



SINDROME VASOPLÉJICO

SALIR DEL SÍNTOMA PARA PENSAR EN LA CAUSA

"Uno de los peores errores que puede cometerse es confundir causa con consecuencia"

"...y tratar síntomas sin evitar o tratar causas"

Dr. Héctor Daniel Dini

Médico Anestesiólogo
2023

dadi64@icloud.com



SINDROME VASOPLÉJICO

DEFINICIÓN

(CAUSA)

- Manifestación clínica de una respuesta inflamatoria.
- Sin evidencia de foco séptico o deterioro severo de la función miocárdica, posterior a la cirugía cardíaca.

Características: Hipotensión refractaria a volumen y drogas vasoactivas
(SÍNTOMA o CONSECUENCIA)

- Sepsis severa - Anafilaxia - Intoxicaciones - Pancreatitis - Distintos estados de shock
- *Con frecuencia en el perioperatorio de cirugía cardíaca*

Deben compartir mecanismos fisiopatológicos...



SINDROME VASOPLÉJICO

INCIDENCIA

5 - 25% de las Cx's Cardíacas

Vasodilatación refractaria > de las 6 hs

Aumenta ARM y/o estadía en UTI

> 36-48 hs eleva mortalidad 16 - 27%

2 - 3 % en Cx sin CEC



SINDROME VASOPLÉJICO

DIAGNÓSTICO

Tabla 1 Criterios diagnósticos de síndrome vasopléjico

PAS < 80 mmHg

IC > 2,2 l/min

PVC < 5 mmHg

POAP < 10 mmHg

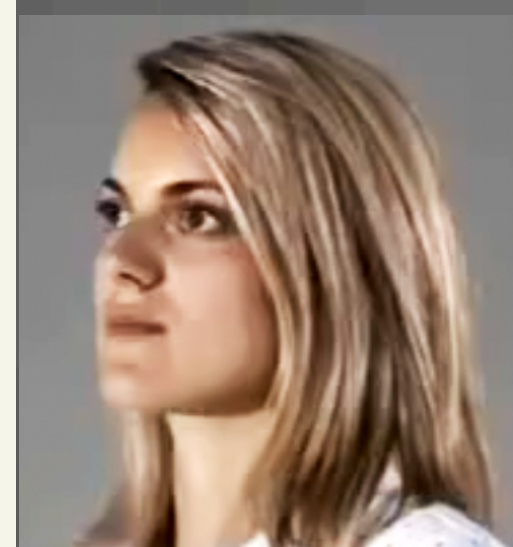
RVS < 800 dyns/cm⁻⁵

Noradrenalina > 0,5 µg/kg/min

IC: índice cardíaco; PAM: presión arterial media; PAS: presión arterial sistólica; POAP: presión de oclusión de arteria pulmonar; PVC: presión arterial media; RVS: resistencia vascular sistémica.
Fuente: autores.



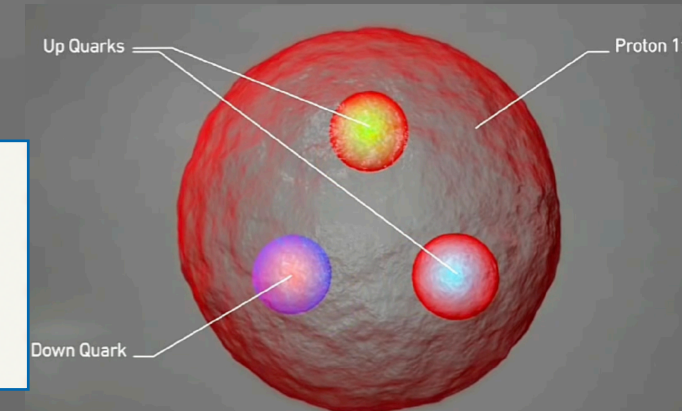
SINDROME VASOPLÉJICO



¿Dónde está lo poco
que monitorizamos?

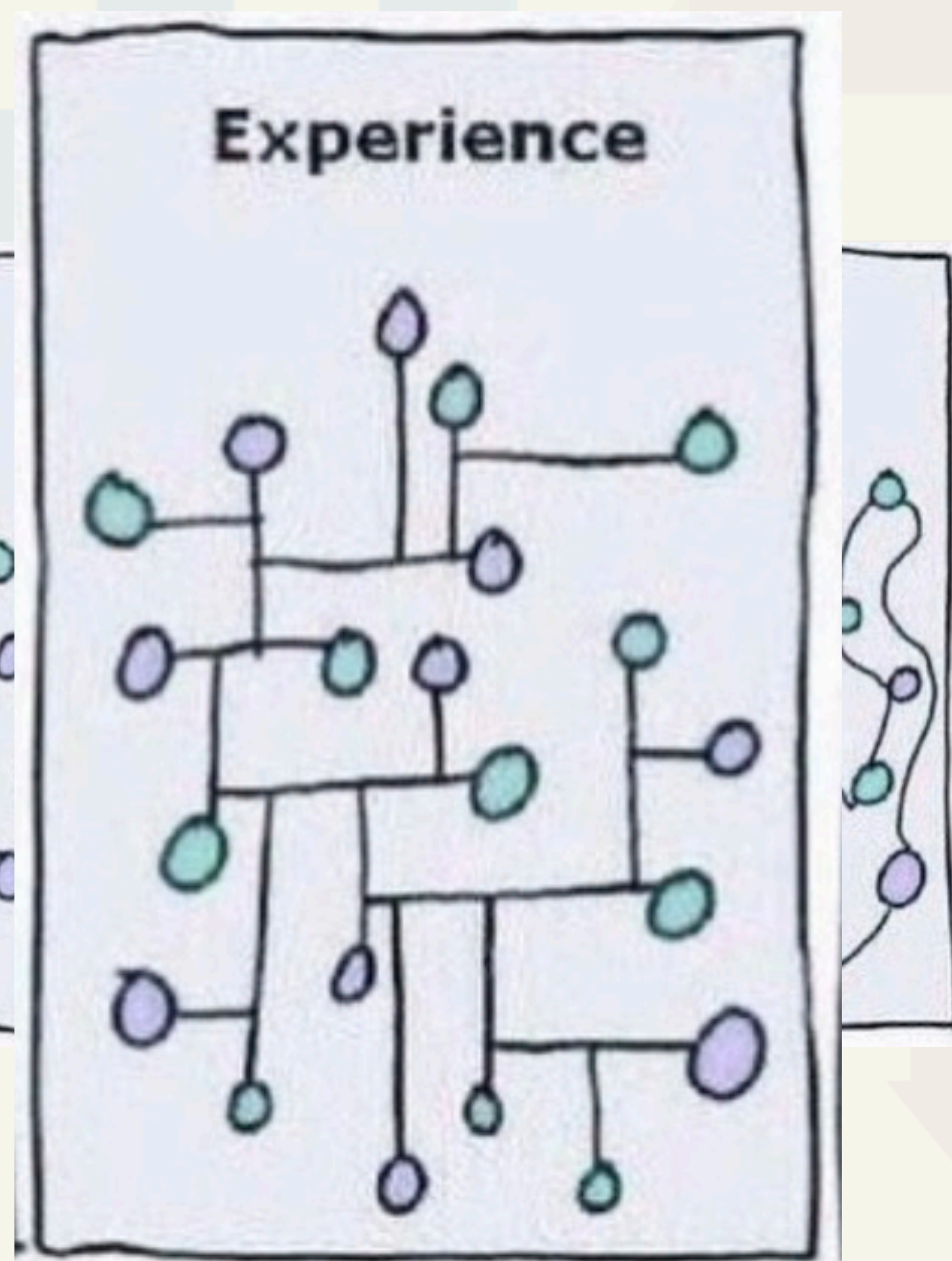
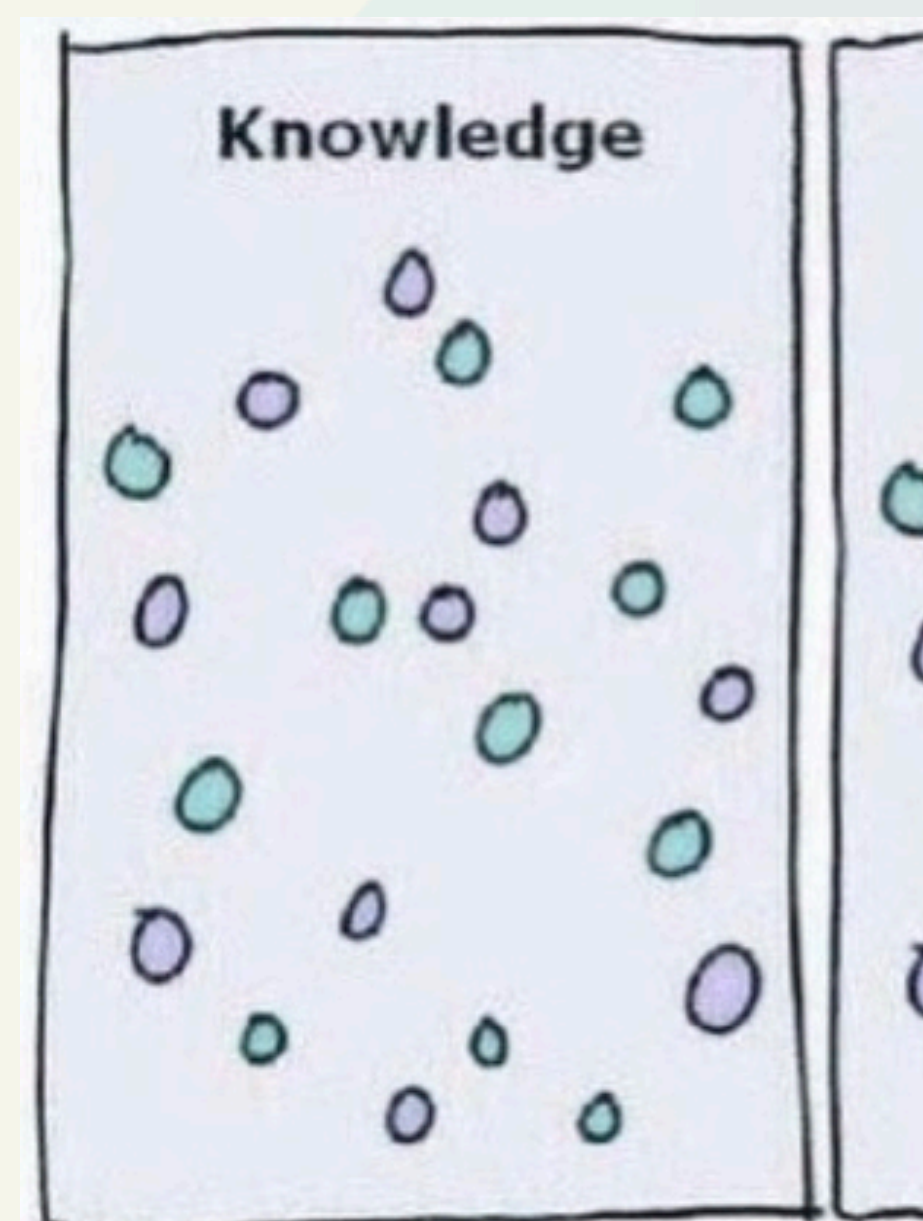
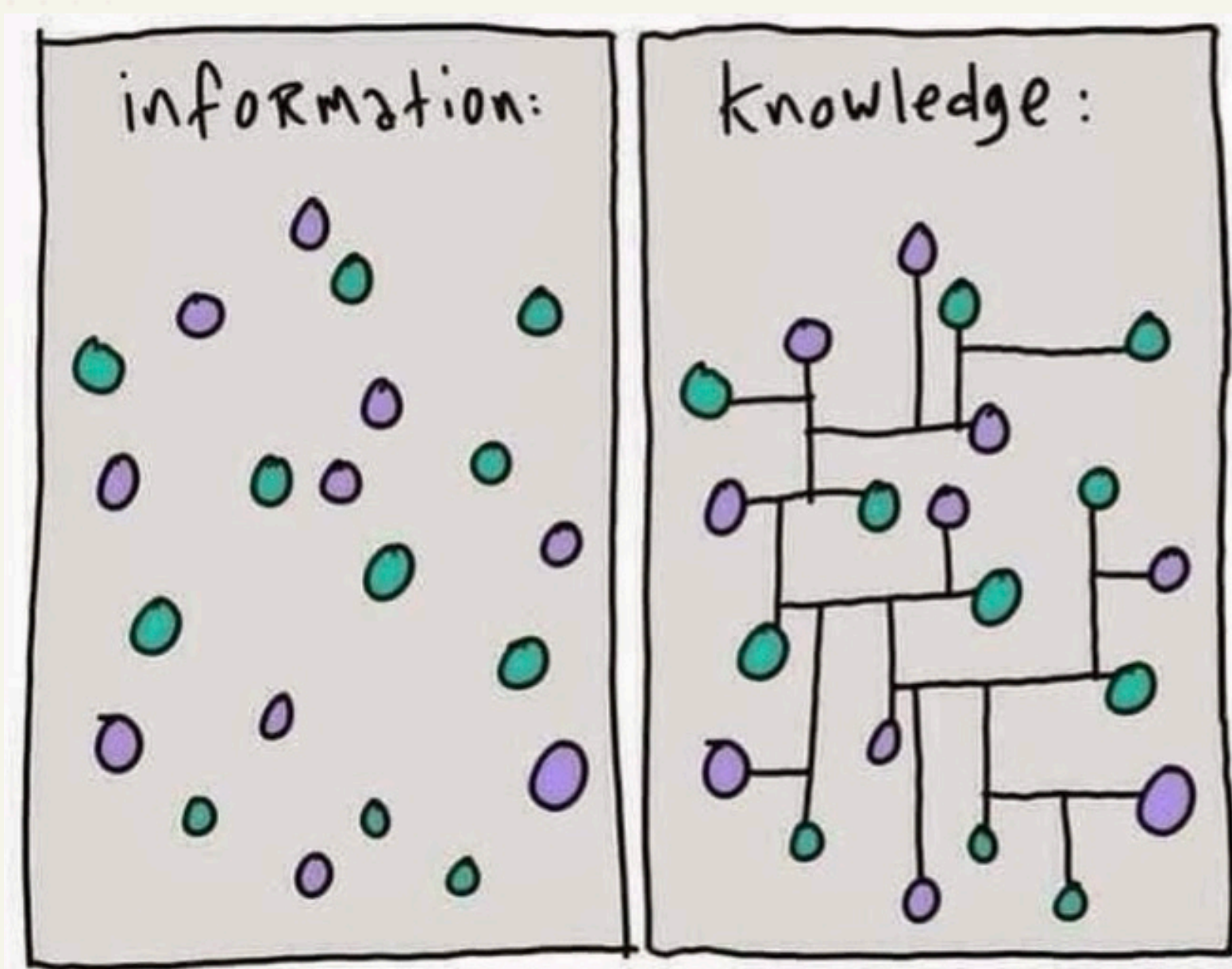


