ARCOTHOVA
Anesthésie-Réanimation Coeur-Thorax-Vaisseaux

Qualiopi
processus certifié
RÉPUBLIQUE FRANÇAISE

PRÉDICTION DE L'HYPOTENSION ARTÉRIELLE EN CHIRURGIE THORACIQUE

DR RUSTE MARTIN
HÔPITAL CARDIOLOGIQUE LOUIS PRADEL
CHU LYON

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CONFLITS D’INTÉRÊTS :

AUCUN

1. INTRODUCTION

RATIONNEL

HYPOTENSION ARTÉRIELLE ET MORBIMORTALITE

Relationship between Intraoperative Mean Arterial Pressure and Clinical Outcomes after Noncardiac Surgery: Toward an Empirical Definition of Hypotension

Michael Walsh, M.D. ; Philip J. Devereaux, M.D., Ph.D.; Amit X. Garg, M.D., Ph.D.; Andrea Kurz, M.D.; Alparslan Turan, M.D.; Reitze N. Rodseth, M.D.; Jacek Cywinski, M.D.; Lehana Thabane, Ph.D.; Daniel I. Sessler, M.D.

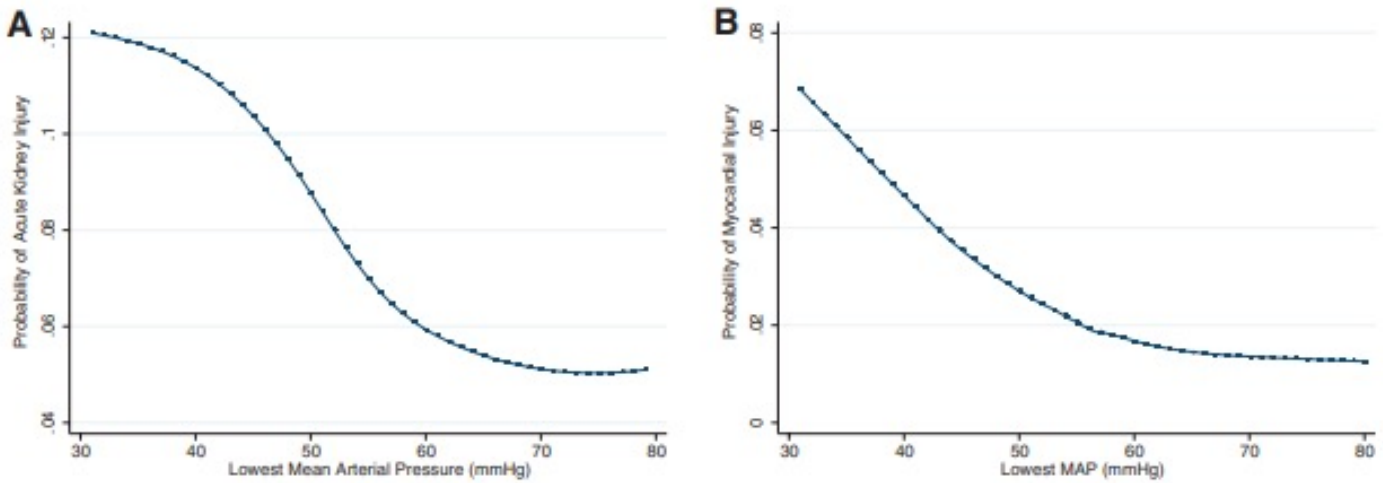


Fig. 3. Predicted probability of (*A*) acute kidney injury and (*B*) myocardial injury by lowest mean arterial pressure (MAP) experienced during surgery.

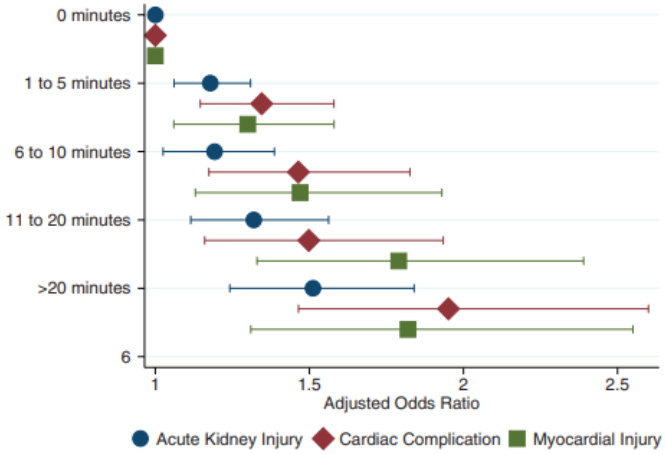


Fig. 4. Adjusted odds ratios for acute kidney injury, cardiac complications, and myocardial injury by time spent with a mean arterial pressure <55 mmHg.

Walsh et al. Anesthesiology 2013

Best Practice & Research Clinical Anaesthesiology
Volume 33, Issue 2, June 2019, Pages 189-197

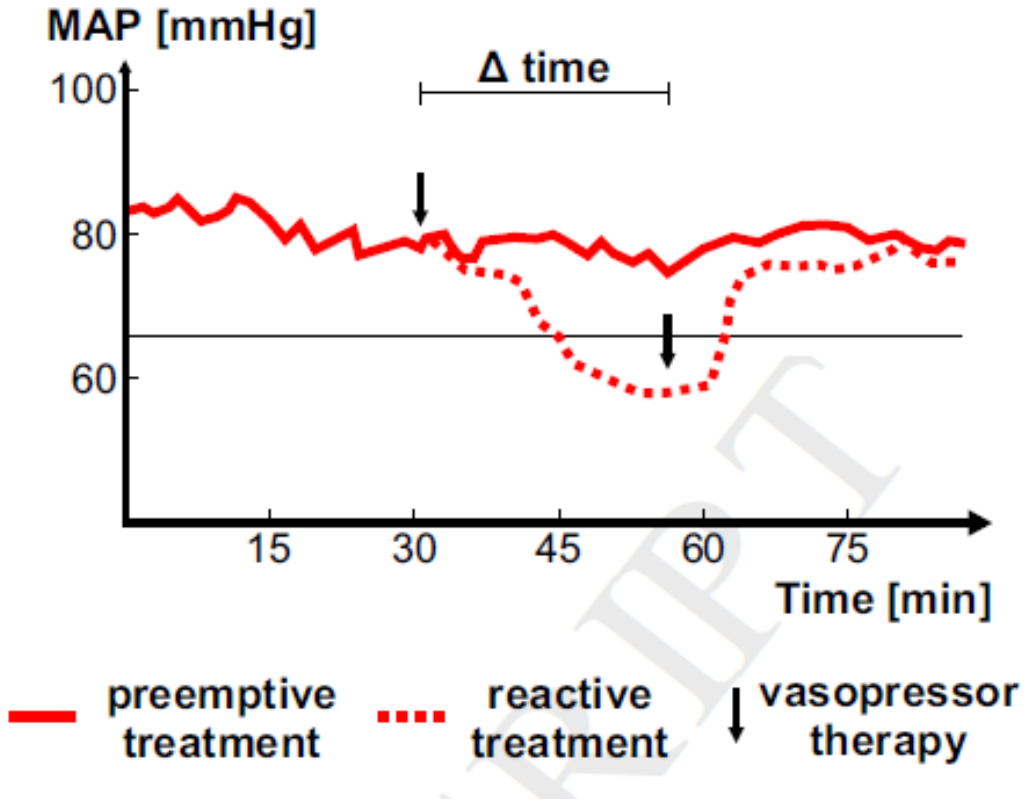
6

Predicting hypotension in perioperative and intensive care medicine

Bernd Saugel (Professor, Anesthesiology) [a, b, 1], Karim Kouz (Resident, Anesthesiology) [a, 1], Phillip Hoppe (Resident, Anesthesiology) [a], Kamal Maheshwari (Staff Anesthesiologist) [c], Thomas W.L. Scheeren (Professor, Anesthesiology) [d]

RATIONNEL

PRÉDICTION DE L'HYPOTENSION ARTÉRIELLE

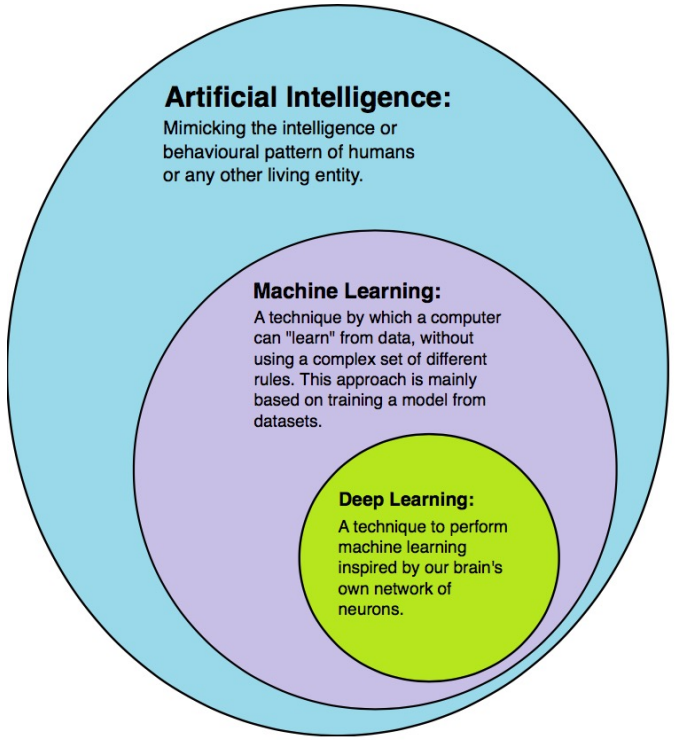


Saugel et al. BPRCA 2019

2. INTELLIGENCE ARTIFICIELLE ET PRÉDICTION DE L'HYPOTENSION ARTÉRIELLE

PRÉDICTION DE L'HYPOTENSION

PRINCIPE : UTILISATION DE MACHINE LEARNING



Wilkipédia

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PRÉDICTION DE L'HYPOTENSION

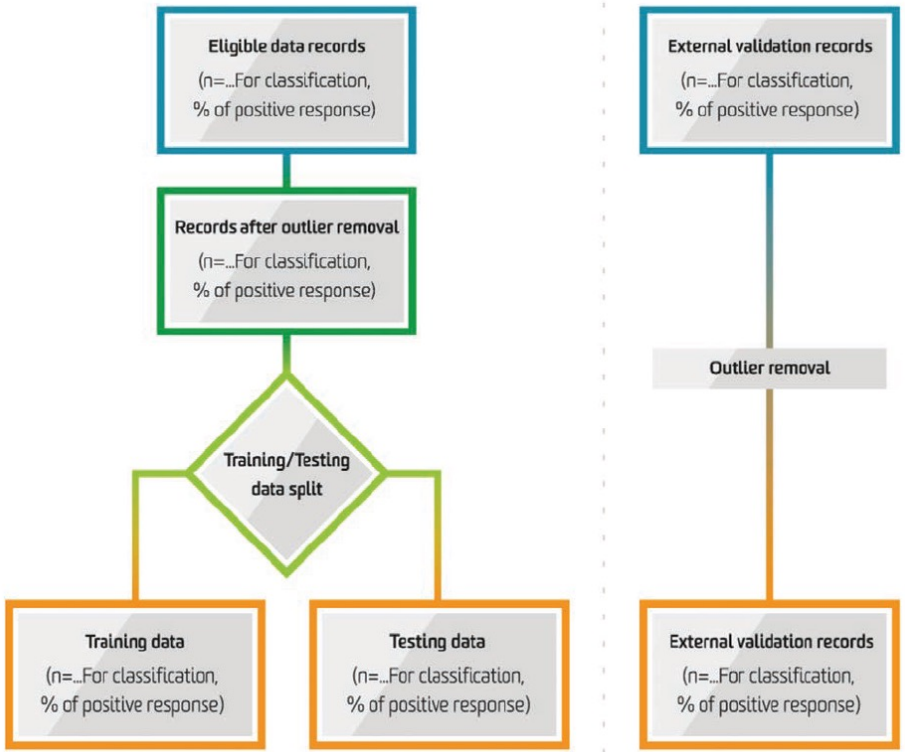
PRINCIPE : UTILISATION DE MACHINE LEARNING

JOURNAL OF MEDICAL INTERNET RESEARCH Luo et al

Original Paper

Guidelines for Developing and Reporting Machine Learning Predictive Models in Biomedical Research: A Multidisciplinary View

Wei Luo[1*], PhD; Dinh Phung[2*], PhD; Truyen Tran[2*], PhD; Sunil Gupta[2*], PhD; Santu Rana[2*], PhD; Chandan Karmakar[2*], PhD; Alistair Shilton[2*], PhD; John Yearwood[2*], PhD; Nevenka Dimitrova[3*], PhD; Tu Bao Ho[4*], PhD; Svetha Venkatesh[2*], PhD; Michael Berk[2*], PhD, FRACP



