37e CONGRÈS ANNUEL DE L'ADARPEF

24 et 25 MARS 2017 PARIS

Avec le soutien de Fondation A. de Rothschild De l'oeil au cerveau

COMMENT MAINTENIR LA PAM PEROPERATOIRE CHEZ LE NOURRISSON ANESTHESIE?

Dr Mathilde DE QUEIROZ

Département d'Anesthésie-Réanimation Pédiatrique

Hôpital Femme Mère Enfant

Lyon



PARTICULARITES PHYSIOLOGIQUES

- Immaturité système nerveux autonome
  - Hyperactivité du parasympathique
  - Immaturité système sympathique

- Immaturité cardiaque, masse myocardique faible, baisse contractilité et VES, faible compliance

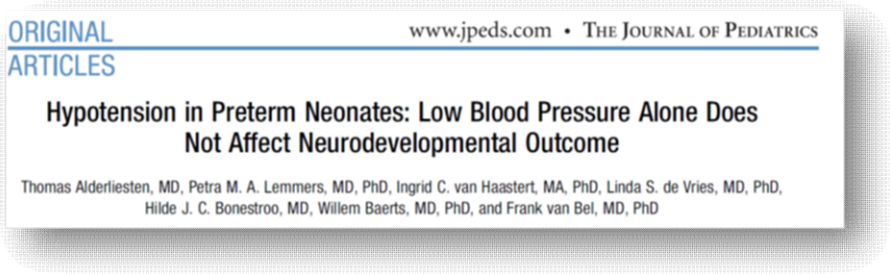
- Volémie variable en fonction âge

- Mauvaise tolérance à hyper et l'hypovolémie

- Baroréflexes altérés par AG

POURQUOI MAINTENIR LA PAM?CONSEQUENCES HYPOTENSION

- Chez préma :
  - Hémorragie intraventriculaire *Faust Arch Arch DisChild Fetal Neonatal Ed 2015*
  - Devenir neuro? Controversé



ORIGINAL ARTICLES

www.jpeds.com • THE JOURNAL OF PEDIATRICS

Hypotension in Preterm Neonates: Low Blood Pressure Alone Does Not Affect Neurodevelopmental Outcome

Thomas Alderliesten, MD, Petra M. A. Lemmers, MD, PhD, Ingrid C. van Haastert, MA, PhD, Linda S. de Vries, MD, PhD, Hilde J. C. Bonestroo, MD, Willem Baerts, MD, PhD, and Frank van Bel, MD, PhD



PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Infantile Postoperative Encephalopathy: Perioperative Factors as a Cause for Concern

Mary Ellen McCann, A.N.J. Schouten, Nicole Dobija, Carlos Munoz, Lianne Stephenson, Tina Y. Poussaint, C.J. Kalkman, Paul R. Hickey, Linda S. de Vries and Robert C. Tasker

Pediatrics 2014;133;e751; originally published online February 10, 2014;
DOI: 10.1542/peds.2012-0973

Avec le soutien de Fondation A. de Rothschild De l'oeil au cerveau

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645

REVIEW ARTICLE 2014

Beyond survival; influences of blood pressure, cerebral perfusion and anesthesia on neurodevelopment

Mary Ellen McCann[1] & Anton N.J. Schouten[2]

- 6 cas cliniques d'encéphalopathie post op
- **4 Nnés à terme**

Fonction profondeur et durée?

TABLE 2 Perioperative Vital Signs in 6 Cases of Infantile Perioperative Encephalopathy

Variable	Case					
	1	2	3	4	5	6
Preoperative BP, mm Hg	NA	80/46	89/59	105/46	76/p	135/59
Intraoperative SBP, mm Hg	42.6 ± 14.5	46.4 ± 5.8	47.8 ± 9.1	53.6 ± 9.1	51.6 ± 11.2	50.2 ± 10.6
Intraoperative MAP, mm Hg	31.6 ± 15.3	33.4 ± 5.1	31.3 ± 6.4	38.3 ± 8.4	33.8 ± 10.5	32.0 ± 11.0
Postoperative BP, mm Hg	66/31	95/60	108/57	75/42	110/63	97/46
MAP <30 mm Hg data points[a]	26	10	22	4	5	13
$ETCO_2$, mm Hg	35 ± 4.5	31.7 ± 3.8	33.8 ± 3.8	45 ± 3.8	41 ± 2.3	33.3 ± 3.3
Intraoperative HR	117 ± 13	102 ± 3	120 ± 9	123 ± 3	131 ± 11	134 ± 11
Intraoperative temperature	37.4 ± 0.8	36.7 ± 0.5	36.3 ± 2	36.9 ± 0.2	35.8 ± 0.2	37.8 ± 0.6
Intraoperative O_2 saturation	99 ± 1	99 ± 2	97 ± 3	100 ± 0	99 ± 1	98 ± 2

CONSEQUENCES CEREBRALES DEBIT ET OXYGENATION

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-
2013

ORIGINAL ARTICLE

Impact of sevoflurane anesthesia on cerebral blood flow in children younger than 2 years

Ossam Rhondali, Aurélie Mahr, Sabine Simonin-Lansiaux, Mathilde De Queiroz, Khalid Rhzioual-Berrada, Sylvie Combet, Jean-Christophe Cejka & Dominique Chassard

- < 6 mois : ↘ Qc si ↘ PAM **> 20%**
- > 6 mois : ↘ Qc si PAM↘ > 40%
- Limite autorégulation PAM=38 mmHg

Pediatric Anesthesia
2014 Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

Impact of sevoflurane anesthesia on brain oxygenation in children younger than 2 years

Ossam Rhondali[1,2], Simon Juhel[1], Sylvain Mathews[2], Quentin Cellier[1], François-Pierrick Desgranges[1], Aurélie Mahr[1], Mathilde De Queiroz[1], Agnès Pouyau[1], Khalid Rhzioual-Berrada[1] & Dominique Chassard[1]

Désaturation cérébrale chez
- < 6 mois
- ↘ PAM **>20%**

FDR désat :
- **PAM < 33 mmHg chez < 6 mois**
- **PAM<43 mmHg chez > 6 mois**

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645
2015

ORIGINAL ARTICLE

< 3mois

Intraoperative changes in blood pressure associated with cerebral desaturation in infants

Daphné Michelet[1,2], Ozkan Arslan[1,2], Julie Hilly[1,2], Nyamjargal Mangalsuren[1,2], Christopher Brasher[1,2], Robert Grace[3], Arnaud Bonnard[2,4], Serge Malbezin[1,2], Yves Nivoche[1,2] & Souhayl Dahmani[1,2,3,5]

Fact prédictifs d'une désaturation cérébrale
- ↘ **de 20,5% de la PAS**
- ↘ de 15,5% de la PAM

DEFINITION HYPOTENSION/ PRESSION NORMALE ?

