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## Faculté de Médecine et Pharmacie

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### **THESE**

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HOT – Hyperthermia Online Trial : enquête sur l'Hyperthermie Maligne

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## Citation

*« Faites que le rêve dévore votre vie, afin que la vie ne dévore votre rêve. »*

*Antoine DE SAINT-EXUPERY*

## **Dédicace**

*A Marine MARTENS, ange partie trop tôt. J'espère que tu es heureuse là où tu es et que tu es fière du chemin que nous avons tous accompli. Pourvu que ton sourire ne s'éteigne jamais.*

## Remerciements

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# Sommaire

<b>Introduction.....</b>	<b>8</b>
<b>Methods.....</b>	<b>9</b>
<b>Results.....</b>	<b>10</b>
Participants.....	10
Primary objectives.....	10
Secondary objectives.....	12
<b>Discussion.....</b>	<b>14</b>
Strengths and limitations.....	17
<b>Conclusions.....</b>	<b>18</b>
<b>References.....</b>	<b>19</b>
<b>Appendix.....</b>	<b>22</b>
<b>Summary.....</b>	<b>26</b>
<b>Serment.....</b>	<b>28</b>

## Introduction

Malignant hyperthermia (MH) is an uncommon disease which incidence sways between 1/62 000 general anaesthesia (GA) and 1/550 000 GA, depending on the study<sup>1,2</sup>. Its high mortality rate (64% in the 70s<sup>3</sup>) decreased until 6,5% in the 2000s<sup>4</sup> thanks to the progress of anaesthesia.

MH is a hereditary disease with a dominant autosomic transmission. Its causal mutations concern the ryanodine gene RYR1 (coding for the ryanodine-sensible Ca<sup>2+</sup> channel of the sarcoplasmic reticulum) and far less often the CACNA1S gene (coding for the dihydropyridine-sensible Ca<sup>2+</sup> channel). Its mechanism relies on an excessive metabolism triggered by exposure to halogenated agents and to succinylcholine. MH manifests itself with symptoms such as tachycardia, increase of end tidal carbon dioxide (EtCO<sub>2</sub>), muscular rigidity and rhabdomyolysis, hyperthermia, and acidosis; which can quickly lead to death.<sup>1</sup>

Being a myorelaxant drug, intravenous (IV) Dantrolene has proven its efficiency in a randomised study published in 1982.<sup>5</sup> Since then, it has become the gold-standard treatment for MH, appearing in every international guideline.<sup>6,7</sup> However, the later Dantrolene is injected, the less effective it will be: Larach's study published in 2010 shows that for each 30-minutes delay between the onset of the disease and the injection, the complication rate is multiplied by 1,6<sup>8</sup>. So, Dantrolene must be dispensed as soon as possible; which requires the staff to be well trained and the drug to be easy to find.

The main purpose of this study is to assess the French anaesthetists and intensivists' readiness towards MH, their accessibility to Dantrolene, and the existence of protocols to make the management easier.



## Methods

This study is an epidemiologic and descriptive analysis.

Its primary goal is to estimate the French anaesthetists and intensivists' preparedness towards MH. Both their theoretical training (tuitions received) and their preparation on the field (knowledge of treatment protocols and of Dantrolene) were studied. Its secondary objectives are to collect feedbacks of their previous MH experiences and to evaluate the anaesthetists' inclination to seek the MH risk factors during their preoperative consultations.

This analysis relies on an anonymous self-reporting survey created using the surveymonkey.com website. Its questionnaire (**Appendix**) is composed of 19 questions and assesses the following criteria:

- The interrogatees' characteristics (junior or senior physician, anaesthetist or intensive care physician, length of service, working place, use of halogenated gas or depolarizing curare)
- The teachings they attended (their quantity, their modalities, and their level of confidence towards them)
- Their preparedness on the field (knowledge of their treatment protocols, accessibility to Dantrolene and ability to use it)
- The feedback of their previous MH experiences (number of MH encountered, its most evocative signs, their feelings during the incident)
- The anaesthetists' motivation to seek MH risk factors during their preoperative consultations.

The survey was sent to French anaesthetists and intensive care physicians using the mailing list of the French Society of Anaesthesia & Intensive Care Medicine (SFAR). The enquiry was conducted from November 7<sup>th</sup> 2019 to February 7<sup>th</sup> 2020.