Luo et al. Journal of medical interest research 2016

PRÉDICTION DE L'HYPOTENSION

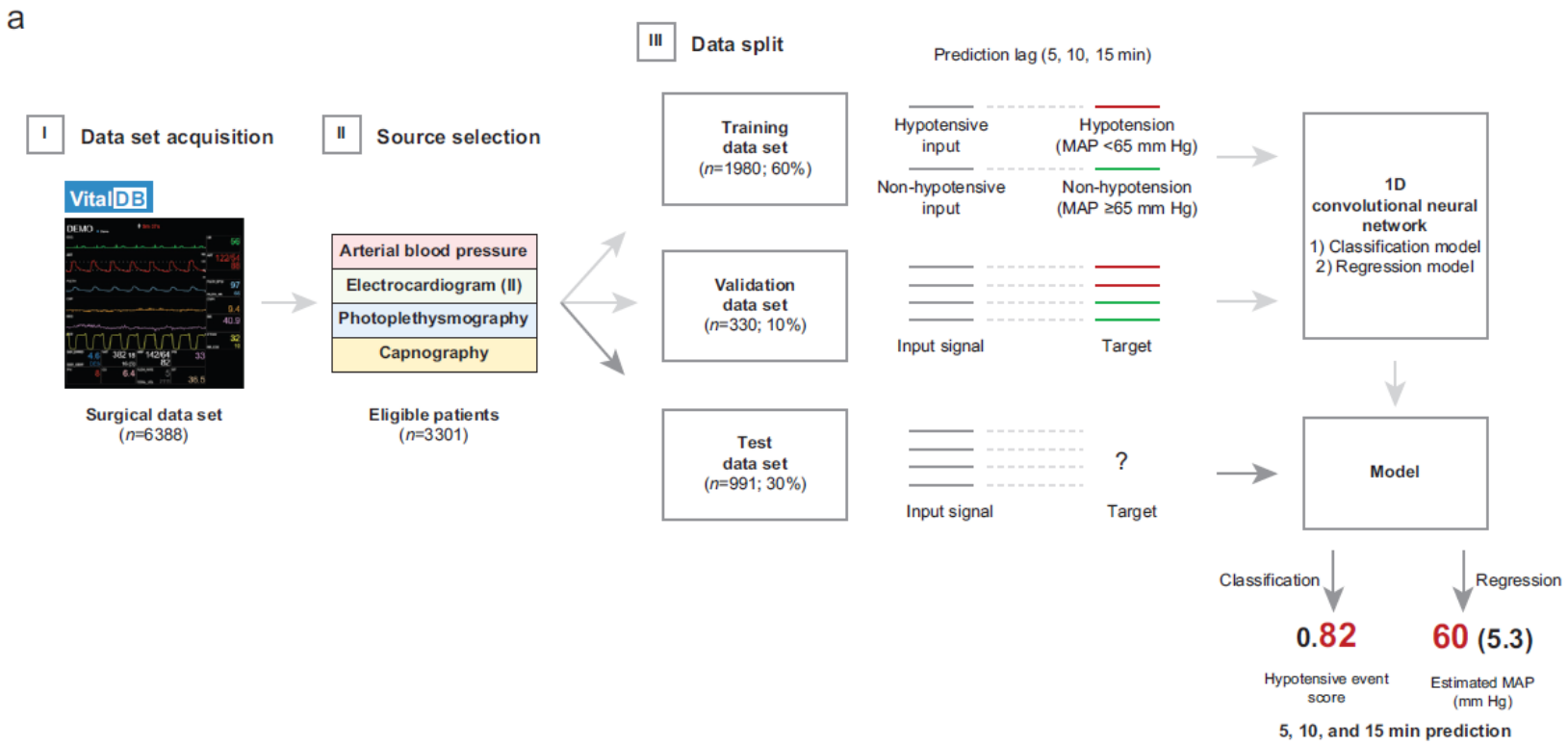
EXEMPLE : DEEP LEARNING

BJA

British Journal of Anaesthesia, 126 (4): 808–817 (2021)
doi: 10.1016/j.bja.2020.12.035
Advance Access Publication Date: 6 February 2021
Clinical Practice

Deep learning models for the prediction of intraoperative hypotension

Solam Lee[1,2], Hyung-Chul Lee[3], Yu Seong Chu[4], Seung Woo Song[5], Gyo Jin Ahn[6], Hunju Lee[1], Sejung Yang[6,*] and Sang Baek Koh[1,*]



Lee et al. BJA 2021

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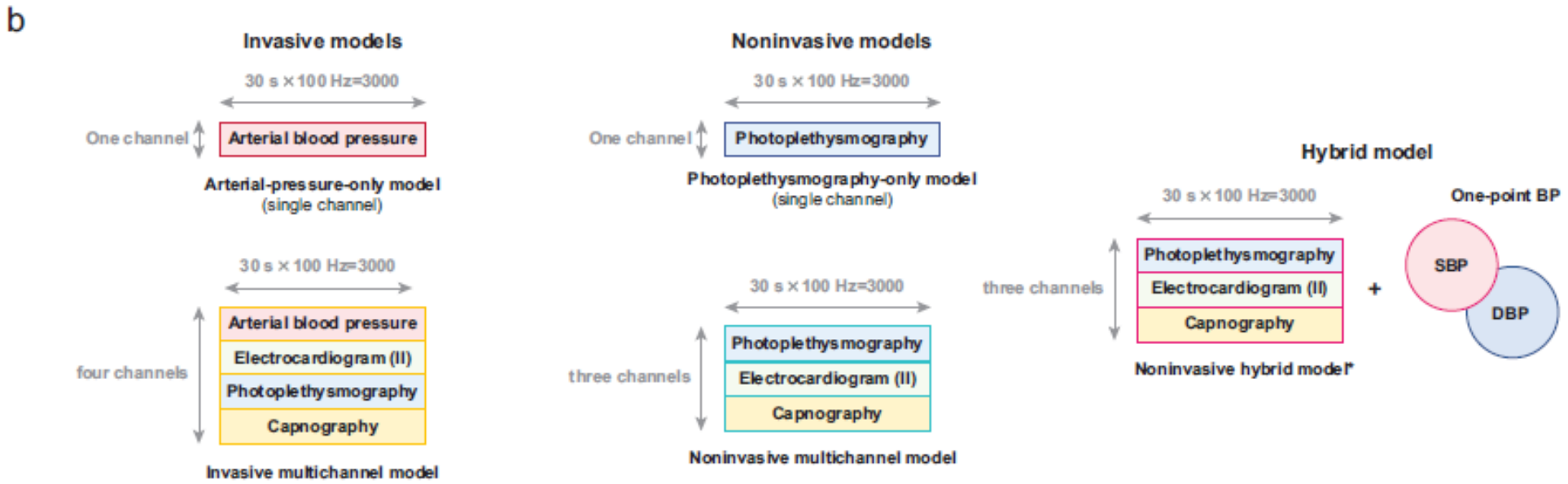

Lee et al. BJA 2021

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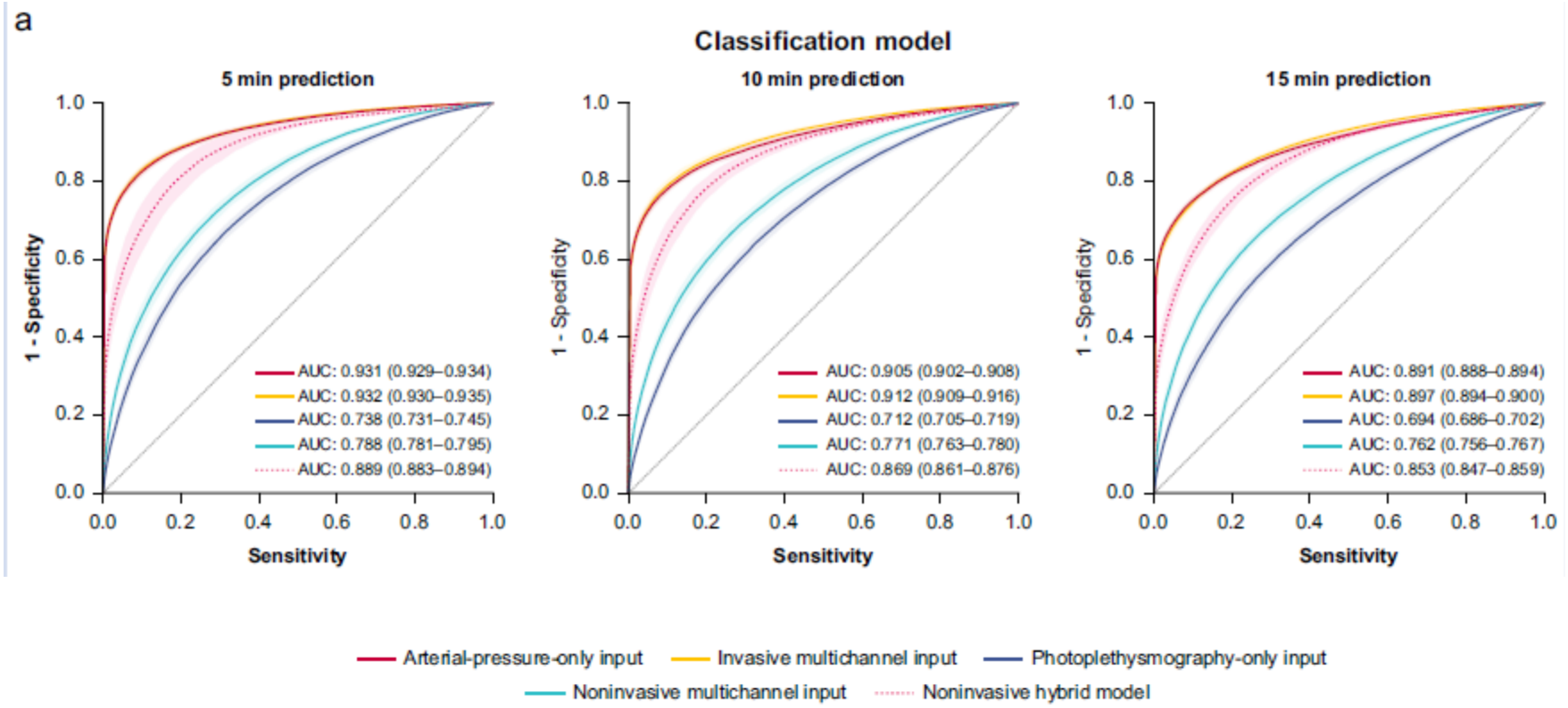

Lee et al. BJA 2021

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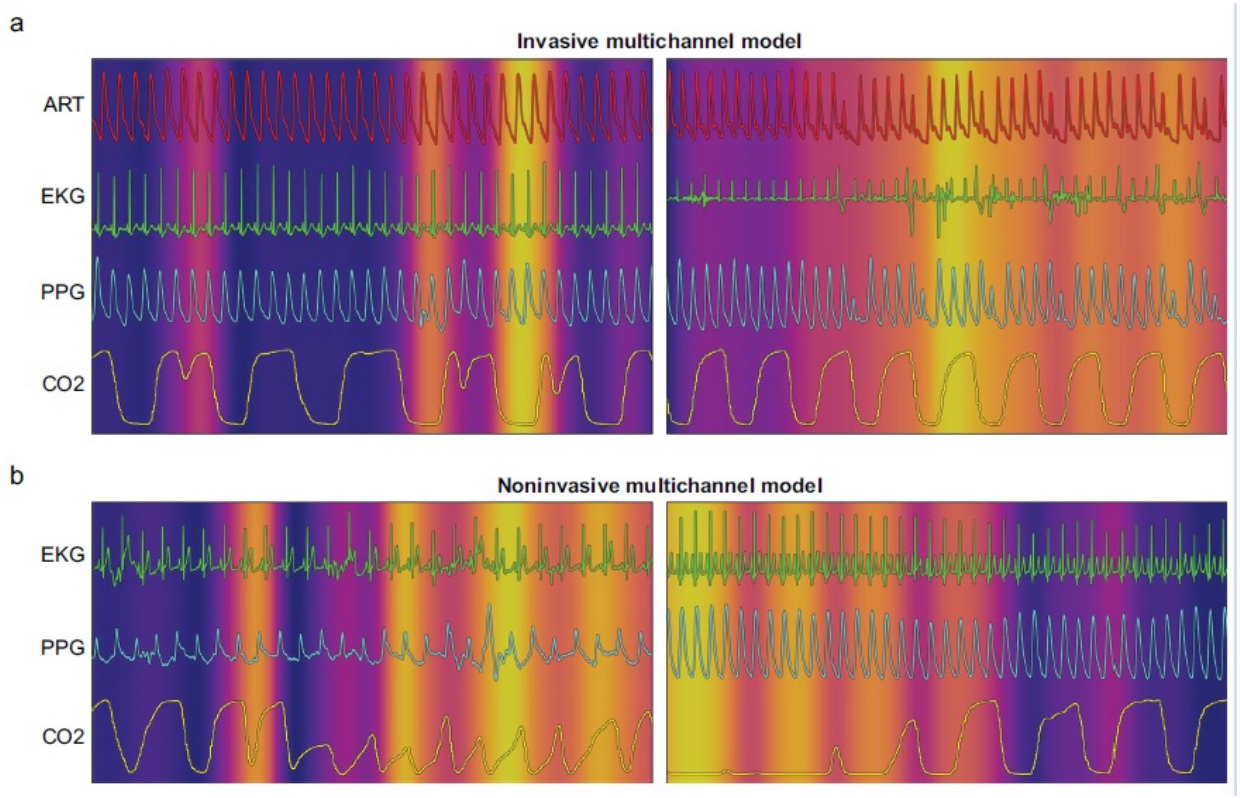

