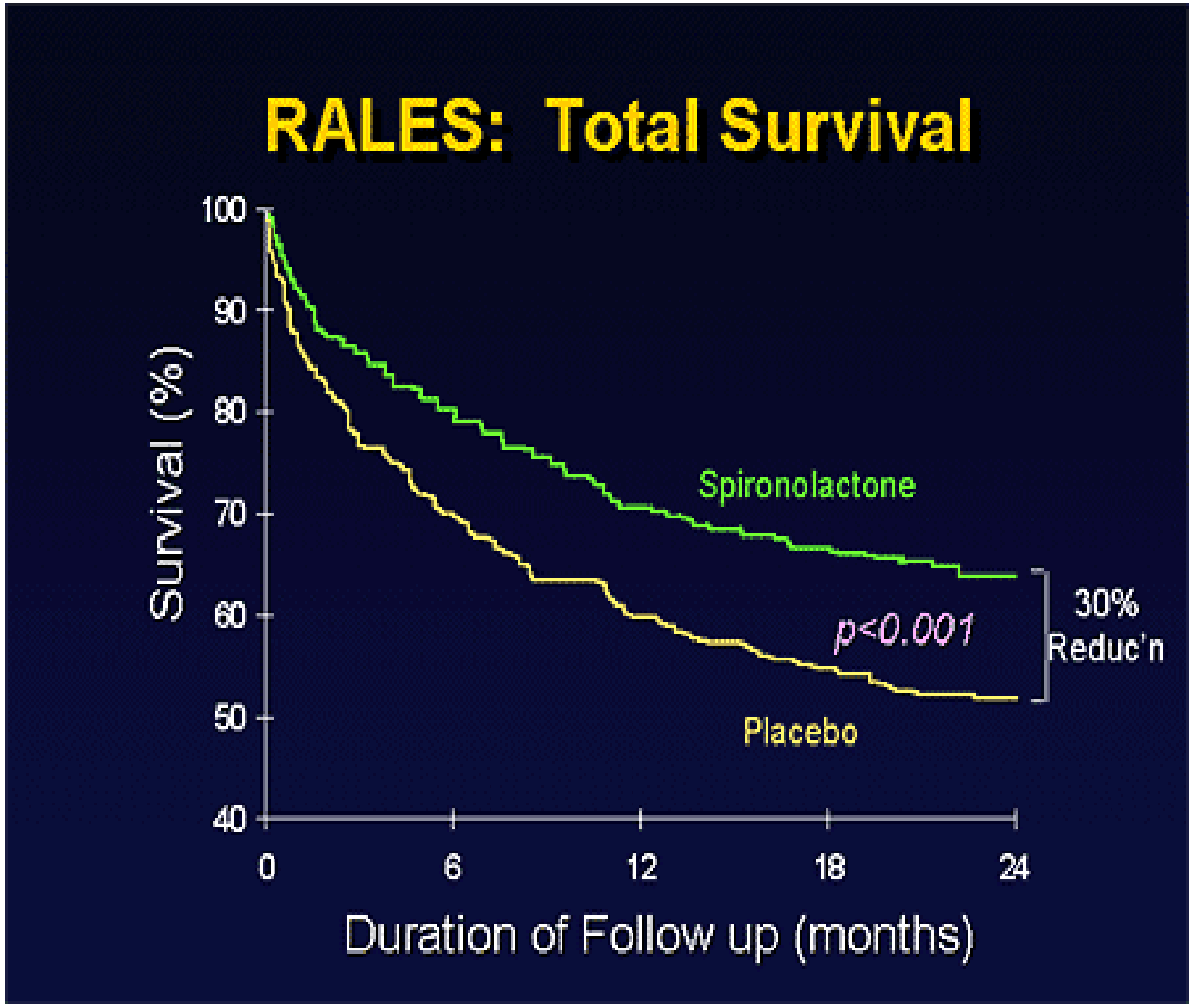
The EVEREST Outcome Trial



Konstam MA, JAMA 2007

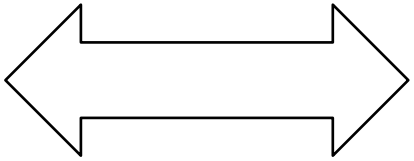
Spironolactone & HF

The Randomized Aldactone Evaluation Study Trial



Pitt B NEJM 1999

L’acqua
vita o morte ?