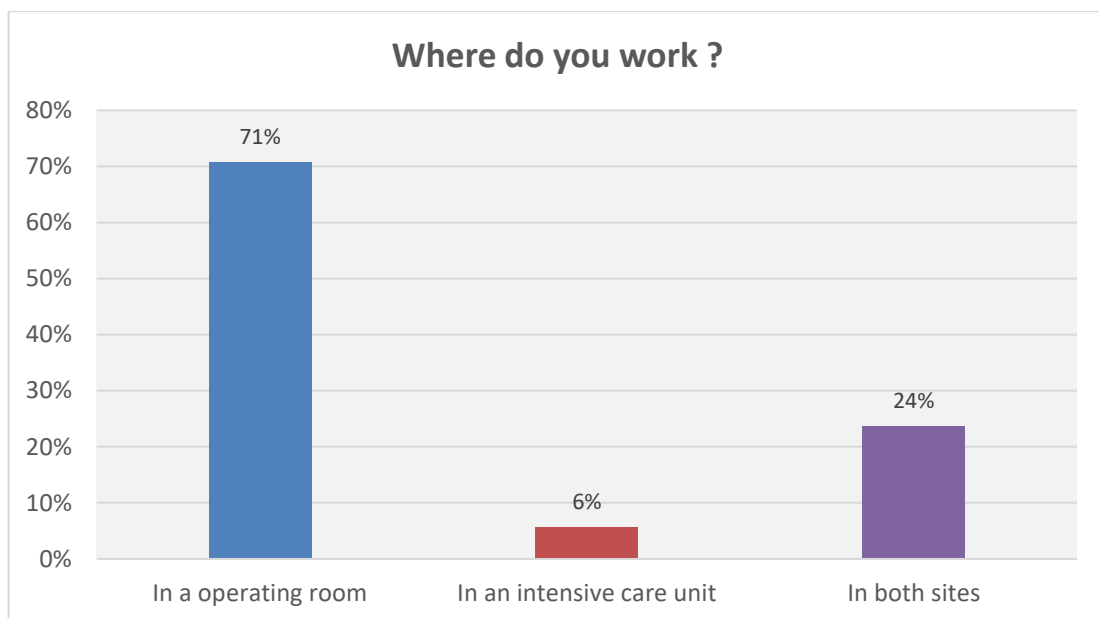
The data analysis was performed using the Excel software (issued by Microsoft®) and the statistics already provided by the surveymonkey.com website. The data is displayed using numbers and percentages. The graphics were created using the Excel software.

## Results

### Participants

4595 anaesthetists and intensivists were polled and 670 (15%) agreed to participate in this study. Among them, 653 answered every question until the end of the questionnaire.

91% of participants are anaesthetists, 63% have been practising for more than 10 years and 71% work in operating theatres, whereas 6% work in intensive care units and 24% share their activity between both sites (**Figure 1**). In their daily practice, 99% of respondents either use depolarizing curare or halogenated gas or both of them.