Quelques difficultés d'emblée…

Pediatric Anesthesia

Pediatric Anesthesia 2009 19: 1048–1053 doi:10.1111/j.1460-9592.2009.03140.x

How do pediatric anesthesiologists define intraoperative hypotension?

OLUBUKOLA O. NAFIU MD FRCA, TERRI VOEPEL-LEWIS MSN RN, MICHELLE MORRIS MS, WILSON T. CHIMBIRA MD FRCA, SHOBHA MALVIYA MD, PAUL I. REYNOLDS MD AND KEVIN K. TREMPER MD PHD

Department of Anesthesiology, University of Michigan, Ann Arbor, MI, USA

Grande variabilité en fonction de l'âge et de l'anesthésiste….

Values and methods used to define IOH by societal affiliation

			P value
			0.001
			0.001
		(6.8)	0.001
		4.5 (5.3)	0.001
ative of IOH (% respondents)			
10–20% decrease	12.3	10.3	n.s.
20–30% decrease	70.3	89.7	0.001
30–40% decrease	10.9	0.0	0.001
>40% decrease	6.5	0.0	0.001
Parameters used to identify IOH (% respondents)			
SBP	78.3	96.2	0.001
MAP	86.3	85.7	n.s.
DBP	46.3	30.6	0.002

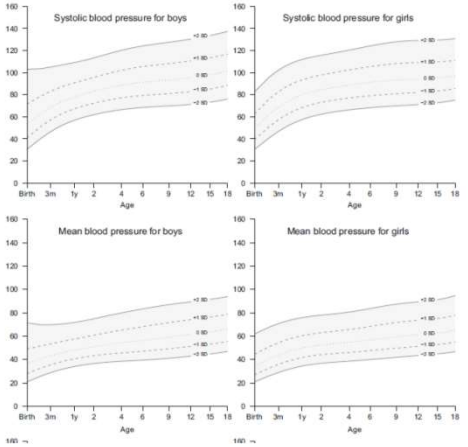
Reference Values for Noninvasive Blood Pressure in Children during Anesthesia

ANESTHESIOLOGY 2016;

A Multicentered Retrospective Observational Cohort Study

Jurgen C. de Graaff, M.D., Ph.D., Wietze Pasma, D.V.M., Stef van Buuren, Ph.D., Jesse J. Duijghuisen, M.D., Olubukola O. Nafiu, M.D., Sachin Khetarpal, M.D., [illegible], M.D., Ph.D.

< 18 ans
N=116362
Après induction et après incision
Valeur PAM la + basse = 17 mmHg



- Limites inf en valeur absolue
  - >6 mois : PAM=43 mmHg
  - < 6 mois : PAM=35 mmHg
- Limites inf en valeur relative
  - > 6 mois : 40% PAM de base
  - < 6 mois : 20% PAM de base
  - < 3 mois : 20 % PAS de base

Rhondali, Michelet

?

Reference Values for Noninvasive Blood Pressure in Children during Anesthesia

ANESTHESIOLOGY 2016;

A Multicentered Retrospective Observational Cohort Study

Jurgen C. de Graaff, M.D., Ph.D., Wietze Pasma, D.V.M., Stef van Buuren, Ph.D., Jesse J. Duijghuisen, M.D., Olubukola O. Nafiu, M.D., Sachin Kheterpal, M.D., Wilton A. van Klei, M.D., Ph.

Should we apply Rhondali's definition of hypotension (MAP <35 mmHg in infants < 6 months) to de Graaff's database, we would have to conclude that it is the norm in neonates to be hypotensive after induction of anesthesia.

Weber Ped Anesth 2016

Il faudrait peut être tout d'abord mesurer la tension… en pré induction

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645

RESEARCH REPORT

Blood pressure and heart rates in neonates and preschool children: an analysis from 10 years of electronic recording

Cedric E. Sottas[1], David Cumin[2] & Brian J. Anderson[1,2]

TA pré induction = 898/30008 soit 3 %...
Monitorage per op FC=90%
Monitorage TA=55%

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645

RESEARCH REPORT

Arterial blood pressure in anesthetized neonates and infants: a retrospective analysis of 1091 cases

Frank Weber, Gijsbert H. M. Honing & Gail P. Scoones
Department of Anaesthesia, Erasmus University Medical Center – Sophia Children's Hospital, Rotterdam, The Netherlands

TA pré induction <10%...

immediately before the induction of anesthesia. It was therefore, until recently, common practice in our department not to take blood pressure measurements in young children immediately prior to the induction of anesthesia, unless they were (hemodynamically) compromised.

Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645

RESEARCH REPORT

Defining hypotension in anesthetized infants by individual awake blood pressure values: a prospective observational study

Frank Weber, Laurens Koning & Gail P. Scoones

2017

Et en consultation??

15% échec en service,21% en préinduction

PROBLEME FREQUENT?

- Fonction de la définition absolue ou relative
  - <1 mois :
    - **77%** hypoTA relative
    - **25%** d'hypoTA absolue
    - hypoTA prolongée
  - 1-6 mois
    - **50%** hypoTA relative
    - **10%** hypoTA absolue
- Surtout phase après IOT avant incision
- FDR
  - < 1 mois
  - Co induction (sévo + propofol)

Conclusions: Relative intraoperative hypotension was routine and absolute intraoperative hypotension was common in neonates and infants under

Nafiu, Simpao, Weber
Ped Anesth

THERAPEUTIQUES

- Remplissage : 1ère intention
- Vasopresseurs
- Effets attendus
- Effets néfastes

Michelet Ped Anesth Jily ACCPM 2015

All patients received a 10 ml·kg^{-1} loading bolus over 15 min before induction. Additional 10 ml·kg^{-1} normal saline boluses were administered intraoperatively at the anesthesiologist's discretion according to the blood pressure, E_TCO_2, urine output, HR changes, or during long duration or high fluid loss surgery. According to our institutional protocol, anesthesiologists also administered 10 ml·kg^{-1} normal saline boluses, where a decrease in $StcO_2$ occurred of more than 20% when compared to preoperative values. If this bolus did not result in <20% reduced $StcO_2$ values when compared to preoperative values (or the correction of the trigger element), a second bolus was administered and the expiratory concentration of sevoflurane was decreased.