¿Dónde están las grandes
cosas que suceden?





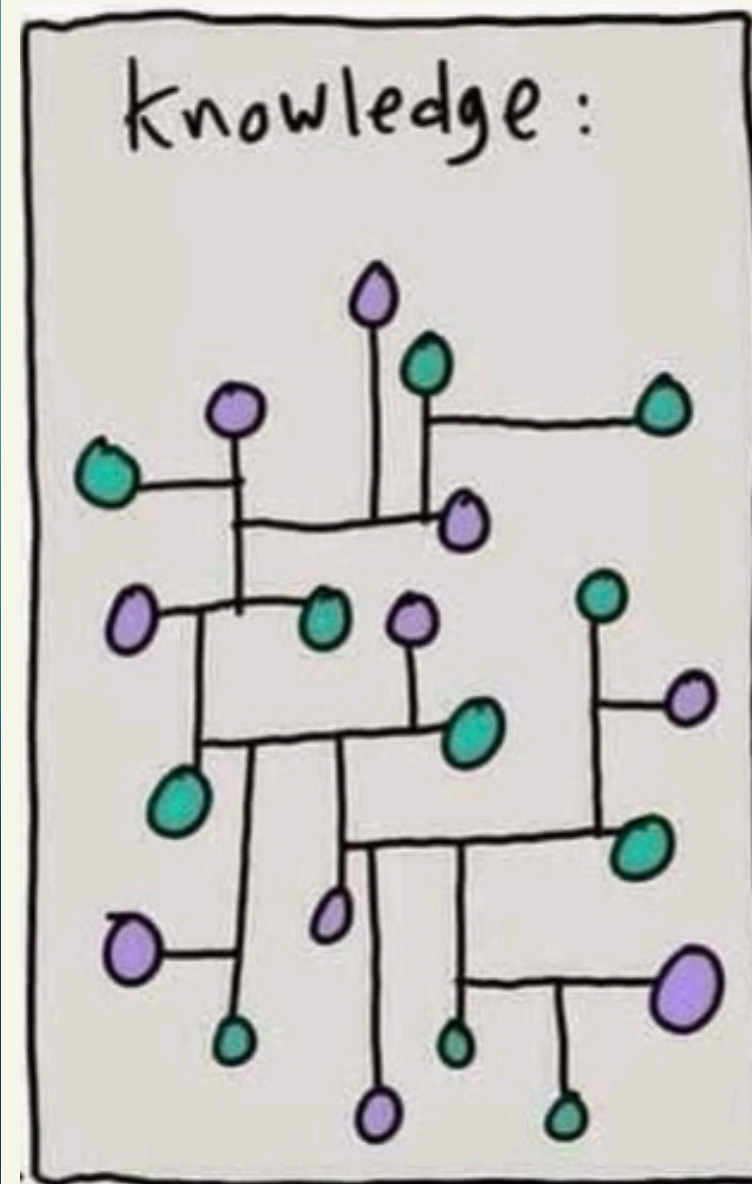
SINDROME VASOPLÉJICO





ÓXIDO NÍTRICO

(NO·): producido por la oxidación de la arginina a citrulina, una reacción catalizada por las enzimas óxido nítrico sintetasas (NOS).





ENDOTELIO. Función

Vasodilatación: Óxido Nítrico. Prostaciclina.

Vasoconstricción: Endotelina, Tromboxano A2, Anión Superóxido (O_2^-)

Antitrombótico: Heparán Sulfato, Peptidoglicano, Trombomodulina.

Regula Fibrinólisis: Activador e Inhibidor del Plasminógeno tisular.

Regulación del Crecimiento (diversos factores derivados de otros sitios-células-plaquetas)

Óxido Nítrico (NO). Vasodilatación. *Shear Stress*



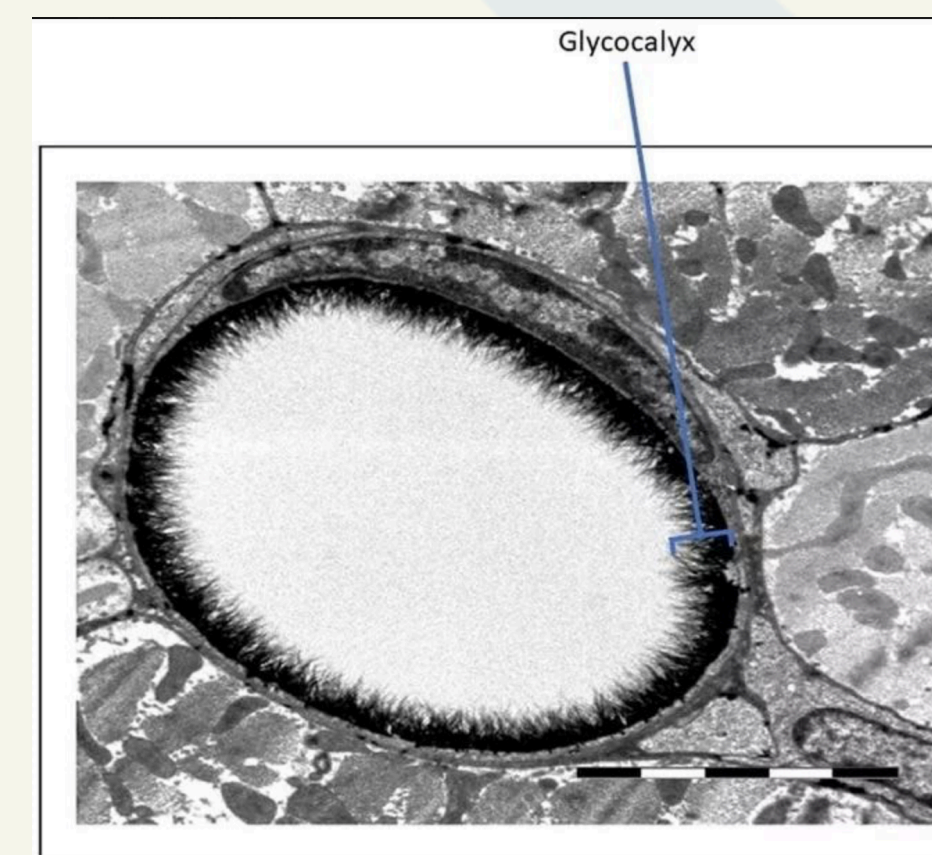
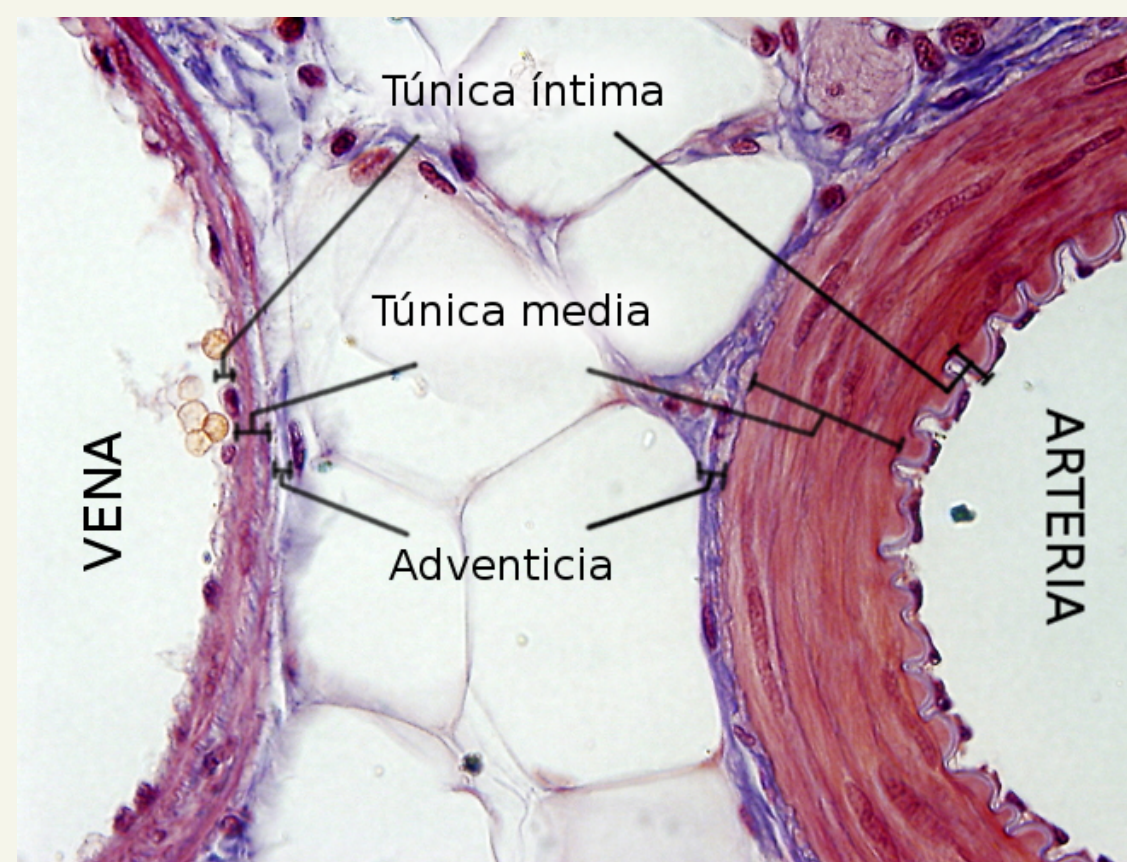
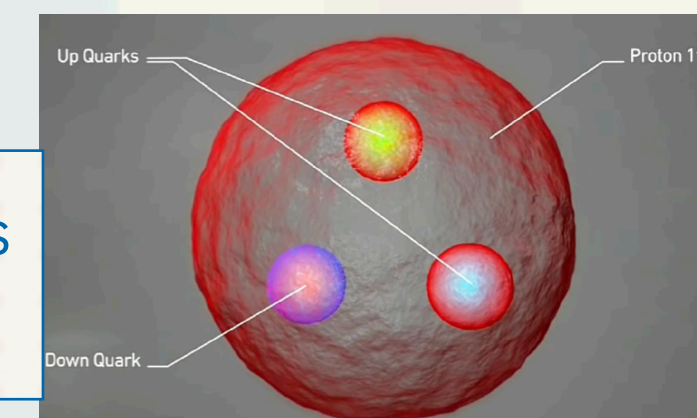
ENDOTELIO... ¿era todo lo que se sabía?