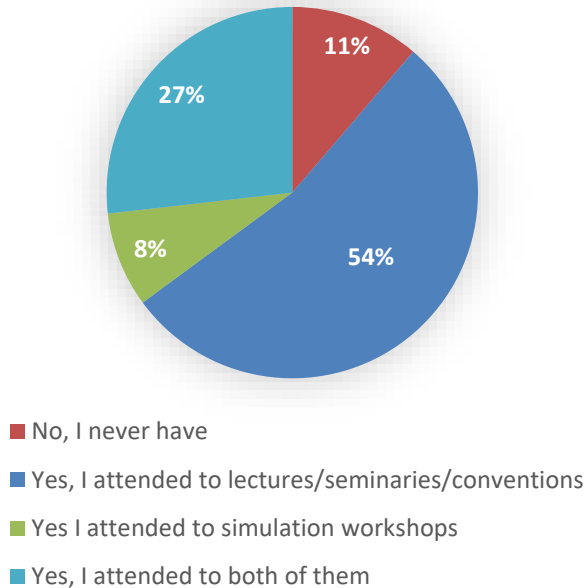


**Figure 1: The participants' working place**

### Primary objectives

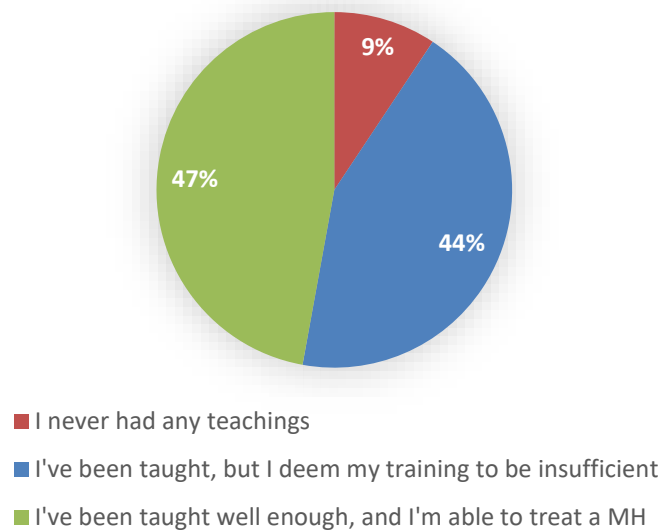
11% of interrogatees never had any teachings about malignant hyperthermia. Among those who did receive some tuitions, 65% attended to 2 sessions or less. The teachings were mainly dispensed during seminars or lectures: only 35% of the respondents had simulation sessions. 44% of participants deem that the teachings received aren't enough to treat malignant hyperthermia properly (**Figures 2 and 3**).

### Did you ever have any tuitions about malignant hyperthermia ?



**Figure 2: Types of teachings received on MH**

### Are you confident about your training on malignant hyperthermia?



**Figure 3: Confidence about the training on MH**

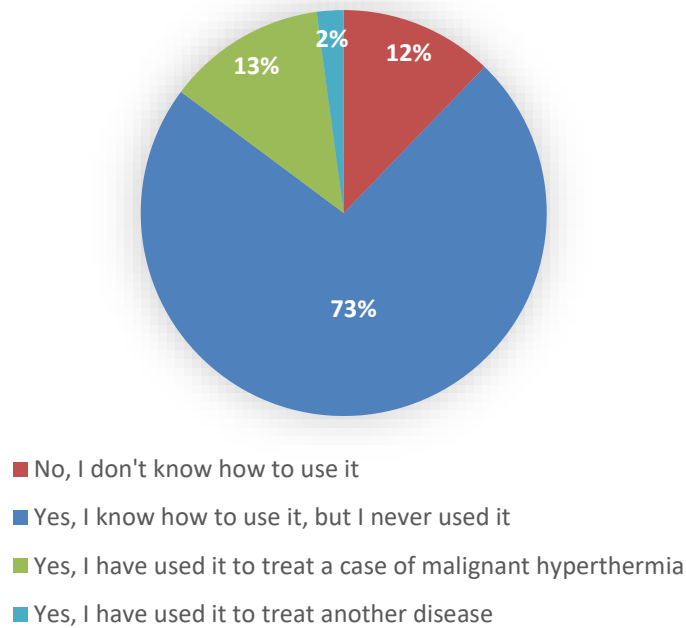
85% of interrogatees have access to a treatment protocol on malignant hyperthermia. In 15% of cases, this protocol isn't known by the physician (7%) or it doesn't exist (8%). Moreover, 35% of participants never read the cognitive aid issued by the SFAR. Speaking of Dantrolene, 86% of interrogatees have some in their very own ward and 77% manage to get some in less than 5 minutes. On the other hand, 73% never got to use it and 12% don't know how to use it (**Figure 4**).

## Secondary objectives

29% of participants have already dealt with a suspicion of malignant hyperthermia. Among those, 36% proved themselves to be genuine malignant hyperthermias, confirmed by gold standard tests. The most evocative signs reported by the respondents are the increase of the EtCO<sub>2</sub> (59%), the hyperthermia (18%) and the muscular rigidity (13%). Whereas 39% of interrogatees deem their care to be optimal, 57% think they could have done better, and 4% felt overwhelmed by the situation (**Figure 5**).