Table 2 Measures taken in patients with postinduction hypotension

	Group 1 (<1 month)	Group 2 (1–3 months)	Group 3 (4–6 months)	Group 4 (>6 months)
Hypotensive first MAP	24	33	10	5
i.v. fluid bolus	16	5	3	1
Decrease volatile anesthetic	12	25	5	4
Increase volatile anesthetic	3	3	2	1
Norepinephrine	2	2	0	0
No intervention	2	4	0	0

Weber Ped Anesth 2016

AVANT TOUT…. OPTIMISER LE JEÛNE!



Pediatric Anesthesia
Pediatric Anesthesia ISSN 1155-5645

RESEARCH REPORT

Optimized preoperative fasting times decrease ketone body concentration and stabilize mean arterial blood pressure during induction of anesthesia in children younger than 36 months: a prospective observational cohort study

Nils Dennhardt[1], Christiane Beck[1], Dirk Huber[1], Bjoern Sander[1], Martin Boehne[2], Dietmar Boethig[3], Andreas Leffler[1] & Robert Sümpelmann[1]

Table 2 Comparison of fasting period, deviation from guideline (ΔGL), mean arterial blood pressure after induction of anesthesia (MAP), glucose, lactate, acid–base balance, and ketone bodies in children before (OLD) and after (OPT) optimization of preoperative fasting times

Variable	OLD (n = 50)	OPT (n = 50)	P-value*
Fasting period (min)	507 ± 207 (449–567)	362 ± 116 (329–395)	<0.00
ΔGL (min)	224 ± 189 (171–278)	74 ± 85 (50–98)	
Glucose (mmol·l^{-1})	4.9 ± 1.1 (4.6–5.2)	5.2 ± 0.8 (5.0–5.5)	0.
Lactate (mmol·l^{-1})	1.2 ± 0.6 (1.1–1.4)	1.2 ± 0.4 (1.1–1.3)	
Bicarbonate (mmol·l^{-1})	22.4 ± 2.2 (21.8–23.0)	22.6 ± 1.8 (22.1–23.0)	0.32
Base excess (mmol·l^{-1})	−2.0 ± 2.4 (−2.7–(−1.3))	−1.6 ± 2.1 (−2.2–(−0.9))	0.29
Anion gap (mmol·l^{-1})	7.5 ± 3.1 (6.6–8.4)	7.8 ± 2.2 (7.2–8.4)	0.20
Ketone bodies (mmol·l^{-1})	0.6 ± 0.6 (0.4–0.8)	0.2 ± 0.2 (0.2–0.3)	<0.001
MAP after induction (mmHg)	50.3 ± 9.8 (47.5–53.1)	55.2 ± 9.5 (52.2–57.6)	0.015

LIQUIDES CLAIRS
2 HEURES AVANT+++

Moins d'hypoTA
10% vs 0%

Avec le soutien de
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PREVENTION/ANTICIPATION

Connaître ses drogues…

- Hypotension fonction drogues utilisées et fonction âge
  - Thiopental : inotrope –, pas de baisse RVS
  - Propofol : inhibition syst sympathiqu… baisse TA , persistante ap…
  - Ketamine : aug…ntatic…
  - Sévo : inhibition co… augmentation initial… contractilité sans bai…

Posologie optimale adaptée à l'âge
Attention co-induction!
Diminution posologie post IOT / pré incision?

Anaesth Intensive Care. 1994 Oct;22(5):545-55.

A comparison of three induction agents in paediatric anaesthesia--cardiovascular effects and recovery.

Jones RD[1], Visram AR, Chan MM, Bacon-Shone J, Mya GH, Irwin MG.

Pediatric Anesthesia

Pediatric Anesthesia 2010 **20**: 605–611 doi:10.1111/j.1460-9592.2010.03330.x

Propofol as an induction agent for endotracheal intubation can cause significant arterial hypotension in preterm neonates

LARS WELZING MD, ANGELA KRIBS MD, FRANK EIFINGER MD, CHRISTOPH HUENSELER MD, ANDRE OBERTHUER MD AND BERNHARD ROTH MD

Department of Neonatology and Paediatric Intensive Care, University Hospital of Cologne, Children's Hospital, Cologne, Germany

British Journal of Anaesthesia 82 (4): 516–20 (1999)

Haemodynamic effects of propofol *vs* thiopental in infants: an echocardiographic study

E. Wodey*, L. Chonow, X. Beneux, O. Azzis, J. Y. Bansard and C. Ecoffey

Neonatology

Original Paper

Neonatology 2010;98:57–63
DOI: 10.1159/000271224

Received: April 21, 2009
Accepted after revision: July 13, 2009
Published online: December 24, 2009

Cerebral and Systemic Hemodynamic Effects of Intravenous Bolus Administration of Propofol in Neonates

Joke Vanderhaegen[a] Gunnar Naulaers[a] Sabine Van Huffel[b] Christine Vanhole[a] Karel Allegaert[a]

Comparative Hemodynamic Depression of Sevoflurane versus Halothane in Infants

An Echocardiographic Study

Eric Wodey, M.D.,* Patrick Pladys, M.D.,† Catherine Copin, M.D.,‡ Marie Madeleine Lucas, M.D.,‡ André Chaumont, M.D.,‡ Philippe Carre, M.D.,‡ Bernard Lelong, M.D.,§ Olivier Azzis, M.D.,‖ Claude Ecoffey, M.D.#



REMPLISSAGE

- Thérapeutique la + utilisée
- En 1ère intention, compensation jeûne

« Le remplissage vasculaire doit être considéré de la même façon qu'un traitement médicamenteux avec ses indications, sa posologie, ses effets indésirables » *Fabrice Michel Conférence d'essentiel SFAR 2016*

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De l'oeil au cerveau

SOLUTE, VOLUME, VITESSE
encore des débats, encore des questions…

- Cristalloides
  - 1ère intention
  - 10 ml/kg? 20 ml/kg? Nb de bolus? Vitesse 20-30 min?
  - Apport de base + **compensation durée de jeûne**
  - NaCl, RL, solutés balancés
- Colloides
  - HEA : hypovolémie/pertes sanguines
  - Albumines : préma, Nné, pas de supériorité en terme de mortalité dans choc septique chez enfant *Akech S BMJ 2010*

Le Congrès
Médecins. Conférence d'Essentiel
©2016 Sfar. Tous droits réservés

L'expansion volémique chez l'enfant

Fabrice Michel

Perioperative Crystalloid and Colloid Fluid Management in Children: Where Are We and How Did We Get Here?

