

## Original article

# Medical emergencies in dental practice

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**Abstract – Introduction:** Dentistry is a clinical activity potentially at risk of medical emergencies and dental practitioners need to be prepared to handle them effectively. **Materials and methods:** We have contacted 25535 French and Belgian dentists through an online survey which included 37 questions about emergency situations they have experienced, emergency equipment at their disposal, training and self-evaluation of competence in the management of medical emergencies. **Results:** 1344 were included. The incidence of medical emergencies was 2.1 events per dentists per year, mostly vasovagal syncope, orthostatic hypotension or hypoglycemia. Life-threatening emergencies and cardiac arrests are rare but occur (0.003 cardiac arrests per dentist per year of practice). Nearly one out of five dentists had no emergency equipment at all. While many practitioners are equipped with oxygen (66.8%), few possess a defibrillator (7.7%). Nearly 10% of practitioners report never being trained for medical emergencies. **Conclusions:** Dental practitioners encounter medical emergencies, mostly benign ones but also, more rarely, life-threatening emergencies. Efforts should be made in the education of dental practitioners regarding the management of medical emergencies during initial and continuing education. The recommended emergency equipment for dental practices should be kept to the minimum necessary in order to increase the number of offices properly equipped.

**Mots clés :**  
urgence médicale /  
chirurgien-dentiste /  
arrêt cardiaque /  
défibrillateur /  
cabinet dentaire

**Résumé – Urgences médicales au cabinet dentaire. Introduction :** La chirurgie dentaire est une activité clinique au cours de laquelle une urgence médicale peut survenir. Les chirurgiens-dentistes doivent se préparer à les gérer efficacement. **Méthodes :** Nous avons contacté 25535 dentistes français et belges par le biais d'un sondage en ligne qui comprenait 37 questions. Ce questionnaire portait sur les urgences médicales auxquelles ils ont été confrontés, l'équipement d'urgence à leur disposition, leur formation et une auto-évaluation de leurs compétences dans la gestion des urgences médicales. **Résultats :** 1344 ont été inclus. L'incidence des urgences médicales était de 2,1 événements par dentiste par an, principalement des malaises vagues, des hypotensions orthostatiques ou des hypoglycémies. Les urgences vitales et les arrêts cardiaques sont rares, mais ils se rencontrent néanmoins (0,003 arrêt cardiaque par dentiste par année de pratique). Près d'un dentiste sur cinq n'avait pas de matériel d'urgence. Alors que de nombreux praticiens sont équipés d'oxygène (66,8 %) ou d'un tensiomètre (64,5 %), peu possèdent un défibrillateur (7,7 %). Près de 10 % des praticiens déclarent ne jamais avoir été formés pour la prise en charge des urgences médicales. Pour 40 % des praticiens formés, la dernière formation a eu lieu il y a plus de 4 ans. Une large majorité des praticiens se sentent capables de gérer un malaise, tandis que moins de la moitié se sentent en mesure de gérer un arrêt cardiaque. **Conclusions :** Les chirurgiens-dentistes rencontrent des urgences médicales dans leur pratique, la plupart bénignes, mais aussi, plus rarement, des urgences graves ou un arrêt cardiaque. Des efforts doivent être faits dans la formation des chirurgiens-dentistes concernant la gestion des urgences médicales au cours de la formation initiale et continue. L'équipement d'urgence recommandée pour les cabinets dentaires doit être réduit au minimum nécessaire afin d'augmenter le nombre de cabinets correctement équipés.

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## Introduction

Dentistry is a clinical activity in which patients are at potential risk of medical emergency because it often involves invasive techniques such as injections, surgical flaps, devitalizations or extractions. Stress generated by dental cares, aging of the population and increase of general health problems and risk factors expose dental practitioners to the occurrence of medical emergency in their offices.

Some data exist about the prevalence and the severity of medical emergencies in dental practice. These data, mainly from older or small studies, suggests that these situations are not frequent but can occasionally involve life-threatening emergencies.

Several dental and emergency societies recommend that practitioners should be regularly trained at handling the most common medical emergencies and that dental offices should have emergency equipment [1-3]. Few studies have been performed to assess emergency equipment available in dental offices, the training of dental practitioners and their perceived competence about handling medical emergencies.