IPONATREMIA

IPO-EUVOLEMICA

Deficit totale di Na^+ > Deficit totale di H_2O

Deplezione ECF

Perdita renale
- Eccesso di diuretici
- Deficit mineralcorticoidi
- "Salt-losing Nephritis"

Sodiuria > 20 mmol/l

Perdita extrarenale
- Vomito
- Diarrea
- Terzo spazio
- Pancreatite
- Peritonite
- Trauma muscolare

Sodiuria < 10 mmol/l

Soluzione salina isotonica

IPERVOLEMICA

Eccesso totale di H_2O > Eccesso totale di Na^+

Eccesso ECF

- Scompenso cardiaco
- Cirrosi
- **Sindrome nefrosica**

Sodiuria < 10 mmol/l

IR acuta e cronica
SIADH

Sodiuria > 20 mmol/l

Soluzione Salina Ipertonica

IPONATREMIA + SETE

IPO-EUVOLEMICA

Deficit totale di Na^+ > Deficit totale di H_2O

Deplezione ECF

Perdita renale
- Eccesso di diuretici
- Deficit mineralcorticoidi
- "Salt-losing Nephritis"

Sodiuria > 20 mmol/l

Perdita extrarenale
- Vomito
- Diarrea
- Terzo spazio
- Pancreatite
- Peritonite
- Trauma muscolare

Sodiuria < 10 mmol/l

Soluzione salina isotonica

H2O

IPERVOLEMICA

Eccesso totale di H_2O > Eccesso totale di Na^+

Eccesso ECF

- Scompenso cardiaco
- Cirrosi
- **Sindrome nefrosica**

Sodiuria < 10 mmol/l

IR acuta e cronica
SIADH

Sodiuria > 20 mmol/l

Soluzione Salina Ipertonica

IPONATREMIA

LIEVE (135-120 mmol/l)	MODERATA (120-110 mmol/l)	SEVERA (< 110 mmol/l)
Asintomatico	Astenia marcata	Ottundimento
Astenia lieve	Cefalea	Allucinazioni
Vertigini	Nausea	Epilessia
	Vomito	Coma

