Available IV fluids

By

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Objectives

+ Fluids are drugs

+ Basic physiological points

+ Available IV fluid

+ Fluid therapy ; evidence based approach

Fluids are Drugs

+ Fluids are probably the most commonly administered intravenous treatment in inpatient care. Because of their excellent safety profile, until recently fluid solutions were not considered "medications"

+ Recent evidence has altered our view on the different types of fluids available for fluid therapy .

Fluids are Drugs

+ Intravenous fluids should be seen as drugs affecting the cardiovascular, renal, gastrointestinal and immune systems and should therefore not be administered “blindly”

+ Specific disease states may require different fluid therapy >> No fluid is ideal for all disease conditions at all times.

Fluids are Drugs

+Evidence from perioperative settings with fluid therapy has associated with several unfavorable outcomes, including acute kidney injury (AKI), respiratory complications, increased lengths of stays, admission costs and 30-day-mortality rates.

Fluids are Drugs

+ Because of the possibilities of multifactorial errors and harmful effects, it is recommended to use the right type of fluid, in the right volume at the right time, by the right route (in a similar way as using any other pharmacological prescription antibiotics or drugs), and tailor the fluid therapy to meet the patient's individualized needs which reduces the risks and improves the outcome (one size don't fit all).

Basic physiological points

>> Distribution of body fluid in adult

+ Total body water (**TBW**) content is about **60%** of body weight in a young adult male and about **50%** in a young adult female

+ Total body water is commonly divided into two volumes: the intracellular fluid (**ICF**) volume and the extracellular fluid (**ECF**) volume

+ **ICF** is defined as all the body water within cells. The **ICF** is normally **two third** of total body water and **40%** of total body weight. Water balance regulates the ICF volume.

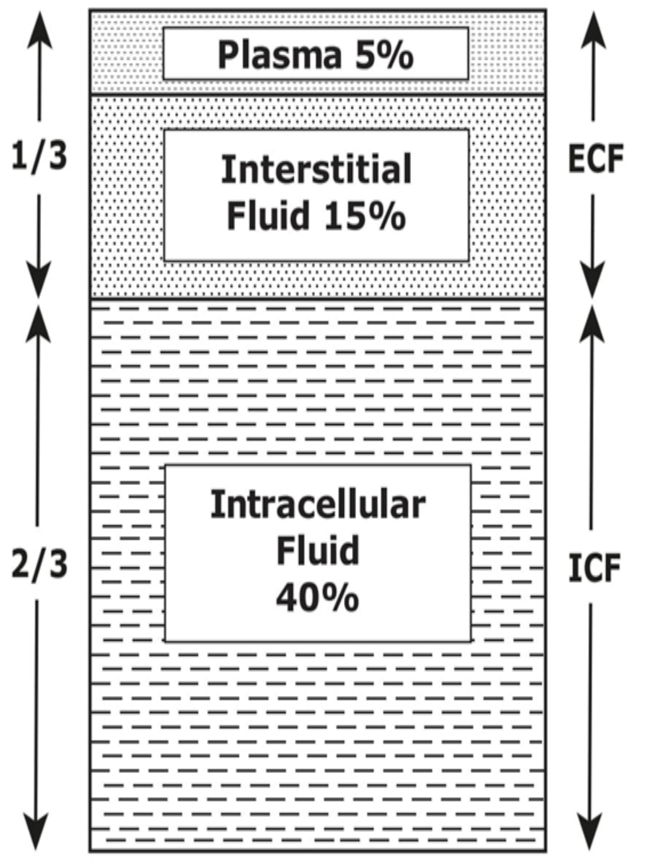
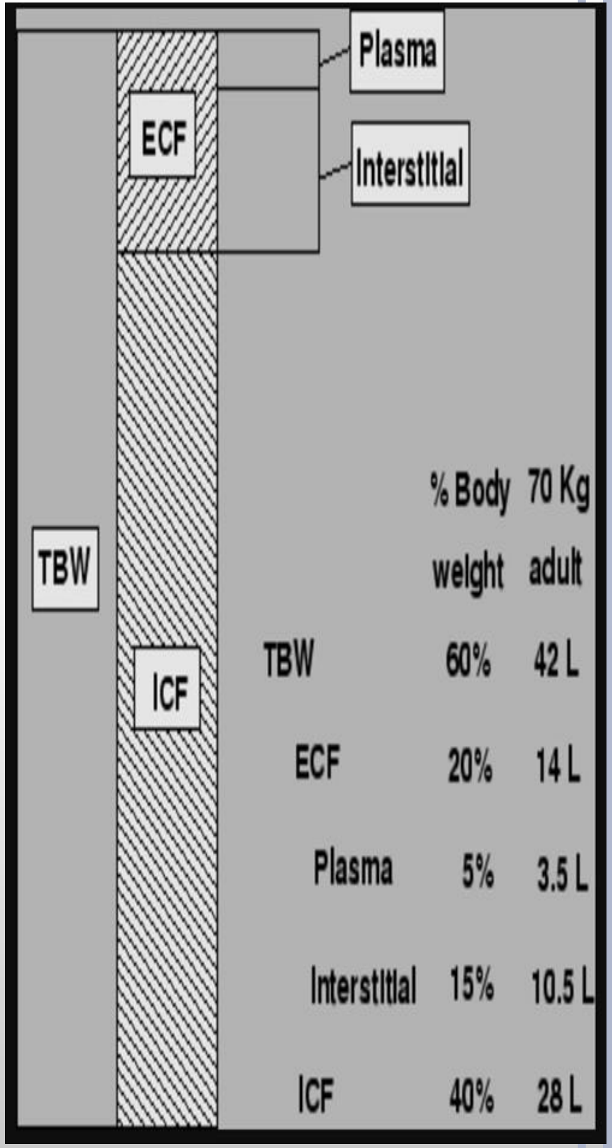


Figure 1.1 Body fluid compartments.

Basic physiological points

+**ECF** is defined as all body water outside the cells - within the tissue spaces (**interstitial fluid**), the blood vessels (**intravascular fluid or plasma**), and the lymphatic vessels (lymph). The **ECF** is normally one third of total body water and **20%** of total body weight.

+ **ECF** is subdivided into extravascular (**interstitial**) fluid (3/4th of ECF or **15%** of total body weight) and plasma or **intravascular** volume (1/4th of ECF, or **5%** of total body weight).

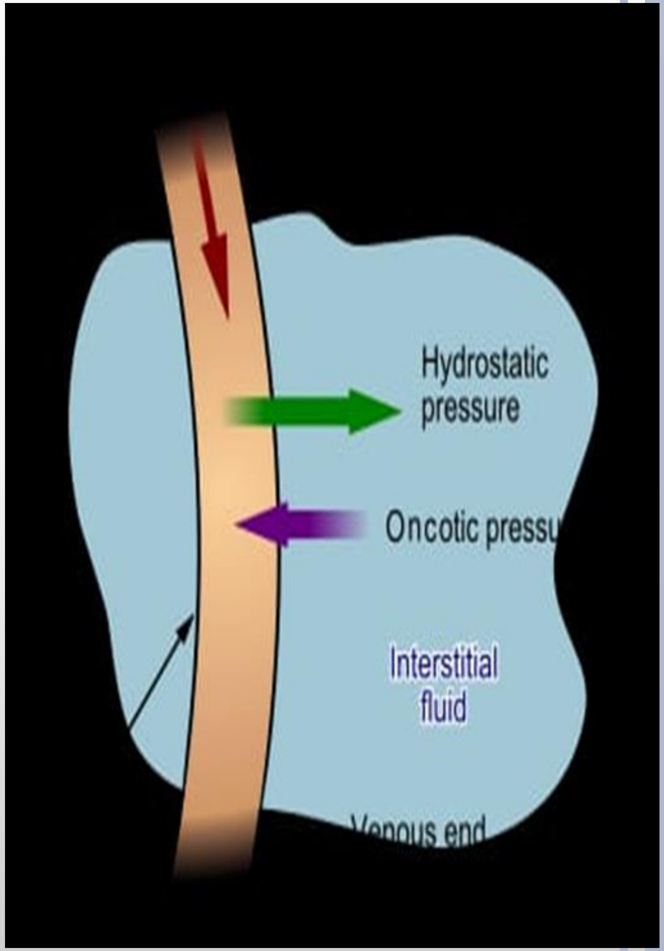


Basic physiological points

+ Fluid and electrolytes Movement :-

- The movement of water and electrolytes between **ICF** and **ECF** compartments is regulated to stabilize their distribution and the composition of body fluids

- The cell membranes that separate fluid compartments are selectively permeable. Water passes freely and readily through cell membranes in response to changes in solute concentration; therefore, the osmolalities in all compartments are equal.