All these data are necessary to understand the specificities of those situations in dental practices and to adapt the programs of initial and continuing education of dental practitioners to their real needs.

The primary aim of the present study was to determine the incidence, types, and severity of medical emergencies occurring in dental practice. Secondary aims were to assess training and equipment of dental practitioners to face these situations, and to evaluate their perceived competency to manage medical emergencies.

## Materials and methods

This survey of current dental practitioners encompassed a 6-month period. An online survey was designed using an online service (<http://www.limeservice.com>). The survey included 37 questions divided in 7 sections and could be completed in less than 4 minutes (Table I).

### Demographic data

We collected general demographic data (age, sex, specialty, number of years in practice, and country of residence) and categorized the location of the practitioner's office(s) as urban, rural or both (urban defined as city of more than 2000 inhabitants; rural defined as city of less than 2000 inhabitants according to 2010 census data). We asked respondents to classify their practice as solo practice, part of a group practice with other dentists only, part of a group practice with a specialty other than dentistry, a hospital-based practice, or practice as part of a health-care center.

### Emergency situations experienced

We asked practitioners whether they have ever experienced during their career a minor medical problem in their office (vasovagal reaction, orthostatic hypotension or hypoglycemia) or a serious medical emergency (acute asthma attack, seizure, allergic reaction, inhalation or ingestion of foreign bodies, acute coronary syndrome) or cardiac arrest.

We also assessed if they had faced a serious medical emergency or cardiac arrest (as defined above) in the workplace during the last twelve-months and asked them to estimate the number and type of any such emergencies.

### Emergency equipment available in dental office

We asked respondents about the availability of the following five items at their practice setting: oxygen, defibrillator, blood pressure meter, bag valve mask, and drugs for emergency management. For each category, dentists were also asked if they had ever used any of these pieces of emergency equipment.

### Training

We asked practitioners if they have been trained to manage medical emergencies during or after their initial dental training and when their last such training was. They were also asked about their perceived need for further training in the management of medical emergencies, and the availability of protocol sheets on the management of medical emergencies in their office.

### Evaluation of self-efficacy in the management of medical emergencies

We asked respondents whether they feel able to handle a minor medical problem (vasovagal response, orthostatic hypotension, hypoglycemia), a serious medical emergency (acute asthma attack, seizures, inhalation or ingestion of foreign bodies, hyperventilation crisis, hypertensive crisis, serious allergic reaction, stroke, acute coronary syndrome) or cardiac arrest using a 4-point Likert scale (fully capable, capable enough, not enough capable, not at all).

Most of the questions were closed response questions to allow for easier analysis. The survey was sent to all active, francophone dental surgeons working in France or Belgium member of the 2 main professional societies for dentists (the Association dentaire française, ADF aka the Association of French Dentist and the Association Dentaire Belge Francophone, ADBF aka the Association of Belgian French Speaking Dentist) with a reminder at 3 months. All surveys were completed anonymously and analyzed in aggregate. Incomplete surveys were excluded, as were surveys not completed by the intended study population.

**Table I.** Survey in French as it was on the web site and English translation. Questions with a \* were mandatory.  
*Tableau I. Questionnaire en français et sa traduction en anglais. Les questions avec une \* étaient obligatoires.*