Lee et al. BJA 2021

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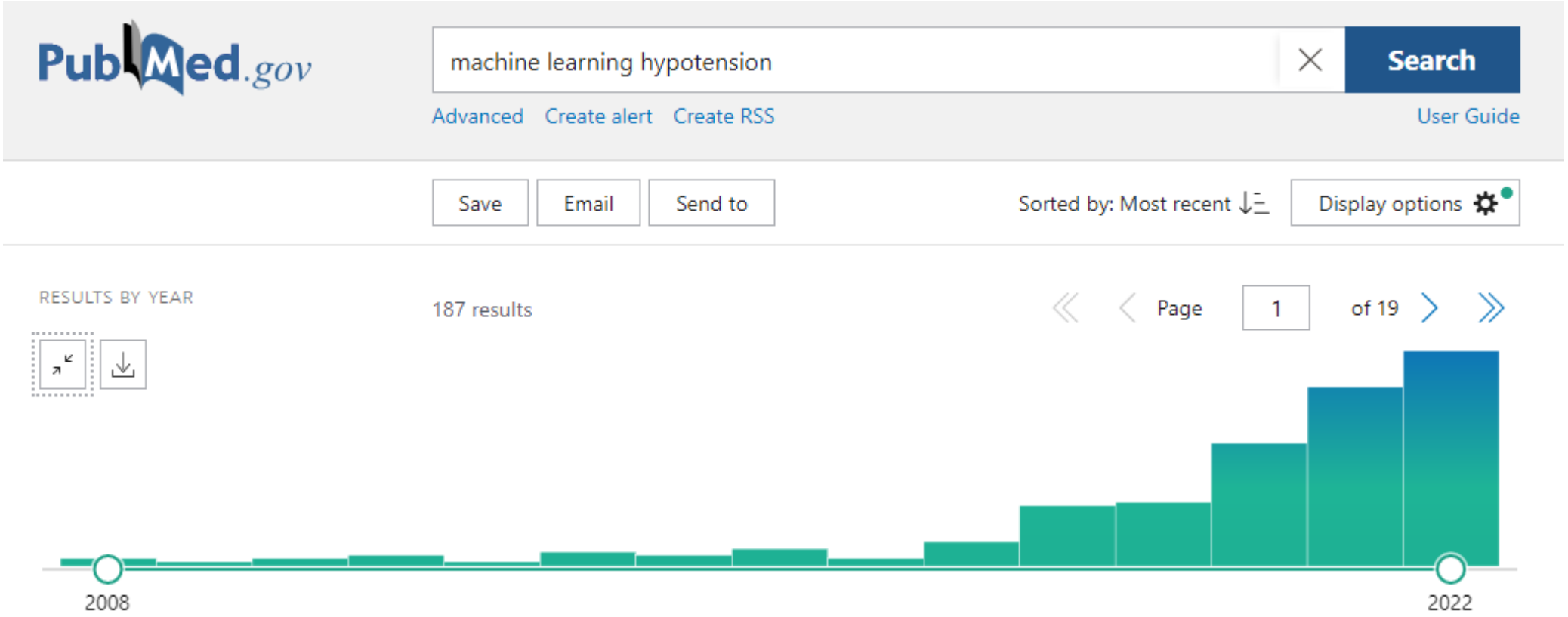
PRÉDICTION DE L'HYPOTENSION

EN PLEIN DÉVELOPPEMENT



3. INTÉRÊT CLINIQUE ET LIMITES DE LA PRÉDICTION DE L'HYPOTENSION : EXEMPLE DE L'HPI

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PRÉDICTION DE L'HYPOTENSION

EXEMPLE HPI : RATIONNEL

Best Practice & Research Clinical Anaesthesiology
Volume 33, Issue 2, June 2019, Pages 189-197

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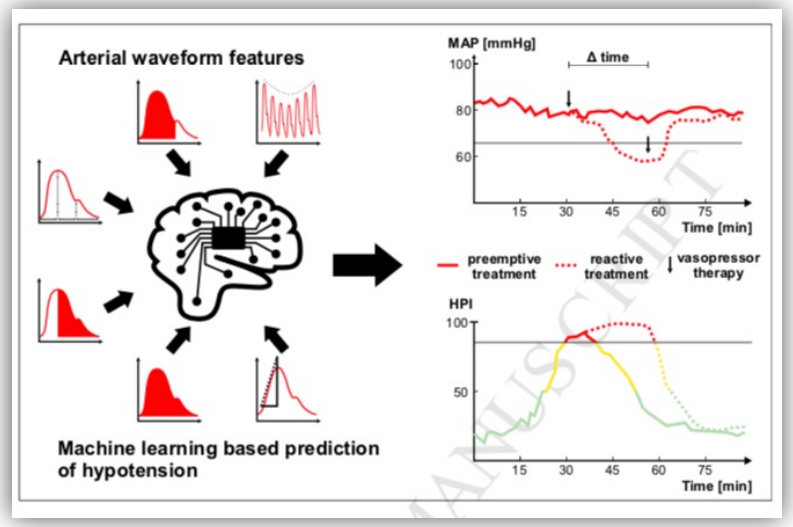
- La survenue d'une hypotension artérielle est tardive
  - Baroréflexe
  - Système RAA
- Changements progressifs donc difficilement perceptibles
- Mécanismes complexes, dynamiques et interdépendants
- Volume important de données + modèle de prédiction complexe ➔ Machine learning



Saugel et al. BPRCA 2019

PRÉDICTION DE L'HYPOTENSION

Perioperative Medicine | October 2018

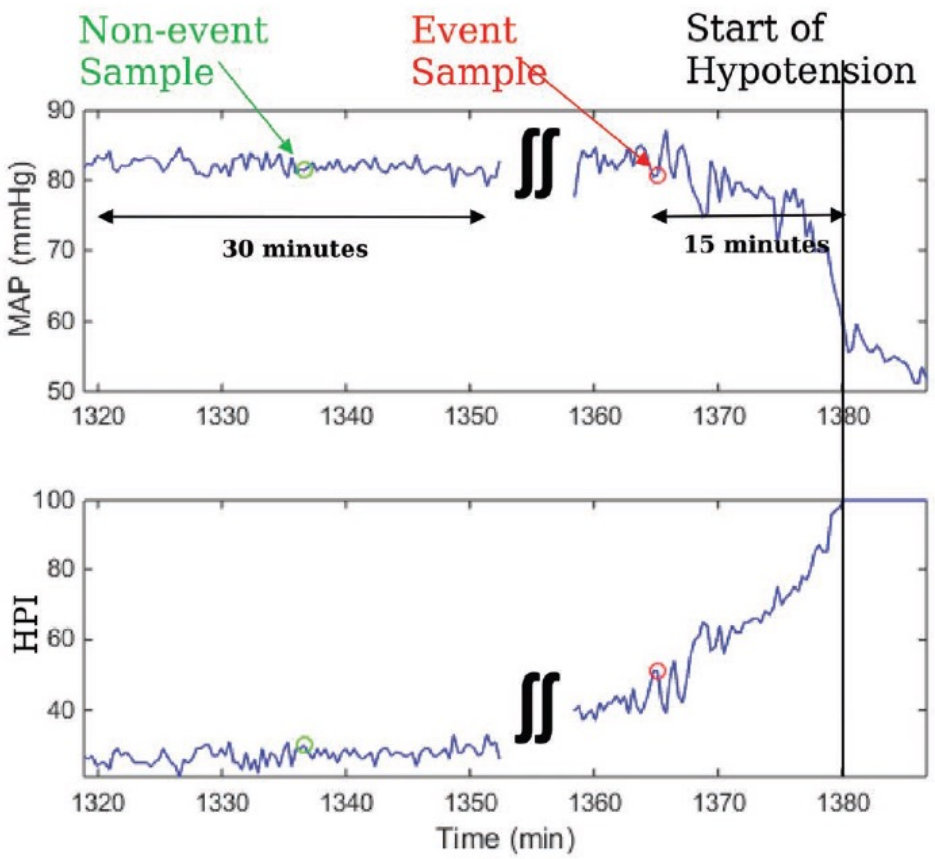
Machine-learning Algorithm to Predict Hypotension Based on High-fidelity Arterial Pressure Waveform Analysis FREE

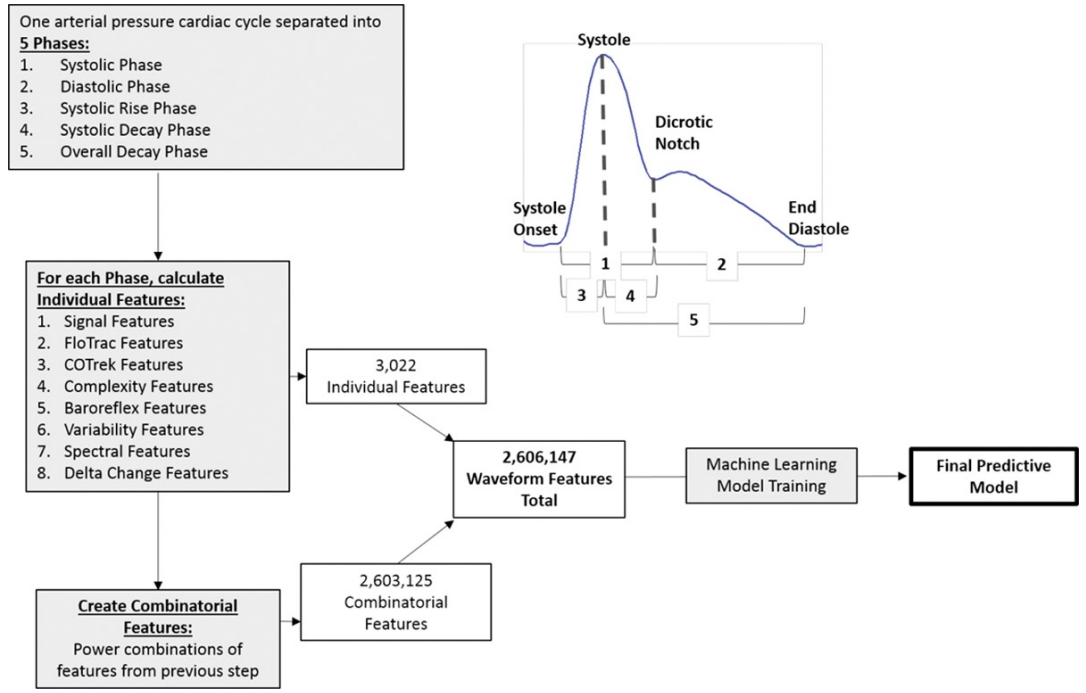
Feras Hatib, Ph.D.; Zhongping Jian, Ph.D.; Sai Buddi, Ph.D.; Christine Lee, M.S.; Jos Settels, M.S.; Karen Sibert, M.D., F.A.S.A.; Joseph Rinehart, M.D.; Maxime Cannesson, M.D., Ph.D.

+ Author and Article Information

Anesthesiology October 2018, Vol. 129, 663–674.

HPI : ÉTUDE PRINCEPS





Hatib et al. Anesthesiology 2018

HCL HOSPICES CIVILS DE LYON

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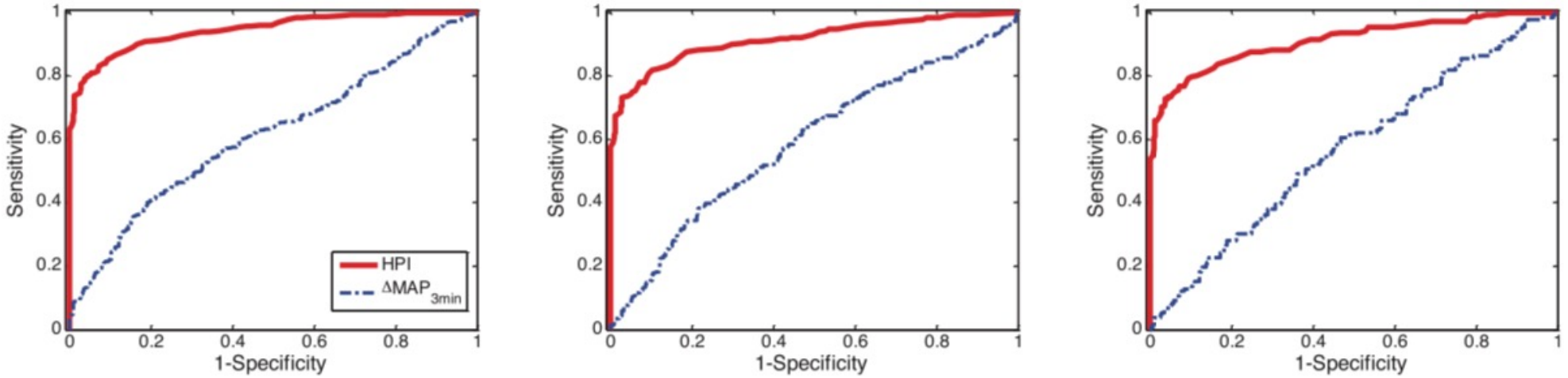

Parameter	Time to Event	AUC	Sensitivity, %	Specificity, %	PPV, %	NPV, %
External validation cohort						
HPI	5 min	0.95 (0.933–0.961)	86.8 (83.6–89.9)	88.5 (84.9–92.0)	93.2 (91.0–95.3)	78.6 (74.3–82.9)
	10 min	0.92 (0.896–0.943)	84.2 (79.6–88.8)	84.3 (80.2–88.4)	83.6 (79.4–87.8)	84.8 (80.8–88.8)
	15 min	0.91 (0.885–0.944)	83.6 (78.2–89.0)	83.3 (78.9–87.8)	74.0 (67.9–80.1)	90.0 (86.5–93.4)

Hatib et al. Anesthesiology 2018

HCL HOSPICES CIVILS DE LYON

PRÉDICTION DE L'HYPOTENSION

HPI : ÉTUDE PRINCEPS

Best Practice & Research Clinical Anaesthesiology
Volume 33, Issue 2, June 2019, Pages 189-197

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- **Limites :**
  - Population de la cohorte d'entrainement mixte
  - Pas de données sur l'hypotension post induction
  - La courbe de pression artérielle ne permet pas de prédire une intervention clinique
  - Comparaison avec le delta MAP peu pertinent
  - Zone grise de pression artérielle entre 65 et 75mmHg