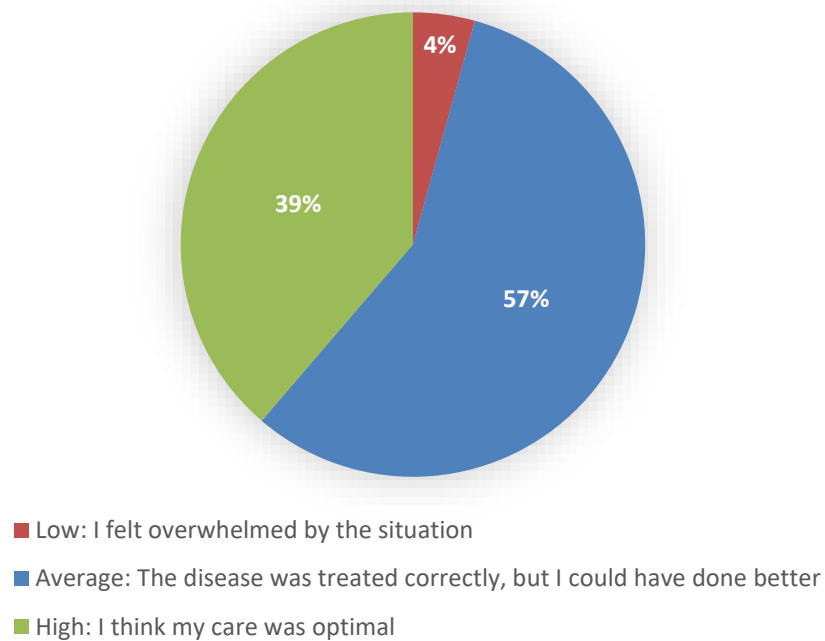
Before the surgery, 89% of anaesthetists seek the risks factors of malignant hyperthermia among their patients during the preoperative consultation: 71% search for them when the patients have a personal and/or a familial background and 18% seek them at each consultation, regardless of the background.

### Do you know how to use IV dantrolene?



**Figure 4: Ability to use Dantrolene and previous experiences**

### What was your level of confidence when dealing with a MH?



**Figure 5: Level of confidence when dealing with a case of MH**

## Discussion

This study shows that anaesthesiologists and intensive care physicians are not sufficiently trained for the management of MH, and that the protocol for the administration of Dantrolene is poorly known or even absent.

This is a questionnaire study sent to 4595 anaesthetists and intensivists. 670 agreed to participate in the study; which makes a response rate of 15%. Among them, 653 answered to the questionnaire entirely; so there are very few subjects lost to follow-up (2% of the total population).

Most of our participants are experienced anaesthetists and work mainly in operating theatres. Only a few of them work in intensive care units or share their activity between both sites. As MH is exclusively triggered by anaesthetic drugs, it occurs almost exclusively in operating theatres. So intensivists might feel less concerned by this disease, which can explain their small number among our subjects. However, the SFAR guidelines published in 2019<sup>9</sup> clearly states that the victims of malignant hyperthermia must be transferred to an intensive care unit for at least 24 hours, in order to treat the potential complications.<sup>10</sup> Even if MH is less likely to occur in an intensive care unit, it is therefore essential for the intensivists to be able to treat this disease properly. Otherwise, this could lead to an inadequate treatment and higher mortality for the patients.<sup>8</sup>

Almost all our interrogatees (anaesthetists and intensivists alike) use depolarizing curare and/or halogenated gas in their daily practice; and these drugs are well known for triggering malignant hyperthermia.<sup>1</sup> This is all the more worrying as halogenated gas are increasingly used in intensive care units<sup>11</sup>, and that Sevoflurane-induced MH have been described under these circumstances.<sup>12</sup>

Since its first description in 1915, most of the studies about malignant hyperthermia talk about its physiopathology, its risk factors and its treatments. Very few of them are carried out on the physicians' knowledge on this disease and none investigates the teachings received beforehand. For example, an article published by Simões et al<sup>13</sup> quantifies the knowledge of Brazilian anaesthetists on malignant hyperthermia (with questions about its clinical signs, its risk factors, its treatment by Dantrolene and the ways to avoid it). But their questionnaire is only about the theoretical knowledge of the physicians; thus it doesn't study neither the teachings received beforehand nor the existence of treatment protocols.

In our study, the participants were asked both the number and the type of teachings received. Most interrogatees received two sessions or less and some of them never had any teachings about malignant hyperthermia. Many of them were taught during seminars or lectures exclusively, and only a few of them attended to simulation

sessions. As a result, most of our subjects don't feel confident about their ability to treat MH and deem that that they haven't been taught enough to treat this disease properly.

These results suggest the need for the teaching to be more frequent and more appropriate. For instance, one interesting type of teaching is the learning by simulation. It challenges both the theoretical knowledge, the practical abilities, the behaviour in stressful settings and the communication skills; so it seems most appropriate for this disease and should be promoted.