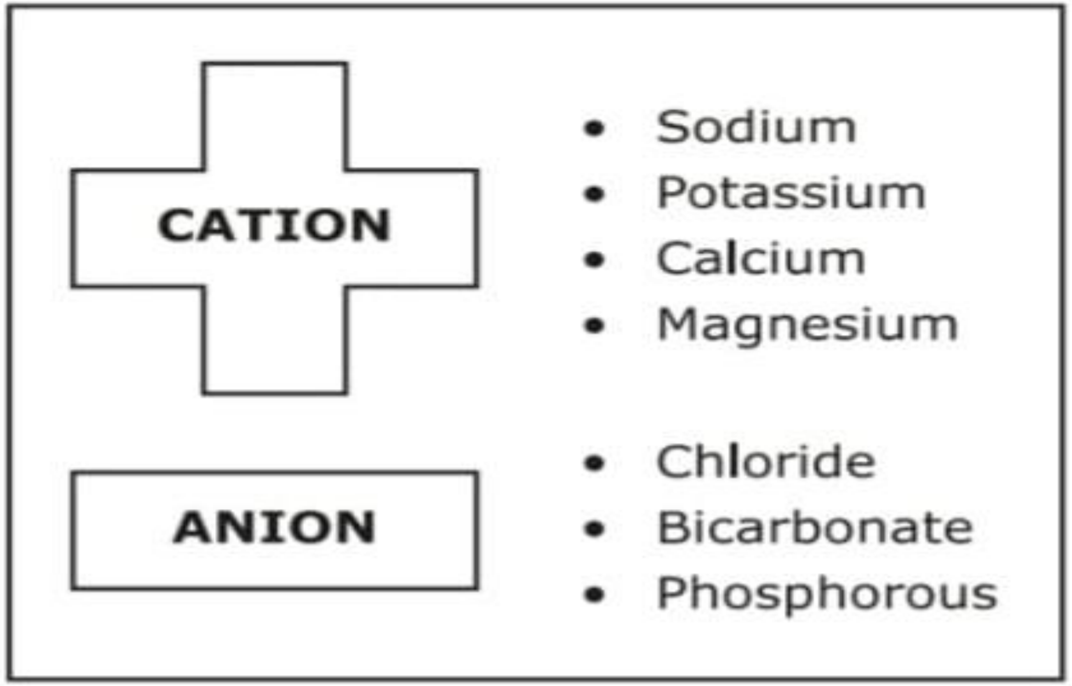
+ Two major determinants of water and electrolyte movements from one compartment to another are **hydrostatic** pressure and **oncotic** pressure.

+ Major water retaining solutes in ECF, ICF, and intravascular compartments are **sodium**, **potassium**, and **plasma protein**, respectively.

+ **IONS** >> Cations and Anions

Table 1.4 Major ions in ECF and ICF

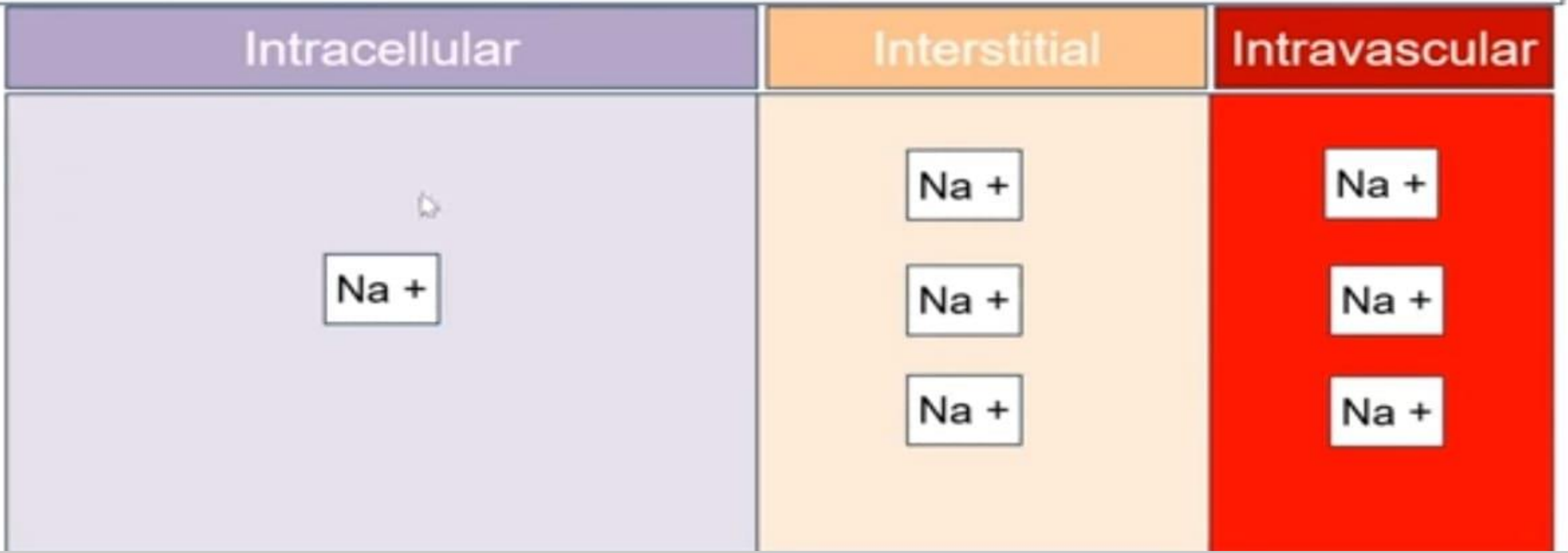
	ECF	ICF
Major cation	Sodium	Potassium and magnesium
Major anion	Chloride and bicarbonate	Phosphate, sulfate and protein



Basic physiological points

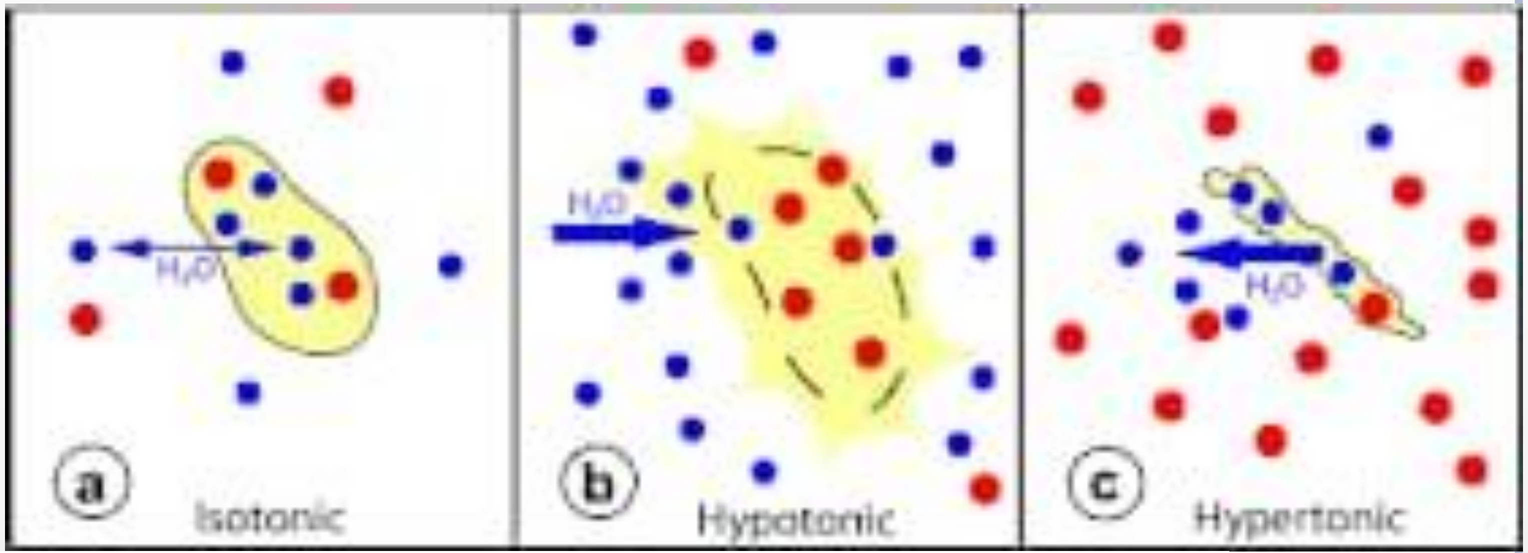
Plasma osmolarity: amount of solute dissolved in plasma=290 mosm/L