Saugel et al. BPRCA 2019

HCL HOSPICES CIVILS DE LYON

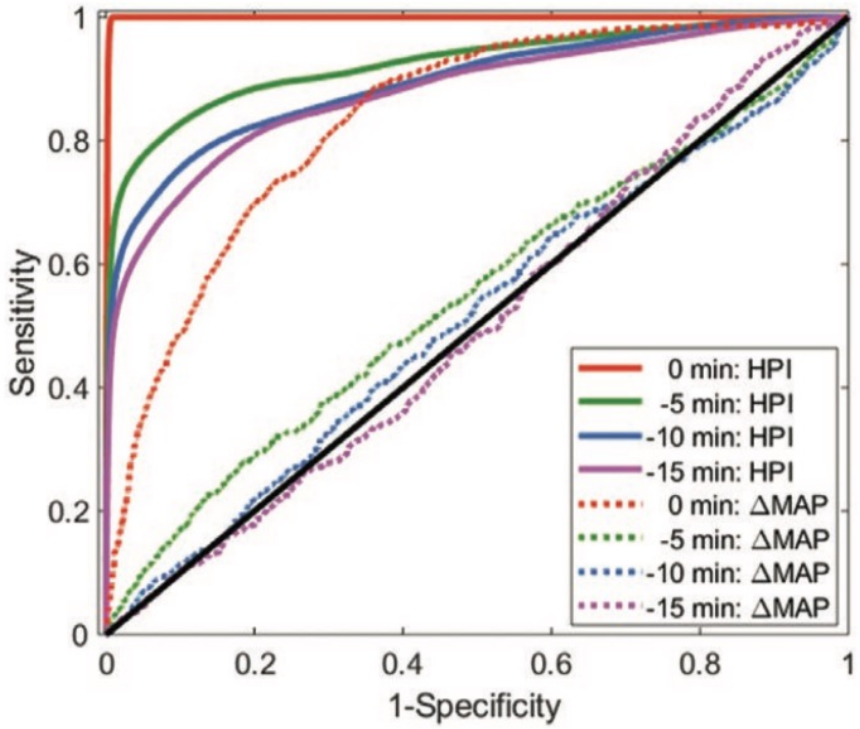
PRÉDICTION DE L'HYPOTENSION

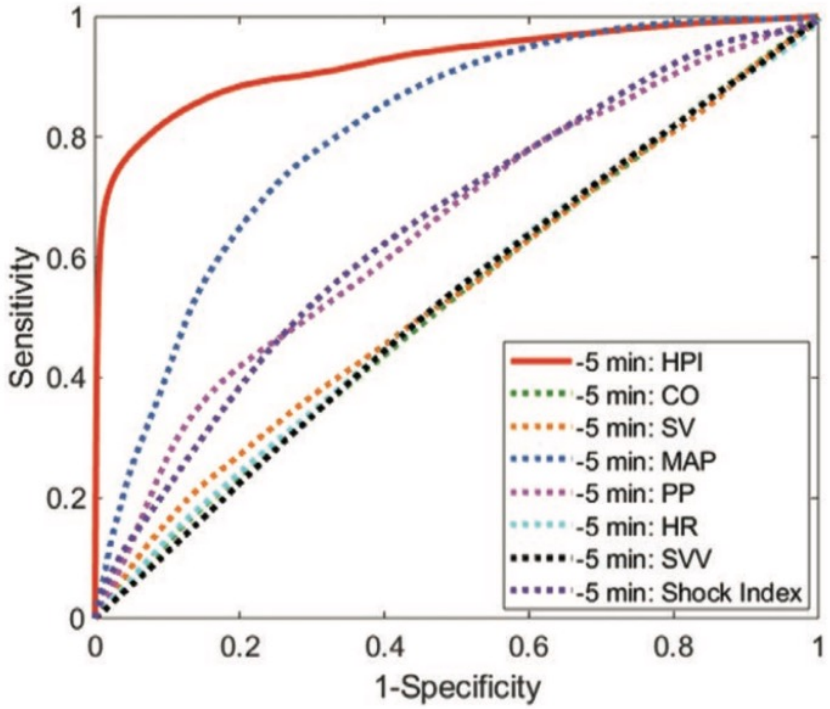
Perioperative Medicine
ORIGINAL CLINICAL RESEARCH REPORT

Ability of an Arterial Waveform Analysis–Derived Hypotension Prediction Index to Predict Future Hypotensive Events in Surgical Patients

Simon James Davies, MD,* Simon Tilma Vistisen, PhD,† Zhongping Jian, PhD,‡ Feras Hatib, PhD,‡ and Thomas W. L. Scheeren, MD, PhD§

HPI : ÉTUDES DE VALIDATION





Davies et al. AA 2020

HCL HOSPICES CIVILS DE LYON

PRÉDICTION DE L'HYPOTENSION

HPI : ÉTUDES DE VALIDATION

EJA

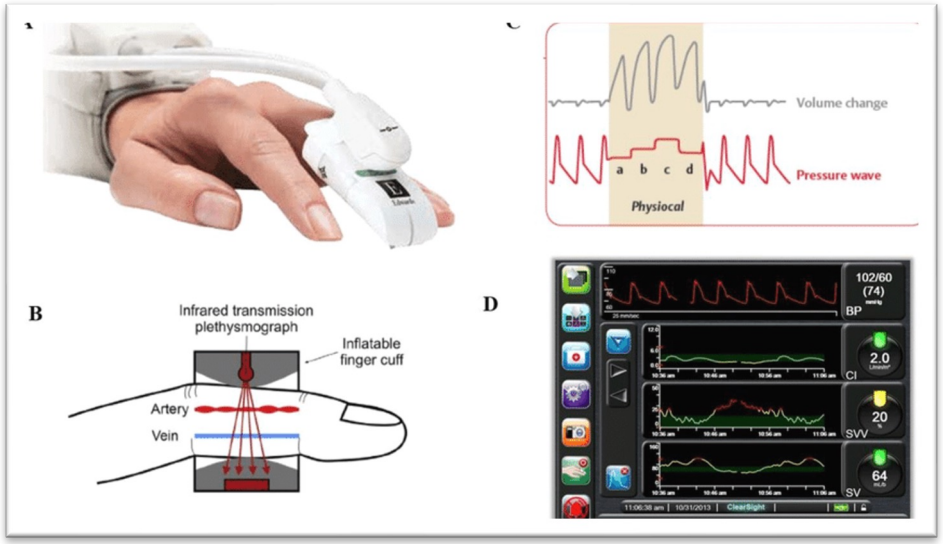
Eur J Anaesthesiol 2021; **38**:609–615

ORIGINAL ARTICLE

Clinical performance of a machine-learning algorithm to predict intra-operative hypotension with noninvasive arterial pressure waveforms

A cohort study

Marije Wijnberge, Björn J.P. van der Ster, Bart F. Geerts, Friso de Beer, Charlotte Beurskens, Dina Emal, Markus W. Hollmann, Alexander P.J. Vlaar and Denise P. Veelo



HPI alarm threshold	Time to event	AUC
HPI in combination with invasive blood pressure measurements (Ha		
>39	5	0.95 (0.93 to 0.96)
>37	10	0.92 (0.90 to 0.94)
>36	15	0.91 (0.89 to 0.94)
HPI in combination with noninvasive blood pressure measurements		
>34	5	0.93 (0.92 to 0.94)
>32	10	0.91 (0.90 to 0.92)
>31	15	0.90 (0.89 to 0.91)

Wijnberge et al. EJA 2021

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PRÉDICTION DE L'HYPOTENSION

HPI : VALIDÉ ?

Best Practice & Research Clinical Anaesthesiology
Volume 33, Issue 2, June 2019, Pages 189-197

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Saugel et al. BPRCA 2019

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PRÉDICTION DE L'HYPOTENSION

HPI : VALIDÉ ?

EJA

Eur J Anaesthesiol 2022; **37**:1–8

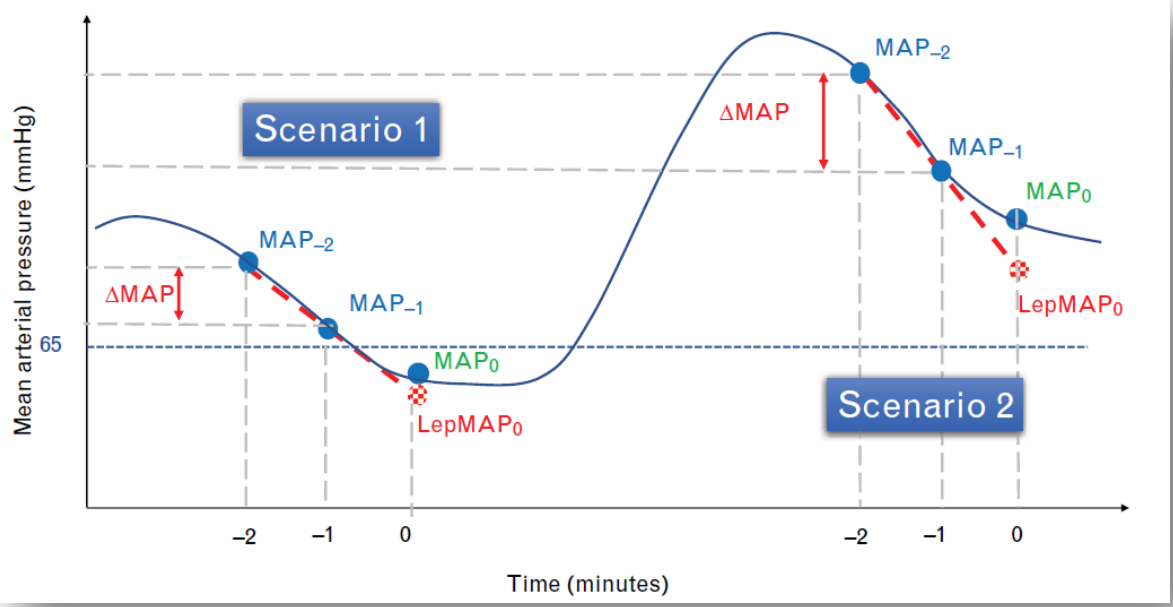
ORIGINAL ARTICLE

Prediction of intraoperative hypotension from the linear extrapolation of mean arterial pressure

Matthias Jacquet-Lagrèze, Antoine Larue, Enrique Guilherme, Rémi Schweizer, Philippe Portran, Martin Ruste, Mathieu Gazon, Frédéric Aubrun and Jean-Luc Fellahi

Intelligence artificielle : « …simuler certains traits de l'intelligence humaine (raisonnement, apprentissage…) »

Dictionnaires le Robert



Exemple :

ΔMAP :
PAM 90 -> 70mmHg = PAM 120 -> 100mmHg

LepMAP :
2x70-90 = 50mmHg
2x100-120 = 80mmHg

Jacquet-Lagrèze et al. EJA 2022

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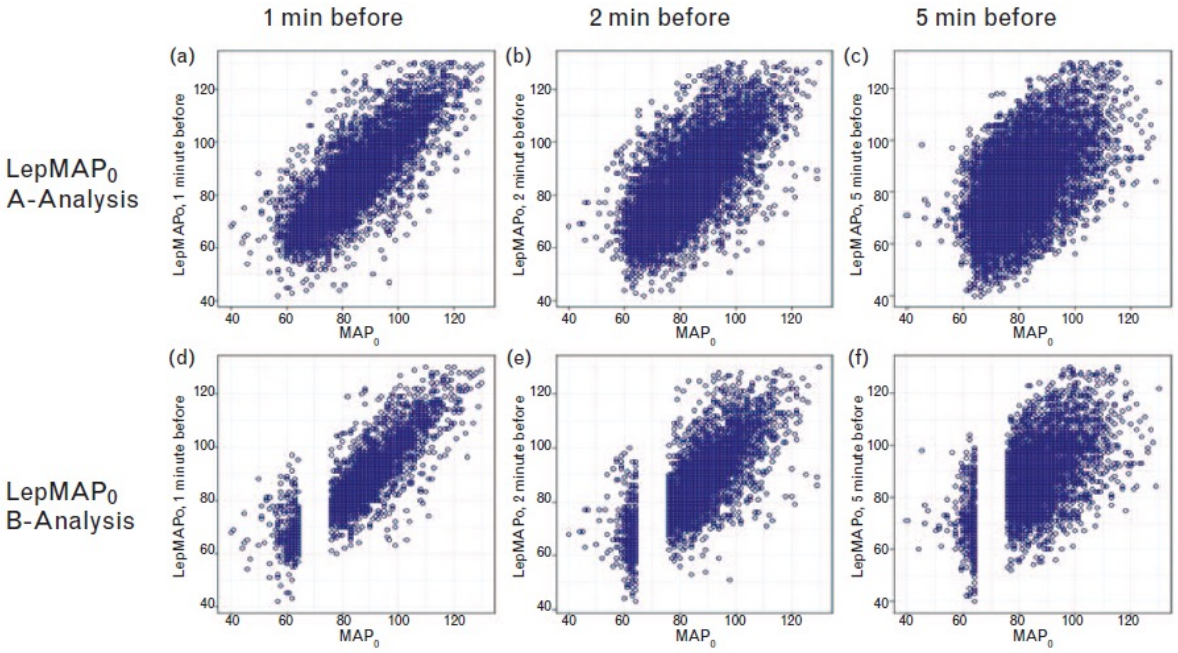