To our knowledge, there is no study about the existence of treatment protocols on malignant hyperthermia. Whereas almost all interrogatees have access to a treatment protocol, some physicians only have a poor knowledge of it. In other cases, this kind of protocol doesn't even exist (including in operating theatres). As well, the cognitive aid issued by the SFAR isn't well known, as only a small number of our interrogatees have read it. Yet, treatment protocols and cognitive aids make care easier and faster, so they are indeed helpful in emergencies. Hardy et al showed that the use of checklists improves significantly the technical and non-technical skills in simulated malignant hyperthermias.<sup>14</sup> So, the spreading and the posting of these documents in operating theatres and intensive care units might help decreasing the mortality of malignant hyperthermia.

Our study also estimates the availability of Dantrolene and the physicians' ability to use it. The majority of our participants have access to Dantrolene in their very own ward and the greatest number of them manage to get some in less than 5 minutes (regardless of the number of vials available). Several studies investigated the adequacy between the Dantrolene available and the Dantrolene needed in case of malignant hyperthermia. In their article<sup>13</sup>, Simões et al claim that in 2002, only 24 out of the 26 Brazilian states had this drug in stock. Moreover, some of the Brazilian hospitals didn't have enough Dantrolene to treat even one case of malignant hyperthermia, which leads to several hospitals sharing the minimal amount required. Even in Japan, 3% of hospital didn't have any Dantrolene in 2014.<sup>15</sup> In Germany, every region and every ward doesn't have the same number of Dantrolene vials<sup>16</sup>: whereas 40% of physicians have access to more than 36 vials within 5 minutes, 27% have 24 vials and 19% only 12 vials. Among the hospitals where the stocks of Dantrolene are not sufficient, 35% don't have any agreement with neighbouring hospitals in order to get some. As well, only 26% of the German intensive care physicians have access to Dantrolene.

This might be troublesome, knowing that a minimal number of 36 vials is required to treat a MH crisis for 20 to 30 minutes in adult patients. The European Malignant Hyperthermia Group published guidelines on the number of vials each unit ought to have in stock.<sup>17</sup> This number depends on the number of extra vials which can be

provided in a limited amount of time. The minimal number of vials on-site is 36 (which is only possible if 24 extra vials can be obtained within 30 minutes) and this number can increase to 60 (if no more Dantrolene can be obtained within one hour). These guidelines also recommend that Dantrolene should be available at all times wherever volatile agents or succinylcholine are used. According to that statement, the Dantrolene stocks should be closest to the patients (in operating theatres or in intensive care units), and their location should be clearly indicated (with signs, for example). The best solution would be to give access to “Malignant Hyperthermia kits” composed of 36 vials of Dantrolene, the dilution kit (100mL of sterile water (epi)), one syringe of 60mL, one 19-gauge needle, one transfer tool), the treatment protocol, the cognitive aid and the summary sheet issued by the SFAR<sup>9</sup>.

However, there is no pre-existing study which tells us whether the physicians know how to use Dantrolene or not. In our enquiry, 12% of respondents don't know how to use Dantrolene (including anaesthetists working in operating theatres). Knowing how troublesome the preparation of this drug can be, this result underlines the need for simulation sessions or workshops. By training the physicians, these would make the preparation of Dantrolene and its administration faster; and would avoid delaying the treatment. In this field, Ryanodex® is a very interesting drug made of nano-particles of Dantrolene stabilized by surfactants which improve its solvability in water<sup>18</sup>; and decrease its preparation time<sup>19</sup>. Despite the lack of studies on this drug, it has proven to be effective on a swine model<sup>20</sup>; so, its use in the United States has been approved by the Food and Drug Administration since 2014. But there is a dilemma between the urge for sufficient stocks of Dantrolene and cost-effectiveness issues<sup>21, 22</sup>, accentuated by the perishability of Dantrolene (which has to be used within 3 years after its production).