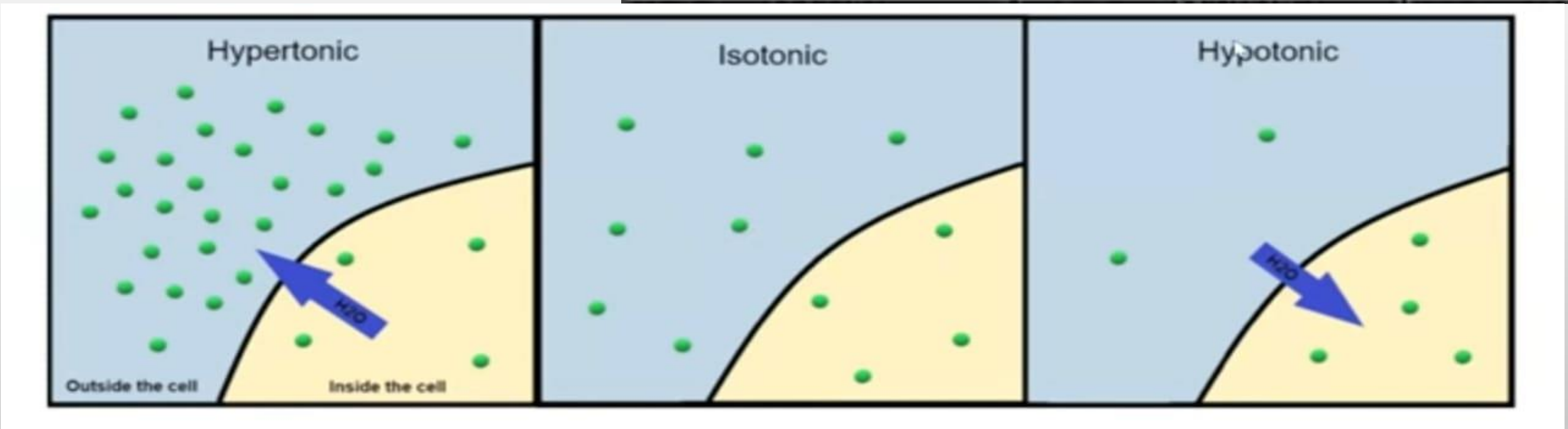
Sodium is the main determinant of plasma osmolarity and it is abundant extracellular



Basic physiological points

+ Effect of fluid infusion:-





Available IV fluids

+ Classification:-

A- Based on Composition:-

1- Crystalloids

2- Colloids

Available IV fluids

Colloids	Crystalloids
Includes **Albumin, Dextran, Hydroxyethyl starches (HES), Gelatin**	Includes **Hypotonic, Hypertonic, Isotonic** solutions
Large molecules that **stay** in intravascular space longer	**Small molecules** that **don't stay** too long in intravascular space
Fast at **expanding** intravascular space & amount administered equal to amount lost	**High amount** of **fluids needed** to equal amount lost **(overload: edema)**
Risks: allergic reaction, coagulation problems	**No** allergic reactions or coagulation problems
Cost More	**Cost Less** and easier to access

Available IV fluids

B-Based on Osmolality:-

1- Isotonic Crystalloid fluid:-

-Normal saline.
-Ringer lactate.
-Ringer acetate.
-Plasmalyte

2- Hypotonic Crystalloid fluid:-

- NaCl 0.45%

3-Hypertonic Crystalloid Fluid:-

- Nacl 3%
- Dw 5% in 0.9% salin

Available IV fluids

Table 2.5 Classification of crystalloid solutions according to osmolality

Characteristics	Isotonic solutions		Hypotonic solutions		Hypertonic solutions	
Osmolality (mOsm/L)	270–310		Lesser than 270		Greater than 310	
Distribution and effect on fluid compartment	Remains within ECF and expands ECF compartment		Fluid quickly moves from the intravascular space into the cells		Pull water from the cells into the intravascular space	
Effect on cell size	No effect		Swollen		Shrink	
Examples	Solutions	Osmolality mOsm/L	Solutions	Osmolality mOsm/L	Solutions	Osmolality mOsm/L
Normal serum osmolality is 275–295 mOsm/kg	0.9% NaCl	308	0.45% NaCl	154	3% NaCl	1026
	Ringer's lactate	273	0.33% NaCl	103	D5W + 0.9% NaCl	560
	PlasmaLyte	290	-	-	-	-

Available IV fluids

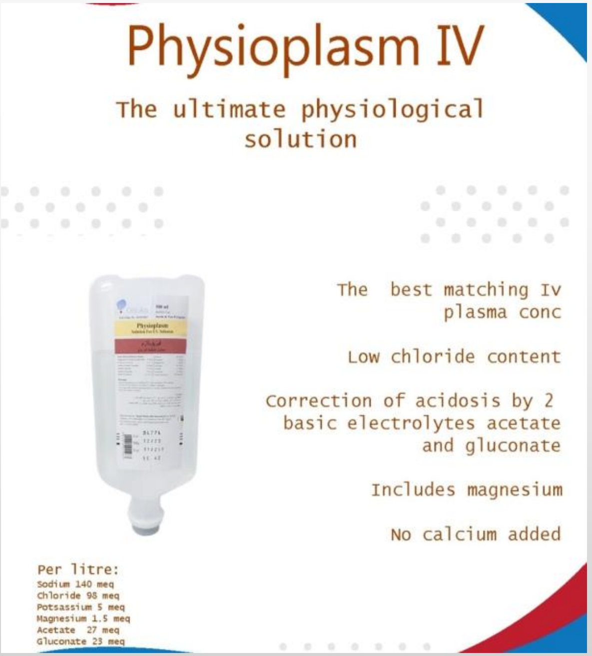
C- Based on buffer and electrolytes :-

<u>1- Dextrose and Nacl solution (Un balanced)</u>

- Dw 5% -Dw 10% - Dw 25%
- Nacl 0.9% - 3% - 0.45%
- DW 5% Nacl 0.45%
- DW 5% Nacl 0.9 %

<u>2- Balanced Crystalloids:-</u>

- Ringer
- Ringer lactate
- Ringer Acetate
- Plasmalyte



Available IV fluids

Fluid	mEq/L							Omolarity (mOsm/L)
	Na	CL	K	Ca*	Mg*	Buffers	pH	
Plasma	140	103	4	2	3	HCO_3^- (25)	7.4	290
0.9% NaCL	154	154	–	–	–	–	5.7	308
Ringer's Lactate	130	109	4	3	–	Lactate (28)	6.5	273
Ringer's Acetate	131	109	4	3	–	Acetate (28)	6.7	275
Normosol®	140	98	5	–	3	Acetate (27)	7.4	295
Plasma-Lyte®						Gluconate (23)		

Available IV fluids

Table 2.1 Composition of common IV solutions

	Dext.*	Calories	Na^+	K^+	Cl^-	Acet.	Lact.	NH_4	Ca^{2+}	Mg^{2+}	HPO_4	Gluc.	Citr.	Osm.	SID
	gm/L	kcals/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mEq/L	mOsm/L	mEq/L
5% dextrose	50	170	-	-	-	-	-	-	-	-	-	-	-	252	0
10% dextrose	100	340	-	-	-	-	-	-	-	-	-	-	-	505	0
0.45% saline	-	-	77	-	77	-	-	-	-	-	-	-	-	154	0
D5W, 0.45% saline	50	170	77	-	77	-	-	-	-	-	-	-	-	406	0
Normal (0.9%) saline	-	-	154	-	154	-	-	-	-	-	-	-	-	308	0
Dextrose saline	50	170	154	-	154	-	-	-	-	-	-	-	-	560	0
Ringer's lactate	-	-	130	4.0	109	-	28	-	3.0	-	-	-	-	273	28
Ringer's acetate	-	-	130	5.0	112	27	-	-	3.0	2.0	-	-	-	276	27
PlasmaLyte	-	-	140	5.0	98	27	-	-	-	3.0	-	23	-	295	50

Available IV fluids

A - Isotonic saline

>> Advantages:-

+ **Availability**

+ **Compatibility** compatible with the co-infusion of blood products and medications like ceftriaxone.

+ **Volume expansion**: With 154 mEq/L of sodium, it effectively expands intravascular volume and corrects hypotension.

Available IV fluids

A - Isotonic saline

>> Advantages:-

+ **Safe for specific conditions**:-

- **Brain injury** (as the osmolarity of normal saline is 308 mOsm/L (compared to normal plasma osmolality of about 285 mOsm/kg), its use for resuscitation in neurological patients is without the risk of cerebral edema.
- **Hypovolemic hyponatremia**
- **Metabolic alkalosis**.

+ **Glucose-free:** Ideal for scenarios with unknown glycemic statuses due to its lack of glucose content.

Available IV fluids

A - Isotonic saline

>> Disadvantages :-

The use of normal saline can be harmful, **as it is neither "normal" nor "physiological"**

Nonphysiological composition: Normal saline differs from the balanced crystalloid Ringer's lactate in 3 key aspects:-

1- It has a significantly **higher chloride** concentration (154 versus 109 mEq/L).

2- It lacks **a buffer**, essential for maintaining pH.

3-It does not contain **several electrolytes**, like potassium and calcium, that are present in plasma.

Available IV fluids

A - Isotonic saline

Harmful effects:

>> Normal saline contains **supraphysiologic chloride concentrations (154 mEq/L)** -50% higher than human serum chloride concentration**>>** The infusion of large volumes of this high chloride-containing fluid can lead to **hyperchloremic acidosis**, an increased risk of **acute kidney injury** ; a greater need for **renal replacement therapy**, higher hospital mortality , **coagulopathy** , **hyperkalemia**, and more pronounced **interstitial fluid retention**

Available IV fluids

B. Balanced crystalloids

(buffered or chloride-restrictive solutions or balanced salt solutions)

Balanced crystalloids are more physiological than normal saline and are increasingly advocated as a first-line resuscitation fluid

Available IV fluids

B. Balanced crystalloids

Advantages:-

-Balanced electrolyte composition
are formulated to closely mirror the electrolyte composition, osmolality, and pH of human plasma, enabling the administration of large volumes without the risk of electrolyte disturbances.