Respiro di Cheyne-Stokes

Iperpnea Apnea

R.A. DeFronzo 95

TERAPIA IPONATREMIA

Calcolo del deficit del sodio

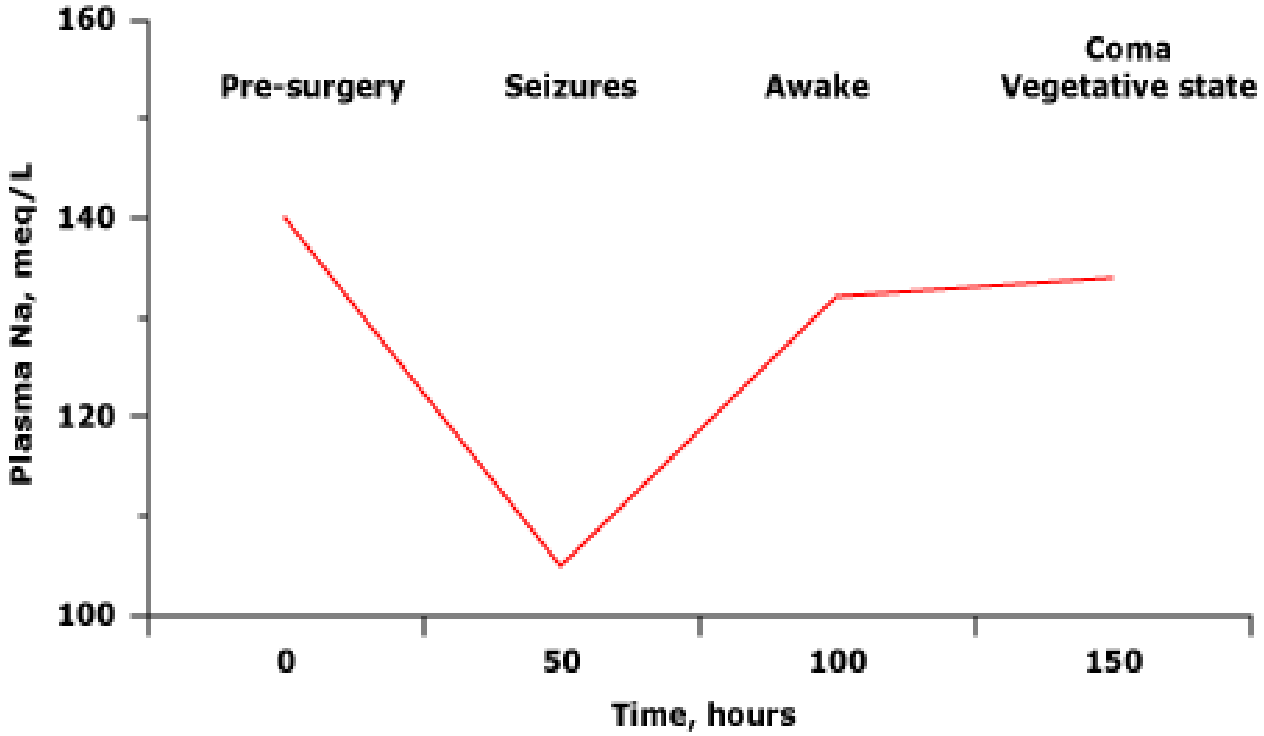
Sapendo che l'acqua corporea totale = 60%
Uomo 70 kg con [Na]p = 120; TBW = 42L;
quindi il deficit di Na+ = 140-120 = 20 mEq x 42L = 840 mEq.

Considerando una infusione di Salina Ipertonica al 3% (513 mEq/L); 700 mEq / 513 = 1,6 L ;

Take Home Message:
Velocità di correzione pari a 0.5 mEq/h;
quindi 20mEq in 40h; quindi 1,6 l Ipertonica in 40h ;
quindi = 40ml/h / 70kg = 0,5 ml/kg/h

