

Urgences hyperbares: Evidence Based Medicine ?

ICHF, 09 novembre 2019



David LUIS
Service de Médecine Intensive et Réanimation



Pas de conflit d'intérêts

L'EBM

Thème: urgences hyperbares

Thème: urgences hyperbares

Intoxication CO

Embolie gazeuse

Thème: urgences hyperbares

Il n'y a rien ?

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Effect of Hyperbaric Oxygen on Neurologic Sequelae and All-Cause Mortality in Patients with Carbon Monoxide Poisoning: A Meta-Analysis of Randomized Controlled Trials

Authors' Contribution:

Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

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Source of support: Departmental sources

Table 1. Baseline characteristics of included studies.

Study	Publication year	Country	Sample size	Mean age (years)	Percentage Male (%)	CO poisoning time	Intervention	Control	Follow-up	Study quality
Raphael [29]	1989	France	173/170	35.4	48.7% (167/176)	<12 hours	HBO 1 (2.0 ATA, 2 hours)+NBO (4 hours)	NBO (6 hours)	1.0 month	4
Raphael [29]	1989	France	141/145	37.4	43.0% (123/163)	<12 hours	HBO 2 (2.0 ATA, 2 hours) + NBO (4 hours)	HBO 1 (2.0 ATA, 2 hours) + NBO (4 hours)	1.0 month	4
Thom [30]	1995	US	33/32	37.0	52.3% (34/31)	<6 hours	HBO (2.8 ATA, 30 minutes, then 2.0 ATA, 90 minutes)	NBO	4.0 weeks	2
Ducasse [31]	1995	France	13/13	NA	NA	<12 hours	HBO (2.5 ATA, 2 hours) + NBO (100% O ₂ , 4 hours +50%O ₂ , 6 hours)	NBO (100% O ₂ , 6 hours +50% O ₂ , 6 hours)	21 days	4
Mathieu [32]	1996	France	299/276	NA	NA	<12 hours	HBO (2.5 ATA, 90 minutes)	NBO (12 hours)	1.0 month	2
Scheinkestel [33]	1999	Australia	104/87	36.3	81.7% (156/35)	Not limited	HBO (2.8 ATA, 60 minutes)	NBO (100 minutes)	1.0 month	4
Weaver [34]	2002	US	76/76	35.5	71.1% (108/44)	<24 hours	HBO 1 (3.0 ATA, 1 hours and 2.0 ATA, 1 hours) + HBO 2 (2.0 ATA, 2 hours)	NBO	6.0 weeks	5
Annane [35]	2011	France	93/86	33.0	41.3% (74/105)	<12 hours	HBO 1 (2.0 ATA, 2 hours) + NBO (4 h)	NBO (6 hours)	1.0 month	3
Annane [35]	2011	France	105/101	37.5	43.2% (89/117)	<12 hours	HBO 2 (2.0 ATA, 2 hours) + NBO (4 h)	HBO 1 (2.0 ATA, 2 hours) +NBO (4 hours)	1.0 month	2

ATA – atmosphere absolute; HBO – hyperbaric oxygen; NBO – normobaric oxygen.

Wang W, Med Sci Monit, 2019; 25: 7684-7693.

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Macnow TE et al. Pediatr Emerg Med Pract. (2016)

[Treatment with normobaric or hyperbaric oxygen and its effect on neuropsychometric dysfunction after carbon monoxide poisoning: A systematic review and meta-analysis of randomized controlled trials.](#)

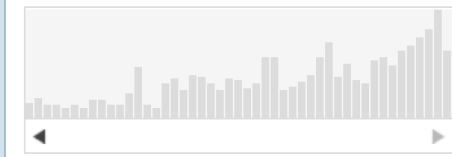
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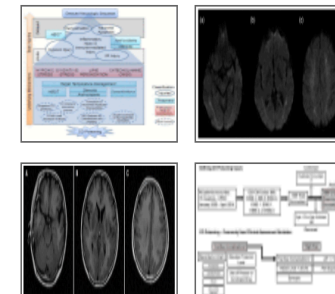
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1. Arora S, Tania P.