-Reduces the risks of hyperchloremia and its harmful effect

Available IV fluids

B. Balanced crystalloids

-**Provides buffer** to prevent or correct metabolic acidosis >> Balanced crystalloids has **source of bicarbonate** (e.g., **lactate** and **acetate**) that are metabolized into bicarbonate, helping to correct metabolic acidosis. This buffering effect is a significant advantage over normal saline, which lacks this buffering capacity.

-The infusion of Ringer's lactate **does not induce lactic acidosis**. The avoidance of this solution due to fears of exacerbating lactic acidosis is based on a misunderstanding >> **Na Lactate.**

Available IV fluids

B. Balanced crystalloids

Safety in hyperkalemia

98% of potassium is distributed within **the intracellular compartment**, and serum potassium levels are significantly influenced by a change in pH that shifts potassium.

Acidosis triggers a shift of potassium from the intracellular fluid (ICF) to the extracellular fluid (ECF).

Since Ringer's lactate rectifies acidosis, it not only prevents hyperkalemia but can actually reduce serum potassium levels, supporting its safety for patients with hyperkalemia.

So, we can conclude that Ringer's lactate is safer than normal saline in hyperkalemia.

Available IV fluids

B. Balanced crystalloids

Safety in neurological disorders:-
RL is a hypotonic fluid with a plasma osmolarity of **273 mOsm/L**, lower than the normal plasma osmolality of about 285 mOsm/kg.

Because of **its hypotonicity**, RL can cause or exacerbate **cerebral edema** and should, therefore, be avoided in cases with a risk of raised intracranial pressure, such as aneurysmal subarachnoid hemorrhage (aSAH), traumatic brain injury (TBI), and in patients undergoing neurosurgery.

Available IV fluids

B. Balanced crystalloids

Use in liver disorders:-

The **lactate** in RL is primarily metabolized into bicarbonate in the **liver**. The administration of RL is not an absolute contraindication for patients with liver dysfunction or cirrhosis, and its clinical impact remains unknown .

However, for those with severe or frank liver failure or post-liver transplantation, where a significant reduction in lactate metabolism is observed, **acetate-buffered solutions** are often preferred over lactate-buffered ones .

Available IV fluids

B. Balanced crystalloids

Balanced crystalloids, like PlasmaLyte, contain acetate instead of lactate, and acetate metabolism occurs in all body tissues and is not limited to liver tissues So, PlasmaLyte can be used instead of RL in severe liver diseases.

Caution: Metabolic alkalosis can occur in patients with severe liver failure and cirrhotic patients due to vomiting, nasogastric suction, diuretics, and hypovolemia. It can promote ammonia production and predispose the development of hepatic encephalopathy. Therefore, balanced fluids that provide buffers and can aggravate metabolic alkalosis should be avoided in such patients.

Resuscitation fluid therapy

Crystalloid VS Colloid

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

For adults with sepsis or septic shock, we suggest using balanced crystalloids instead of normal saline for resuscitation (weak recommendation)

For adults with sepsis or septic shock, we suggest using albumin in patients who received large volumes of crystalloids (weak recommendation)

No cutoff value for crystalloid infusion above which albumin might be considered as part of resuscitation.

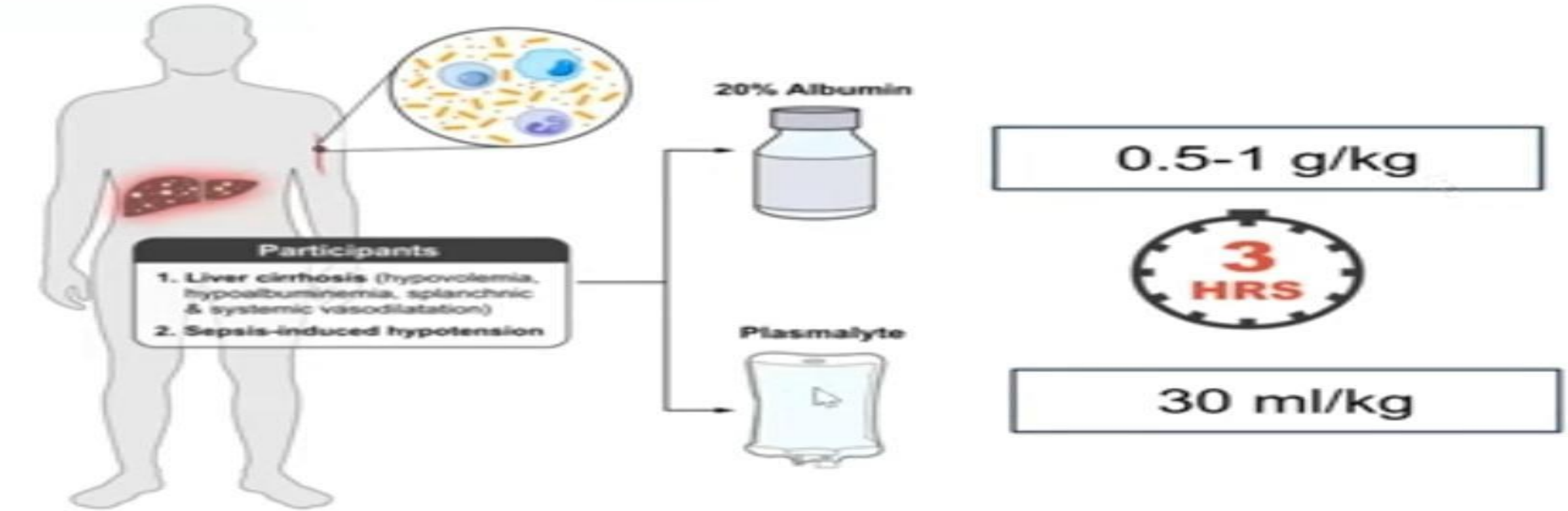
Resuscitation fluid therapy

Crystalloid VS Colloid

Research Article
Cirrhosis and Liver Failure

JOURNAL OF HEPATOLOGY

A randomized-controlled trial comparing 20% albumin to plasmalyte in patients with cirrhosis and sepsis-induced hypotension [ALPS trial]



Resuscitation fluid therapy

Crystalloid VS Colloid

Research Article
Cirrhosis and Liver Failure

JOURNAL
OF HEPATOLOGY

A randomized-controlled trial comparing 20% albumin
to plasmalyte in patients with cirrhosis and sepsis-

[redacted]

Resuscitation fluid therapy

Crystalloid VS Colloid

Practice Guideline > Intensive Care Med. 2024 Jun;50(6):813-831.
doi: 10.1007/s00134-024-07369-9. Epub 2024 May 21.

European Society of Intensive Care Medicine clinical practice guideline on fluid therapy in adult critically ill patients. Part 1: the choice of resuscitation fluids

Yaseen M Arabi [1], Emilie Belley-Cote [2], Andrea Carsetti [3], Daniel De Backer [4], Katia Donadello [5] [6], Nicole P Juffermans [7], Naomi Hammond [8] [9], Jon Henrik Laake [10], Dawei Liu [11], Kathryn Maitland [12], Antonio Messina [13] [14], Morten Hylander Møller [15] [16], Daniele Poole [17], Rob Mac Sweeney [18], Jean-Louis Vincent [19], Fernando G Zampieri [20], Fayez AlShamsi [21]; European Society of Intensive Care Medicine

The recent ESICM guidelines, in general, prefer the use of crystalloids over colloids for volume expansion during resuscitation, particularly for hypovolemia not caused by bleeding

Resuscitation fluid therapy

Crystalloid VS Colloid

Randomized Controlled Trial > N Engl J Med. 2012 Nov 15;367(20):1901-11.
doi: 10.1056/NEJMoa1209759. Epub 2012 Oct 17.

Hydroxyethyl starch or saline for fluid resuscitation in intensive care

John A Myburgh [1], Simon Finfer, Rinaldo Bellomo, Laurent Billot, Alan Cass, David Gattas, Parisa Glass, Jeffrey Lipman, Bette Liu, Colin McArthur, Shay McGuinness, Dorrilyn Rajbhandari, Colman B Taylor, Steven A R Webb; CHEST Investigators; Australian and New Zealand Intensive Care Society Clinical Trials Group

Collaborators, Affiliations + expand

PMID: 23075127 DOI: 10.1056/NEJMoa1209759

Conclusions: In patients in the ICU, there was no significant difference in 90-day mortality between patients resuscitated with 6% HES (130/0.4) or saline. However, more patients who received resuscitation with HES were treated with renal-replacement therapy.