Informations générales	Demographic data
<b>1 Vous êtes :</b> * Veuillez sélectionner <b>une seule</b> des propositions suivantes : une femme, un homme	<b>1 You are:</b> * Please select <b>one</b> of the following propositions: a woman, a man
<b>2 Votre âge ? *</b>	<b>2 Your age? *</b>
<b>3 Votre spécialité ? *</b> Choisissez <b>toutes</b> les réponses qui conviennent : Chirurgien-dentiste, Spécialiste en Orthopédie dento-faciale, Chirurgien oral (pratique exclusive de la chirurgie et/ou de l'implantologie), autre :	<b>3 Your specialty? *</b> Choose all that apply: Dentist, Orthodontics specialist, Oral Surgeon (exclusive practice of surgery and / or implant), other:
<b>4 Depuis combien d'année(s) exercez-vous ? *</b>	<b>4 How many year(s) have you been working? *</b>
<b>5 Dans quel département exercez-vous ?</b>	<b>5 In which state do you practice?</b>
<b>6 Si vous habitez dans un pays autre que la France, lequel ?</b>	<b>6 If you live in a country other than France, which one?</b>
<b>7 Dans quel type de secteur exercez-vous ? *</b> Veuillez choisir <b>au plus 1</b> réponse : urbain (commune de plus de 2000 habitants), rural (commune de moins de 2000 habitants), les deux	<b>7 In what type of area do you practice? *</b> Please select <b>no more than one</b> answer: urban (town of more than 2000 inhabitants), rural (town of less than 2000 inhabitants), both
<b>8 Vous exercez en *</b> Choisissez <b>toutes</b> les réponses qui conviennent : cabinet individuel, cabinet de groupe (avec des chirurgiens-dentistes ou des orthodontistes), cabinet de groupe (avec d'autres spécialistes : kinésithérapeute, infirmier, médecin généraliste, médecin spécialiste...), hôpital ou clinique, centre de santé (municipal, mutualiste ...)	<b>8 You exercise in *</b> Choose <b>all that apply</b> : individual firm, group practice (with dentists or orthodontists), group practice (with other specialists: physiotherapist, nurse, general practitioner, medical specialist ...) hospital or clinic, health center (county, mutual ...)
Confrontation à l'urgence	Emergency situations experienced
<b>9 Avez-vous déjà été confronté à un malaise (malaise vagal, hypoglycémie ou hypotension orthostatique) dans le cadre professionnel ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non	<b>9 Have you ever been faced with minor medical problem (vasovagal syncope, hypoglycemia or orthostatic hypotension) in the workplace? *</b> Please select <b>one</b> of the following propositions: Yes, No
<b>10 Avez-vous déjà été confronté à une autre situation d'urgence médicale (crise d'asthme, convulsions, allergie, inhalation de corps étrangers, syndrome coronarien aigu...) dans le cadre professionnel ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non	<b>10 Have you ever been confronted to a serious medical emergency (asthma attack, seizures, allergies, inhalation of foreign bodies, acute coronary syndrome ...) in the workplace? *</b> Please select <b>one</b> of the following propositions: Yes, No
<b>11 Avez-vous déjà été le témoin d'un arrêt cardiaque ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non	<b>11 Have you ever witnessed a cardiac arrest? *</b> Please select one of the following propositions: Yes, No
<b>12 Cet arrêt cardiaque est survenu : *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était Oui à la question 11 Choisissez <b>toutes</b> les réponses qui conviennent : dans le cadre professionnel, en dehors du cadre professionnel (vie privée, loisir...)	<b>12 The cardiac arrest occurred: *</b> Answer this question only if the following conditions are met: the answer was yes to question 11 Choose <b>all</b> that apply: in the workplace, outside work
Équipement de votre cabinet	Emergency equipment available in dental office
<b>13 Sur votre lieu d'exercice, disposez-vous de matériel d'urgence ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non	<b>13 In your office, do you have emergency equipment? *</b> Please select <b>one</b> of the following propositions: Yes, No
<b>14 Dans votre cabinet vous disposez de : *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était Oui à la question 13 Choisissez <b>toutes</b> les réponses qui conviennent : une bouteille d'oxygène, un défibrillateur, du matériel pour mesurer la pression artérielle, matériel de ventilation artificielle (insufflateur manuel), des médicaments d'urgence, autre :	<b>14 In your office you have: *</b> Answer this question only if the following conditions are met: the answer was yes to question 13 Choose <b>all</b> that apply: oxygen, a defibrillator, blood pressure meter, artificial ventilation equipment (bag valve mask), emergency drugs, other:

**Table I.** Continued.

Tableau I. Suite.