¿Dónde está lo poco que monitorizamos?



¿Dónde están las grandes cosas que suceden?





GLICOCÁLIX. Estructura y Ubicación

Received: 31 March 2020

Revised: 2 May 2020

Accepted: 23 June 2020

J Biochem Mol Toxicol. 2020

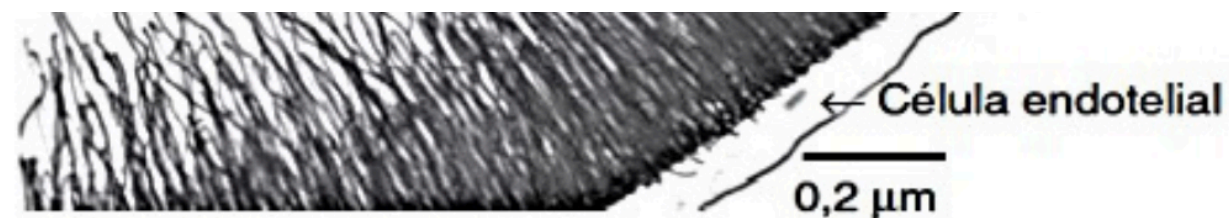
DOI: 10.1002/jbt.22571

REVIEW

WILEY

A review on the physiological and pathophysiological role of endothelial glycocalyx

Huan-qiu Liu | Ji Li | Cheng-luan Xuan | Hai-chun Ma 



unidad de azúcar

CITOSOL

GPI anchor



GLICOCÁLIX. Funciones

- Proteger, sensor y transducir de las fuerzas mecánicas del torrente sanguíneo
- Regular la permeabilidad de agua y solutos
- Regular la filtración glomerular
- Regular la permeabilidad de macromoléculas (proteínas)
- Regular el hematocrito capilar y el flujo sanguíneo capilar
- Actuar como barrera a la filtración de lipoproteínas
- Prevenir la adhesión de plaquetas y leucocitos al endotelio
- Regular localmente la coagulación (prevención de trombosis, activación de fibrinólisis)



GLICOCÁLIX. Lesión

- Trastornos de las fuerzas mecánicas de tensión
- Enzimas: heparinasa, hialuronidasa, neuraminidasa, metaloproteinasa de la matriz, etc.
- Especies reactivas de oxígeno
- Hipernatremia
- Dieta aterogénica (hipercolesterolemia)
- Lipoproteínas de baja densidad oxidadas
- Hiperglicemia aguda, hiperglicemia crónica, diabetes mellitus I-II
- Factor de necrosis tumoral alfa
- Hiperhomocisteinemia
- Enfermedades autoinmunes: lupus eritematoso sistémico, enfermedad indiferenciada del tejido conectivo



GLICOCÁLIX. Enfermedades Sistémicas

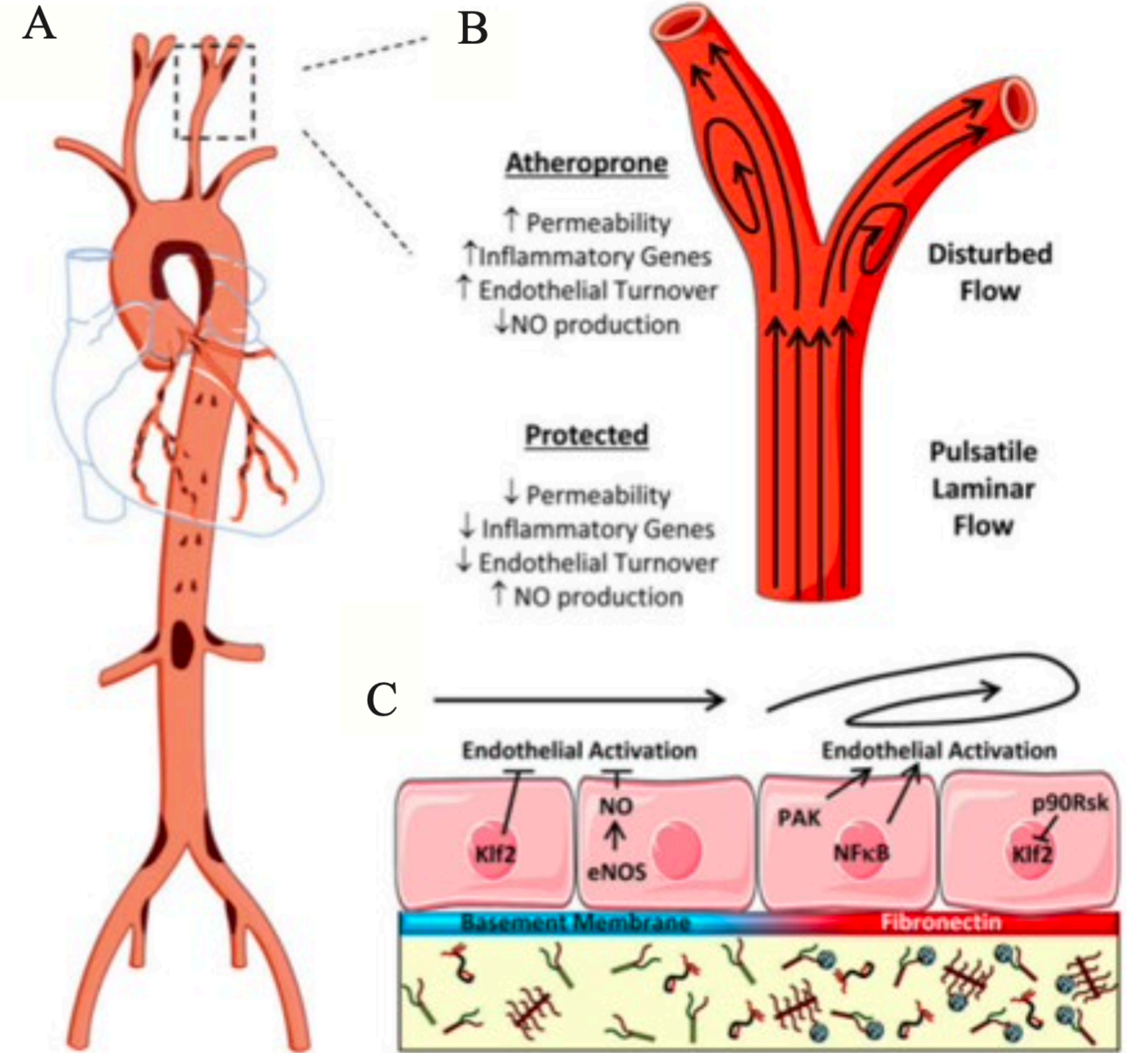
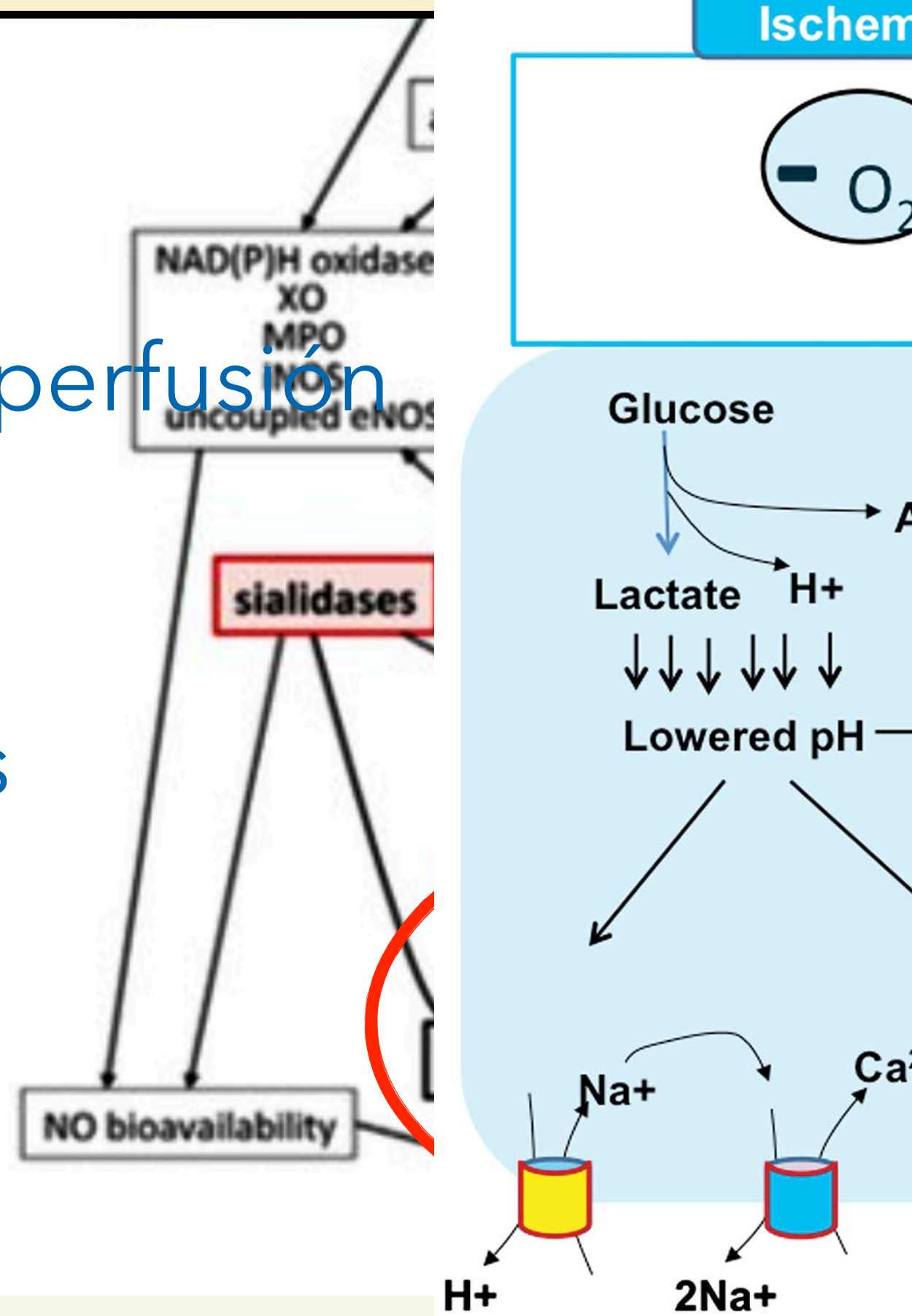
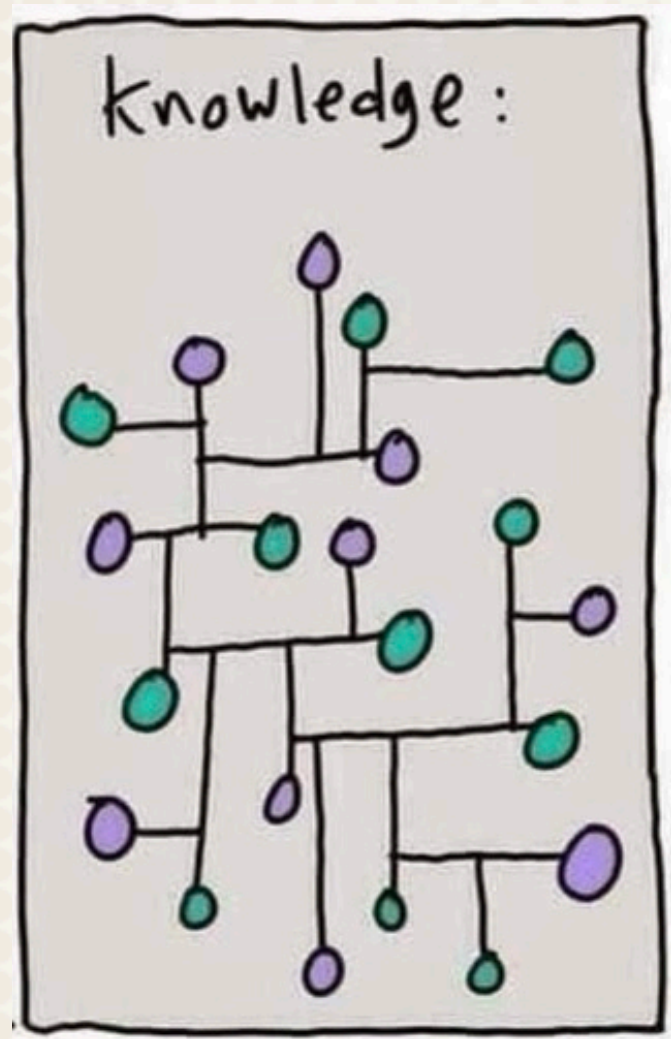
Inflamación asociada a los desórdenes vasculares

(Hiperglucemia, aterosclerosis, I/R Injuria, Enf. Vasc.)