Resuscitation fluid therapy

Crystalloid VS Colloid

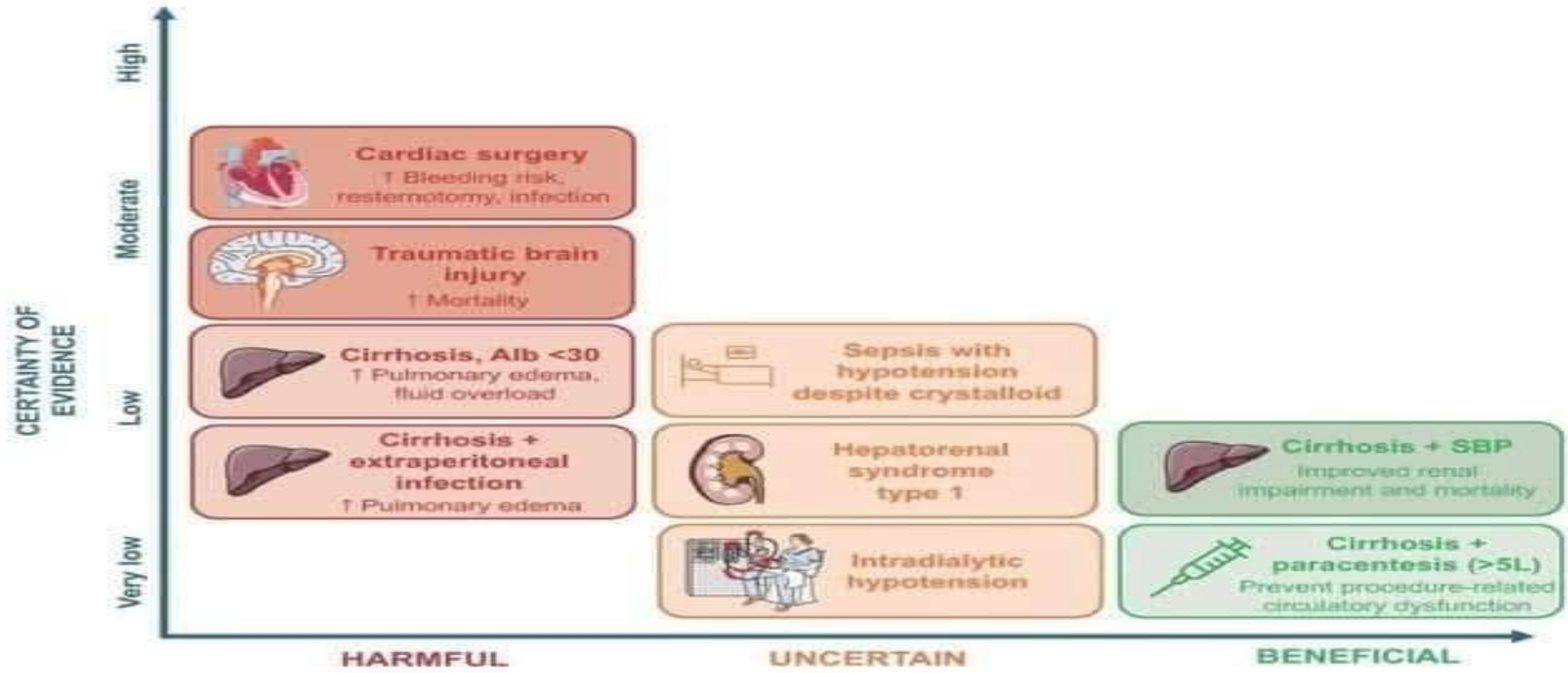
Hydroxyethyl starch is harmful;

Hydroxyethyl starch (HES) was once the most commonly used colloid, but due to its adverse effects,Current recommendations are against its use.

HES is currently indicated as **a rescue therapy** for treating hypovolemia induced by **acute blood loss** when **crystalloids alone are insufficient** with low dose < 30 ml / kg with **close observation of renal function**

Resuscitation fluid therapy

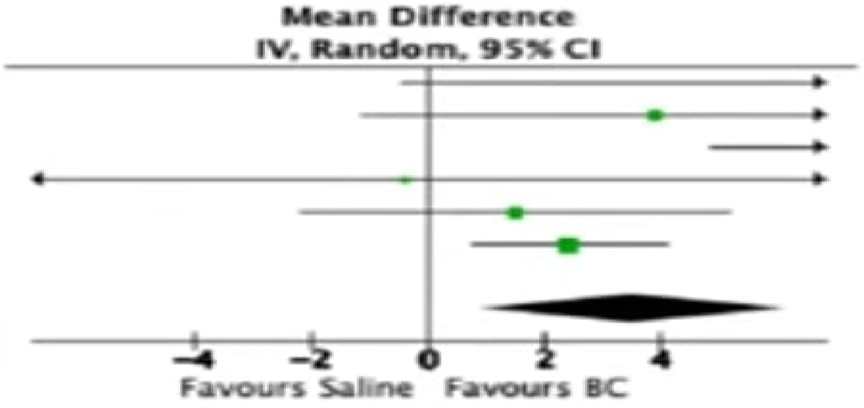
ALBUMIN



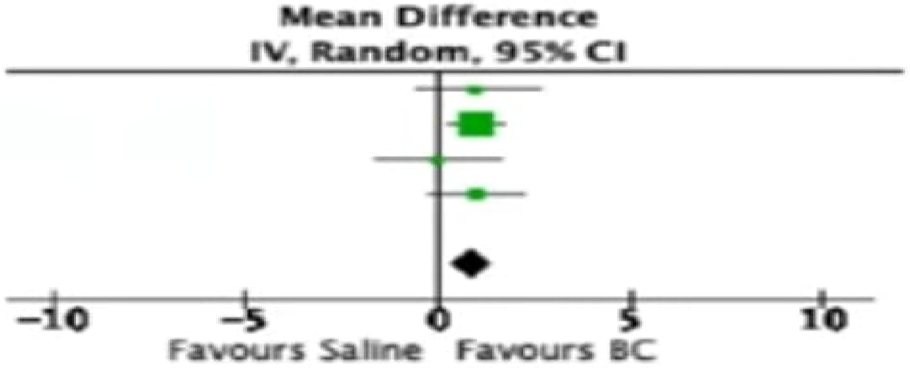
Resuscitation fluid therapy

Balanced vs Unbalanced

Saline Compared to Balanced Crystalloid in Patients With Diabetic Ketoacidosis: A Systematic Review and Meta-Analysis of Randomized Controlled Trials



Time to DKA resolution is faster with balanced solution



Duration of hospital stay is less with balanced solution

Crti care exploration 2022 Jan 6;4(1):e0613

Resuscitation fluid therapy

Balanced vs Unbalanced

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Balanced Crystalloids versus Saline in Critically Ill Adults

Authors: Matthew W. Semler, M.D., Wesley H. Self, M.D., M.P.H., Jonathan P. Wanderer, M.D., Jesse M. Ehrenfeld, M.D., M.P.H., Li Wang, M.S., Daniel W. Byrne, M.S., Joanna L. Stollings, Pharm.D., +11 , for the SMART Investigators and the Pragmatic Critical Care Research Group* Author Info & Affiliations

Published February 27, 2018 | N Engl J Med 2018;378:829-839 | DOI: 10.1056/NEJMoa1711584
VOL. 378 NO. 9 | Copyright © 2018

SMART Trial 2018:- Avery larg study Among **15802 critically ill adults,** The use of balanced crystalloids for intravenous fluid administration resulted in **a lower rate of mortality , new renal-replacement therapy, or persistent renal dysfunction** than the use of saline

Resuscitation fluid therapy

Balanced vs Unbalanced

The NEW ENGLAND JOURNAL of MEDICINE

RESEARCH SUMMARY

Balanced Multielectrolyte Solution versus Saline in Critically Ill Adults

Finfer S et al. DOI: 10.1056/NEJMoa2114464

CLINICAL PROBLEM

Saline solution is the most commonly administered intravenous fluid in intensive care units (ICUs). Recent concerns about potentially increased risks of acute kidney injury and death associated with saline use have led to increased use of balanced multielectrolyte solution (BMES) as an alternative. However, it is unclear whether BMES improves patient outcomes in this clinical setting.

PLUS Study 2022 >> 5000 patients

No evidence that the risk of death or acute kidney injury among critically ill adults in the ICU was lower with the use of balanced crystaloid than with saline.