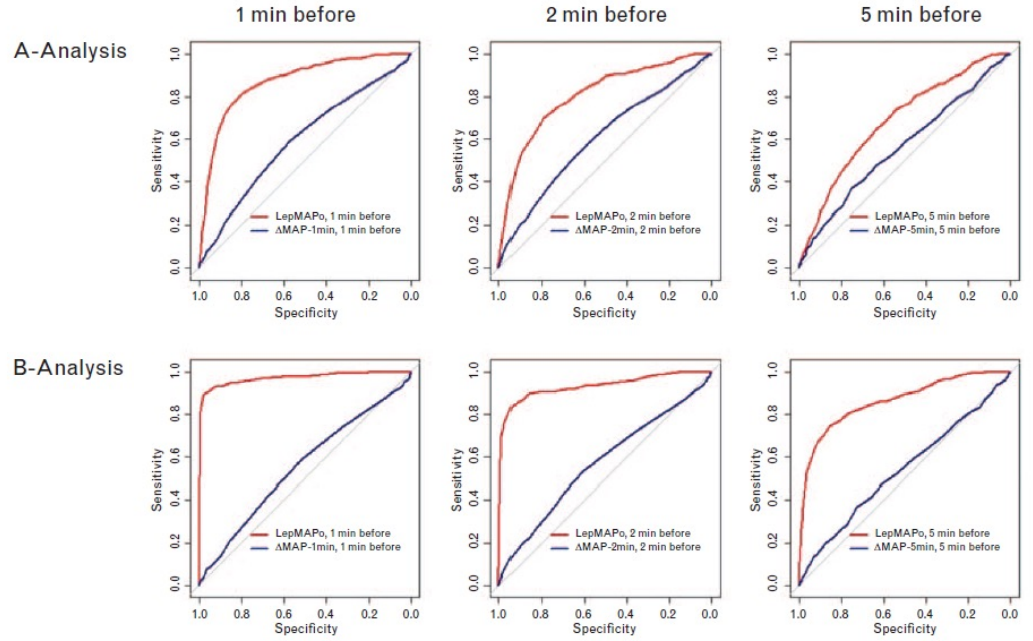

Jacquet-Lagrèze et al. EJA 2022

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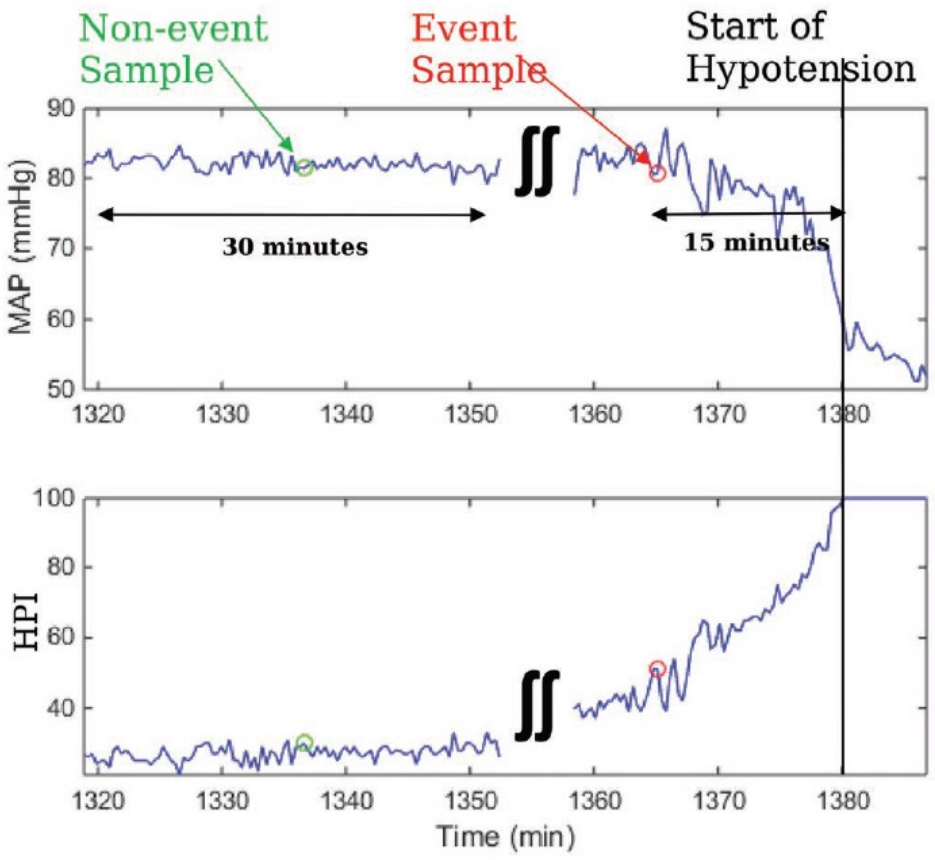
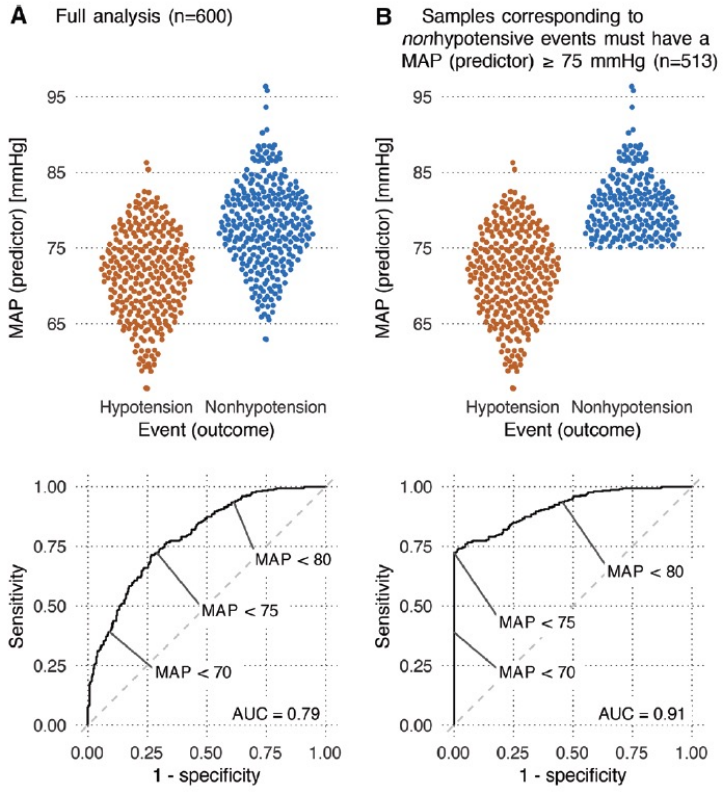


ANESTHESIOLOGY

Performance of the Hypotension Prediction Index May Be Overestimated Due to Selection Bias

Johannes Enevoldsen, M.D., Simon T. Vistisen, M.Sc., Ph.D.

Anesthesiology 2022; 137:283–9



Enevoldsen et al. Anesthesiology 2022

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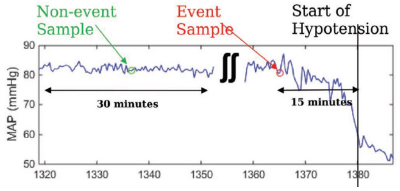

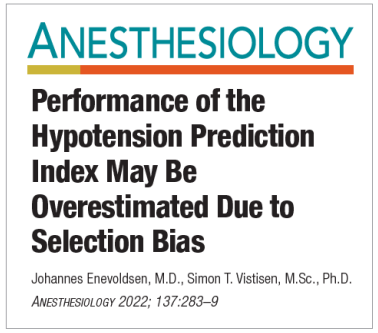

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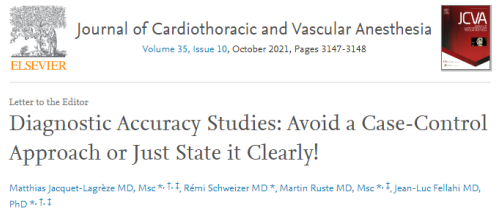
Anesthesiology 2022; 137:283–9

… most HPI values we observe in a clinical setting will not be represented in the analysis, because they are neither 5 min before a hypotensive event nor the midpoint of a nonhypotensive event…



Journal of Cardiothoracic and Vascular Anesthesia

Volume 35, Issue 10, October 2021, Pages 3147-3148

ELSEVIER

Letter to the Editor

Diagnostic Accuracy Studies: Avoid a Case-Control Approach or Just State it Clearly!

Matthias Jacquet-Lagrèze MD, Msc *, †, ‡, Rémi Schweizer MD *, Martin Ruste MD, Msc *, ‡, Jean-Luc Fellahi MD, PhD *, †, ‡

…we can determine that 342 segments only were used to build the receiver operating characteristic curve, far smaller than the 20,779 segments potentially able to be analyzed…

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HOSPICES CIVILS DE LYON

PRÉDICTION DE L'HYPOTENSION

HPI : VALIDÉ ?

ANESTHESIOLOGY

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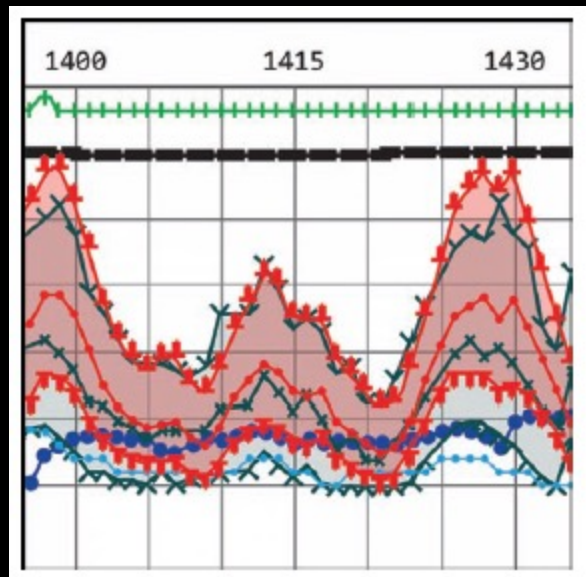
Matthias Jacquet-Lagrèze MD, Msc, Rémi Schweizer MD, Martin Ruste MD, Msc, Jean-Luc Fellahi MD, PhD



"The [Hypotension Prediction] Index needs to be rigorously evaluated in high-quality validation studies that are not affected by selection bias."

Wijeysundera et al. Anesthesiology 2022

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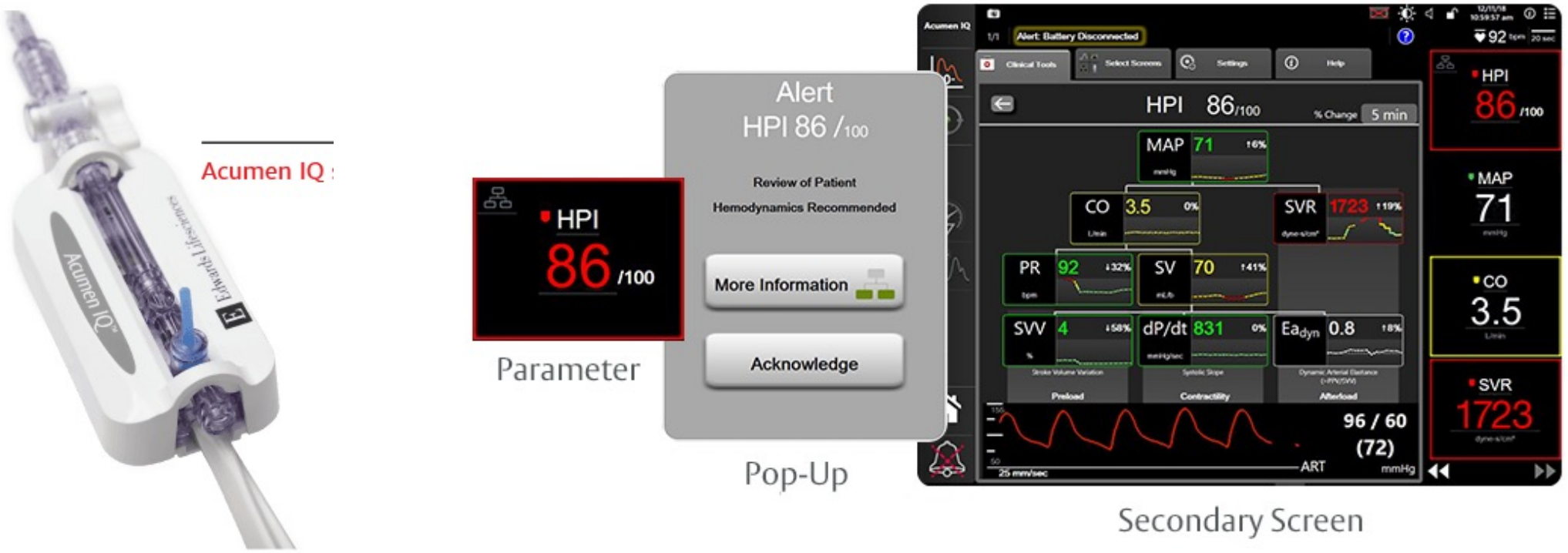
HCL HOSPICES CIVILS DE LYON

PRÉDICTION DE L'HYPOTENSION

ACUMEN IQ (EDWARDS LIFESCIENCES)

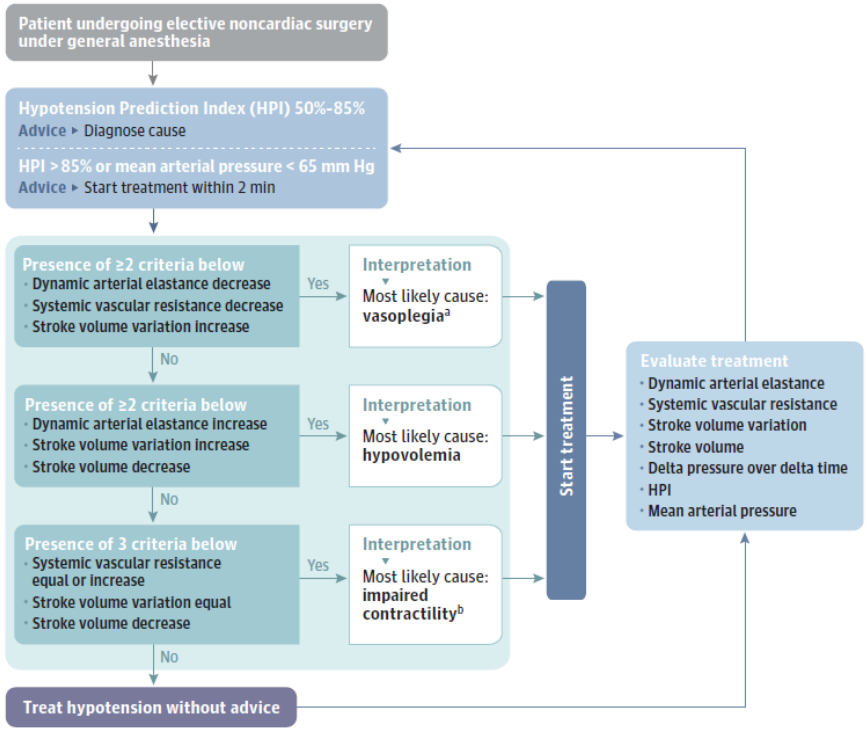


PRÉDICTION DE L'HYPOTENSION

JAMA | Preliminary Communication | CARING FOR THE CRITICALLY ILL PATIENT
Effect of a Machine Learning–Derived Early Warning System for Intraoperative Hypotension vs Standard Care on Depth and Duration of Intraoperative Hypotension During Elective Noncardiac Surgery
The HYPE Randomized Clinical Trial

HPI : ESSAIS RANDOMISÉS

Figure 2. Hemodynamic Diagnostic Guidance and Treatment Protocol



VS

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Table 2. Primary and Secondary End Points