Bailey Anesth Analg 2012

colloid use in children. We should ultimately change our approach to major intraoperative fluid shifts by a rational, monitored, goal-directed combination of both crystalloid and colloid therapy, similar to that occurring in adult surgical patients.[33]

Mini fluid challenge?
Muller Anesthesio 2011

RECOMMANDATIONS

Allemandes 2016

- Per op : soluté balancé glucosé 10 ml/kg/h à ajuster
- Remplissage : 10-20 ml/kg à répéter max 3 fois
- **Si pertes en pré op, remplir avant induction si possible**
- Colloides possibles si hypovolémie si échec cristalloides et pas de pathologie rénale, max 50 ml/kg/j

Françaises RFE 2013

- Choix du soluté non documenté
- RV = 10-20 ml/kg selon patient et situation clinique
- **Règles des 4-2-1** solution glucosée 1% chez NRS ou chez Nné + **compensation du jeune dont 50% la première heure et 50% les 2 heures suivantes** (avis d'expert)

Commentaires ADAPEF (e-adarpef.fr)

- rien dans la plupart des situations clinico-chirurgicales simples, mineures et brèves (<1h) sauf chez le nouveau-né
- 10 ml/kg en 1 h en cas de jeûne > 4 heures (attention en ambulatoire où des durées de jeûne supérieures à 10h ne sont pas inhabituelles !)
- avec en plus dans ces 2 situations la possibilité d'administrer 10 ml/kg d'une solution de cristalloïde (NaCl 0,9%,par exemple) en cas d'hypotension peranesthésique

STATUT HEMODYNAMIQUE NOURRISSON SOUS AG?

Patients were formally entered into the study if the attending paediatric anaesthetist felt that it was necessary to provide a fluid bolus during the maintenance of anaesthesia. The need for VE was based on traditional endpoints such as clinical history, type of surgery, perioperative events, and standard monitoring data excluding TED measurements.

Raux BJA 2012

Archives of Disease in Childhood 1997;77:516–518

Clinicians' abilities to estimate cardiac index in ventilated children and infants

Shane M Tibby, Mark Hatherill, Michael J Marsh, Ian A Murdoch



	Potential predictor	Area under ROC with 95% CI (numerical value on right, vertical line is 0.5)		Fluid bolus, *n*	Setting	Study
Clinical	HR		0.55	33	Neuro OR	Byon[24]
			0.62	19	Neuro OR, 0-6 yrs	Pereira de Souza Neto[6]
			0.66	11	Neuro OR, 6-14 yrs	Pereira de Souza Neto[6]
			0.53	27	Cardiac OR	Renner 2011[8]
	SAP		0.67	33	Neuro OR	Byon[24]

Gan Anesth Analg 2003

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24 et 25 MARS 2017 PARIS

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Pediatric Anesthesia

Pediatric Anesthesia ISSN 1155-5645

SYSTEMATIC REVIEW

Respiratory variation in aortic blood flow peak velocity to predict fluid responsiveness in mechanically ventilated children: a systematic review and meta-analysis

François-Pierrick Desgranges[1], Olivier Desebbe[2], Edmundo Pereira de Souza Neto[3,4,5], Darren Raphael[6] & Dominique Chassard[1]

Table 3 Results of the studies included in the systematic review

References	Sample size (*n*)	Percentage of responders (%)	Best threshold value (%)	Sensitivity (%)	Specificity (%)	Area under ROC curve (95% CI)
Durand *et al.* (17)	26	69.2	12	81.2	85.7	0.82 (0.99–1.8)
Choi *et al.* (18)	21	52.4	20	91	90	0.83 (0.61–1.00)
Pereira de Souza Neto *et al.* (19)	30	56.7	10	100	100	1.00 (0.88–1.00)
Renner *et al.* (20)	27	48.1	7	100	85	0.92
Byon *et al.* (21)	33	45.5	11	86.7	72.2	0.80 (0.64–0.96)
Lee *et al.* (22)	26	50.0	14	92	85	0.96 (0.88–1.00)

ROC, receiver operati… acteristic; CI, confidence interval.

Anaesth… 34 (2015) 265–270

ELSEVIER

SFAR Société Française d'Anesth…

Original Article

Use of near-infrared spectroscopy… intravenous fluid load in anaesthetized…

Julie Hilly[a,c], Claire Pailleret[a,c], Mélanie Fromentin[a,c], Yves Nivoche[a,c], Souhayl Dahmani[a,c,d,*]

…e expressed as median [range].

	Responders (*n* = 10)	Non-responders (*n* = 13)

Entre 30 et 65% des enfants ne sont pas répondeurs au remplissage…

= RV inapproprié!

British Journal of Anaesthesia **108** (1): 100–7 (2012)
Advance Access publication 20 October 2011 · doi:10.1093/bja/aer336

PAEDIATRICS

Intraoperative use of transoesophageal Doppler to pred… response to volume expansion in infants and neonates

O. Raux*, A. Spencer, R. Fesseau, G. Mercier, A. Rochette, S. Bringuier, K. Lakhal, X. Capdevila an… C. Dadure

Groups	R (*n* = 26)	NR (*n* = 24)

British Journal of Anaesthesia **114** (1): 103–9 (2015)
Advance Access publication 14 October 2014 · doi:10.1093/bja/aeu361

BJA

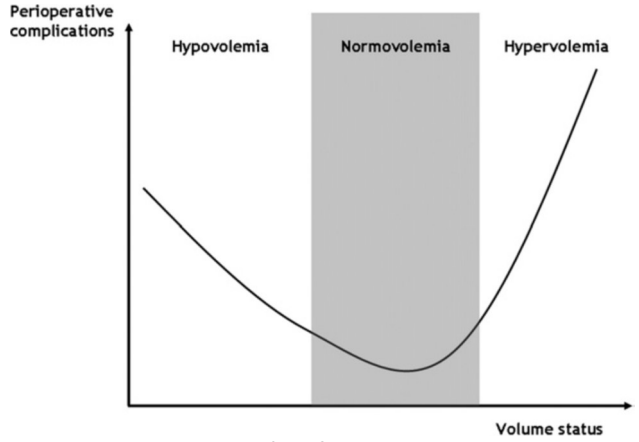
Stroke volume variation and indexed stroke volume measured using bioreactance predict fluid responsiveness in postoperative children†

E. Vergnaud, C. Vidal, J. Verchère, J. Miatello, P. Meyer, P. Carli and G. Orliaguet*

15 patients responders

15 patients non-responders

MONITORAGE : Pourquoi? Avec quoi?