Diabetes

Isquemia - Reperfusión

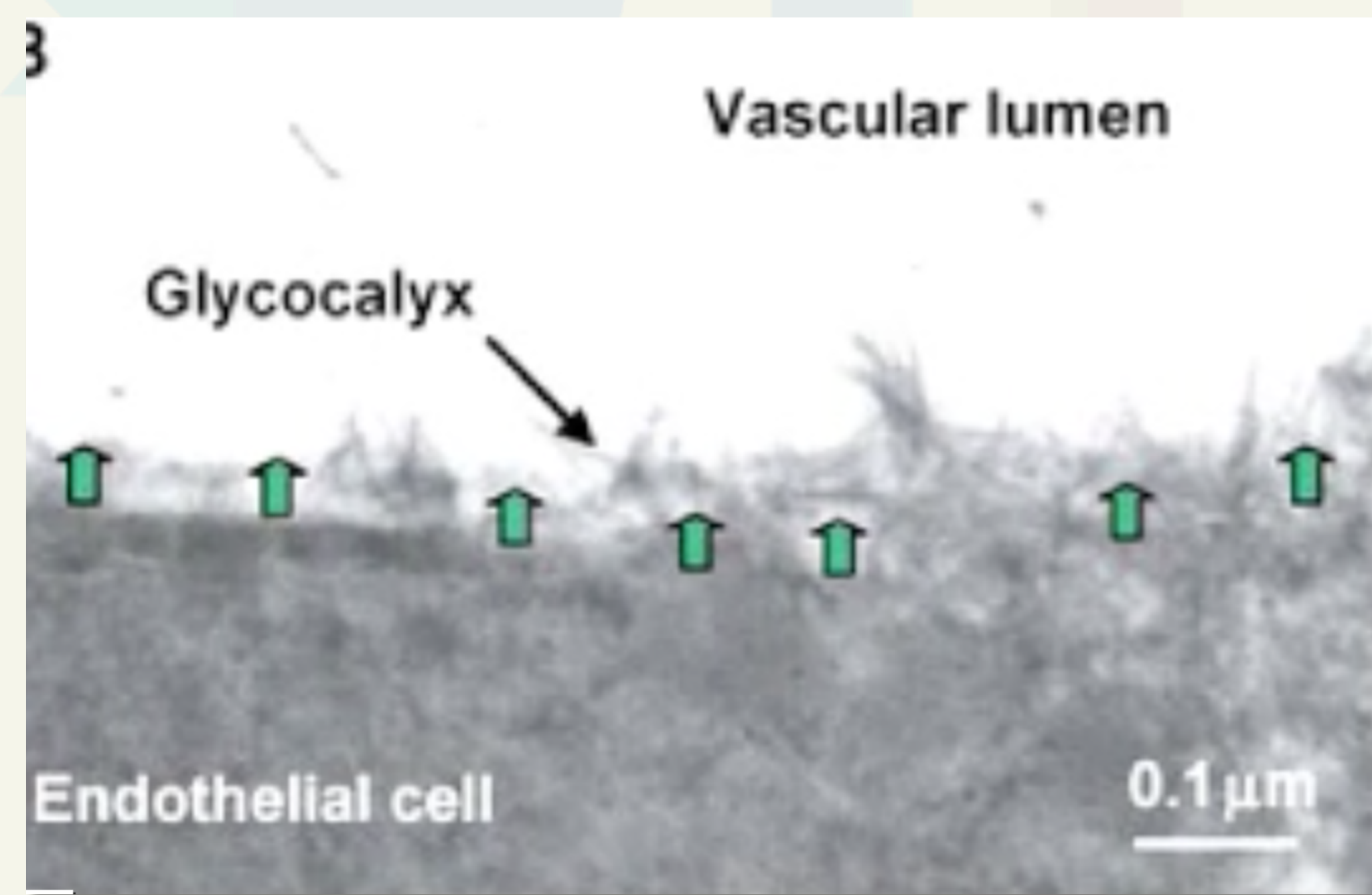
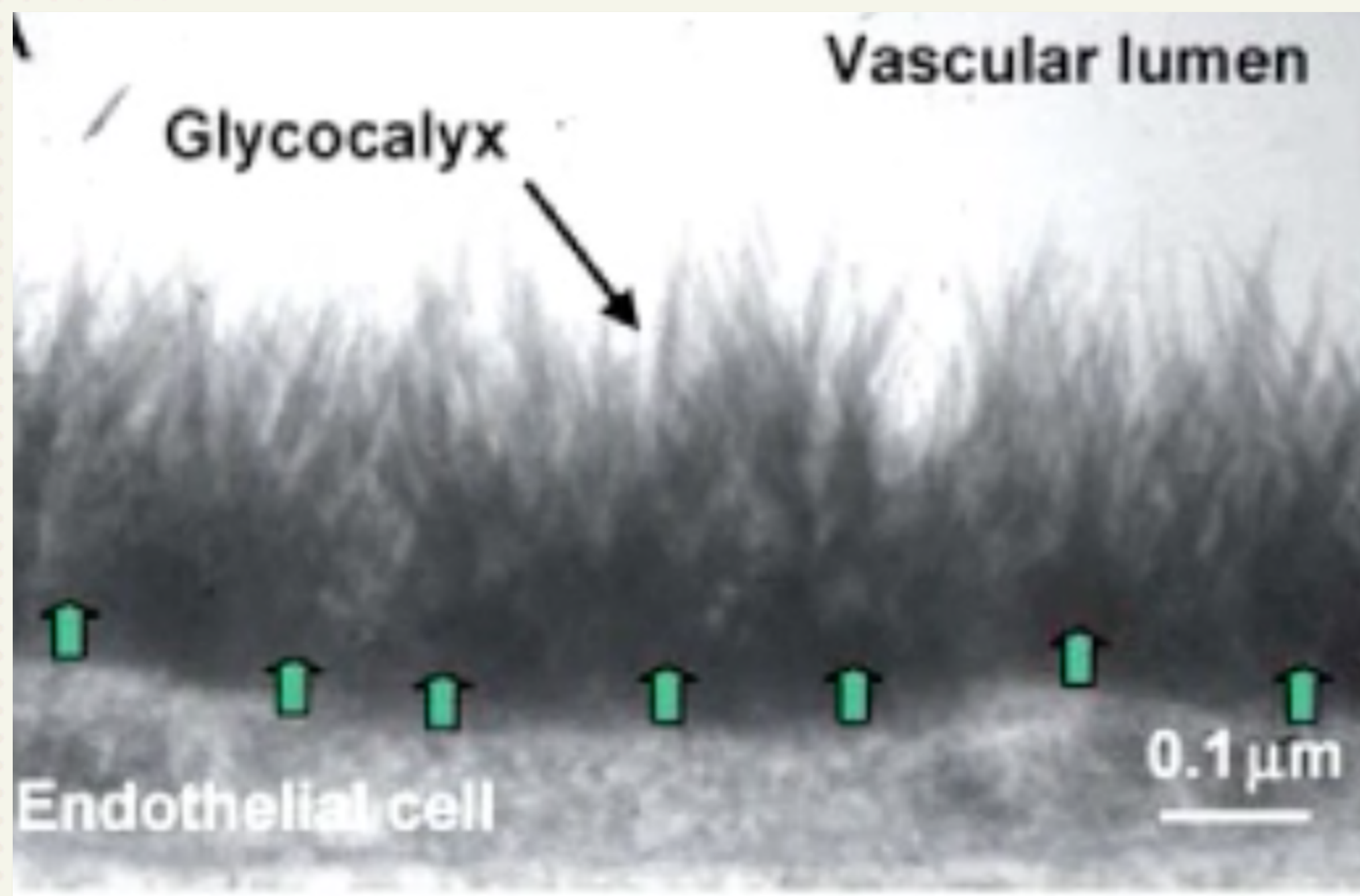
Aterosclerosis





Dos cosas.

¿Quién ingresa de este modo?



¿Quién migra de estado?

¿Quién empeora?



La Capa Superficial Endotelial tiene un grosor de aproximadamente **1 μm**

Se **une** a aproximadamente **800 ml** de plasma sanguíneo



El volumen de plasma se puede dividir en: **PARTE CIRCULANTE**
PARTE NO CIRCULANTE.

En permanente recambio entre ambos

Sitio de acción de los **FLUIDOS EXTERNOS** para comenzar el **DAÑO** del **GLICOCÁLIX**

REVIEW ARTICLE | VOLUME 21, ISSUE 7, P1714-1723,
JULY 2023

Journal of Thrombosis and Haemostasis

Volume 21, Issue 7, July 2023, Pages 1714-1723

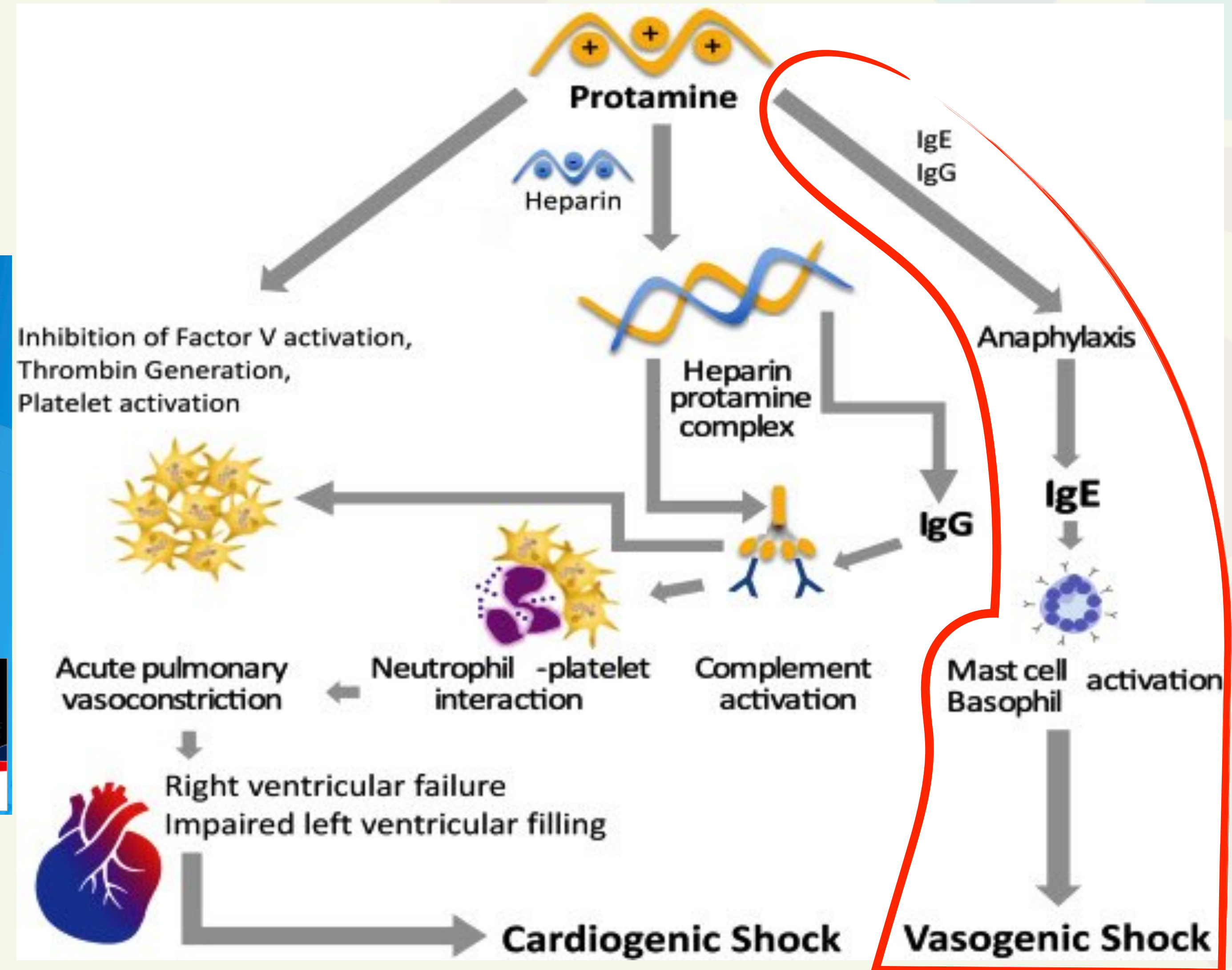
What's fishy about protamine?
Clinical use, adverse reactions,
and potential alternatives

Jerrold H. Levy • Kamrouz Ghadimi •

Jayachandran N. Kizhakkedathu • Toshiaki Iba

Published: April 14, 2023 •

DOI: <https://doi.org/10.1016/j.jtha.2023.04.005>





Sub-Heparinización

¿Anticoagulamos correctamente?