	Median (Interquartile Range)[a]			
	Intervention (n = 31)	Control (n = 29)	Median Difference (95% CI)[b]	*P* Value[c]
Primary End Point				
Time-weighted average of hypotension, mm Hg	0.10 (0.01-0.43)	0.44 (0.23-0.72)	0.38 (0.14 to 0.43)	.001
Secondary End Points				
Hypotension				
Area under the threshold, mm Hg/min[d]	20.0 (2.2-148.3)	142.2 (64.67-258.92)	74.0 (33.0 to 137.7)	.002
Incidence	3.0 (1.0-8.0)	8.0 (3.5-12.0)	4.0 (1.0 to 7.0)	.004
Total time, min	8.0 (1.3-26.0)	32.7 (11.5-59.7)	16.7 (7.7 to 31.0)	.001
Surgery time, %	2.8 (0.8-6.6)	10.3 (4.6-15.6)	5.6 (3.0 to 9.4)	<.001
Hypertension				
Time-weighted average, mm Hg	0.09 (0.00-0.21)	0.05 (0.00-0.13)	0.00 (−0.85 to 0.17)	.47
Area above the threshold, mm Hg/min[d]	33.3 (0.0-88.0)	13.3 (0.0-44.3)	−3.5 (−29.0 to 5.5)	.40
Incidence	2.0 (0.0-3.0)	1.0 (0.0-2.0)	0.0 (−1.0 to 0.0)	.23
Total time, min	4.0 (0.0-10.7)	3.0 (0.0-6.8)	−0.7 (−4.3 to 0.7)	.40
Surgery time, %	1.5 (0.0-3.3)	0.9 (0.0-1.9)	−0.2 (−1.4 to 0.3)	.40
Treatment behavior				
Reaction time, s[e]	53.0 (24.0-99.0)	87.3 (53.0-172.5)	34.3 (22.8 to 47.3)	<.001
Post Hoc End Points				
Treatment behavior				
No. of treatments per patient[f]	15.0 (5.0-29.0)	9.0 (3.5-13.0)	−6.0 (−13.0 to −1.0)	.02

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Table 3. Cumulative Doses of Medications Given During Surgery

	Median (Interquartile Range)			
Medications	Intervention (n = 31)	Control (n = 29)	Median Difference (95% CI)	*P* Value
Noradrenaline, µg	1034.0 (770.7-1720.0)	925.7 (428.7-2131.0)	−118.0 (−534.3 to 418.0)	.67
Noradrenaline, µg/kg/min[a]	0.057 (0.033-0.071)	0.040 (0.021-0.066)	−0.010 (−0.025 to 0.005)	.18
Ephedrine, mg	10.0 (0.0-22.5)	10.0 (10.0-16.3)	0.0 (−5.0 to 5.0)	.52
Phenylephrine, µg	200.0 (100.0-600.0)	300.0 (100.0-500.0)	0.0 (−200.0 to 100.0)	.84
Fluids, mL	2100.0 (1750.0-3000.0)	1800.0 (1550.0-2950.0)	−150 (−600.0 to 470.0)	.58
Colloids, mL	250.0 (0.0-500.0)	0.0 (0.0-500.0)	0.0 (−250.0 to 0.0)	.09
Crystalloids, mL	1800.0 (1500.0-2700.0)	1800.0 (1450.0-2650.0)	100.0 (−550.0 to 300.0)	.72
Fluid balance, mL[b]	1180.0 (680.0-1650.0)	1150.0 (582.5-1552.5)	−80.00 (−480.00 to 300.00)	.62

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Médecine personnalisée

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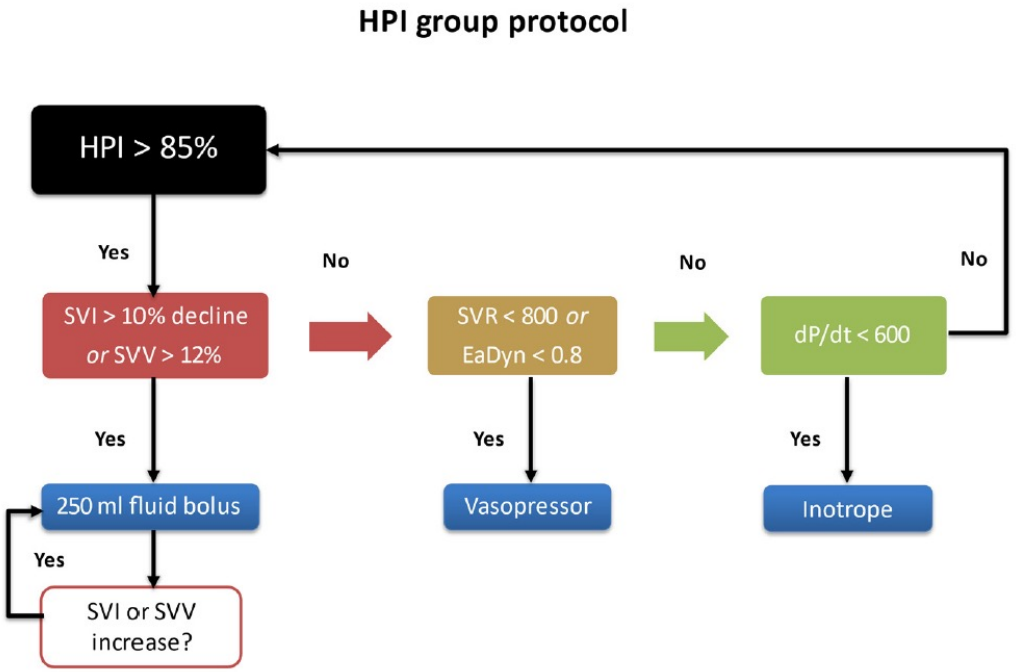
Journal of Clinical Medicine
MDPI
Article
The Use of the Hypotension Prediction Index Integrated in an Algorithm of Goal Directed Hemodynamic Treatment during Moderate and High-Risk Surgery
Marina Tsoumpa [1], Aikaterini Kyttari [1], Stamo Matiatou [1], Maria Tzoufi [1], Panayota Griva [1], Emmanouil Pikoulis [2], Maria Riga [1], Paraskevi Matsota [1] and Tatiana Sidiropoulou [1,*]



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Tsoumpa et al. JCMC 2021

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PRÉDICTION DE L'HYPOTENSION

HPI : ESSAIS RANDOMISÉS

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Table 2. Outcomes.

Endpoints	HPI (n = 49) Median (IQR)	Control (n = 50) Median (IQR)	Median Difference (95% CI)	p Value
Hypotension *				
TWA hypotension, mmHg	0.16 (0.01–0.32)	0.50 (0.11–0.97)	−0.28 (−0.48 to −0.09)	0.0003
Area Under the Threshold, mmHg * min	42.42 (2.07–100.86)	104.71 (28.02–351.54)	−60.28 (−111.09 to −17.71)	0.0012
Number of hypotensive events, n	26 (6–54)	73 (32–190)	−43 (−78 to −18)	0.0002
Time in Hypotension, min	8.68 (2.0–17.3)	24.16 (10.7–63.)	−14.33 (−26 to −6)	0.0002
Percentage of Hypotension, %	3.7 (0.89–6.31)	10.17 (3.41–16.79)	−6.67 (−9.57 to −3.41)	<0.0001
Hypertension $				
TWA hypertension, mmHg	0.95 (0.27–1.81)	0.29 (0.08–0.83)	0.40 (0.10 to 0.83)	0.0032
Area Above the Threshold, mmHg * min	245.49 (94.36–393.04)	82.10 (25.62–174.51)	99.88 (29.10 to 196.33)	0.0032
Number of hypertensive events, n	73 (40–115)	34 (14–65)	29 (11 to 51)	0.0022
Time in Hypertension, min	24.30 (13.3–38.)	11.33 (4.7–21.7)	9.67 (3.6 to 16.7)	0.0024
Percentage of Hypertension, %	9.71 (3.87–18.05)	4.09 (1.79–9.44)	3.85 (1.23 to 7.32)	0.0034
Average Hypertension Above 100	109.33 (105.46–112.39)	106.91 (103.63–110.75)	2.09 (0.01 to 4.43)	0.0438

* hypotension was defined as MAP < 65 mmHg for 1 min; $ hypertension was defined as MAP >100 mmHg for 1 min; TWA = time-weighted average; HPI = Hypotension Prediction Index.

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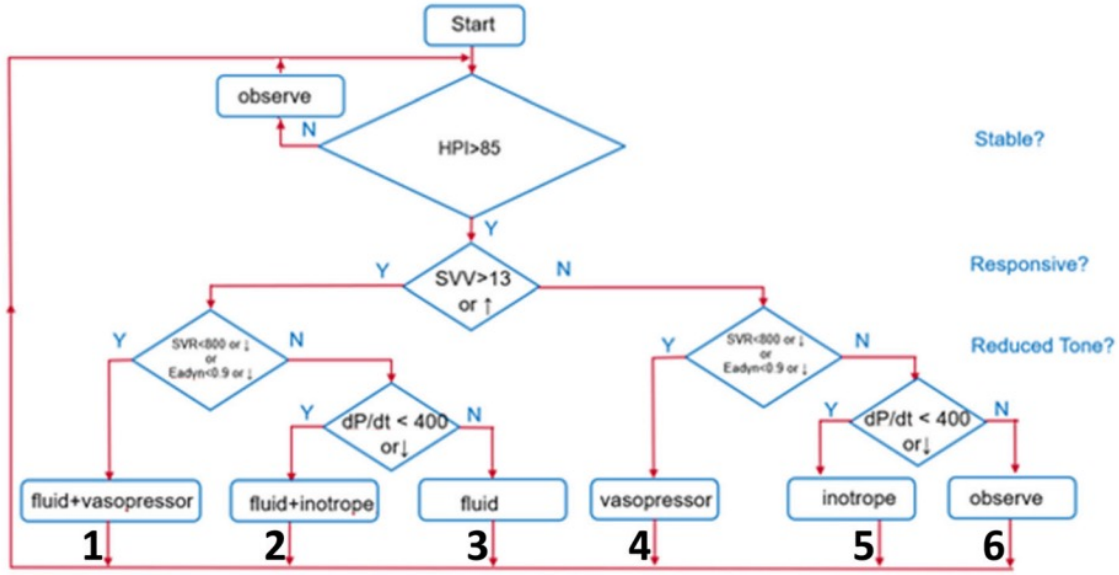
ANESTHESIOLOGY

Hypotension Prediction Index for Prevention of Hypotension during Moderate- to High-risk Noncardiac Surgery

A Pilot Randomized Trial

Kamal Maheshwari, M.D., M.P.H., Tetsuya Shimada, M.D., Ph.D., Dongsheng Yang, M.S., Sandeep Khanna, M.D., Jacek B. Cywinski, M.D., Samuel A. Irefin, M.D., Sabry Ayad, M.D., Alparslan Turan, M.D., Kurt Ruetzler, M.D., Yuwei Qiu, M.D., Partha Saha, M.D., Edward J. Mascha, Ph.D., Daniel I. Sessler, M.D.

ANESTHESIOLOGY 2020; 133:1214–22



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Traitement standard :

Maheshwari et al. Anesthesiology 2021

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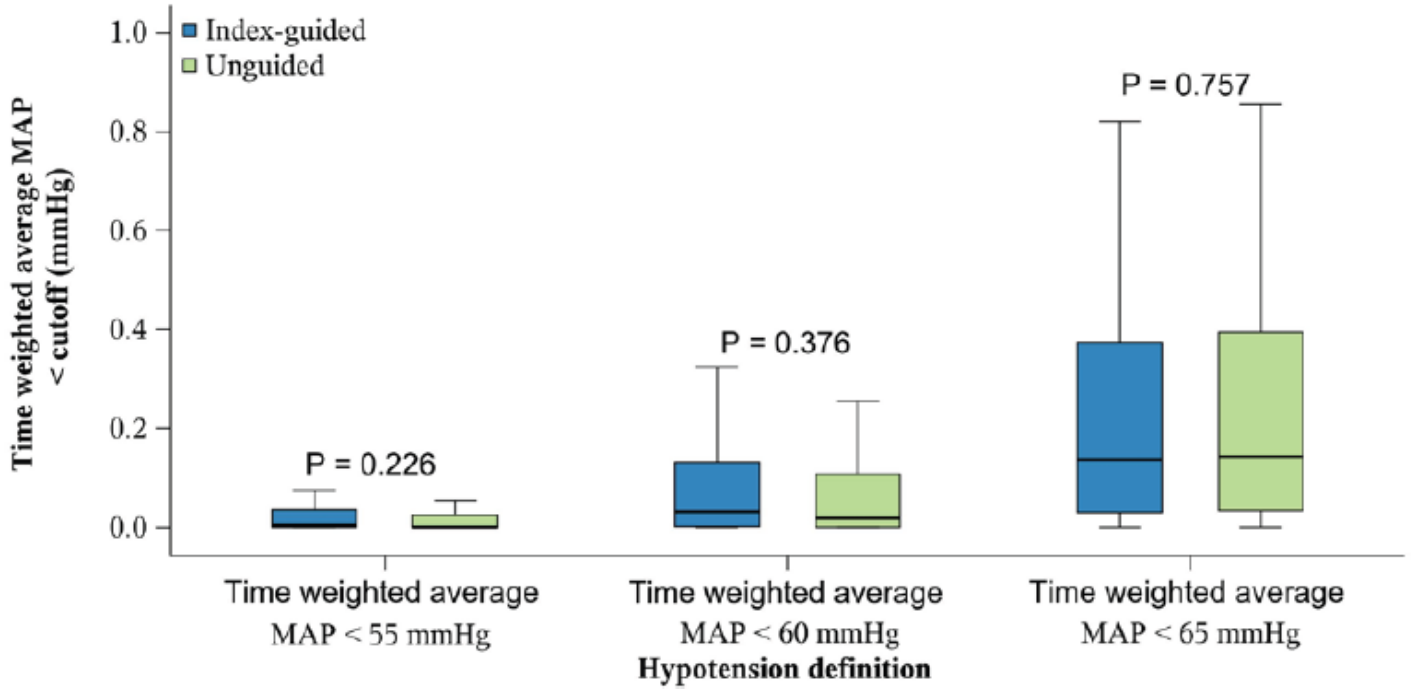

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Etudes	TWA MAP<65, HPI	TWA MAP<65, Control	*P* value
Wijnberge et al	0.10 (0.1-0.43)	0.44 (0.23-0.72)	0.001
Tsoumpa et al.	0.16 (0.001-0.32)	0.50 (0.11-0.97)	0.0003
Maheshwari et al	0.14 (0.03-0.37)	**0.14 (0.03-0.39)**	0.757

→ Le clinicien est capable de limiter la durée d'hypotension artérielle peropératoire.