Cannesson. J Cardiothorac Vasc Anesth 2009

Pediatr Nephrol (2013) 28:661–666
DOI 10.1007/s00467-012-2369-4

ORIGINAL ARTICLE

Fluid overload and mortality are associated v kidney injury in sick near-term/term neonate

David J. Askenazi · Rajesh Koralkar · Hayden E. Hundley · Angela Montesanti · Neha Patil · Namasivayam Ambalavanan

Fluid overload is associated with impaired oxygenation and morbidity in critically ill children*

Ayse A. Arikan, MD; Michael Zappitelli, MD, MSc; Stuart L. Goldstein, MD; Amrita Naipaul, NP; Larry S. Jefferson, MD; Laura L. Loftis, MD

Pediatric Crit Care 20

van Paridon et al. Critical Care (2015) 19:293
DOI 10.1186/s13054-015-1010-x

CRITICAL CARE

RESEARCH Open Access

Timing of antibiotics, volume, and vasoactive infusions in children with sepsis admitted to intensive care

Bregje M. van Paridon[1], Cathy Sheppard[2], Garcia Guerra G[3], Ari R. Joffe[3,4*] for the Alberta Sepsis Network

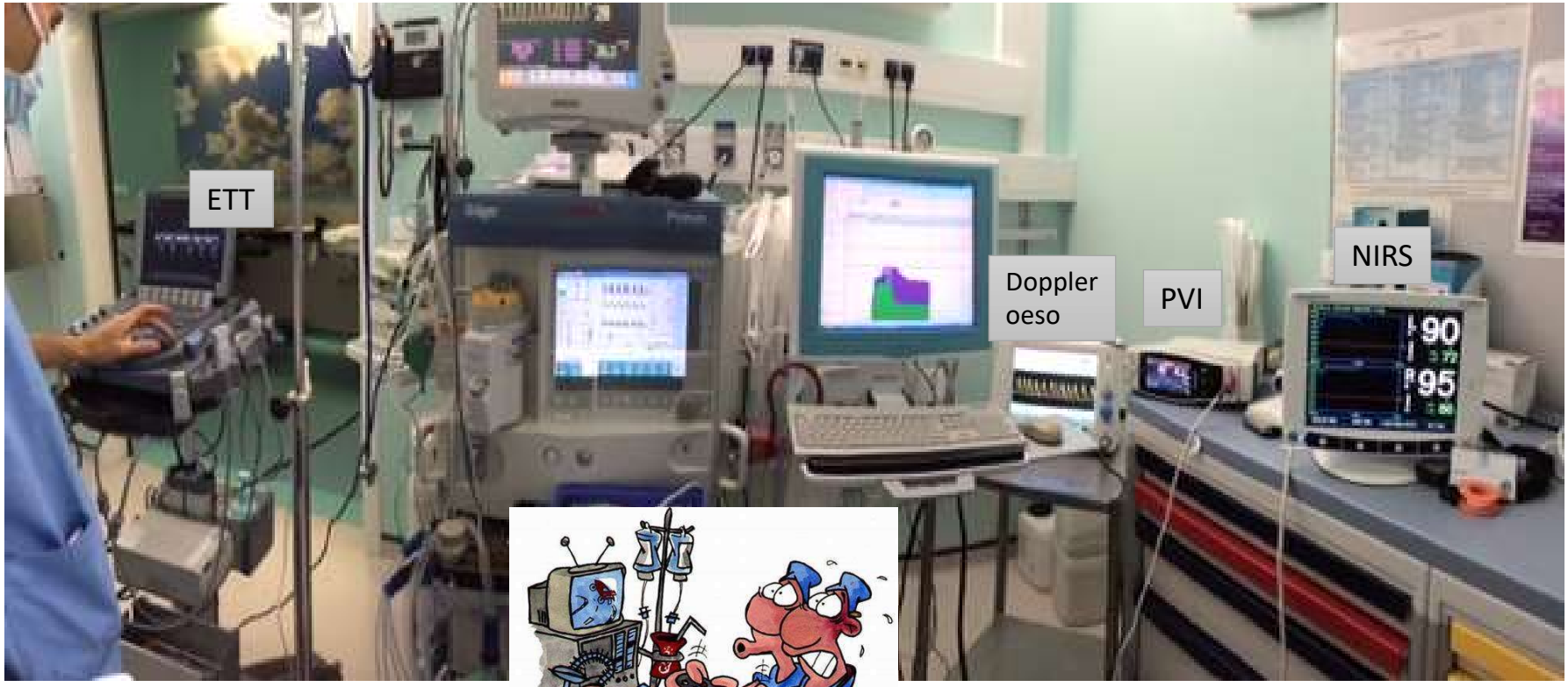
Predicting Fluid Responsiveness in Children: A Systematic Review

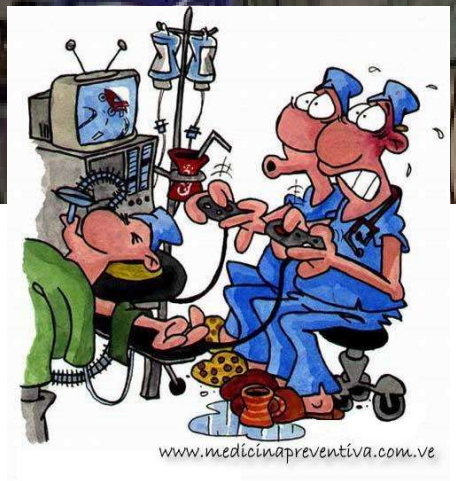
Heng Gan, MBBCh, MRCPCH, FRCA,*† Maxime Cannesson, MD, PhD,‡ John R. Chandler, MBBCh, FCARCSI, FDSRDS,§ and J. Mark Ansermino, MBBCh, MSc (Inf), FFA (SA), FRCPC*†

Echo cœur Δpic de vélocité aortique
Doppler œsophagien?

Chirurgie mineure/courte ? Probablement non
Chirurgies moyennes et majeures? Oui si on peut…

Pour l'étude mini fluid challenge…





37e CONGRÈS ANNUEL DE L'ADARPEF
24 et 25 MARS 2017 PARIS
Avec le soutien de Fondation A. de Rothschild De l'oeil au cerveau

Anaesth Crit Care Pain Med 34 (2015) 265–270

ELSEVIER
SFAR Société Française d'Anesthésie et de Réanimation

Original Article

Use of near-infrared spectroscopy in predicting response to intravenous fluid load in anaesthetized infants

Julie Hilly[a,c], Claire Pailleret[a,c], Mélanie Fromentin[a,c], Alia Skhiri[a,c], Arnaud Bonnard[b,c], Yves Nivoche[a,c], Souhayl Dahmani[a,c,d,*]

Table 2
Difference of haemodynamic and respiratory parameters before and after fluid load in overall population, responders and non-responders.