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Malik N et al. Future Cardiol. (2017)

[Tenth European Consensus Conference on Hyperbaric Medicine: recommendations for accepted and non-accepted clinical indications and practice of hyperbaric oxygen treatment.](#)

Mathieu D et al. Diving Hyperb Med. (2017)

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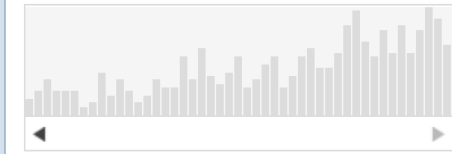
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☐ [Echocardiographic evaluation of intracardiac venous gas emboli following in-water recompression.](#)

1. Dituri J, Sadler R, Siddiqi F, Sadler C, Javeed N, Annis H, Whelan H.
Undersea Hyperb Med. 2016 Mar-Apr;43(2):103-12.
PMID: 27265987
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☐ [Observation of increased venous gas emboli after wet dives compared to dry dives.](#)

2. Møllerlækken A, Breskovic T, Palada I, Valic Z, Dujic Z, Brubakk AO.
Diving Hyperb Med. 2011 Sep;41(3):124-8.
PMID: 21948496
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☐ [Pre-dive vibration effect on bubble formation after a 30-m dive requiring a decompression stop.](#)

3. Germonpré P, Pontier JM, Gempp E, Blatteau JE, Deneweth S, Lafère P, Marroni A, Balestra C.
Aviat Space Environ Med. 2009 Dec;80(12):1044-8.
PMID: 20027852
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4. Blatteau JE, Pontier JM.
Eur J Appl Physiol. 2009 Jul;106(5):691-5. doi: 10.1007/s00421-009-1065-y. Epub 2009 May 8.
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1	<input type="checkbox"/>	Completed	One vs. Three Hyperbaric Oxygen Treatments for Acute Carbon Monoxide Poisoning	• Carbon Monoxide Poisoning	<ul style="list-style-type: none"> Combination Product: Hyperbaric Oxygen (HBO2) - 3 sessions Combination Product: Hyperbaric Oxygen (HBO2) - 1 session 	<ul style="list-style-type: none"> Intermountain LDS Hospital Salt Lake City, Utah, United States Intermountain Medical Center Salt Lake City, Utah, United States
2	<input type="checkbox"/>	Terminated	Hyperbaric Oxygen Therapy for Comatose Patients With Acute Carbon Monoxide Poisoning	• Carbon Monoxide Poisoning	<ul style="list-style-type: none"> Other: Hyperbaric oxygen therapy Other: hyperbaric oxygen therapy 	<ul style="list-style-type: none"> Raymond Poincaré Hospital GArchés, France
3	<input type="checkbox"/>	Terminated	Hyperbaric Oxygen Therapy for Acute Domestic Carbon Monoxide (CO) Poisoning	• Carbon Monoxide Poisoning	<ul style="list-style-type: none"> Other: normobaric oxygen therapy Other: Hyperbaric oxygen therapy 	<ul style="list-style-type: none"> Raymond Poincaré Hospital Garches, France
4	<input type="checkbox"/>	Recruiting	Hyperbaric Oxygen Therapy and SPECT Brain Imaging in Carbon Monoxide Poisoning	• Neuropsychiatric Sequelae of Carbon Monoxide Poisoning	<ul style="list-style-type: none"> Drug: HBOT 	<ul style="list-style-type: none"> Family Physicians Center Marrero, Louisiana, United States
5	<input type="checkbox"/>	Recruiting	Treatment of Human Cord Blood Mononuclear Cell for Delayed Encephalopathy After Carbon Monoxide	• Delayed Encephalopathy After Carbon Monoxide	<ul style="list-style-type: none"> Biological: Human cord blood mononuclear cell 	<ul style="list-style-type: none"> Liaocheng city people's hospital Liaocheng, Shandong, China

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Age :

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Older Adult (65+)

Sex :