PRÉDICTION DE L'HYPOTENSION

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ANESTHESIOLOGY

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ANESTHESIOLOGY 2020; 133:1214–22

Table 5. Agreement between Suggested Intervention Using Treatment Algorithm[13] and Actual Intervention by Clinical Team

Index > 85	Actual Intervention						
Suggested Intervention	**1: Fluid + Vasopressor**	**2: Fluid + Inotrope**	**3: Fluid**	**4: Vasopressor**	**5: Inotrope**	**6: Observe**	**Total**
1: Fluid + vasopressor	52	1	11	31	1	58	154
2: Fluid + inotrope	13	13	10	24	1	25	86
3: Fluid	20	2	75	33	3	82	215
4: Vasopressor	4	0	21	182	17	164	388
5: Inotrope	4	0	8	35	9	45	101
6: Observe	7	0	24	70	9	473	583
Total	100	16	149	375	40	847	1,527

The kappa coefficient has 0.33 (95% CI, 0.29 to 0.36), indicating slight agreement beyond chance between the suggested and actual interventions. The observed proportion of agreement was 0.53 and the expected proportion of agreement was 0.30.

-> 55% des alertes n'ont donné lieu à aucune intervention

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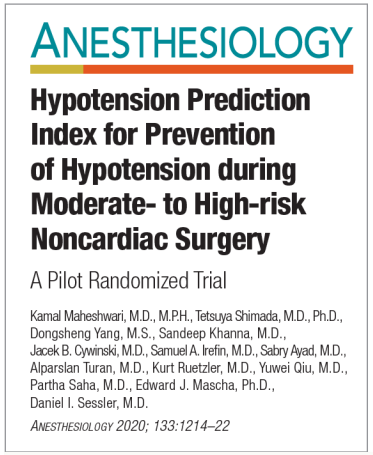
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-> 38% des alertes ne correspondaient à aucune intervention selon l'algorithme

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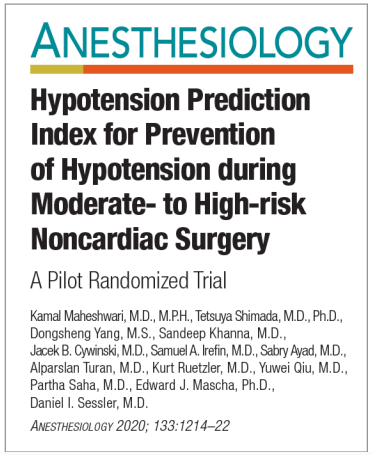
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-> Analyse limitée aux interventions : diminution de moitié des IOH

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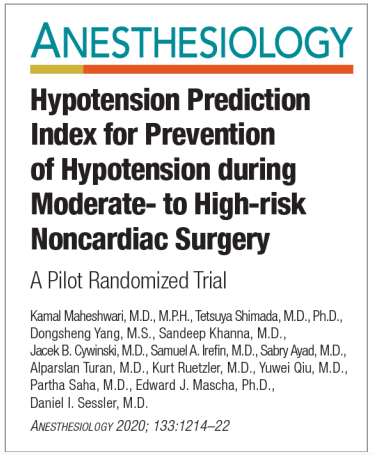

Explications avancées par les auteurs :

- Algorithme trop complexe
- Ne permet pas d'anticiper l'administration de remplissage vasculaire assez en avance
- Nombre élevé d'alarme (notion de fatigabilité)

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HPI

The Promise and Challenges of Predictive Analytics in Perioperative Care

Duminda N. Wijeysundera, M.D., Ph.D., Daniel I. McIsaac, M.D., M.P.H., Martin J. London, M.D.

What do these findings mean for anesthesia providers in the operating room?

- **clinicians can reasonably still use** the prediction index in clinical practice with the caveat that **its prognostic accuracy may be lower** than initially projected.

- This reduced accuracy will **most likely manifest as false positives**, where anesthesia providers are prompted to consider mitigation interventions (…)

Wijeysundera et al. Anesthesiology 2022

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4. PRÉDICTION DE L'HYPOTENSION ARTÉRIELLE EN CHIRURGIE THORACIQUE ?

HYPOTENSION ARTÉRIELLE

EN CHIRURGIE THORACIQUE ?

Contents lists available at ScienceDirect
Anaesthesia Critical Care & Pain Medicine
journal homepage: www.elsevier.com

Short communication

Opioid-free anaesthesia for video-assisted thoracoscopic surgery: A retrospective cohort study with propensity score analysis

Antoine Larue[a,d], Matthias Jacquet-Lagrèze[a,b,c,d,*], Martin Ruste[a,b,d], François Tronc[b,d,e], Jean-Luc Fellahi[a,b,c,d]

	All (n = 151)
ASA	
II	75 (49.7)
III	76 (50.3)
Surgery	
Lobectomy	128 (84.8)
Wedge resection	23 (15.2)
Indication	
Cancer	128 (84.8)
Infectious disease	6 (4.0)
Other surgery	17 (11.2)

	All (n = 151)
Total fluid administration ± ml	1146 ± 418
Vasoactive agents	
Ephedrine	89 (58.9)
Mean dose ± mg	10 ± 12
Phenylephrine	5 (3.3)
Mean dose ± µg	4 ± 26
Norepinephrine	6 (4.0)
Mean dose ± µg	11 ± 89

	All (n = 151)
Haemodynamic characteristics	
MAP, mmHg	85.3 ± 9.7
MAP variability ± %	15.6 ± 4.8
HR, beats/min	70.6 ± 10.1
HR variability ± %	13.1 ± 5.5
MAP < 65 mmHg duration ± min	14.5 ± 23.7
MAP < 55 mmHg duration ± min	1.8 ± 9.1
HR < 50 beats/min duration ± min	7.0 ± 18.3
Durations ± min	
Surgery	139.8 ± 40.9
Anaesthesia	204.5 ± 49.5
PACU discharge	134.6 ± 40.8
Hospital stay ± days	5.7 ± 3.3

Jacquet-Lagrèze et al. ACCPM 2022

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HYPOTENSION ARTÉRIELLE

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Short communication

Opioid-free anaesthesia for video-assisted thoracoscopic surgery: A retrospective cohort study with propensity score analysis

Antoine Larue[a,d], Matthias Jacquet-Lagrèze[a,b,c,d,*], Martin Ruste[a,b,d], François Tronc[b,d,e], Jean-Luc Fellahi[a,b,c,d]

	All (n = 151)
ASA	
II	75 (49.7)
III	76 (50.3)
Surgery	
Lobectomy	128 (84.8)
Wedge resection	23 (15.2)
Indication	
Cancer	128 (84.8)
Infectious disease	6 (4.0)
Other surgery	17 (11.2)

	All (n = 151)
Total fluid administration ± ml	1146 ± 418
Vasoactive agents	
Ephedrine	89 (58.9)
Mean dose ± mg	10 ± 12
Phenylephrine	5 (3.3)
Mean dose ± µg	4 ± 26
Norepinephrine	6 (4.0)
Mean dose ± µg	11 ± 89

	All (n = 151)
Haemodynamic characteristics	
MAP, mmHg	85.3 ± 9.7
MAP variability ± %	15.6 ± 4.8
HR, beats/min	70.6 ± 10.1
HR variability ± %	13.1 ± 5.5
MAP < 65 mmHg duration ± min	14.5 ± 23.7
MAP < 55 mmHg duration ± min	1.8 ± 9.1
HR < 50 beats/min duration ± min	7.0 ± 18.3
Durations ± min	
Surgery	139.8 ± 40.9
Anaesthesia	204.5 ± 49.5
PACU discharge	134.6 ± 40.8
Hospital stay ± days	5.7 ± 3.3

Jacquet-Lagrèze et al. ACCPM 2022

HYPOTENSION ARTÉRIELLE

EN CHIRURGIE THORACIQUE ?

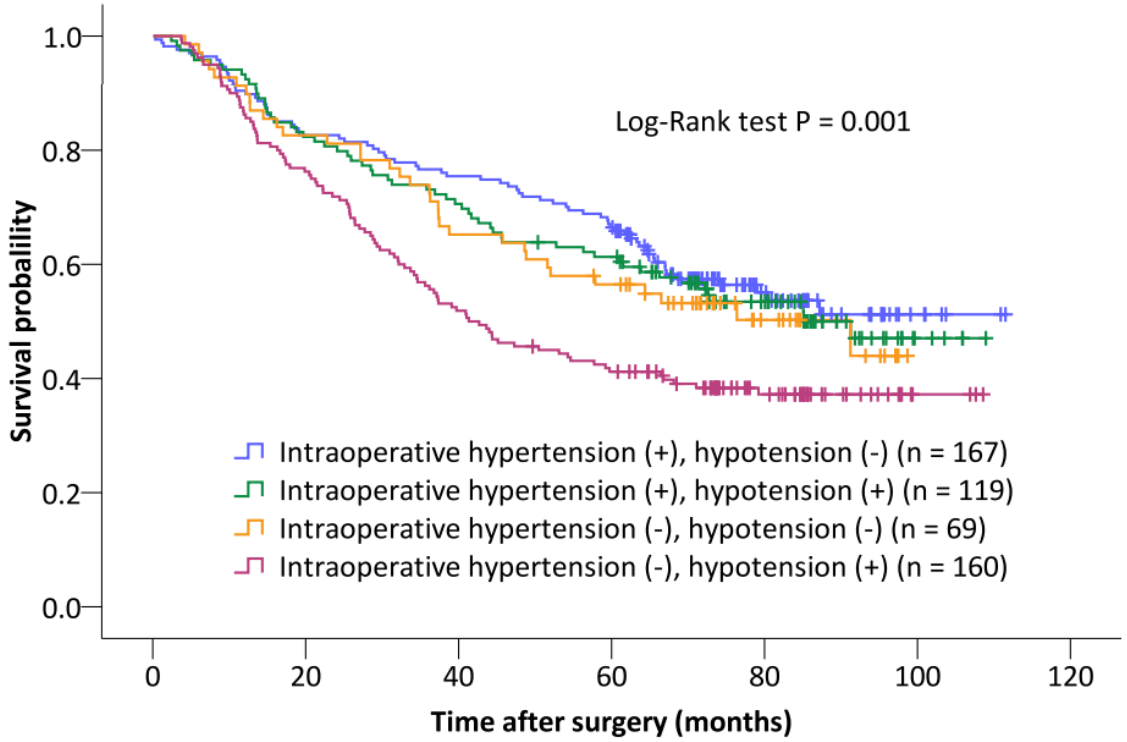
Huang et al. BMC Anesthesiology (2020) 20:160
https://doi.org/10.1186/s12871-020-01062-2

BMC Anesthesiology

RESEARCH ARTICLE Open Access

Intraoperative hypotension is associated with shortened overall survival after lung cancer surgery

Wen-Wen Huang[1], Wen-Zhi Zhu[2], Dong-Liang Mu[1], Xin-Qiang Ji[3], Xue-Ying Li[4], Daqing Ma[5] and Dong-Xin Wang[1,6*]



Huang et al. BMC Anesthesiology 2020

PRÉDICTION DE L'HYPOTENSION

EN CHIRURGIE THORACIQUE ?

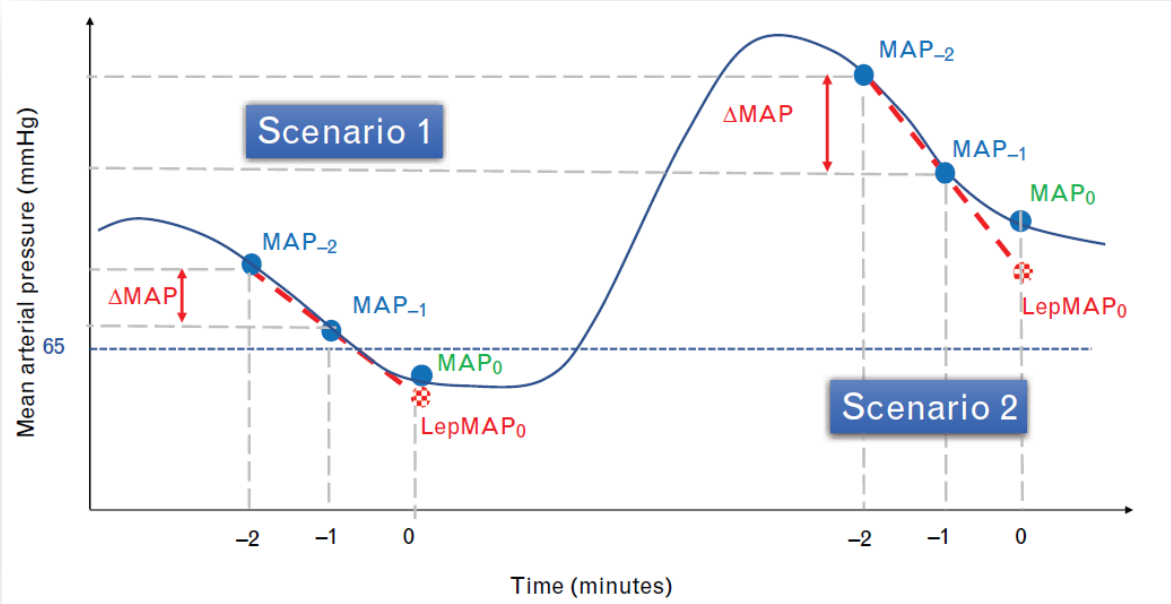
EJA

Eur J Anaesthesiol 2022; **37**:1–8

ORIGINAL ARTICLE

Prediction of intraoperative hypotension from the linear extrapolation of mean arterial pressure