¿Qué tiempos manejamos?

350" x 8-10 min, ¿importa?

-  1982. Kinetics of Intravenously Administered Heparin in Normal Humans. de Swart, AM .pdf
-  2007. Heparin resistance and the potential impact on maintenance of therapeutic coagulation. Despotis.pdf
-  2007. Perioperative haemostasis and coagulation management in cardiac surgery/ a European survey. Ranucci.pdf
-  2009. New Standards Reduce Heparin Potency. Voelker.pdf
-  2010. Activated Clotting Times, Heparin Responses, and Antithrombin/ Have We Been Wrong All These Years?.pdf
-  2010. Anticoagulation management during cardiopulmonary bypass/ A survey of 54 North American institutions. Lobato.pdf
-  2010. Changes in the USP Heparin Monograph and Implications for Clinicians.pdf
-  2010. Correlations Between Activated Clotting Time Values and H...Young Infants Undergoing Cardiopulmonary Bypass. Guzzetta.pdf
-  2011. Activation of the Hemostatic System During Cardiopulmonary Bypass. Sniecinski.pdf
-  2012. Change in Heparin Potency and Effects on the Activated Cl...ime in Children Undergoing Cardiopulmonary Bypass. Guzzetta.pdf

Instituto de Fisiopatología y Bioquímica Clínica.

HEMATOLOGÍA
Volumen 21 N° Extraordinario: 166-175
XXIII Congreso Argentino
de Hematología
Noviembre 2017

Charleston, South Carolina

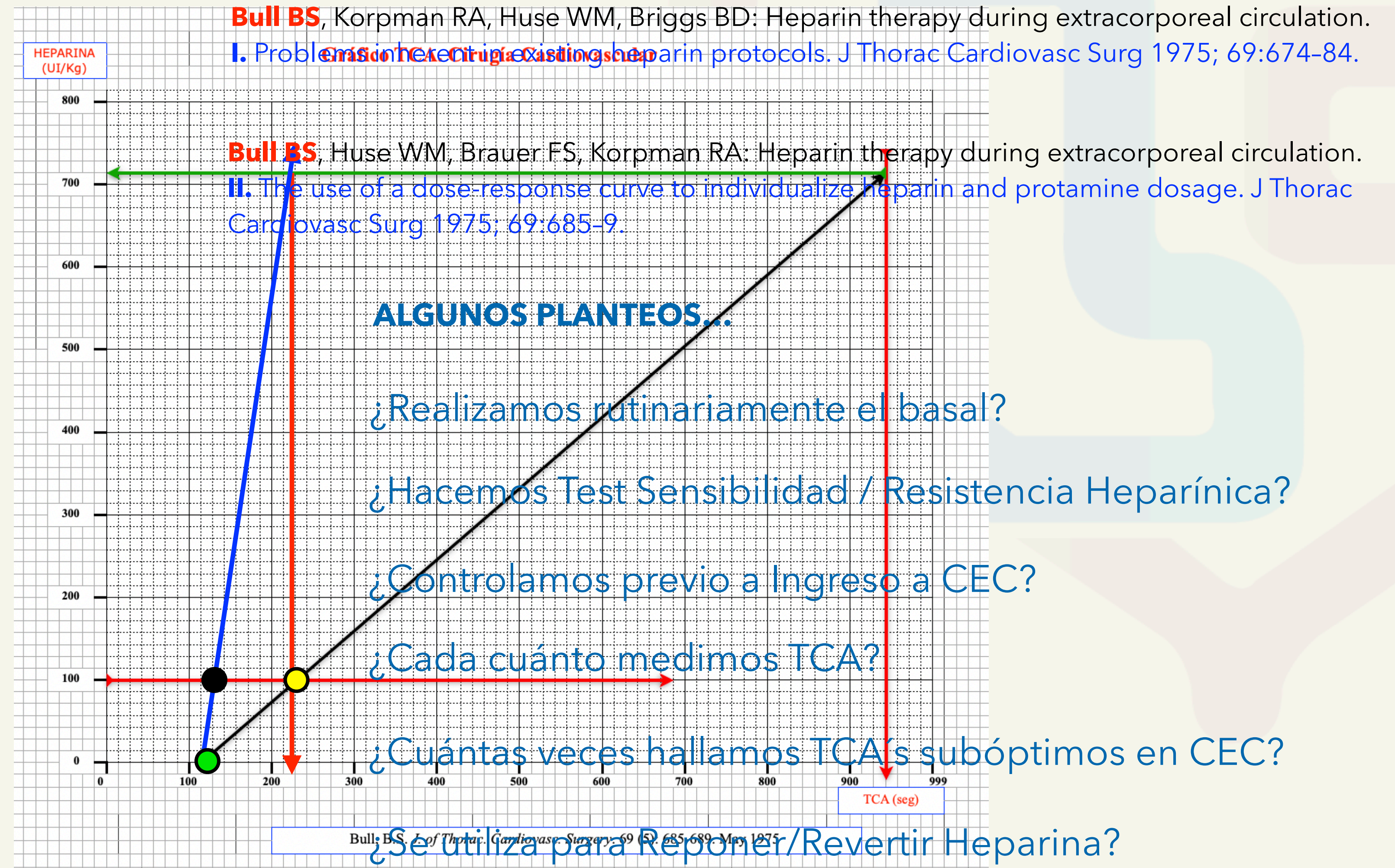
¿Es inocua la Heparina?

ascazziota@gmail.com

- Mi opinión es que el uso diario y rutinario nos hace perder cosas...

-  2008. Contaminated Heparin Associated with Adverse Clinical Events and Activation of the Contact System.pdf
-  2008. Detection of High-Charge Density Polyanion Contaminants...I Heparin Preparations Using Potentiometric Polyanion Sensors.pdf
-  2009. Orthogonal analytical approaches to detect potential contaminants in heparin .pdf
-  2016. The US regulatory and pharmacopeia response to the global heparin contamination crisis.pdf

El viejo gráfico de Bull... aún vigente "remasterizado"



El Problema de los FLUÍDOS

British Journal of Anaesthesia **113** (5): 748–55 (2014)
Advance Access publication 17 September 2014 · doi:10.1093/bja/aeu298

BJA

Vascular content, tone, integrity, and haemodynamics for guiding fluid therapy: a conceptual approach[‡]

L. S. Chawla^{1*†}, C. Ince^{2†}, D. Chappell³, T. J. Gan⁴, J. A. Kellum⁵, M. Mythen⁶ and A. D. Shaw⁷ for the ADQI XII Fluids Workgroup

Table 2 Vascular components at the systemic, regional, and micro-circulatory level. SVR, systemic vascular resistance; OVR, organ vascular resistance

	vC	vT	vB	BF
Systemic	Blood volume	SVR	Biomarker panel	Cardiac output
Regional	Arterial Hb/Ht	OVR (reactive hyperaemia)	Indocyanine green	Pulse pressure variation, peripheral temperature, NIRS, laser Doppler
Micro-circulation ³¹	Capillary Ht Functional capillary density Glycocalyx volume ²⁴	Arteriolar diameter ²³	VEGF, Syndecan 1 or 4, thrombomodulin, hyaluronic acid, heparin sulphate Glypican 1 (all glycocalyx markers) malondialdehyde (oxidative stress), myelo peroxidase, nitrate/nitrite (nitroso stress)	Capillary BF, heterogeneity of BF, rolling sticking leucocytes



FLUÍDOS: ¡un Fármaco!

Fluids are drugs

Duration

Type

Dose

Timing

Speed

REVIEW

Fluid management before, during and after elective surgery

Niels Van Regenmortel^{a,b}, Philippe G. Jorens^b, and Manu L.N.G. Malbrain^a

Purpose of review
Fluid management is regarded as a cornerstone of successful perioperative care, but fluid prescription is not always tailored that way. Two major problems have become noticeable over recently.

Recent findings
Although when use of the word a specific reference is made to resuscitation fluids and the place of balanced crystalloids, recent guidelines also emphasize the importance of fluid prescription in a maintenance and a replacement setting. The use of balanced solutions was advised. It is given attention because most authors stress the deleterious effect of unbalanced solutions on relevant clinical endpoints. When the advice on the use of fluids is applied, and crystalloids are used, the use of balanced solutions is advised. The use of balanced solutions is advised in a general setting. The use of balanced solutions is advised in all settings.

Summary
The combination of a careful prescription of maintenance fluids, additional replacement solutions tailored to the patient's needs, and a careful but conservative approach to resuscitation fluids seems to be the best practice to avoid fluid overload. Further balanced or balanced solutions are the best practice choice for maintenance purposes. In acute and critical situations, which are still to be resolved.

Keywords
balanced solutions, crystalloids, fluid resuscitation, fluid management, fluid therapy, perioperative.

INTRODUCTION
Although being essential in the preoperative, intraoperative and postoperative phases, until recently, fluid therapy was widely regarded as an innocent bystander or a necessary evil at best. It was demonstrated that fluid prescription in the preoperative and postoperative period was frequently left to the most inexperienced members of the team, sometimes lacking training to even have knowledge of fluid and electrolyte balance [1]. However, it has been shown, however, that a perioperative weight gain of not more than 5–10% can lead to increased morbidity and a longer length of hospital stay [2]. Thus, fluid management expertise on the day of surgery is of great importance. Another area where has been going on, lately, on the topic of resuscitation fluids used in case of acute hypovolemia, challenging the place of the traditional crystalloids [3]. Because perioperative fluid therapy is crucial to achieving better clinical outcomes, we will try to critically discuss the current best practice. But of the most relevant recent literature on the different indications in the setting.

TAILORING FLUID PRESCRIPTION TO THE PATIENT'S NEEDS: THREE DISTINCTIVE FLUID INDICATIONS
It is important to acknowledge that three main indications for fluid therapy exist in the perioperative setting. Because the best fluid to perfectly fit one that has not been given to the patient, although considering why fluids should be used, followed by selecting the correct type and dose of fluid on that occasion, will be the key to ensuring fluid-related morbidity. There are three distinctive indications: fluid resuscitation, fluid to correct an intercompartmental volume deficit or acute hypovolemia. Most of the recent scientific attention went to this particular indication of fluid therapy, especially in the setting.

Fluid Academy @Fluid_Academy · 29m

#IFAD2015 Fluids are drugs @Manu_Malbrain journals.viamedica.pl/anaesthesiolog... #FOAMed @avkwong @CritCareReviews @AnesthCritCare