Resuscitation fluid therapy

Balanced vs Unbalanced

frontiers | Frontiers in Medicine

TYPE Original Research
PUBLISHED 06 April 2023
DOI 10.3389/fmed.2023.1071741

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SPECIALTY SECTION
This article was submitted to Pulmonary Medicine, a section of the journal Frontiers in Medicine

A retrospective analysis of normal saline and lactated ringers as resuscitation fluid in sepsis

Shahin Isha[1†], Parthkumar H. Satashia[1†], Siva Naga S. Yarrarapu[1], Austin B. Govero[1], Michael F. Harrison[1,2], Hassan Z. Baig[1], Pramod Guru[1], Anirban Bhattacharyya[1], Colleen T. Ball[3], Sean M. Caples[4], Ami A. Grek[1], Michael R. Vizzini[1], Syed Anjum Khan[5], Katherine J. Heise[1], Hiroshi Sekiguchi[6], Warren L. Cantrell[1], Jeffrey D. Smith[1], Sanjay Chaudhary[1], Karthik Gnanapandithan[7], Kristine M. Thompson[2], Charles G. Graham[2], Jed C. Cowdell[7], Aleksandra Murawska Baptista[7], Claudia R. Libertin[8], Pablo Moreno Franco[1] and Devang K. Sanghavi[1*]

FRONT MED 2023

Conclusion: Not any statistically significant difference in mortality rates, hospital LOS, ICU admission, mechanical ventilation, oxygen therapy and RRT between sepsis patients receiving lactated ringers and normal saline as predominant resuscitation fluid.

Resuscitation fluid therapy

Balanced vs Unbalanced

To date, **not a single study** has demonstrated **the superiority of saline** over balanced crystalloids in the selection of appropriate resuscitation fluids.

The absence of evidence establishing the superiority of saline indirectly reinforces the preference for using balanced crystalloids.

This is consistent with the existing body of evidence **highlighting the efficacy of balanced crystalloids in fluid resuscitation**, even in the absence of high-quality reference evidence.

Further large-scale prospective studies are needed to solidify the current guidelines on the use of balanced crystalloids

Maintenance fluid therapy

Daily losses

Urine	Sweat

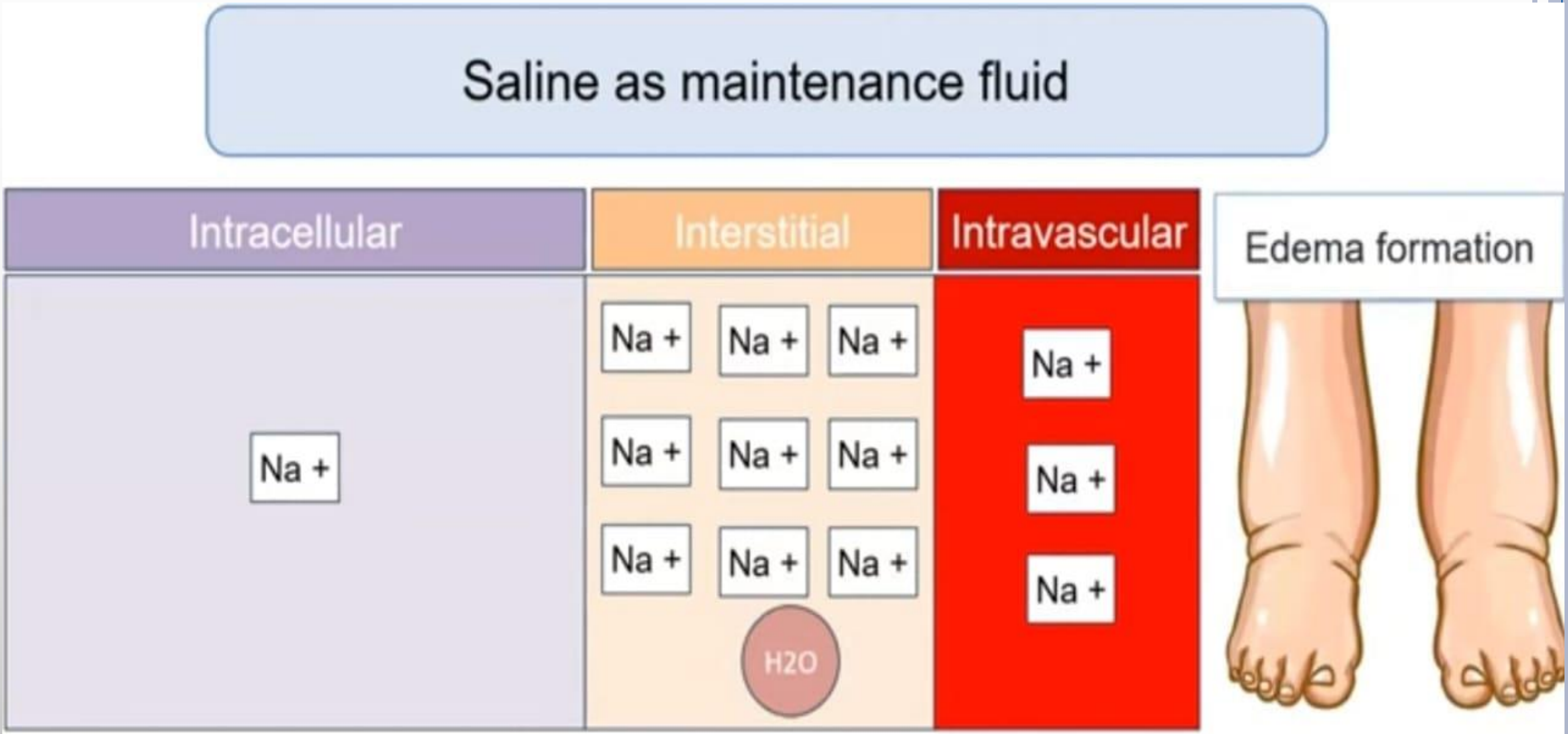
Mainly water

Low sodium content 20-30 mEq/L

Maintenance fluid therapy

[redacted]

Maintenance fluid therapy



Maintenance fluid therapy

Sodium balance

ORIGINAL ARTICLES

Sodium balance, not fluid balance, is associated with respiratory dysfunction in mechanically ventilated patients: a prospective, multicentre study

Figure 2. Correlation between cumulative sodium balance and next-day Pao_2/Fio_2 ratio

Only cumulative sodium not fluid balance is negatively correlated with PaO2/FiO2

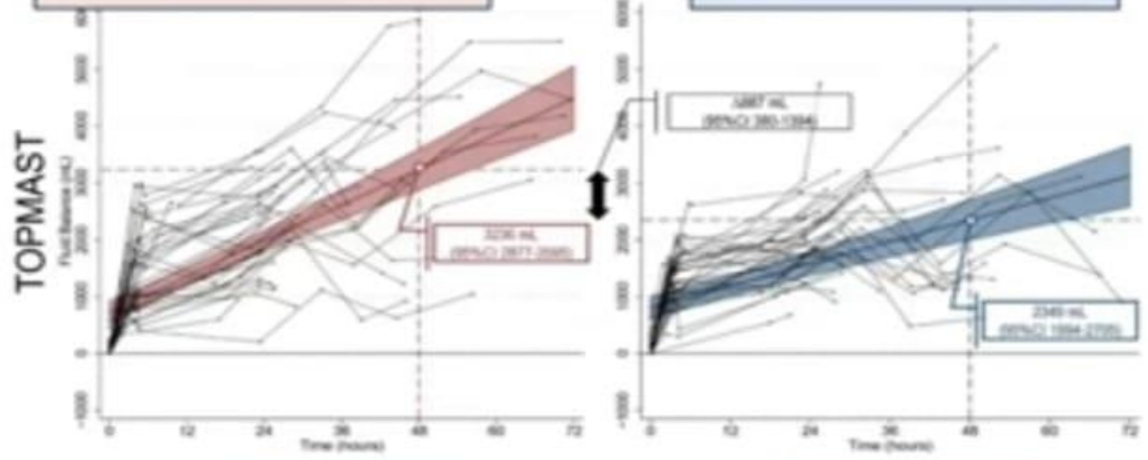
Maintenance fluid therapy

Sodium balance

ORIGINAL

154 compared to 54 mmol per liter of sodium in intravenous maintenance fluid therapy for adult patients undergoing major thoracic surgery (TOPMAST): a single-center randomized controlled double-blind trial

Na:154 mEq/L | Vs | Na: 54 mEq/L

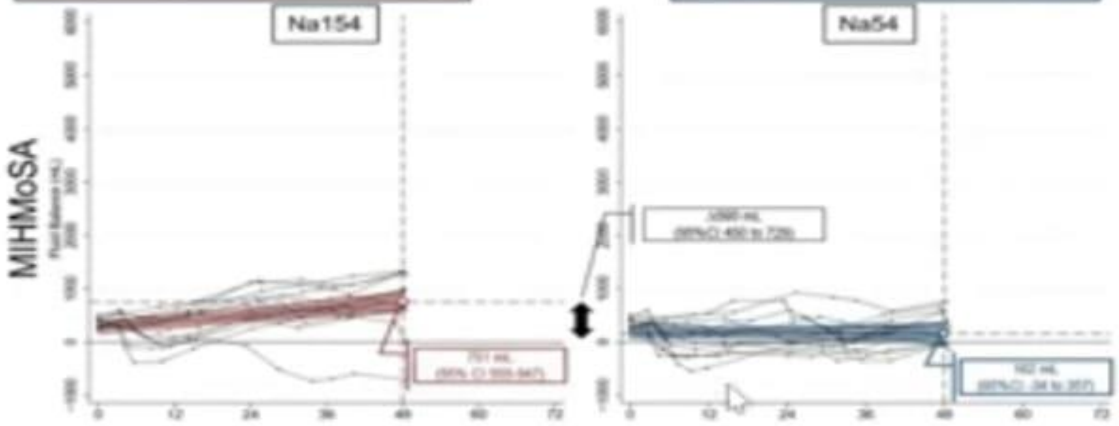


+ 3200 | + 2300

Effect of isotonic *versus* hypotonic maintenance fluid therapy on urine output, fluid balance, and electrolyte homeostasis: a crossover study in fasting adult volunteers