A substantial number of our interrogatees had already dealt with a suspected or confirmed case of malignant hyperthermia. More than one third of them proved themselves to be genuine malignant hyperthermias, confirmed by gold standard tests. These rates seem particularly high, given that the prevalence of MH is actually very low. This result is probably overestimated because of a double-voluntary bias. On the one hand, most of the participants are anaesthetists (as such, they are particularly exposed to this phenomenon). On the other hand, the physicians who agreed to answer to this questionnaire are the ones who felt the most involved in the care of this disease (and probably the ones who already had to deal with it). Moreover, MH might be an underdiagnosed disease because the tests required in order to confirm the diagnosis (genetic analyses and contracture tests with halothane and caffeine) aren't easily available.<sup>23</sup> For example, the gold-standard test (the contracture test) needs a muscle biopsy to be executed, and it is only available in 2 centres in France (the Teaching Hospital of Lille and the Timone Hospital in Marseille). This can't rule out the



possibility that many suspicions can't lead to a proper diagnosis; thus underestimating the prevalence of this disease.

As stated in many other studies, hypercapnia, hyperthermia and muscular rigidity are the most frequent signs of malignant hyperthermia reported by our participants. Surprisingly tachycardia only helped 6% of our interrogatees to make the right diagnosis, even though it is known to be one of the most frequent and the earliest signs of malignant hyperthermia (In Larach's study<sup>8</sup>, tachycardia was reported by 72% of subjects).

We were not able to find studies talking about the physicians' feelings when dealing with malignant hyperthermia. In our study, most physicians think that they could have done better and some of them even felt overwhelmed by the crisis. This emphasizes the fact that the actual teachings on malignant hyperthermia might not be sufficient, thus underlining the need for more frequent and more appropriate tuitions.

As well, there isn't any pre-existing article describing whether anaesthetists seek MH risk factors in their pre-operative consultations or not. In our enquiry, nearly all our anaesthetists seek the MH risks factors among their patients. The greatest part do it when an evocative personal and/or familial background is present; but some even do it for every single patient, regardless of his background.

## Strengths and limitations

Our study has several strengths and limitations.

It is a national multicentre study which includes a large number of subjects. To our knowledge, it is the only one investigating the physicians' ability to treat malignant hyperthermia, both on the theoretical and on the practical plan. It is also one of the very few studies to include intensivists, whose point of view has hardly been surveyed in this subject.

The biggest flaw of this study is that it relies on a self-reporting survey. So, it is highly influenced by response and memorisation biases. It is also exposed to a voluntary bias, which explains the large number of anaesthetists included; and the probably overestimated number of MH reported. Finally, our interrogatees might have been vulnerable to a social desirability bias, which might have led to an overestimation of the positive answers.

Moreover, the number of intensive care physicians included is very small. This can be explained by two main reasons. On the one hand, given that MH is only triggered by exposure to anaesthetic agents, it occurs in operating theatres most of the time. So, while it is dreaded by most anaesthetists, many intensivists might feel less

involved in this problem. On the other hand, we requested the SFAR's help to promote the diffusion of the questionnaire among the anaesthetists and intensive care physicians. However, most of the SFAR's subscribers are anaesthetists, the intensivists composing only a minority of the adherents.

## **Conclusions**

This trial shows the great availability of Dantrolene, but also the lack of appropriate training and the poor knowledge of MH treatment protocols.

Despite the progress of anaesthesia and intensive care, MH still kills<sup>24</sup>, so information campaigns are required to raise the physicians' awareness against this disease. Better teachings (with simulation sessions) and better infrastructures are also needed to improve the treatment of malignant hyperthermia, this deadly and probably not-so-rare disease.

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# Appendix

## The original questionnaire (in French)

### Introduction

Chers collègues,

L'hyperthermie maligne est une maladie rare, mais qui est grevée d'une mortalité importante malgré les progrès de l'anesthésie. La rapidité de la prise en charge a une influence directe sur le pronostic de la maladie. Il est donc fondamental que le traitement soit administré le plus précocement possible et pour ce faire, un bon entraînement des équipes et une bonne accessibilité au Dantrolène IV sont essentiels.

Ce court questionnaire, diffusé avec l'aide de la SFAR, a pour objectif d'établir un état des lieux des connaissances théoriques et des compétences pratiques des soignants dans la prise en charge de l'hyperthermie maligne.

Une seule réponse est attendue à chaque question. Vous n'aurez besoin que de 2 à 3 minutes pour répondre à l'ensemble des questions. Merci pour le temps que vous y consacrerez.