REVIEW

DOI:10.1097/MCC.0000000000000113

Fluid management before, during and after elective surgery

Niels Van Regenmortel^{a,b}, Philippe G. Jorens^b, and Manu L.N.G. Malbrain^a



FLUÍDOS. Indicaciones

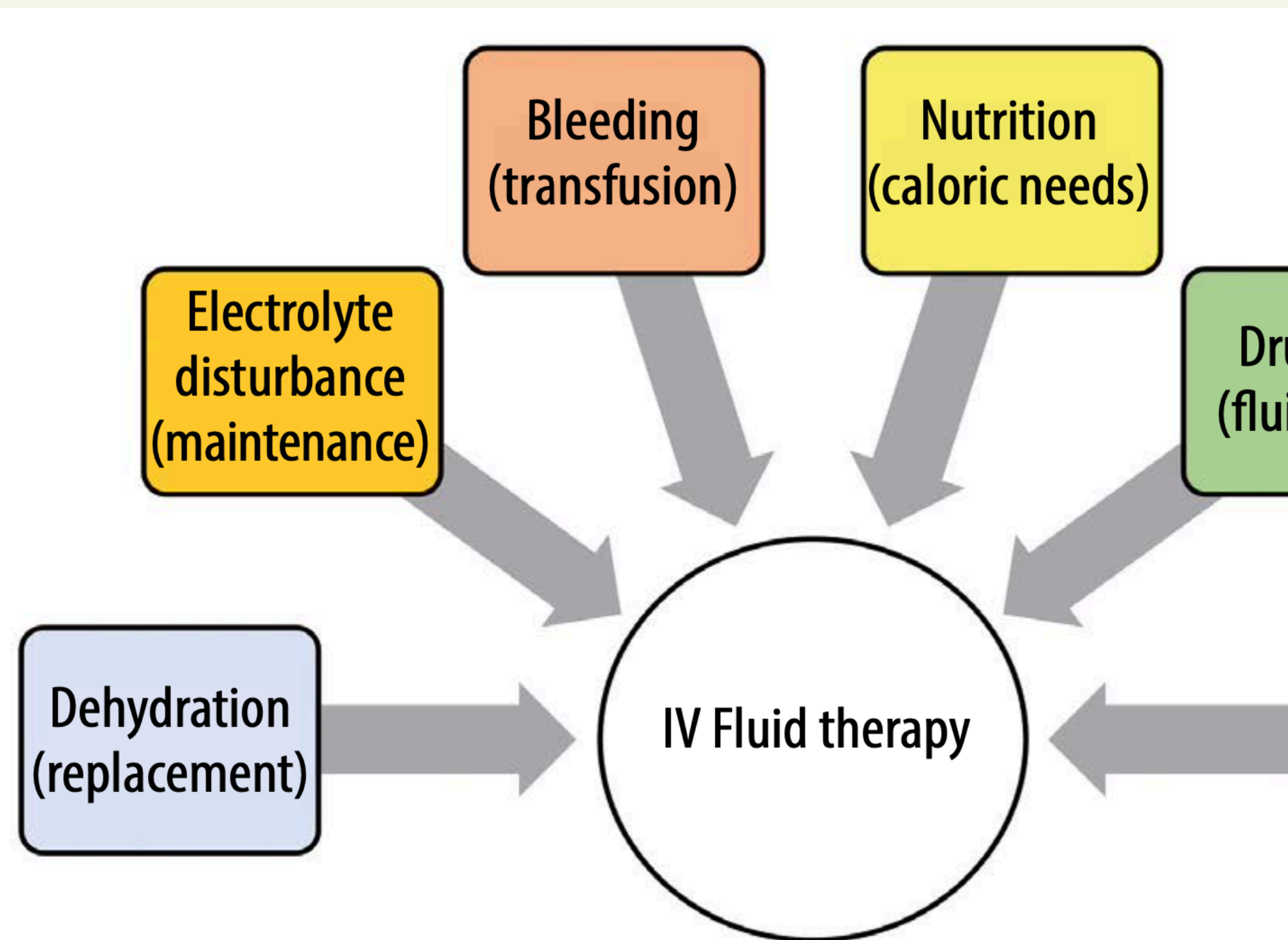
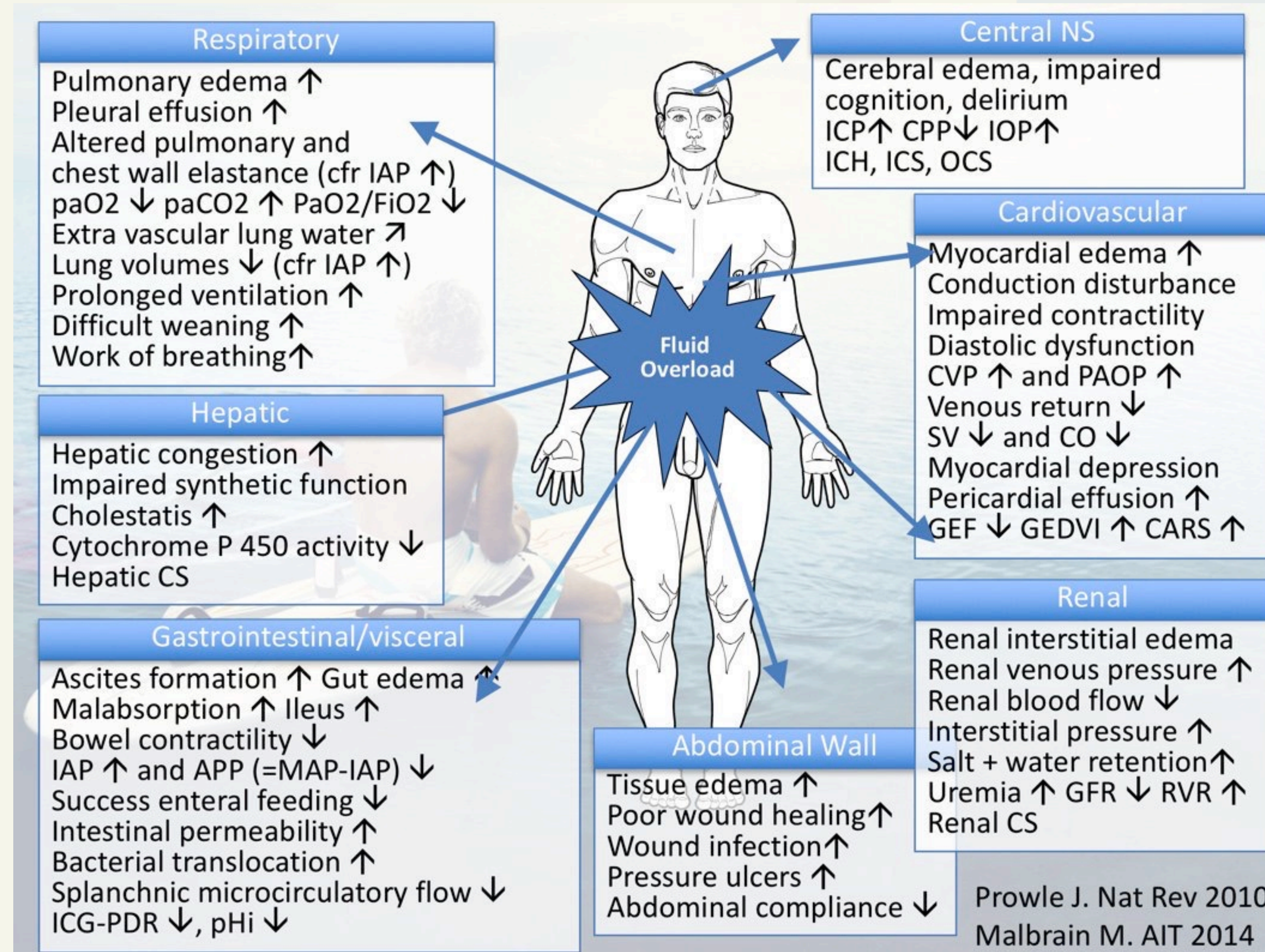


FIGURE 1. Fluid therapy indications



FLUÍDOS. Complicaciones.

Malbrain, Manu





FLUIDOS. Referencias

Thacker, Julie

Mythen, Monty

Marik, Paul

Magder, Sheldon

Perel, Azriel

Bellamy, MC

Michard, Frederic

Woodcock, Tom

Prowle, John

Thiele, Robert H

Regenmortel, Niels Van

Cannesson, Maxime

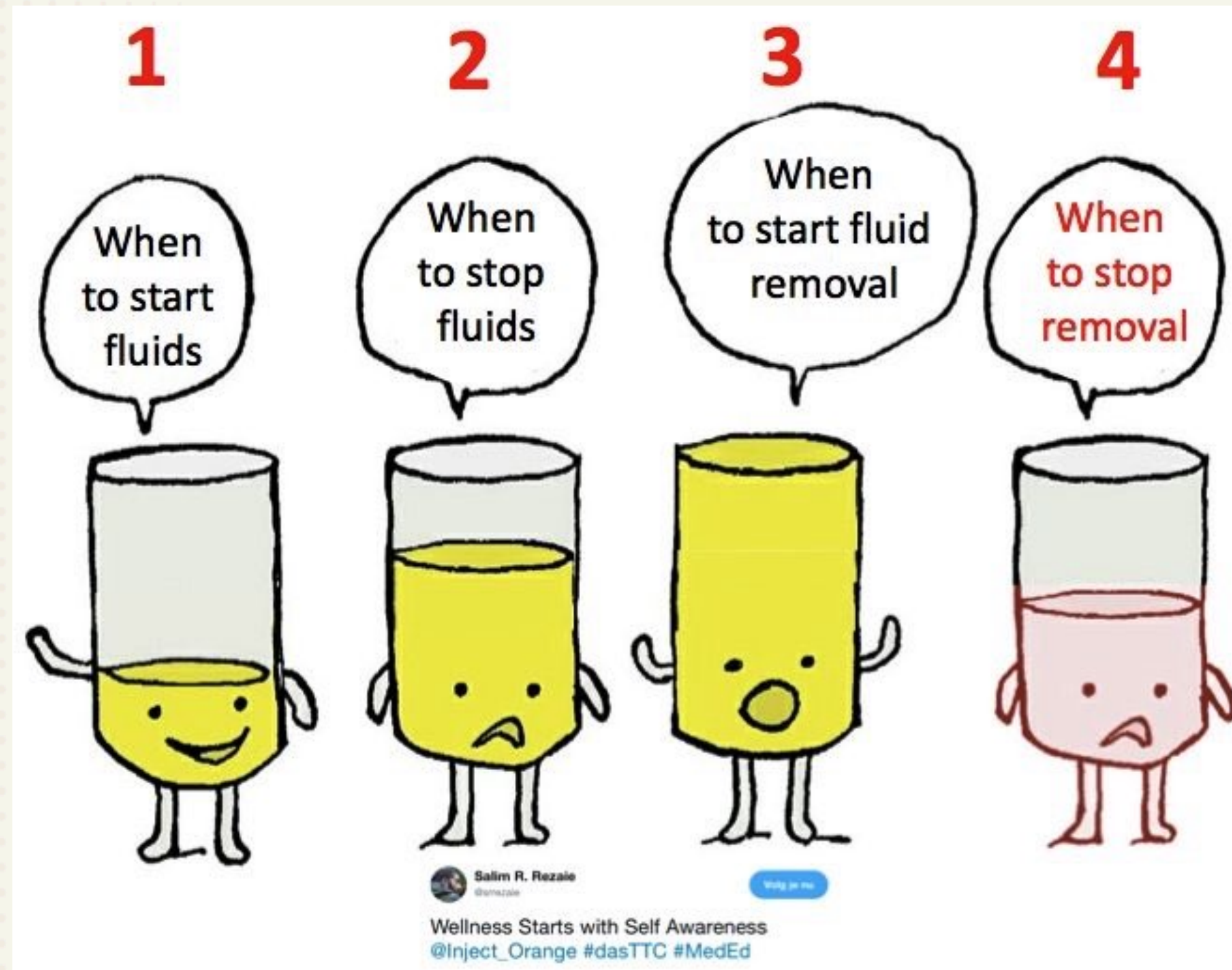
MANU MALBRAIN

ROBERT HANN

54



FLUÍDOS. Manejo Clínico.



DE-RESUSCITATION

Fluid overload, de-resuscitation, and outcomes in critically ill or injured patients: a systematic review with suggestions for clinical practice

Manu L.N.G. Malbrain

Paul E. Marik

Andrew W. Kirkpatrick

Niels Van Regenmortel

DOI: 10.5603/AIT.2014.0060

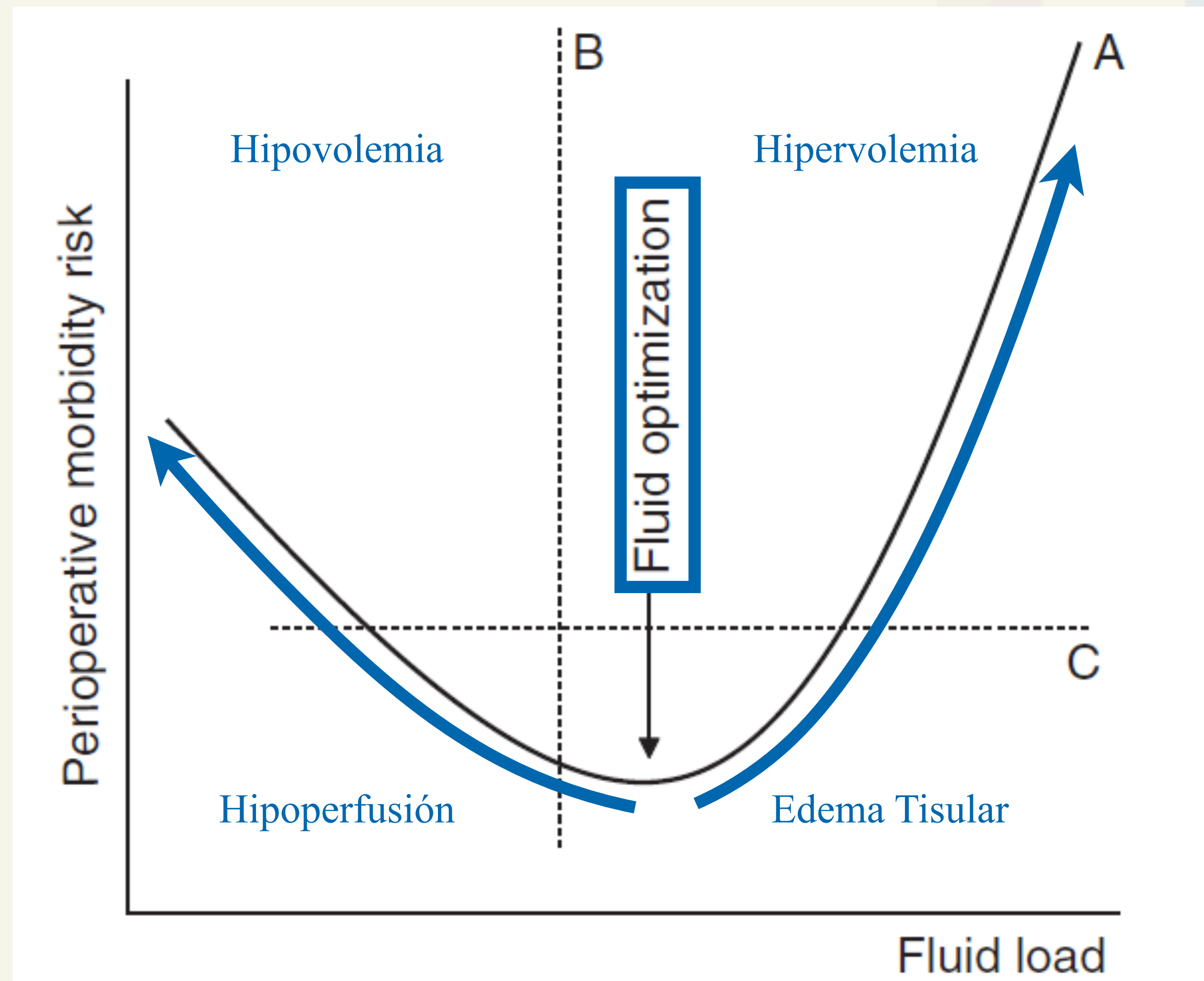
Anaesthesiology Intensive Therapy 2014 (Review), vol 46, n°5. 361-380