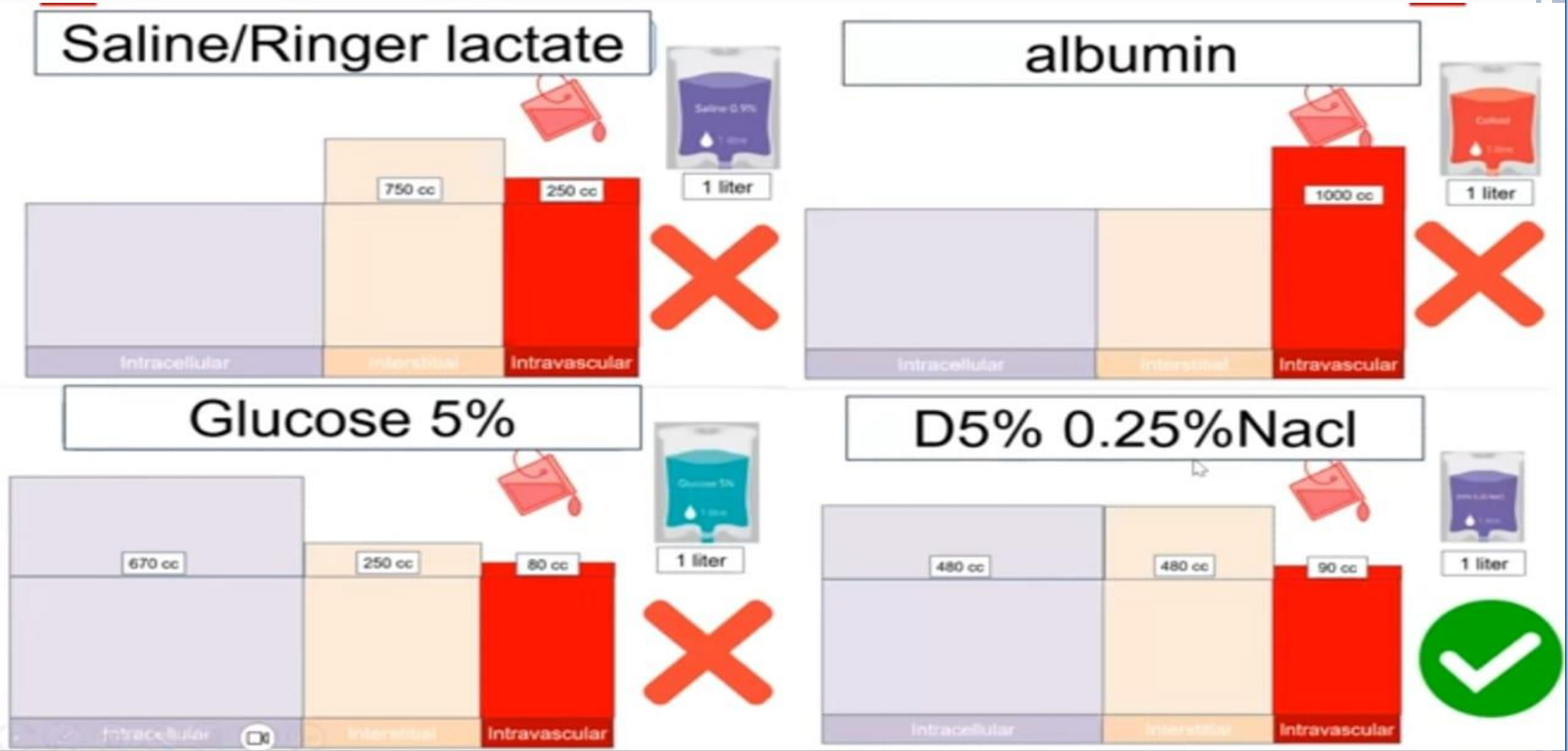
N. Van Regenmortel[1,2,*], T. De Weerdt[3], A. H. Van Craenenbroeck[3], E. Roelant[4,5], W. Verbrugghe[1], K. Dams[1], M. L. N. G. Malbrain[2],

Na:154 mEq/L | Vs | Na: 54 mEq/L



+ 750 | + 160

Maintenance fluid therapy



Maintenance fluid therapy

ORIGINAL ARTICLES

Sodium balance, not fluid balance, is associated with respiratory dysfunction in mechanically ventilated patients: a prospective, multicentre study

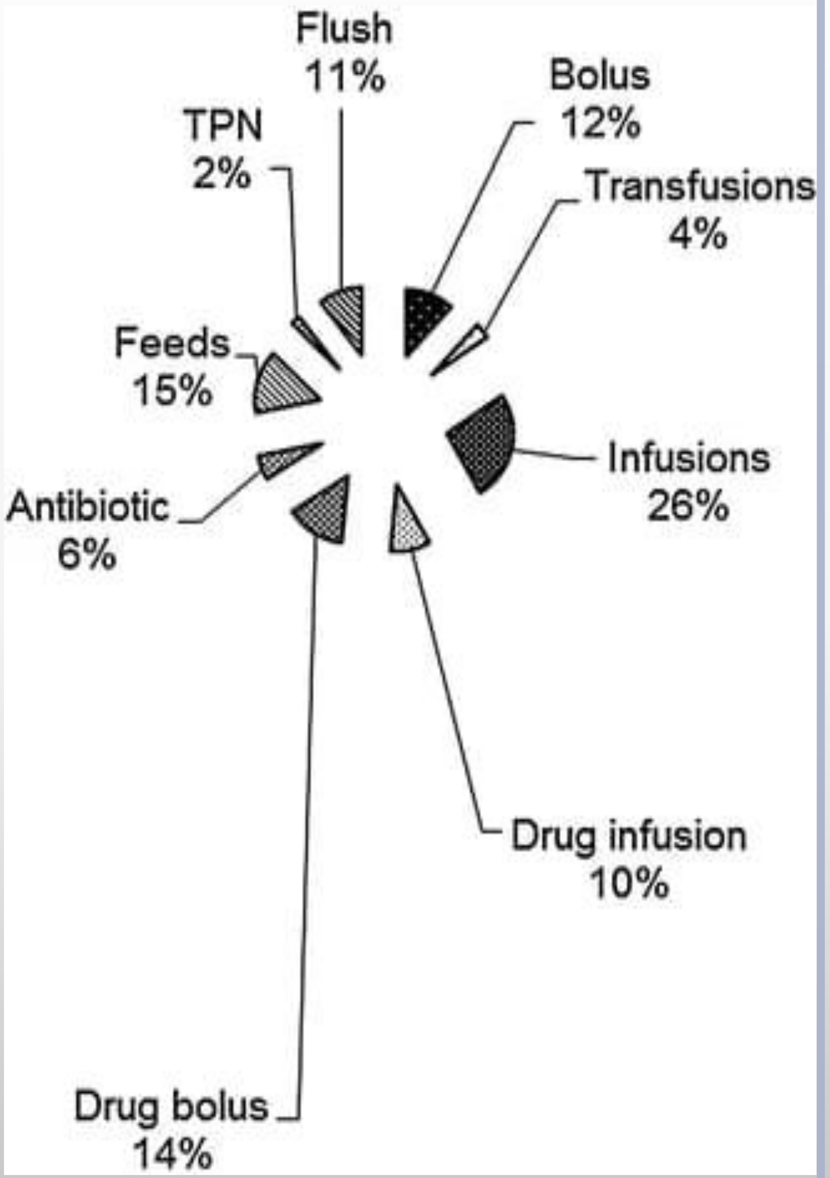
Table 5. Contribution of sources to administered daily fluid and sodium on different study days

	Fluid (%)			Sodium (%)		
Fluid source	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Boluses	50.3	36.5	11.6	43.7	19.8	9.9
Infusions	14.8	27.2	32.5	13.8	13.6	9.5
Enteral nutrition	2.6	11.2	26.7	4.1	13.1	22.3
Blood products	9.5	2.1	1.1	7.7	4.6	3
TPN	0.6	0.9	3.2	0.8	1.2	2.2
Inadvertent sources*	22.2	22.1	24.8	29.9	47.6	52.8