	Overall population (n = 23)			Responders (n = 10)			Non-responders (n = 13)		
	Before FC	After FC	P (before vs. after FC)	Before FC	After FC	P (before vs. after FC)	Before FC	After FC	P (before vs. after FC)
SaO_2 (%)	100 [95–100]	100 [96–100]	NS	100 [95–100]	100 [99,100]	NS	100 [95–100]	100 [96–100]	NS
FiO_2 (%)	48 [42–52]	48 [38–51]	NS	48 [43–52]	48 [32–51]	NS	47 [42–50]	46 [38–51]	NS
$ETCO_2$ (mmHg)	31 [18–39]	35 [19–44]	0.001	32 [23–35]	35 [27–39]	0.03	31 [18–39]	34 [19–44]	0.007
Sevoflurane (%)	2.8 [1.5–3.5]	2.7 [1.4–3.5]	NS	2.7 [1.5–3.5]	2.5 [1.4–3.5]	NS	2.8 [1.8–3.3]	2.7 [1.9–3.5]	NS
HR (bpm)	136 [102–180]	137 [100–167]	NS	138 [107–180]	140 [100–153]	NS	135 [102–169]	137 [102–167]	NS
MAP (mmHg)	46 [20–85]	47 [34–74]	0.003	34 [20–50]	47 [37–59]	0.005	49 [33–85]	46 [34–74]	NS
$StcO_2$ (%)	68 [16–95]	77 [51–95]	0.02	60 [16–79]	78 [59–88]	0.005	70 [58–95]	76 [51–95]	NS

SaO_2: arterial O_2 saturation; $ETCO_2$: end tidal CO_2; HR: heart rate; MAP: mean arterial pressure; $StcO_2$: cerebral O_2 saturation.

StcO2 < 59% 10 min après IOT et avant RV ou delta StcO2> 28% => réponse + au RV

Chirurgie mineure pour < 3 mois??



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VASOPRESSEURS

EPHEDRINE

Mécanisme:

- Action via les récepteurs adrénergiques
- Stimulation récepteurs **alpha et béta**, libération NAD endogène (épuisable)

Effet clinique:

- **Vasoconstricteurs** puissant, inotrope et chronotrope
- **Augmente la PA et la FC**
- **Conservation débit cardiaque**

Posologie:

- Vidal: 0,1 à 0,2mg/kg toutes les 4-6h…
- Etude éphédrine en cours!

PHENYLEPHRINE

Mécanisme*:*

- **Alpha 1 agoniste pure**: **vasoconstriction artérielle et veineuse** puissante
- **Bradycardie reflexe**
- Augmentation post charge

Effets cliniques:

- Augmentation rapide PAM
- Diminution fonction VD
- **Effet sur DC controversé , fonction pré charge dépendance**
- **Vasoconstriction cérébrale**

Posologie*:*

- Bolus 50-100 ug chez l'adulte
- Pas de recommandation pédiatrique
- Recette : 1-5 µg/kg



EPHEDRINE

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De l'oeil au cerveau

Hemodynamic Effects of Intravenous Ephedrine in Infants and Children Anesthetized with Halothane and Nitrous Oxide

Anesth Analg 1996

Noriko Taguchi, MD, Toshiaki Nishikawa, MD, Shinichi Inomata, MD, Masakazu Taguchi, MD, Soichiro Yamashita, MD, and Hiroshi Naito, MD

Department of Anesthesiology, Institute of Clinical Medicine, University of Tsukuba, Tsukuba City, Ibaraki, Japan

110 enfants, 0-15 ans.
Poso: 0.1 ou 0.2 mg/kg
Réponse + faible des enfants < 1 an
Poso nécessaire > 0,1 mg/kg

R073

Utilisation de l'éphédrine pour le traitement de l'hypotension per-anesthésique chez enfant de moins de six mois

P. Boucher [a,b,*], F.-P. Desgranges [a], A. Mahr [a], G. Queyrel [a], R. Caillerez [a], M. De Queiroz [a], K. Berrada [a], D. Chassard [a], O. Rhondali [a]

[a] *Anesthésie pédiatrique, hôpital Femme-Mère-Enfant, Bron, France*
[b] *Anesthésie, CHU de Clermont-Ferrand, Clermont-Ferrand, France*

Dose : 0,7-1,33 mg/kg (médiane=0,25 mg/kg)
Correction TA chez 36/150 patients
Doses d'éphedrine + élevées chez corrigés 0.23 vs 0.3 mg/kg

Dose d'éphédrine (mg/kg)	< 0,3 (n = 88)	0,3–0,6 (n = 36)	≥ 0,6 (n = 17)	p
ΔPAS (%)	17 ± 16	25 ± 18	44 ± 37	< 0,001
ΔPAM (%)	16 ± 19	28 ± 21	42 ± 41	< 0,001

Etude en cours pour détermination posologie chez < 6 mois

Age-Related Cardiovascular Effects of Catecholamines in Anesthetized Piglets

Nancy M. Buckley, Phyllis M. Gootman, Edward L. Yellin, and Paul Brazeau

With the technical assistance of Isaac D. Frasier

1979

PHENYLEPHRINE

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Pediatric Anesthesia

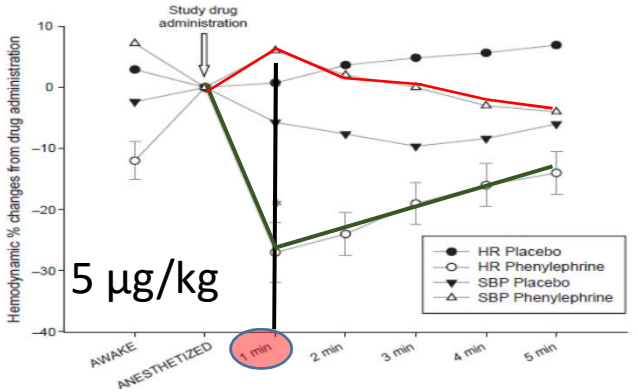
Pediatric Anesthesia ISSN 1155-5645

ORIGINAL ARTICLE

2013

Phenylephrine as a simulated intravascular epidural test dose in pediatrics: a pilot study

Carlo Pancaro[1], Viviane G. Nasr[1], Jessica K. Paulus[2], Iwona Bonney[1], Alejandro F. Flores[3], Jonas B. Galper[4] & Iqbal Ahmed[1]



SBP

FC

5 µg/kg

0031-3998/11/6905-0436
PEDIATRIC RESEARCH
Copyright © 2011 International Pediatric Research Foundation, Inc.
Vol. 69, No. 5, 2011
Printed in U.S.A.