All

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Male

Accepts Healthy Volunteers

Study Type

All

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7	<input type="checkbox"/>	Completed	Is it Possible to Treat Cyanide Poisoning With HBO?	<ul style="list-style-type: none">Carbon Monoxide Poisoning From Fire Accidents	<ul style="list-style-type: none">Procedure: HBO - hyperbaric oxygen treatment	<ul style="list-style-type: none">Lab. for hyperbar medicin, afs. 4092, Anæstesi og Operationsklinikken, HOC, Rigshospitalet København Ø, Denmark
8	<input type="checkbox"/>	Not yet recruiting	Carbon Monoxide-induced Coma: Prognostic Factors	<ul style="list-style-type: none">ComaCarbon Monoxide Poisoning		
9	<input type="checkbox"/>	Unknown †	Carbon Monoxide Monitoring and Emergency Treatment	<ul style="list-style-type: none">Carbon Monoxide Poisoning	<ul style="list-style-type: none">Device: Continuous Positive Airway PressureDevice: Non-rebreather oxygen mask	<ul style="list-style-type: none">Fletcher Allen Health Care Burlington, Vermont, United States
10	<input type="checkbox"/>	Unknown †	Occult Carbon Monoxide Poisoning Detection by Pulsated Carboxymetry in an Emergency Department	<ul style="list-style-type: none">Carbon Monoxide Poisoning	<ul style="list-style-type: none">Device: Dosage of the blood HbCO thanks to the carboxymeter MASIMO RAD 57	<ul style="list-style-type: none">Poitiers Universitary Hospital Poitiers, France

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☒ All

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☐ Male

☐ Accepts Healthy Volunteers ⓘ

Study Type

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3	<input type="checkbox"/>	Terminated	Hyperbaric Oxygen Therapy for Acute Domestic Carbon Monoxide (CO) Poisoning	• Carbon Monoxide Poisoning	• Other: normobaric oxygen therapy • Other: Hyperbaric oxygen therapy	• Raymond Poincaré Hospital Garches, France
4	<input type="checkbox"/>	Recruiting	Treatment of Human Cord Blood Mononuclear Cell for Delayed Encephalopathy After Carbon Monoxide Poisoning	• Delayed Encephalopathy After Carbon Monoxide Poisoning	• Biological: Human cord blood mononuclear cell • Other: hyperbaric oxygen	• Liaocheng city people's hospital Liaocheng, Shandong, China
5	<input type="checkbox"/>	Not yet recruiting	Hyperbaric Oxygen for Carbon Monoxide Induced Chronic Encephalopathy	• Carbon Monoxide Poisoning • Chronic Encephalopathy	• Device: hyperbaric oxygen and sham hyperbaric oxygen	
6	<input type="checkbox"/>	Unknown [†]	Carbon Monoxide Monitoring and Emergency Treatment	• Carbon Monoxide Poisoning	• Device: Continuous Positive Airway Pressure • Device: Non-rebreather oxygen mask	• Fletcher Allen Health Care Burlington, Vermont, United States

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2	<input type="checkbox"/>	Terminated	Hyperbaric Oxygen Therapy for Comatose Patients With Acute Carbon Monoxide Poisoning	• Carbon Monoxide Poisoning	<ul style="list-style-type: none">Other: Hyperbaric oxygen therapyOther: hyperbaric oxygen therapy	<ul style="list-style-type: none">Raymond Poincaré Hospital GArchés, France
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4	<input type="checkbox"/>	Recruiting	Treatment of Human Cord Blood Mononuclear Cell for Delayed Encephalopathy After Carbon Monoxide Poisoning	• Delayed Encephalopathy After Carbon Monoxide Poisoning	<ul style="list-style-type: none">Biological: Human cord blood mononuclear cell	<ul style="list-style-type: none">Liaocheng city people's hospital

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33

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Abstract

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Background

Poisoning with carbon monoxide (CO) remains an important cause of accidental and intentional injury worldwide. Several unblinded non-randomized trials have suggested that the use of hyperbaric oxygen (HBO) prevents the development of neurological sequelae. This has led to the widespread use of HBO in the management of patients with carbon monoxide poisoning.