Wet, dry o something else?

Br Journal of Anaesth 97 (6): 755-7 (2006)

M. C. Bellamy





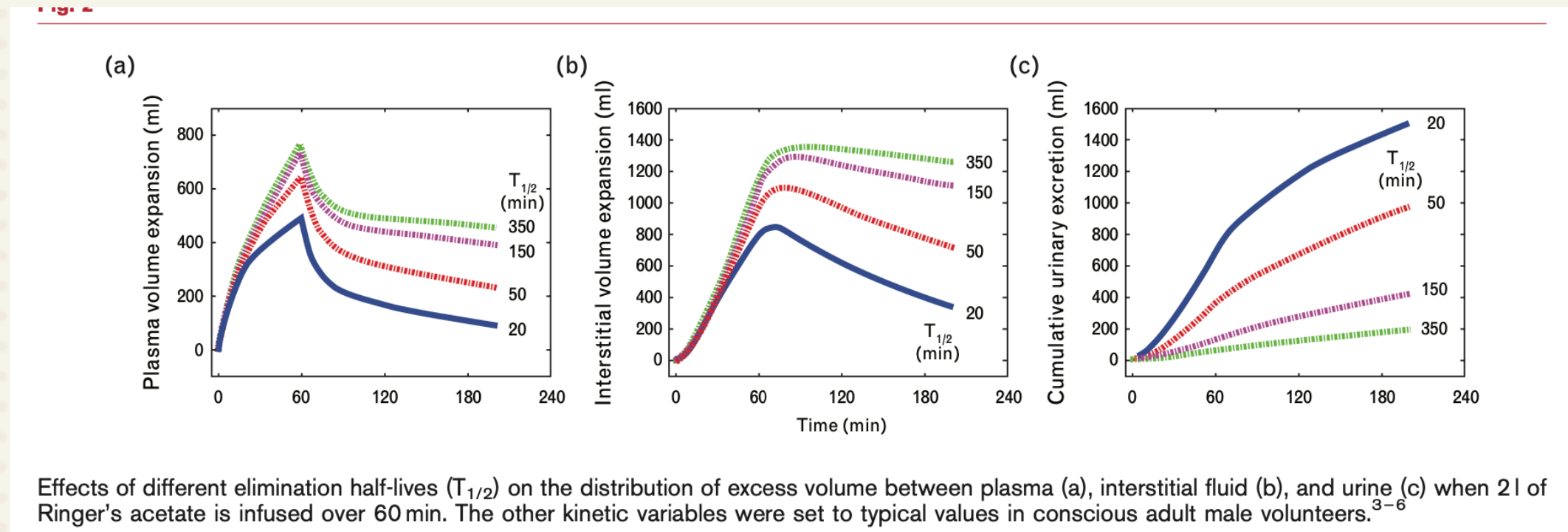
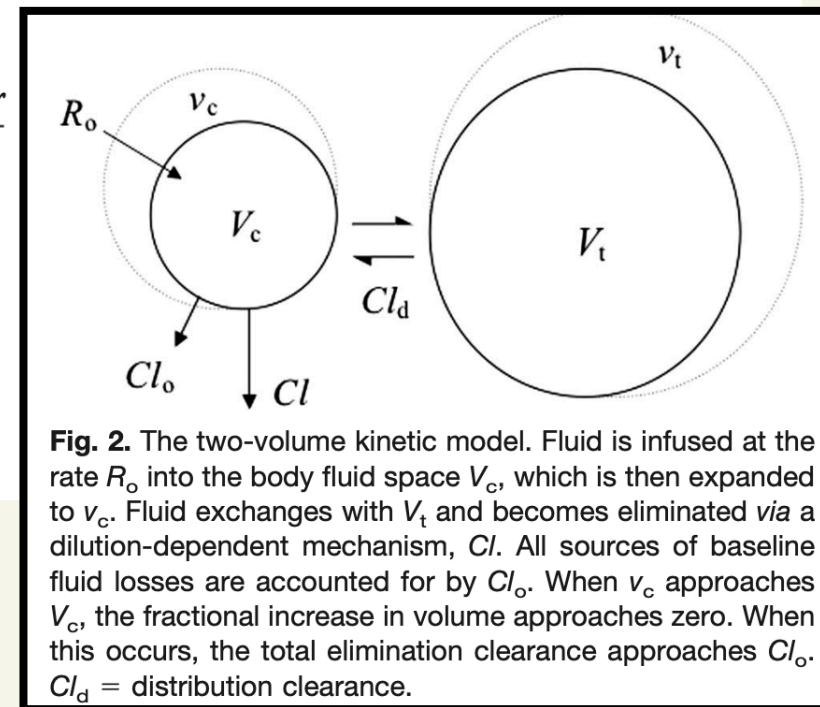
Vida Media de los Fluídos...

REVIEW ARTICLE
Anesthesiology 2010; 113:470–81
Copyright © 2010, the American Society of Anesthesiologists, Inc. Lippincott Williams & Wilkins

David S. Warner, M.D., Editor

Volume Kinetics for Infusion Fluids

Robert G. Hahn, M.D., Ph.D.*



Effects of different elimination half-lives ($T_{1/2}$) on the distribution of excess volume between plasma (a), interstitial fluid (b), and urine (c) when 2 l of Ringer's acetate is infused over 60 min. The other kinetic variables were set to typical values in conscious adult male volunteers.^{3–6}

EJA

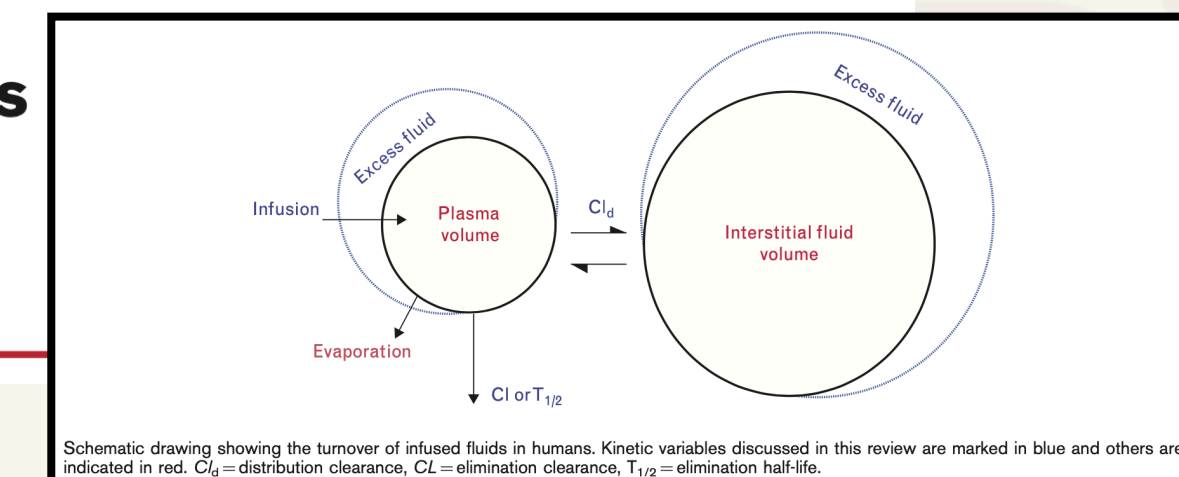
Eur J Anaesthesiol 2016; 33:475–482

OPEN

REVIEW

The half-life of infusion fluids An educational review

Robert G. Hahn and Gordon Lyons



Schematic drawing showing the turnover of infused fluids in humans. Kinetic variables discussed in this review are marked in blue and others are indicated in red. Cl_d = distribution clearance, Cl = elimination clearance, $T_{1/2}$ = elimination half-life.

Nunes et al. Annals of Intensive Care 2014, 4:25
<http://www.annalsofintensivecare.com/content/4/1/25>

Annals of Intensive Care
a SpringerOpen Journal

RESEARCH

Open Access

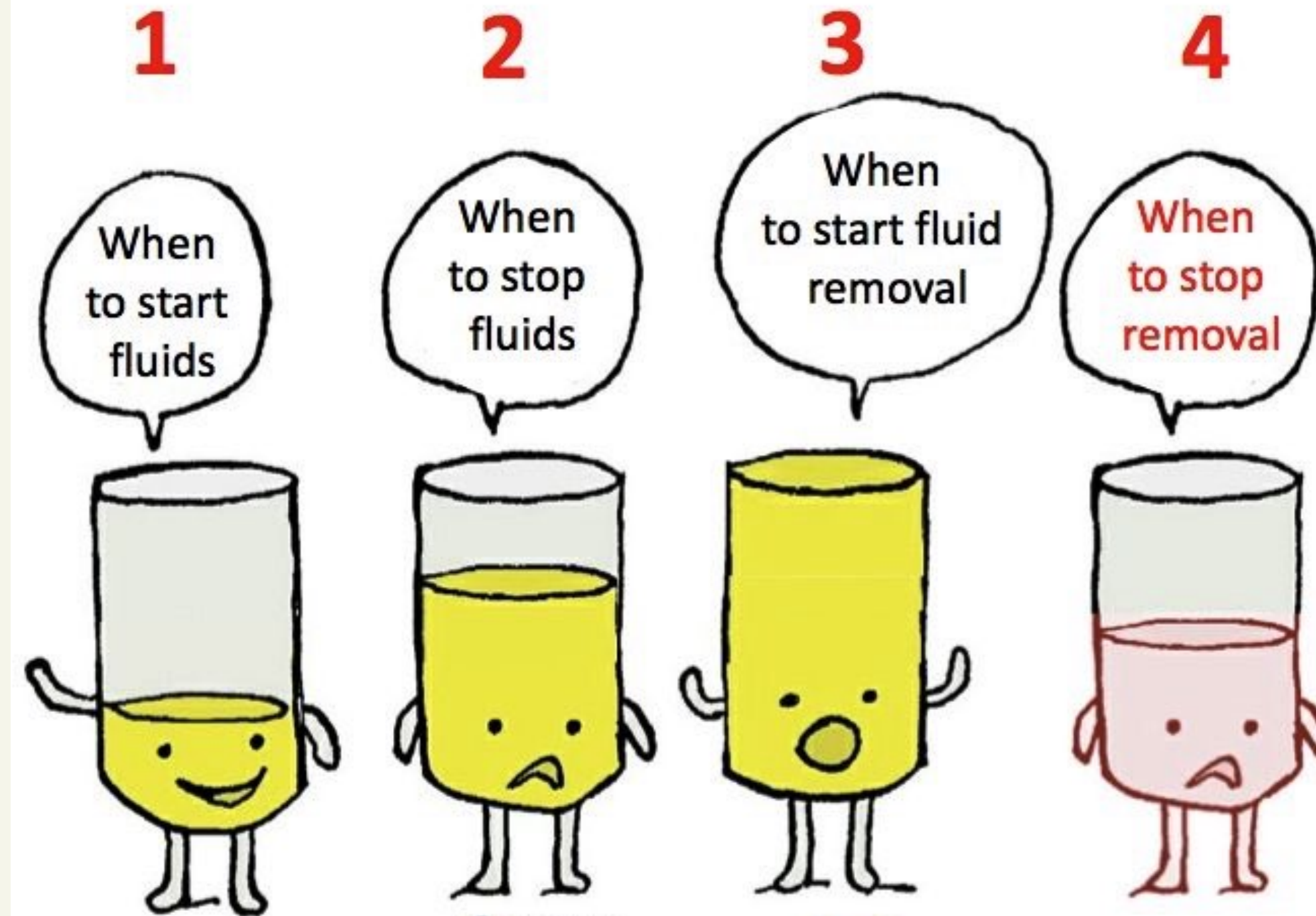
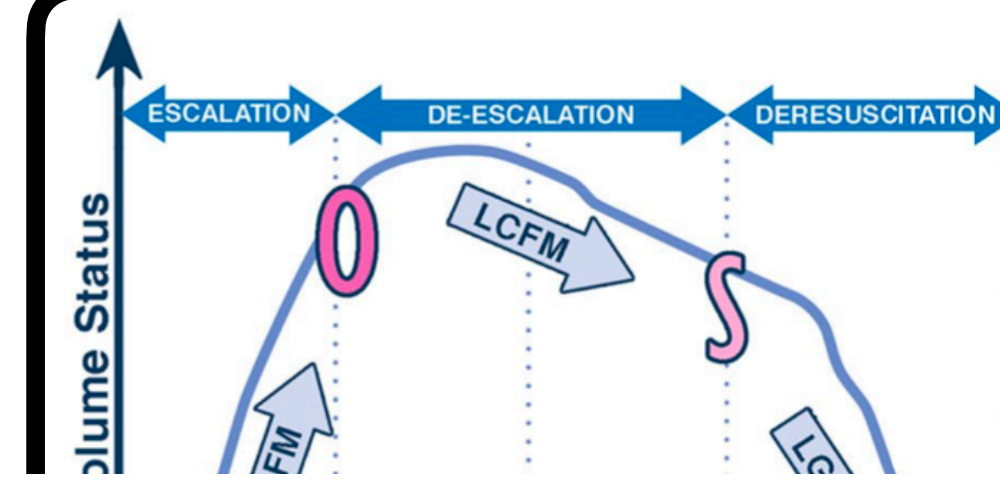
Duration of hemodynamic effects of crystalloids in patients with circulatory shock after initial resuscitation