Rapid Assessment of Cerebral Autoregulation by Near-Infrared Spectroscopy and a Single Dose of Phenylephrine

BENDICHT P. WAGNER, ROLAND A. AMMANN, DENIS C. G. BACHMANN, SUSANNE BORN, AND ANDREAS SCHIBLER

British Journal of Anaesthesia **90** (5): 636–41 (2003)
DOI: 10.1093/bja/aeg119

BJA

Cerebral autoregulation in children during sevoflurane anaesthesia†

M. S. Vavilala[1 2]*, L. A. Lee[1], M. Lee[1], A. Graham[2], E. Visco[1] and A. M. Lam[1 3]

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EFFETS SUR OXYGENATION CEREBRALE

neurocritical care society Neurocrit Care (2010) 12:17–23
DOI 10.1007/s12028-009-9313-x

ORIGINAL ARTICLE

Phenylephrine but not Ephedrine Reduces Frontal Lobe Oxygenation Following Anesthesia-Induced Hypotension

Peter Nissen · Patrice Brassard · Thomas B. Jørgensen · Niels H. Secher

British Journal of Anaesthesia **107** (2): 209–17 (2011)
Advance Access publication 3 June 2011 · doi:10.1093/bja/aer150

BJA

NEUROSCIENCES AND NEUROANAESTHESIA

Effect of phenylephrine and ephedrine bolus treatment on cerebral oxygenation in anaesthetized patients

L. Meng[1*], M. Cannesson[1], B. S. Alexander[1], Z. Yu[2], Z. N. Kain[1], A. E. Cerussi[3], B. J. Tromberg[3] and W. W. Mantulin[3]

Chez l'adulte…

A Decrease in Spatially Resolved Near-Infrared Spectroscopy-Determined Frontal Lobe Tissue Oxygenation by Phenylephrine Reflects Reduced Skin Blood Flow

Shigehiko Ogoh, PhD,* Kohei Sato, PhD,† Kazunobu Okazaki, PhD,‡ Tadayoshi Miyamoto, PhD,§ Frederik Secher, ‖ Henrik Sørensen, PhD,‖ Peter Rasmussen, PhD,¶ and Niels H. Secher, MD, DMSc‖

Anesth Analg 2014

British Journal of Anaesthesia **113** (3): 452–8 (2014)
Advance Access publication 6 February 2014 · doi:10.1093/bja/aet481

BJA

External carotid artery flow maintains near infrared spectroscopy-determined frontal lobe oxygenation during ephedrine administration

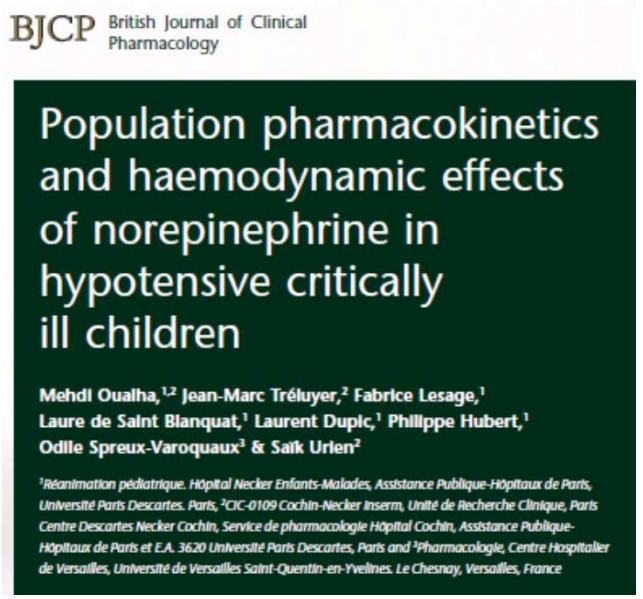
H. Sørensen[1*], P. Rasmussen[2], K. Sato[3], S. Persson[1], N. D. Olesen[1], H. B. Nielsen[1], N. V. Olsen[2,4], S. Ogoh[5] and N. H. Secher[1]

Avec le soutien de Fondation A. de Rothschild De l'oeil au cerveau

NORADRENALINE

De plus en plus utilisée en réa pédiatrique

- Mécanisme:
  - Alpha1 et Alpha2 puissant B1 faible
- Effets cliniques:
  - Vasoconstricteur puissant,Augmentation de la contractilité, BDC reflexe
  - **Autorégulation préservée dans TC**
  - **Efficacité fonction âge, poids, sévérité**
- Posologie:
  - Vidal : Non recommandée chez l'enfant…
  - Début 0,1ug/kg/min


BJCP British Journal of Clinical Pharmacology

Population pharmacokinetics and haemodynamic effects of norepinephrine in hypotensive critically ill children

Mehdi Oualha,[1,2] Jean-Marc Tréluyer,[2] Fabrice Lesage,[1] Laure de Saint Blanquat,[1] Laurent Dupic,[1] Philippe Hubert,[1] Odile Spreux-Varoquaux[3] & Saïk Urien[2]

[1]Réanimation pédiatrique. Hôpital Necker Enfants-Malades, Assistance Publique-Hôpitaux de Paris, Université Paris Descartes. Paris, [2]CIC-0109 Cochin-Necker Inserm, Unité de Recherche Clinique, Paris Centre Descartes Necker Cochin, Service de pharmacologie Hôpital Cochin, Assistance Publique-Hôpitaux de Paris et E.A. 3620 Université Paris Descartes, Paris and [3]Pharmacologie, Centre Hospitalier de Versailles, Université de Versailles Saint-Quentin-en-Yvelines. Le Chesnay, Versailles, France


Should Norepinephrine, Rather than Phenylephrine, Be Considered the Primary Vasopressor in Anesthetic Practice?

Berend Mets, MBChB, PhD, FRCA, FFA(SA)

Anesth Analg 2016

DOPAMINE - DOBUTAMINE

- Dobutamine : inotrope +
- Dopamine : encore recommandée mais de moins en moins utilisée…

ELSEVIER MASSON
Disponible en ligne sur www.sciencedirect.com
ScienceDirect
Annales Françaises d'Anesthésie et de Réanimation 26 (2007) 576–580
annales françaises d'ANESTHÉSIE ET DE RÉANIMATION
http://france.elsevier.com/direct/ANNFAR/

Congrès de l'Adarpef

Existe-t-il encore une place pour la dopamine en réanimation pédiatrique ? ☆

Is there still a place for dopamine in the paediatric critical care setting?