Aurélie LEE KIM KHIOOK (interne, CHU de Poitiers), Damien MARIE (CCA, CHU de Poitiers)

### A propos de vous

1. Quelle est votre fonction ?
  - ☐ Anesthésiste-réanimateur
  - ☐ Réanimateur MIR
  - ☐ DESAR (interne d'anesthésie-réanimation)
  - ☐ DESMIR (interne de médecine intensive et réanimation)
2. Depuis combien de temps exercez-vous en anesthésie ou en réanimation ?
  - ☐ < 2 ans
  - ☐ Entre 2 et 5 ans
  - ☐ Entre 5 et 10 ans
  - ☐ > 10 ans
3. Dans quelle structure exercez-vous ?
  - ☐ En libéral
  - ☐ En centre hospitalier
  - ☐ En CHU
  - ☐ J'effectue des remplacements

4. Dans quel service exercez-vous ?
- ☐ Au bloc opératoire
  - ☐ En réanimation
  - ☐ J'ai une activité mixte (entre anesthésie et réanimation)
5. Utilisez-vous dans votre pratique du curare dépolarisant et/ou des halogénés ?
- ☐ Non, ni l'un ni l'autre
  - ☐ Oui, du curare dépolarisant
  - ☐ Oui, des halogénés
  - ☐ Oui, j'utilise les deux

### Connaissances théoriques et formation préalable

6. Avez-vous déjà été formé(e) pour la prise en charge de l'hyperthermie maligne ?
- ☐ Non
  - ☐ Oui, lors de cours/de congrès
  - ☐ Oui, lors de séances de simulation
  - ☐ Oui, j'ai pu bénéficier des deux
7. Combien de séances de formation avez-vous reçues (toutes modalités confondues) ?
- ☐ 0
  - ☐ 1 ou 2
  - ☐ 3 et +
8. Estimez-vous votre niveau de formation suffisant ?
- ☐ Je n'ai pas reçu de formation
  - ☐ J'ai été formé(e), mais j'estime mon niveau de formation insuffisant
  - ☐ J'ai été formé(e), et je me sens capable de faire face à une hyperthermie maligne

### La prise en charge de l'hyperthermie maligne en pratique

9. Existe-t-il un protocole de prise en charge de l'hyperthermie maligne dans votre service ?
- ☐ Non
  - ☐ Je ne sais pas
  - ☐ Oui

10. Quel est votre niveau de connaissance par rapport à ce protocole ?

- ☐ Il n'y a pas de protocole
- ☐ Je ne le connais pas
- ☐ Je ne le connais que dans les grandes lignes
- ☐ Je le connais dans son intégralité

11. Connaissez-vous l'aide cognitive Hyperthermie maligne de la SFAR ?

- ☐ Non, je ne l'ai jamais consultée
- ☐ Oui, je l'ai déjà consultée ; mais je ne l'ai jamais utilisée
- ☐ Oui, je l'ai déjà consultée et je l'ai déjà utilisée

12. Où se trouve le Dantrolène IV sur votre lieu d'exercice ?

- ☐ Je ne sais pas si nous en avons / Je ne sais pas où il se trouve
- ☐ Nous n'en avons pas dans mon hôpital
- ☐ Nous en avons dans mon hôpital, mais pas dans mon service
- ☐ Nous en avons dans mon service

13. Combien de temps vous faudrait-il pour vous procurer du Dantrolène IV ?

- ☐ > 30 minutes
- ☐ Entre 15 et 30 minutes
- ☐ Entre 5 et 15 minutes
- ☐ < 5 minutes

14. Savez-vous comment utiliser le Dantrolène IV ?

- ☐ Non, je ne sais pas comment on l'utilise
- ☐ Oui, je sais comment le préparer mais je n'en ai jamais utilisé
- ☐ Oui, je l'ai déjà utilisé pour traiter une hyperthermie maligne
- ☐ Oui, je l'ai déjà utilisé pour traiter une autre pathologie

## Situation vécue

15. Avez-vous déjà suspecté une hyperthermie maligne ?

- ☐ Oui
- ☐ Non (passer directement à la section suivante)

16. Quel était le principal signe clinique qui vous a fait suspecter une hyperthermie maligne ?

- ☐ La tachycardie
- ☐ L'élévation de l'EtCO<sub>2</sub>
- ☐ L'hyperthermie



- La rigidité musculaire
- Les troubles du rythme
- Autre (veuillez préciser)