Thieme Souza Oliveira Nunes, Renata Teixeira Ladeira, Antônio Tonete Bafi, Luciano Cesar Pontes de Azevedo, Flavia Ribeiro Machado and Flávio Geraldo Rezende Freitas*



R.O.S.E. Protocol

A



Salim R. Rezaie
@srezaie

Wellness Starts with Self Awareness
@Inject_Orange #dasTTC #MedEd

min/m²
SV > 12-15%
positive
3mmol/L (shock)
10%

iveness
negative
state < 2mmol/L
-12cm²/m²
mmHg

IPS
> 14cm²/m²,
US score
2-15mmHg
6-18mmHg;
W/ICW > 1;

E

Evacuation phase with focus on **organ recovery** and resolving fluid overload (in case of no flow state) with active late goal directed fluid removal (LGFR) and negative FB.

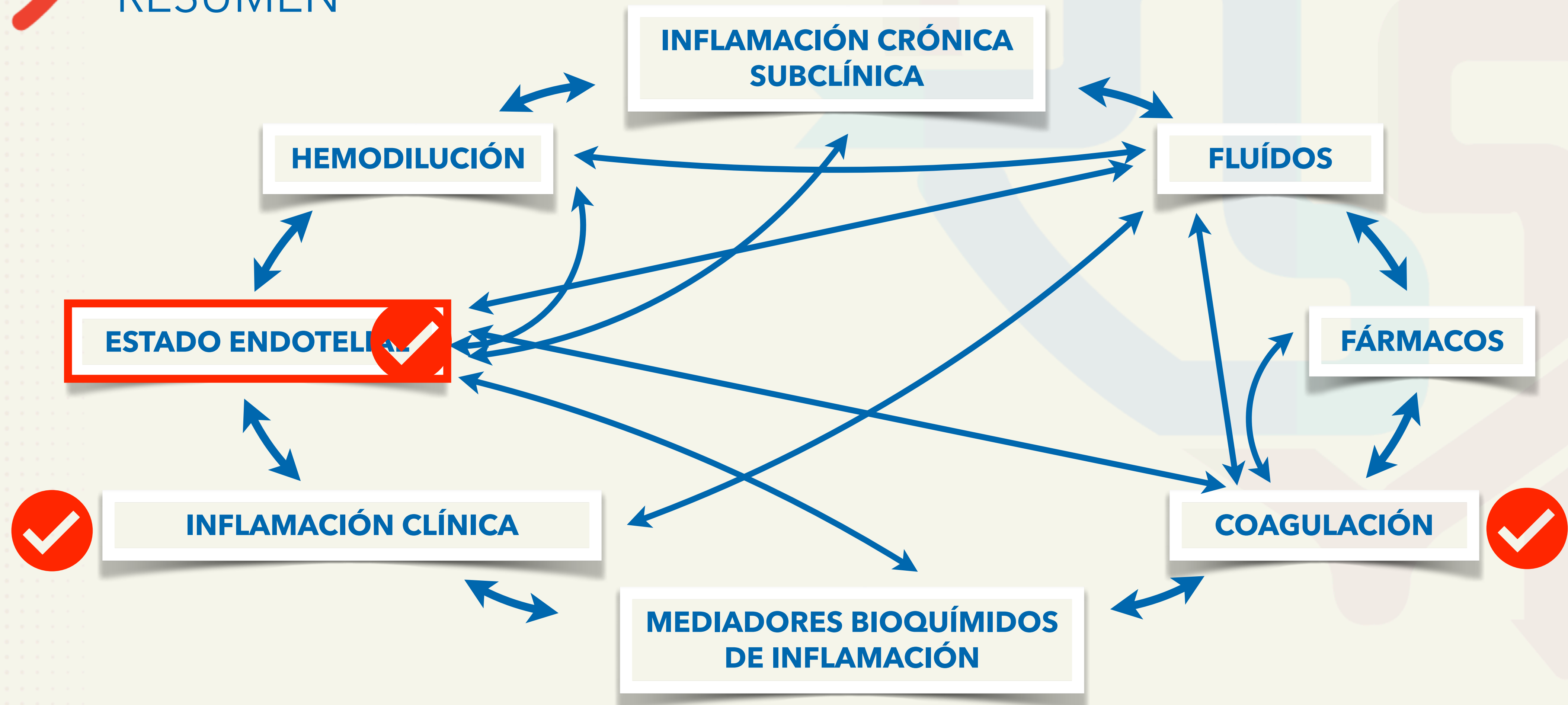
Triggers to stop fluid removal: hypoperfusion

- MAP/APP < 55/45mmHg**
- PPV or SVV > 15%
- PLR test positive
- Lactate > 2,5mmol/L
- S_vO₂ < 70-75%
- S_{ov}O₂ < 65-70%
- ICG PDR < 14-16%



SINDROME VASOPLÉJICO

RESUMEN





SINDROME VASOPLÉJICO

TRATAMIENTO

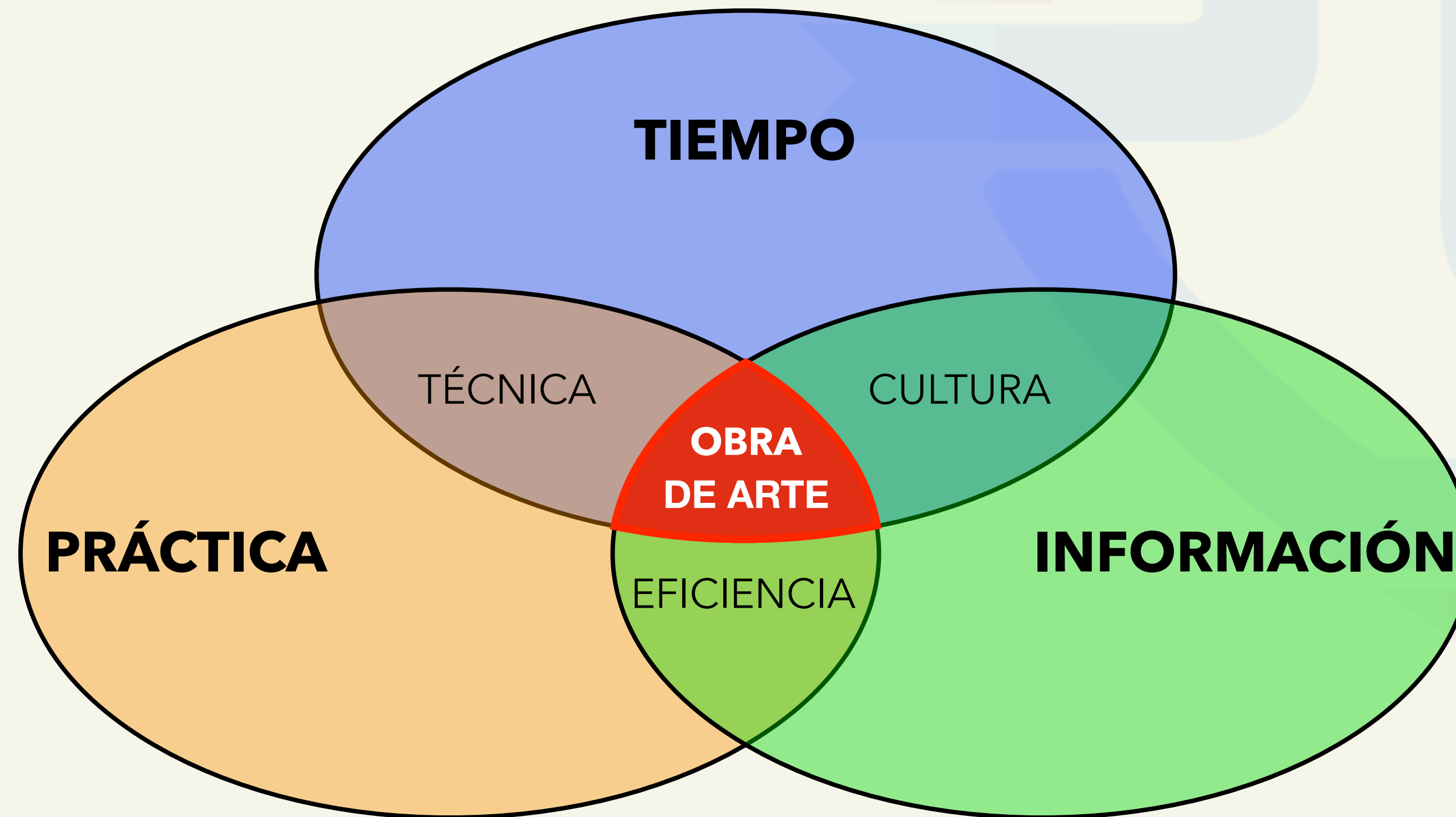
Tabla 3 Vasopresores en síndrome vasopléjico

Medicamento	Acción / Receptor	Dosis
Fenilefrina	Alfa-1 agonista	40-100 μ g bolo 0,5-10 μ g/min infusión
Noradrenalina	Alfa-1, alfa-2 y beta-1 agonista	4-10 μ g bolo 0,05-0,5 μ g/kg/min infusión
Adrenalina	Alfa-1, alfa-2 y beta-1 agonista	40-100 μ g bolo 0,5-10 μ g/min infusión
Vasopresina	V1, independiente de receptores adrenérgicos	1-6 U/h infusión
Terlipresina	V2, independiente de receptores adrenérgicos	1 mg bolo
Azul de metileno	Inhibición de guanilatociclasa	1-2 mg/kg bolo 0,25-1 mg/kg/h por 6 h

Fuente: autores.



SINDROME VASOPLÉJICO



RESULTADO EXITOSO CON LOS PACIENTES.



MUCHAS GRACIAS!!

SINDROME VASOPLÉJICO

SALIR DEL SÍNTOMA PARA PENSAR EN LA CAUSA

"Uno de los peores errores que puede cometerse es confundir causa con consecuencia"

"...y tratar síntomas sin evitar o tratar causas"

Dr. Héctor Daniel Dini

Médico Anestesiólogo

2023

dadi64@icloud.com