Objectives

To examine randomised trials of the efficacy of hyperbaric oxygen (HBO) compared to normobaric oxygen (NBO) for the

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neurologic sequelae at one month, while four others did not. One of these is an incomplete publication (an abstract of an interim analysis). Although pooled random effects meta-analysis does not suggest a significant benefit from HBOT (OR for neurological deficits 0.78, 95%CI 0.54 to 1.12), significant methodologic and statistical heterogeneity was apparent among the trials, and this result should be interpreted cautiously. Moreover, design or analysis flaws were evident in all trials. Importantly, the conclusions of one positive trial may have been influenced by failure to adjust for multiple hypothesis testing, while interpretation of the other positive trial is hampered by a high risk of bias introduced during the analysis including an apparent change in the primary outcome. Both were also stopped early 'for benefit', which is likely to have inflated the observed effect. In contrast three negative trials had low power to detect a benefit of HBO due to exclusion of severely poisoned patients in two and very poor follow-up in the other. One trial that was said to be finished around eight years ago has not reported the final analysis in any forum.

Authors' conclusions

Existing randomised trials do not establish whether the administration of HBO to patients with carbon monoxide poisoning reduces the incidence of adverse neurologic outcomes. Additional research is needed to better define the role, if any, of HBO in the treatment of patients with carbon monoxide poisoning. This research question is ideally suited to a multi-center randomised controlled trial.

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There is insufficient evidence to support the use of hyperbaric oxygen for treatment of patients with carbon monoxide poisoning

Many people are poisoned by carbon monoxide gas each year, either intentionally (e.g. in suicide attempts) or by accident. Carbon monoxide interferes with oxygen transport in the body, and can also directly damage a variety of organs including the brain. The usual treatment involves removing the affected person from the source of the gas, general supportive care, and administering oxygen which hastens the elimination of carbon monoxide from the body. High pressure oxygen (hyperbaric oxygen) is only available at a few hospitals, and it is sometimes used to speed this process even further. However, the review of published trials found conflicting, potentially biased, and generally weak evidence regarding the usefulness of hyperbaric oxygen

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Outcome and prognostic factors of patients treated in the intensive care unit for carbon monoxide poisoning



Wei-Chih Liao^{a,b,c,1}, Wen-Chien Cheng^{a,b,1}, Biing-Ru Wu^{a,b},
Wei-Chun Chen^{a,b,d}, Chih-Yu Chen^{a,b}, Chia-Hung Chen^{a,d,*},
Chih-Yen Tu^{a,b,c,**}, Te-Chun Hsia^{a,b,d}

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Treatment of acute carbon monoxide poisoning with induced hypothermia

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Objective The effect of induced hypothermia on severe acute carbon monoxide (CO) poisoning remains to be addressed further. We investigated the effect of induced hypothermia on severe acute CO poisoning.

Methods Retrospective chart review was conducted for patients who diagnosed as severe acute CO poisoning in emergency department and underwent induced hypothermia from May 2013 to May 2014. Hospital courses with critical medication and major laboratory results were investigated through the chart review.

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L'EBM

Les limites

Puissance

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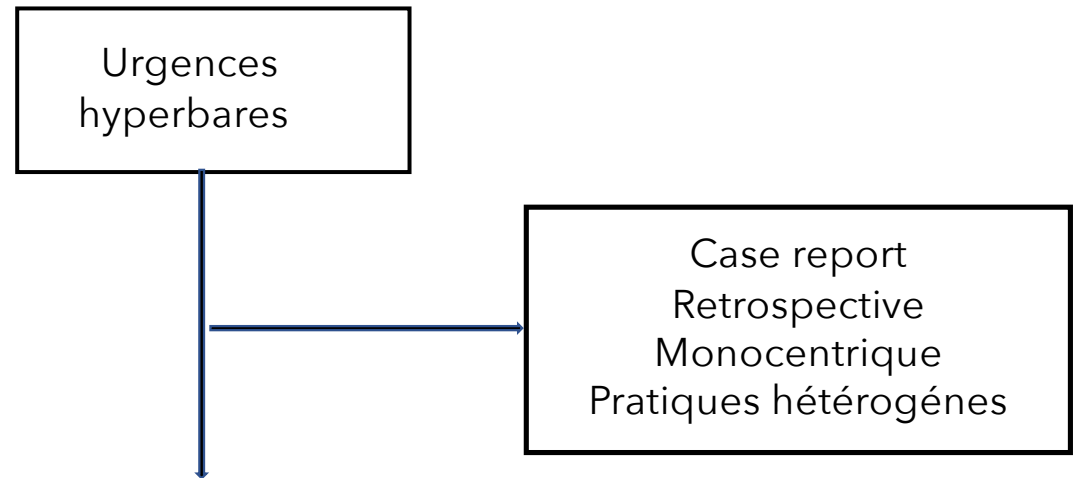
Pourtant bénéfique:

- du point de vue médical (SIGAPS,...)
- du point de vue médico administratif (€)

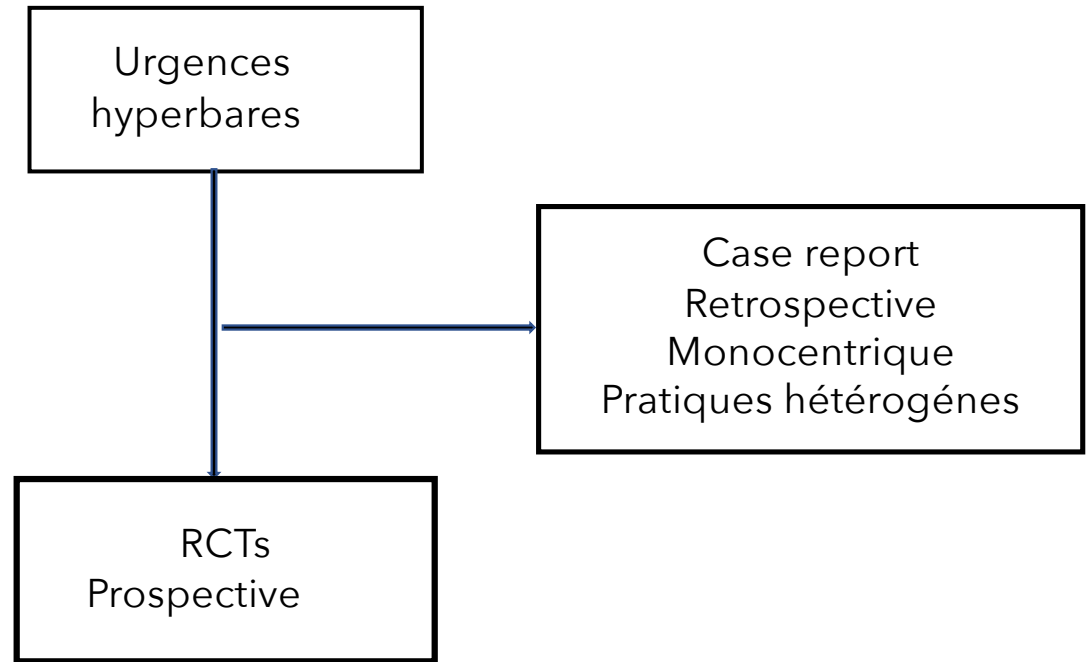
Urgences hyperbares et EBM

Urgences
hyperbares

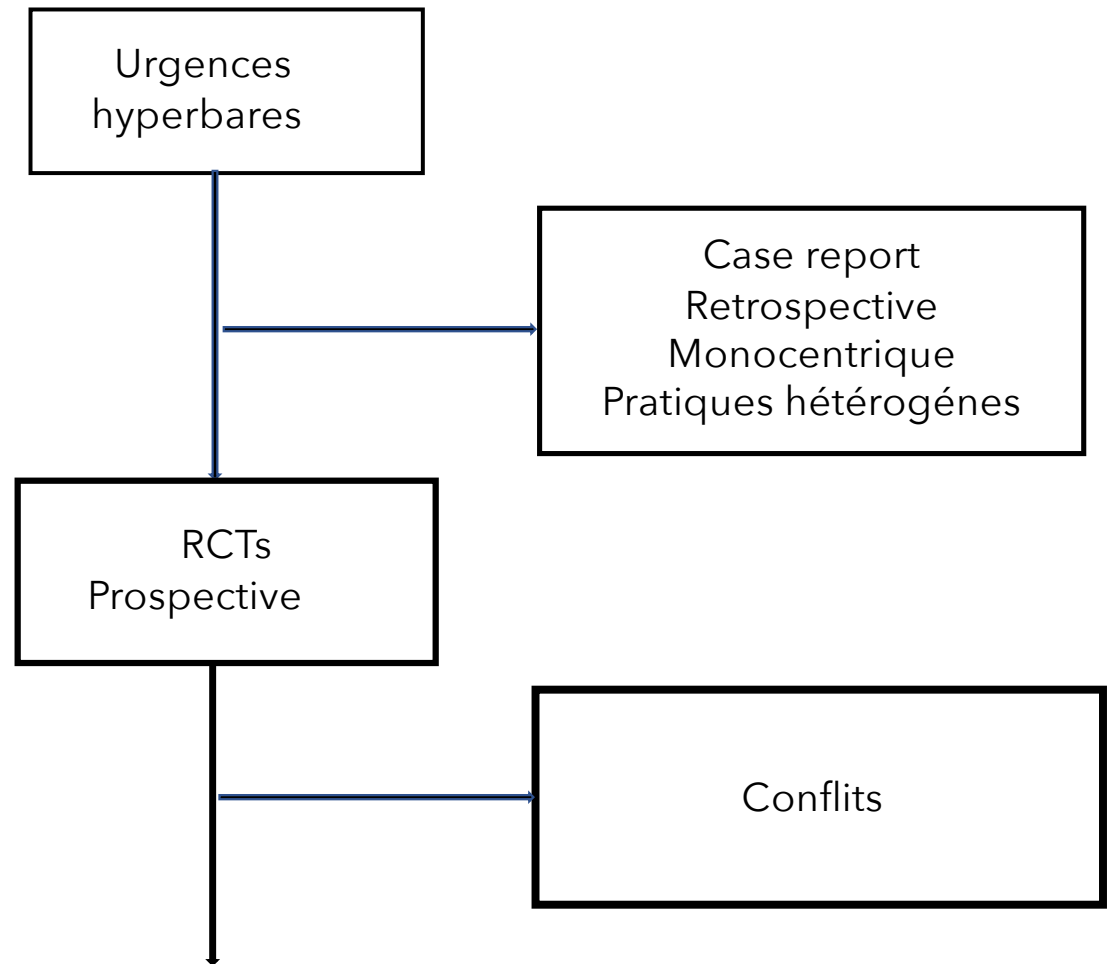
Urgences hyperbares et EBM



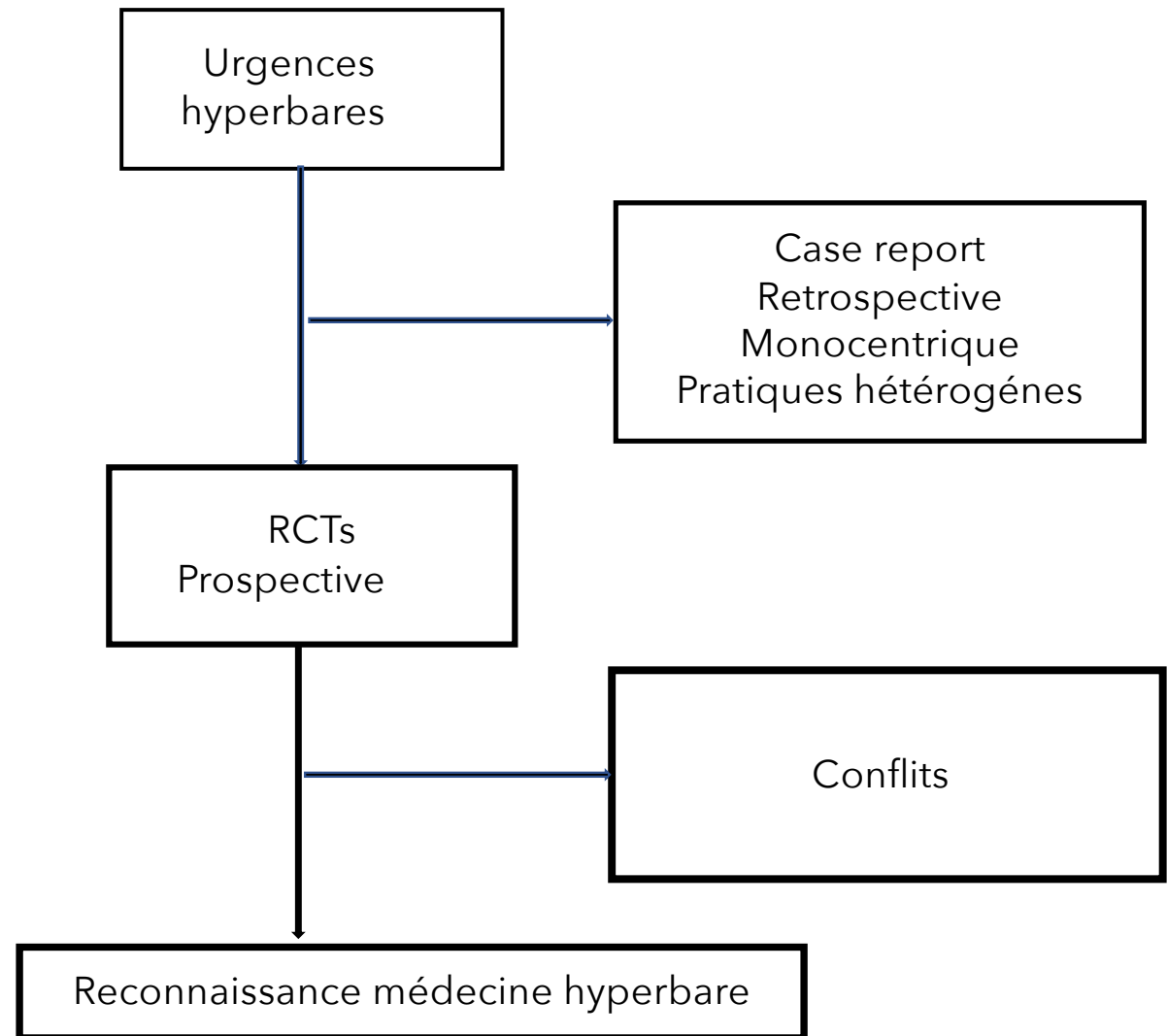
Urgences hyperbares et EBM



Urgences hyperbares et EBM



Urgences hyperbares et EBM



Urgences hyperbares et EBM

URC
en hyperbarie

Urgences
hyperbares

Case report
Retrospective
Monocentrique
Pratiques hétérogènes

RCTs
Prospective

Conflits

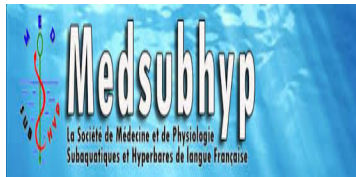
Reconnaissance médecine hyperbare



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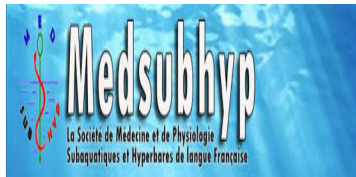
EBM c'est possible pour les urgences hyperbares.....mais ensemble

National



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Francophone

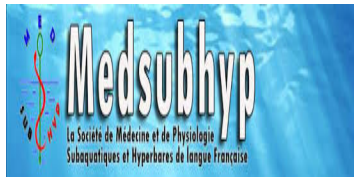


EBM c'est possible pour les urgences hyperbares.....mais ensemble

Européen



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