F. Leclerc*, A. Sadik

Service de réanimation pédiatrique, hôpital Jeanne-de-Flandre, faculté de médecine, université de Lille-II, avenue E.-Avinée, 59037 Lille cedex, France

Disponible sur internet le 22 mai 2007

QUELLE(S) VOIE(S) D'ADMINISTRATION?

Should Norepinephrine, Rather than Phenylephrine, Be Considered the Primary Vasopressor in Anesthetic Practice?

Berend Mets, MBChB, PhD, FRCA, FFA(SA)

Anesth Analg 2016

Concentration
5 µg/ml
sur VVP

The Use of Vasoactive Agents Via Peripheral Intravenous Access During Transport of Critically Ill Infants and Children

David A. Turner, MD and Monica E. Kleinman, MD†*

Pediatric Emergency Care • Volume 26, Number 8, August 2010

Vasoactive Medications	No. Patients (%) (n = 73)
Dopamine monotherapy	66 (90)
Epinephrine monotherapy	2 (3)
Dobutamine plus phenylephrine (Neo-Synephrine)	1 (1)
Dopamine plus additional agents	4 (5)
Dopamine and epinephrine	3
Dopamine, dobutamine, and epinephrine	1

- VVC
  - tous…..
- VVP
  - phényléphrine, éphédrine
  - NAD??

Faut-il vraiment traiter??

Under pressure to treat?

Eugene Michael Dempsey[1,2]

It is the responsibility of the clinical and research community to try and finally answer the question: when is it safe to not treat?

Arch Dis Child Fetal Neonatal Ed September 2015 Vol 100 No 5

hypoTA avec NIRS normale???



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CHEZ PREMATURE

Neonatology. 2009;95(4):311-6. doi: 10.1159/000180113. Epub 2008 Dec 4.

Early treated hypotension and outcome in very low birth weight infants.

Kuint J[1], Barak M, Morag I, Maayan-Metzger A.

The SafeBoosC II randomized trial: treatment guided by near-infrared spectroscopy reduces cerebral hypoxia without changing early biomarkers of brain injury

Pediatric RESEARCH Volume 79 | Number 4 | April 2016

Anne M. Plomgaard[1], Wim van Oeveren[2], Tue H. Petersen[3], Thomas Alderliesten[4], Topun Austin[5], Frank van Bel[4], Manon Benders[4], Olivier Claris[6], Eugene Dempsey[7], Axel Franz[8], Monica Fumagalli[9], Christian Gluud[10], Cornelia Hagmann[11], Simon Hyttel-Sorensen[1], Petra Lemmers[4], Adelina Pellicer[12], Gerhard Pichler[13], Per Winkel[10] and Gorm Greisen[1]

ORIGINAL ARTICLES www.jpeds.com • The Journal of Pediatrics

Hypotension in Preterm Neonates: Low Blood Pressure Alone Does Not Affect Neurodevelopmental Outcome

Thomas Alderliesten, MD, Petra M. A. Lemmers, MD, PhD, Ingrid C. van Haastert, MA, PhD, Linda S. de Vries, MD, PhD, Hilde J. C. Bonestroo, MD, Willem Baerts, MD, PhD, and Frank van Bel, MD, PhD

Early Systemic Hypotension and Vasopressor Support in Low Birth Weight Infants: Impact on Neurodevelopment

Adelina Pellicer, MD, PhD[a], María del Carmen Bravo, MD[a], Rosario Madero, MD[b], Sofía Salas, MD[a], José Quero, MD, PhD[a], Fernando Cabañas, MD, PhD[a]

Pediatrics 2009

PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Effect of Antihypotensive Treatment on Cerebral Oxygenation of Preterm Infants Without PDA

Hilde J. C. Bonestroo, Petra M. A. Lemmers, Wim Baerts and Frank van Bel
Pediatrics 2011;128;e1502; originally published online November 7, 2011; DOI: 10.1542/peds.2010-3791

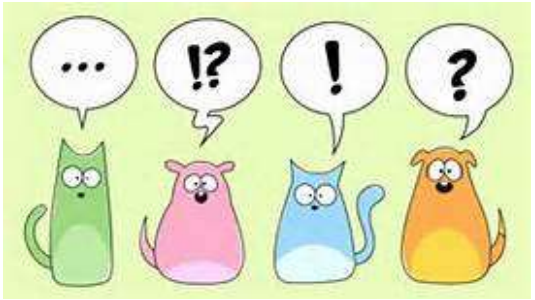


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PAS D'ETUDE CHEZ NOURRISSONS…

QUESTIONS

- PAM= seul objectif? TA≠flux
- **Débits/ oxygénation régionaux?**
- Conséquences sur développement neuro?
- Monitoring?
  - Non-invasif
  - Invasif



Neonatal Intensive Care

Increasing Mean Arterial Blood Pressure and Heart Rate With Catecholaminergic Drugs Does Not Improve the Microcirculation in Children With Congenital Diaphragmatic Hernia: A Prospective Cohort Study

Erik A. B. Buijs, MSc[1]; Irwin K. M. Reiss, MD, PhD[2]; Ulrike Kraemer, MD[1]; Eleni-Rosalina Andrinopoulou, MSc[3]; Alexandra J. M. Zwiers, MSc[1]; Can Ince, PhD[1]; Dick Tibboel, MD, PhD[1]

2014

"It is a source of regret that measurement of flow is much more difficult than measurement of pressure. This has led to an undue interest in blood pressure measurements." This statement by Austrian physician Adolf Jarisch Jr, almost 100 years ago

CONCLUSION

- Tout d'abord mesurer la tension….. faute de mieux….
- Physiopathologie complexe
- Thérapeutiques personnalisées
  - Age
  - Terrain
  - Chirurgie
- Monitorage?
- Objectif**s** : PAS, PAM, NIRS, bio, débit cardiaque?



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SAFETOTS

Safetots.org initiative addresses the teaching, training, education and supervision of the safe conduct of pediatric anesthesia.

l'Adarpef soutient l'initiative Safetots, qui aborde le thème de la pratique en toute sécurité de l'anesthésie pédiatrique, par l'enseignement et la formation. Pour en savoir plus: voir le lien



MERCI

Prochains RDV : SFAR 2017 et congrès des sociétés pédiatriques Lyon 2018