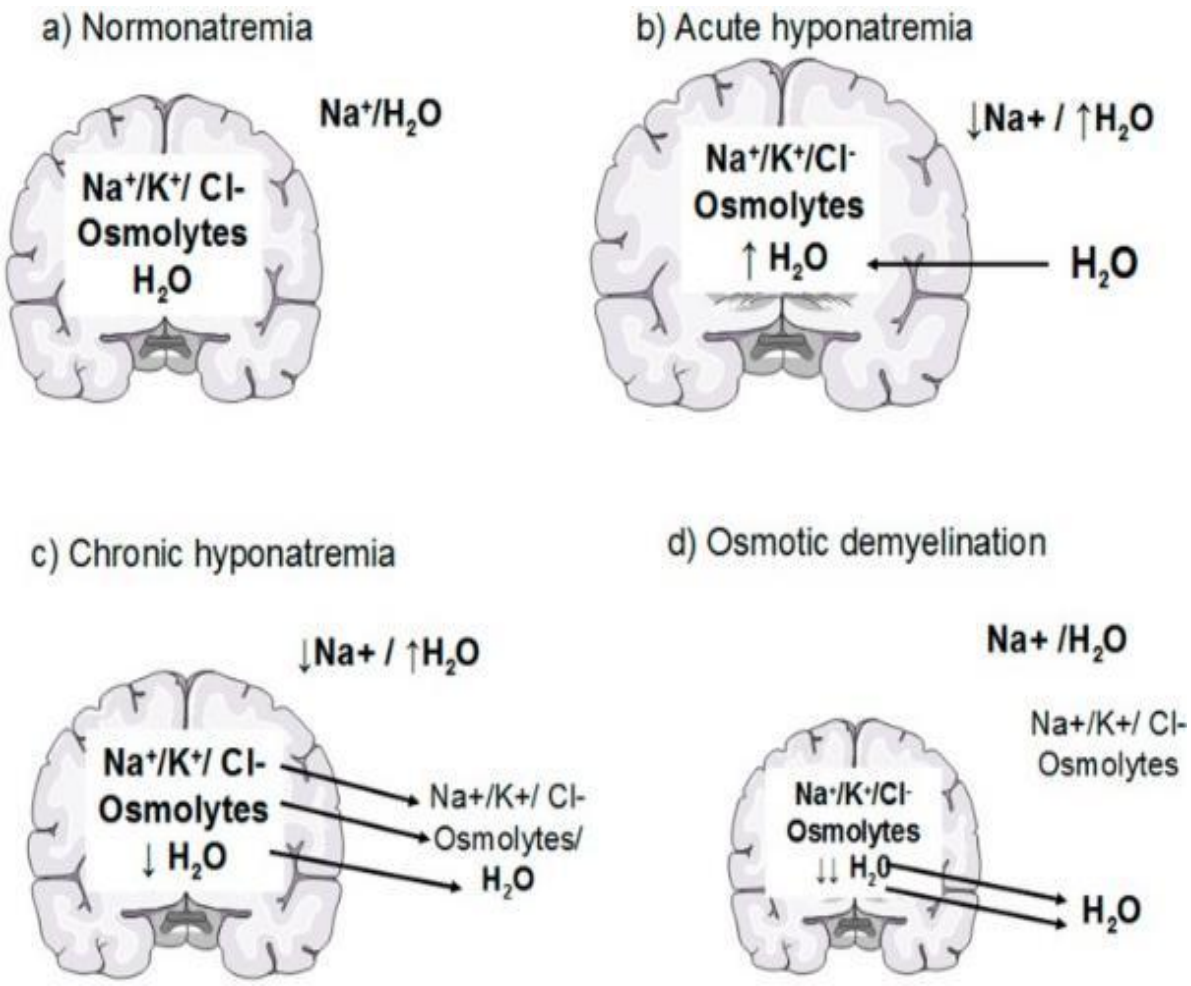
Adrogué HJ, N Engl J Med 2000

Course of osmotic demyelination in hyponatremia



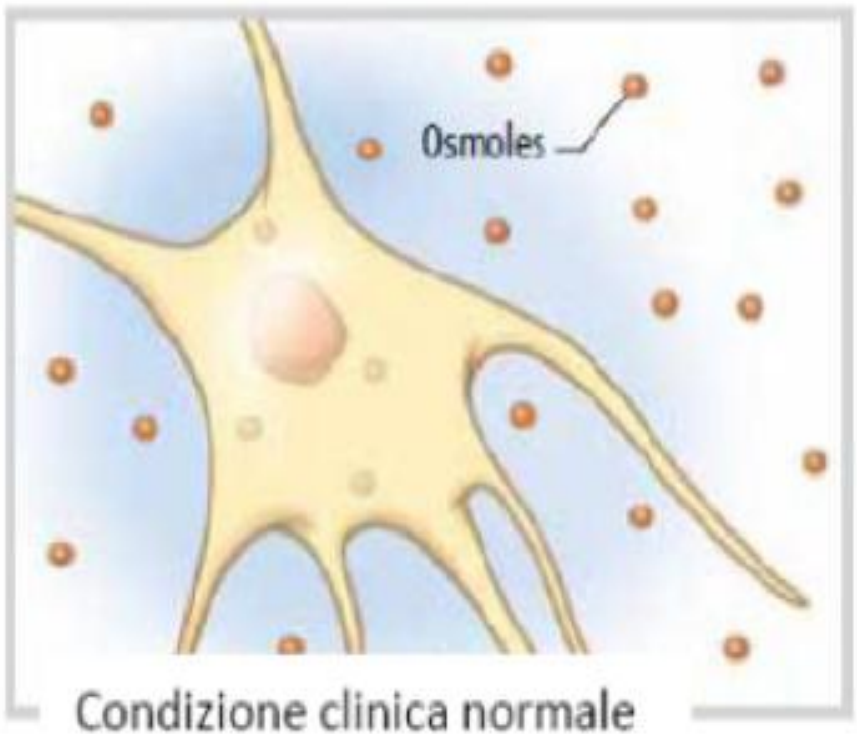
Arieff, AI, N Engl J Med 1986

Trattamento

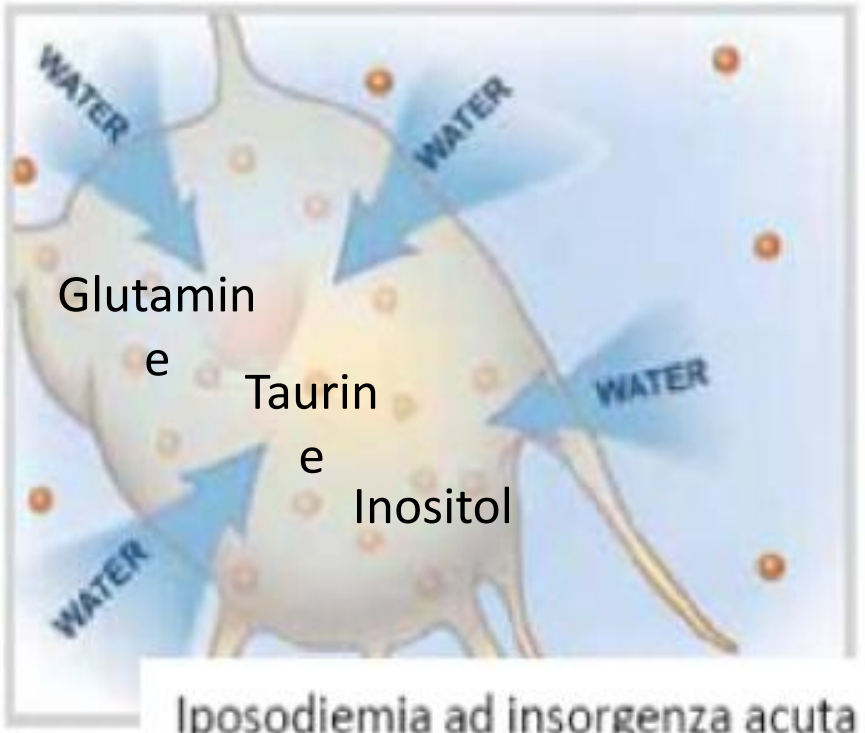


Adrogue HJ, NEJM 2000

Stress Osmotico della Cellula Cerebrale



Condizione clinica normale



Iposodiemia ad insorgenza acuta

Iponatremia Acuta

(swelling)

Sterns NEJM 2015

IPONATREMIA
Raccomandazioni

Si consiglia di correggere la sodiemia ad una **velocità < 0.5 mmol/h**

Un aumento della concentrazione sierica di sodio **> 20 mmol/l in 24 h** è associata ad una aumentato rischio di **mielinolisi pontina (sindrome demielinizzazione osmotica)**

Adrogue N Engl J Med. 00

GRAZIE

Augiero

Barbato

Cortile

Di Nuzzo

Langella

Lo Priore

Sommese

Vernoni

Carlino – Bologna – Ciarambino - D'Addio – Guerrera - Ricciotti

Battista

Bicoku

Bottone

Campanile

D'Arco

De Vita

Di Sette

Fischetti

Gaudino

Giaquinto

Latini

Menna

Milione

Palma

Persiano

Scarano

Sena

Schettini

Volpe