17. Cette suspicion d'hyperthermie maligne a-t-elle été confirmée (par des tests de référence)?

- Oui, il s'agissait d'une vraie hyperthermie maligne
- Non, il s'agissait finalement d'un diagnostic différentiel

18. Quel était votre niveau de maîtrise ressenti par rapport à la situation ?

- Faible : je me suis senti dépassé(e) par la situation
- Intermédiaire : je maîtrisais les grandes lignes, mais il y a des choses que j'aurais pu mieux faire
- Elevé : j'estime que ma prise en charge était optimale

#### En consultation (pour les anesthésistes)

19. Recherchez-vous les facteurs de risque d'hyperthermie maligne chez vos patients ?

- Non, jamais
- Oui, mais uniquement si le patient a des antécédents personnels et/ou familiaux évocateurs (ex : myopathies, "coup de chaleur")
- Oui, systématiquement

# Summary

## Background

Malignant hyperthermia may be an uncommon disease, but it can quickly be lethal should an effective treatment be delayed. The aim of this study is to assess how well the French anaesthetists and intensivists are trained in theory (tuitions received...) and in practice (knowledge of protocols, accessibility to Dantrolene...) in order to treat malignant hyperthermia.

## Methods

This study is based on an anonymous self-reporting survey; thus, the consent of the participants is obtained per se. The questionnaire was designed with the surveymonkey.com website and diffused by the French Society of Anaesthesia and Intensive Care (SFAR) via its mailing list.

Our main objectives are to estimate the number and the type of teachings received by the participants; as well as their preparation on the field (knowledge of the protocols, accessibility to Dantrolene...). Our other objectives are to quantify the number of malignant hyperthermias (both the suspected cases and the confirmed ones); and the number of anaesthetists who are used to seeking its risk factors in their preoperative consultations.

The statistical analyses were performed with the use of the surveymonkey.com website and the Microsoft Excel software.

## Findings

670 French anaesthetists and intensivists took part in the study. 63% of them have been practising for more than 10 years and 71% work in operating theatres. 99% of interrogatees either use depolarizing curare or halogenated gas or both of them.

11% of respondents never had any tuitions about the treatment of malignant hyperthermia. Among those who did receive some teachings, 65% attended to 2 sessions or less. Moreover, 44% of participants consider that the tuitions provided are not enough to treat this disease properly.

About on-field preparations, 7% of respondents don't know the treatment protocol; and in 8% of cases, it doesn't exist at all. As well, 35% of interrogatees never took knowledge of the cognitive aid issued by the SFAR. However, 86% of participants have

access to Dantrolene in their own ward and in 77% of cases it is available in less than 5 minutes. But 12% of respondents don't know how to use it.

In their professional practice, 29% of participants had to deal with a suspected case of malignant hyperthermia (amongst which 36% of genuine malignant hyperthermias confirmed by gold-standard tests). Most physicians (61% overall) either remember feeling overwhelmed or admit that their medical care could have been improved.

During their preoperative consultations, 89% of all surveyed anaesthetists seek the risk factors of malignant hyperthermia amongst their patients.

## Conclusions

Many anaesthetists and intensivists never had any teachings about the treatment of malignant hyperthermia; and those who did have some courses don't feel like they are trained enough. Although Dantrolene is quickly available, the treatment protocol still remains unknown to some of the participants; and in the worst cases it doesn't even exist.

This data points out the necessity for more frequent and more appropriate teachings about malignant hyperthermia. It is also crucial for the medical teams to consider the treatment protocols in order to improve their medical care against malignant hyperthermia, this serious but not-so-rare disease.



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## SERMENT



En présence des Maîtres de cette école, de mes chers condisciples et devant l'effigie d'Hippocrate, je promets et je jure d'être fidèle aux lois de l'honneur et de la probité dans l'exercice de la médecine. Je donnerai mes soins gratuits à l'indigent et n'exigerai jamais un salaire au-dessus de mon travail. Admis dans l'intérieur des maisons mes yeux ne verront pas ce qui s'y passe ; ma langue taira les secrets qui me seront confiés, et mon état ne servira pas à corrompre les mœurs ni à favoriser le crime. Respectueux et reconnaissant envers mes Maîtres, je rendrai à leurs enfants l'instruction que j'ai reçue de leurs pères.

Que les hommes m'accordent leur estime si je suis fidèle à mes promesses ! Que je sois couvert d'opprobre et méprisé de mes confrères si j'y manque !