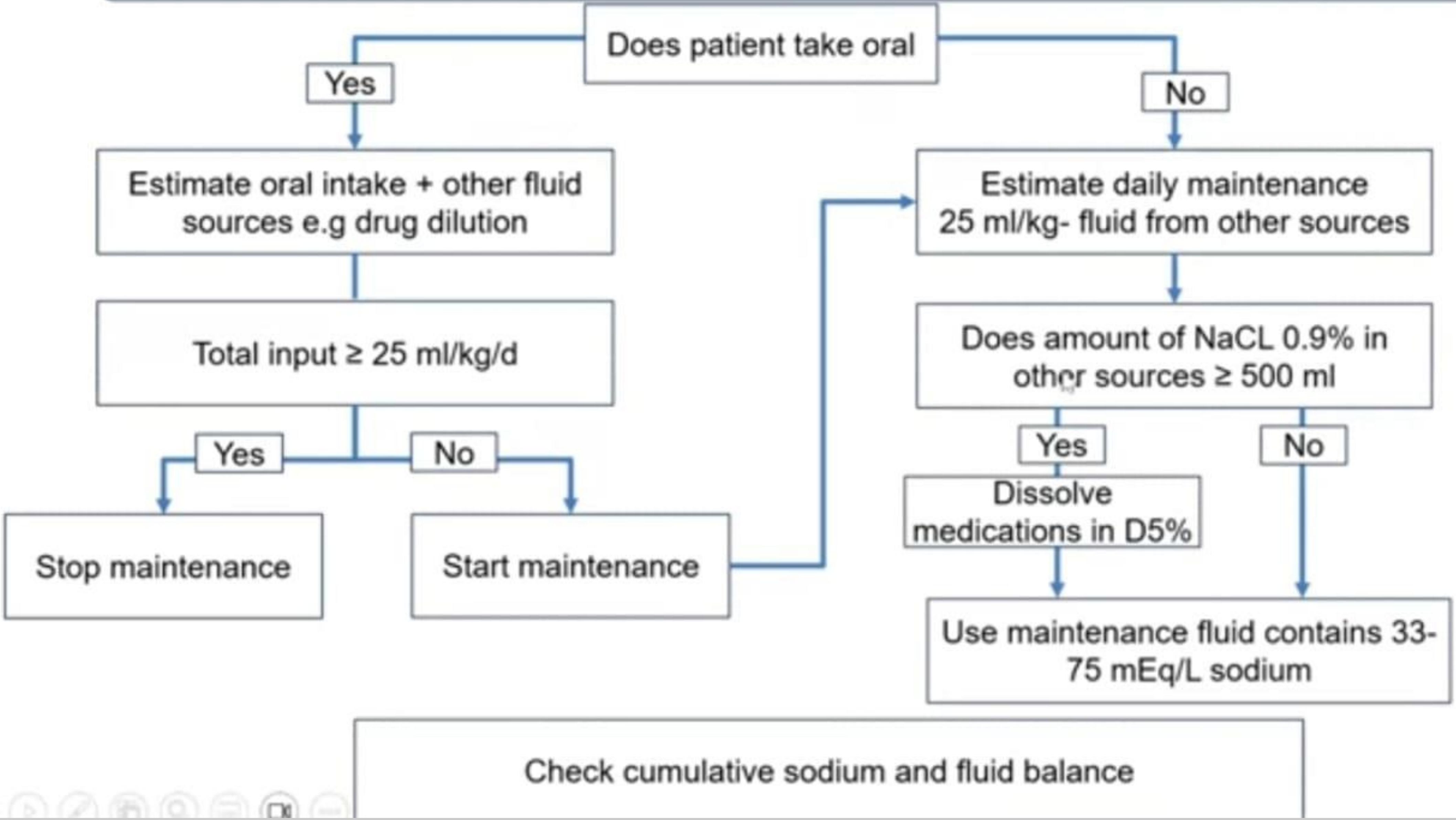
TPN = total parenteral nutrition. * Total fluid and sodium from, eg, drug boluses, antibiotics, drug infusions and flushes.

50% of sodium in day 2 and 3 came from inadvertent sources

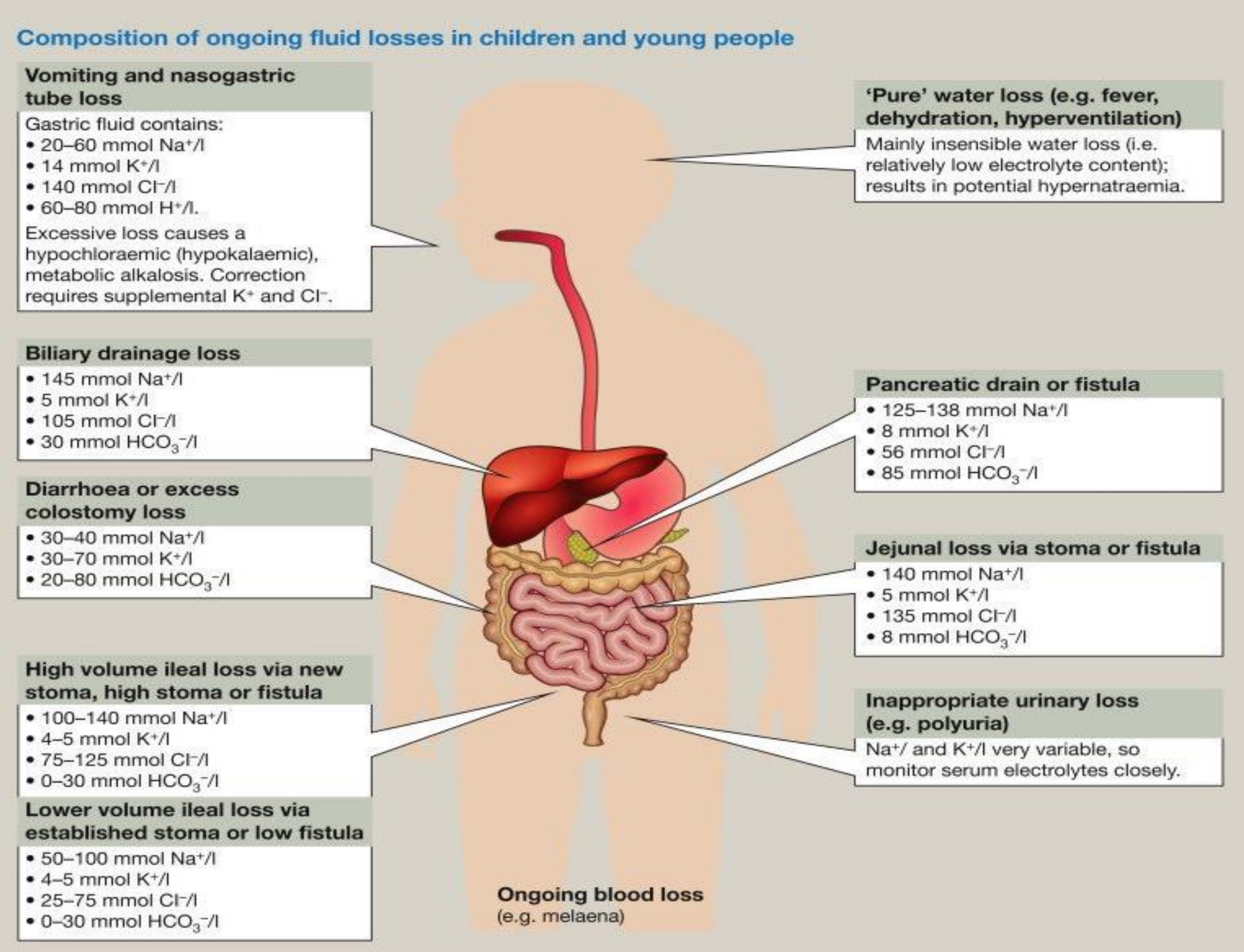
- Drug dilution
- Flushes
- TPN



Maintenance fluid strategy



Replacement fluid therapy



Most of loses have moderate to high sodium content

Replacement fluid therapy

Hypertonic saline in TBI

HTN 3% boluses (1.4 - 2.5 ml / kg) Q 6 hours via peripheral ivs has alow risk of complications and succefully lowers intracranial pressure in patients with neurological emergencies

If you initiate 3% HTS therapy in patient with TBI ; you have to check serum Na and osmolarity each 6 hrs to target Na = 150- 155 and serum osmolarity = 315 - 320

Take Home Message

+Fluids are Drugs

+ THE FOUR INDICATIONS OF FLUID THERAPY:

>> There are only 4 indications to give IV Fluids:
Resuscitation , Maintenance, Replacement and finally for Nutrition.

+ THE FOUR D's OF FLUID THERAPY:-

>> We must take in our consideration, the pharmacodynamic and pharmacokinetic properties of different fluids and should consider the "four D's" of fluid therapy when treating our patients with : Drug, Dosing, Duration, and De-escalation.

Take Home Message

+ Specific disease states may require different fluid therapy
>> **No fluid is ideal for all disease** conditions at all times.
>> one size not fit all

+ **Crystalloid** is first line therapy – **Colloid** is second one

+ **Ballanced solution** more benificial in selected cases >> need more study

+ **De-escalation** whenever possible: De-resuscitation if fluid overload (FO) as FO causes increase morbidity/mortality
Don't forget also Sodium balance

Thank You