Matthias Jacquet-Lagrèze, Antoine Larue, Enrique Guilherme, Rémi Schweizer, Philippe Portran, Martin Ruste, Mathieu Gazon, Frédéric Aubrun and Jean-Luc Fellahi



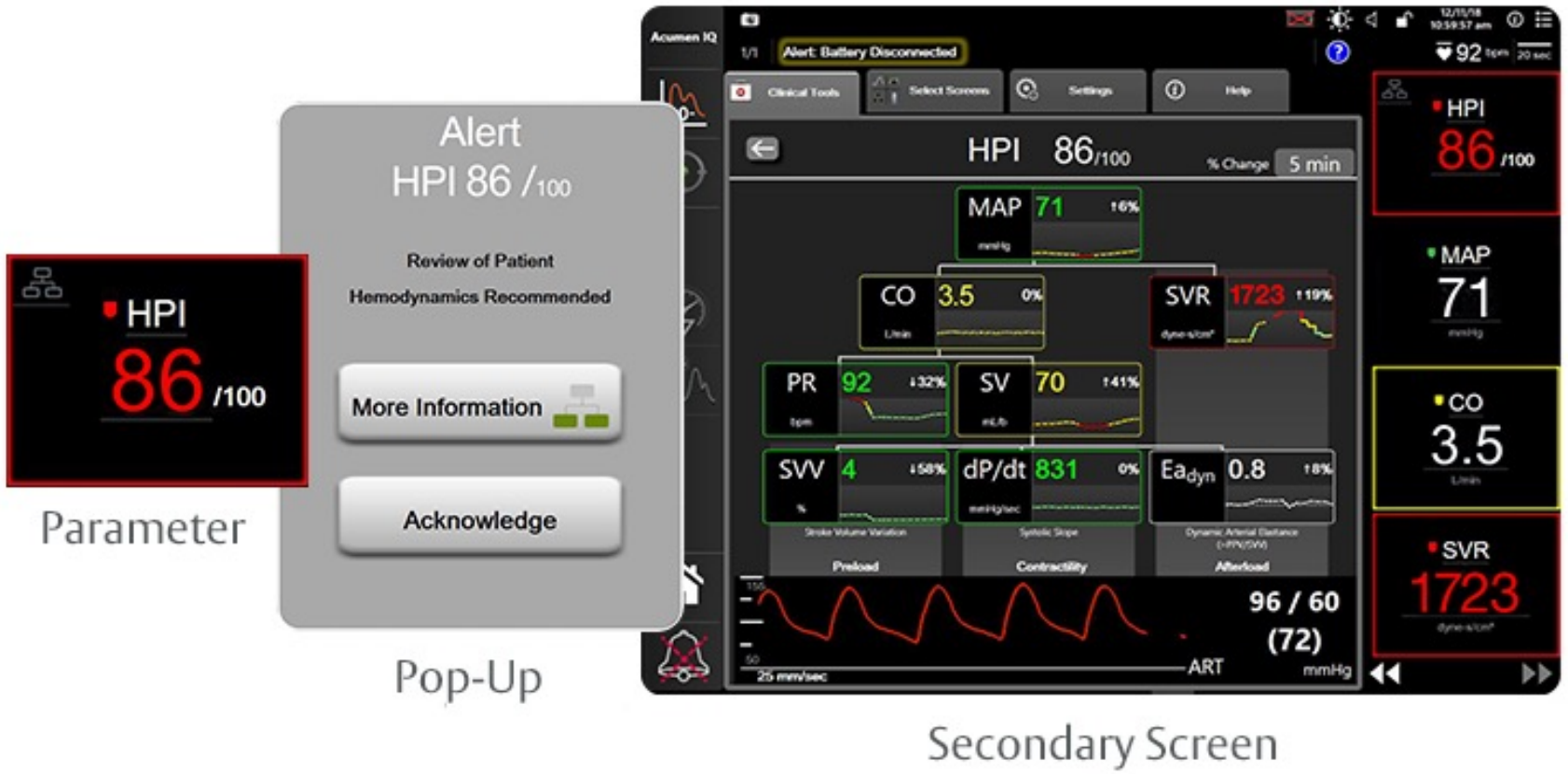
- 56/83 patients bénéficiaient d'une chirurgie thoracique

Jacquet-Lagrèze et al. EJA 2022

HCL HOSPICES CIVILS DE LYON

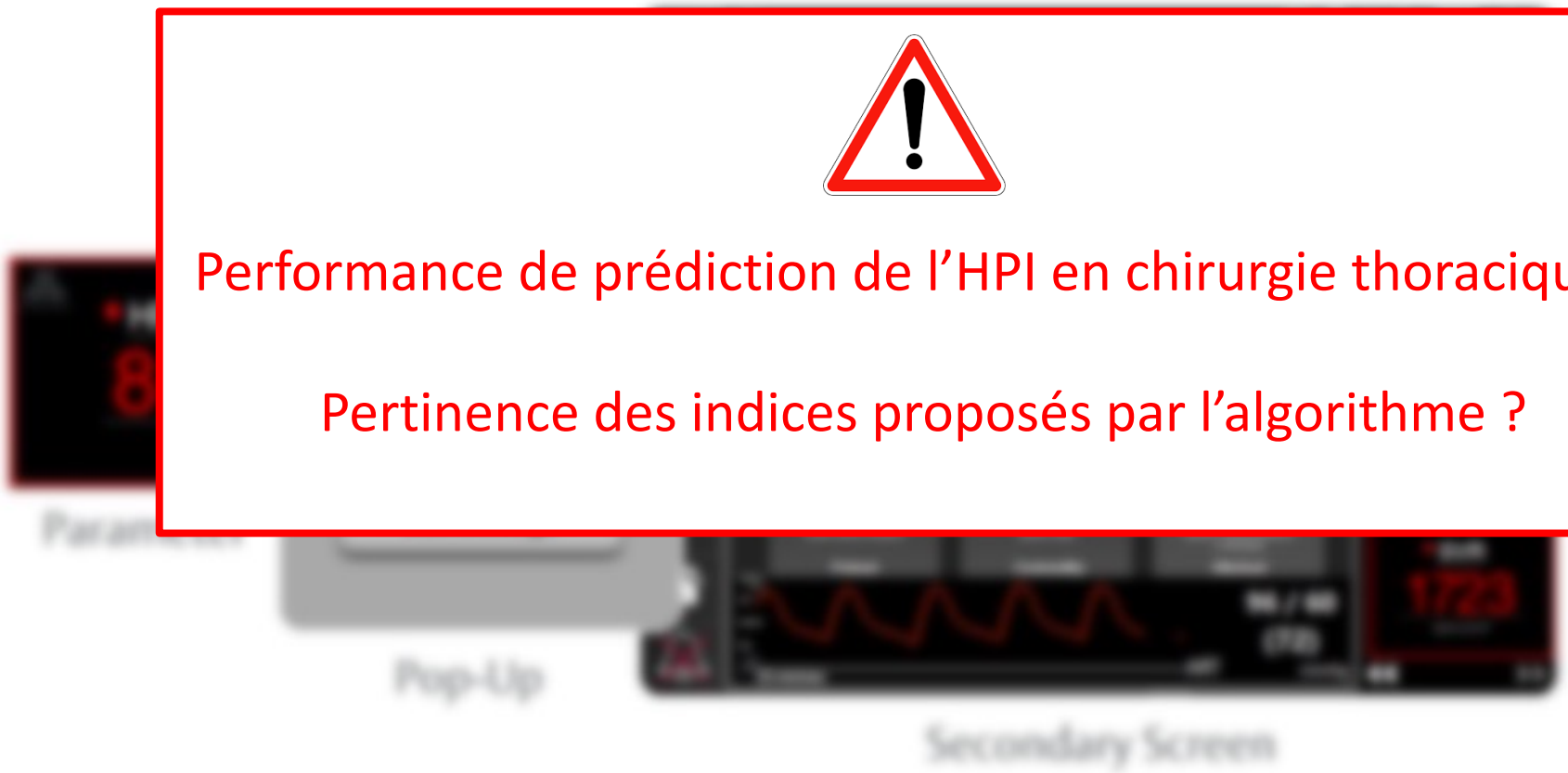
PRÉDICTION DE L'HYPOTENSION

HPI : EN CHIRURGIE THORACIQUE ?



PRÉDICTION DE L'HYPOTENSION

HPI : EN CHIRURGIE THORACIQUE ?

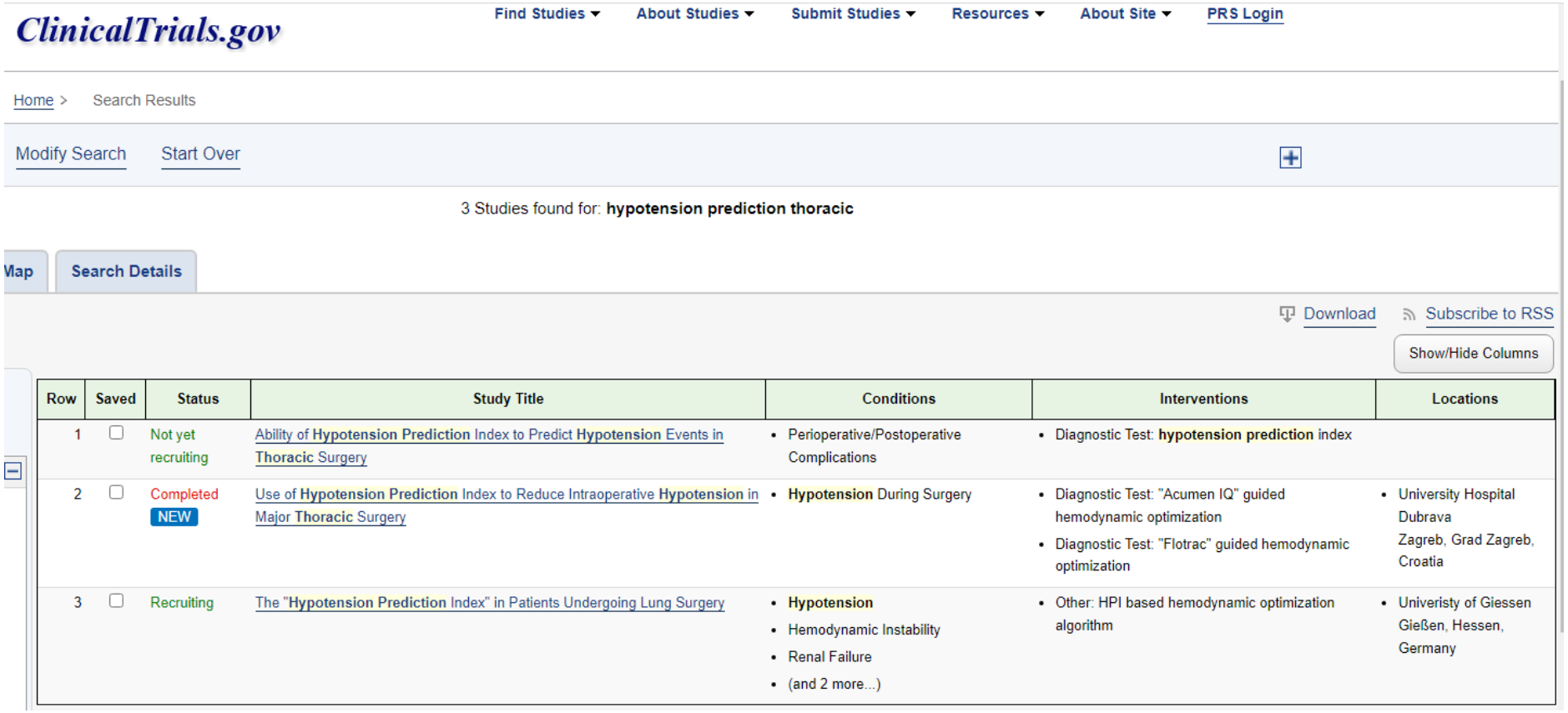


Performance de prédiction de l'HPI en chirurgie thoracique ?

Pertinence des indices proposés par l'algorithme ?

PRÉDICTION DE L'HYPOTENSION

EN CHIRURGIE THORACIQUE ?



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1	☐	Not yet recruiting	Ability of **Hypotension Prediction** Index to Predict **Hypotension** Events in **Thoracic** Surgery	• Perioperative/Postoperative Complications	• Diagnostic Test: **hypotension prediction** index	
2	☐	Completed NEW	Use of **Hypotension Prediction** Index to Reduce Intraoperative **Hypotension** in Major **Thoracic** Surgery	• **Hypotension** During Surgery	• Diagnostic Test: "Acumen IQ" guided hemodynamic optimization • Diagnostic Test: "Flotrac" guided hemodynamic optimization	• University Hospital Dubrava Zagreb, Grad Zagreb, Croatia
3	☐	Recruiting	The "**Hypotension Prediction** Index" in Patients Undergoing Lung Surgery	• **Hypotension** • Hemodynamic Instability • Renal Failure • (and 2 more...)	• Other: HPI based hemodynamic optimization algorithm	• Univeristy of Giessen Gießen, Hessen, Germany

5. CONCLUSION

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PRÉDICTION DE L'HYPOTENSION EN CHIRURGIE THORACIQUE

- Le machine learning est une technique très puissante pour développer des outils de prédiction.

- Elle permet aujourd'hui d'envisager une prise en charge pro-active de la pression artérielle au bloc opératoire.

- Ces outils doivent cependant être développés avec deux ambitions :
  - Une applicabilité clinique large
  - Un impact sur le devenir du patient

- Aucun outil n'a pour le moment démontré un intérêt clinique dans le cadre de la prise en charge des patients en chirurgie thoracique

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PRÉDICTION DE L'HYPOTENSION

…Box noted that "all models are wrong, but some are useful"…

…While a model can never be "truth" a model might be ranked from very useful, to useful, to somewhat useful to, finally, essentially useless.

Burnham, K. P.; Anderson, D. R. (2002)