<p><b>15 Avez-vous déjà utilisé votre bouteille d'oxygène ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour l'oxygène Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>15 Have you ever used your oxygen? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for oxygen Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>16 Votre bouteille a été changée pour la dernière fois, il y a ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour l'oxygène Veuillez choisir <b>au plus</b> 1 réponse : &lt; 5 ans, 5 à 10 ans, &gt; 10 ans, ne sais pas</p>	<p><b>16 How long ago your oxygen has been changed for the last time? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for oxygen Please select <b>no more</b> than one answer: &lt; 5 years, 5-10 years, &gt; 10 years, do not know</p>
<p><b>17 De quel type de défibrillateur disposez-vous ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour le défibrillateur Veuillez choisir <b>au plus</b> 1 réponse : manuel, semi-automatique, automatique, ne sais pas</p>	<p><b>17 What type of defibrillator you have? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for defibrillator Please select <b>no more</b> than one answer: manual, semi-automatic, automatic, do not know</p>
<p><b>18 Avez-vous déjà utilisé votre défibrillateur ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour le défibrillateur Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>18 Have you ever used your defibrillator? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for defibrillator Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>19 Avez-vous déjà utilisé votre matériel pour mesurer la pression artérielle ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour le tensiomètre Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>19 Have you ever used your equipment to measure blood pressure? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for the monitor Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>20 Avez-vous dans votre cabinet l'un de ces médicaments d'urgence ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour les médicaments Choisissez <b>toutes</b> les réponses qui conviennent : adrénaline (Anapen, Anakit, Anahelp...), trinitrine (Natyspray, Lénitral...), beta-2-mimétique (Ventoline, Bricanyl...), glucagon (Glucagen...), corticoïdes, autre(s) médicament(s)</p>	<p><b>20 Do you have in your closet one of these emergency drugs? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for drugs Choose <b>all</b> that apply: epinephrine (Anapen, Anakit, Anahelp ...) nitroglycerin (Natyspray, Lénitral ...), beta-2-agonist (Ventolin, Bricanyl ...), glucagon (Glucagen ...), steroids, other drug (s)</p>
<p><b>21 Avez-vous déjà utilisé un médicament d'urgence de votre cabinet (en dehors du sucre par voie orale) ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 14 pour les médicaments Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>21 Have you ever used an emergency drug in your practice (apart from oral sugar)? *</b> Answer this question only if the following conditions are met: the answer was yes to question 14 for drugs Please select one of the following propositions: Yes, No</p>
<p><b>22 Avez déjà utilisé l'un de ces médicament(s) d'urgence dans votre cabinet ?</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 21 Choisissez <b>toutes</b> les réponses qui conviennent : adrénaline (Anapen, Anakit, Anahelp...), trinitrine (Natyspray, Lénitral...), beta-2-mimétique (Ventoline, Bricanyl...), glucagon (Glucagen...), corticoïdes, autre(s) médicaments</p>	<p><b>22 Have already used one of these drug (s) of emergency in your office?</b> Answer this question only if the following conditions are met: the answer was yes to question 21 Choose <b>all</b> that apply: epinephrine (Anapen, Anakit, Anahelp ...) nitroglycerin (Natyspray, Lenitral ...), beta-2-agonist (Ventolin, Bricanyl ...), glucagon (Glucagen ...), steroids, other drugs</p>
<b>Votre formation</b>	<b>Training</b>
<p><b>23 Avez-vous été formé à la prise en charge des urgences médicales durant vos études de chirurgie-dentiste ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>23 Have you been trained in the management of medical emergencies during your studies of dental surgery? *</b> Please select <b>one</b> of the following propositions: Yes, No</p>

**Table I.** Continued.

Tableau I. Suite.

<p><b>24 Avez-vous suivi une formation sur la prise en charge des urgences médicales après vos études de chirurgie-dentiste ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>24 Have you received training on the management of medical emergencies after graduation from dental surgery? *</b> Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>25 Laquelle/ lesquelles ? *</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 24 Choisissez <b>toutes</b> les réponses qui conviennent : Brevet de secourisme (AFPS, PSC1...), AFGSU, Journée de formation continue (ADF, Organisme de formation continue...), Diplôme universitaire sur les urgences, ne se rappelle plus, autre :</p>	<p><b>25 That / which? *</b> Answer this question only if the following conditions are met: the answer was yes to question 24 Choose <b>all</b> that apply: BLS (AFPS, PSC1 ...) AFGSU, Continuing Education Day (ADF, Continuous Agency training ...), Graduate Diploma in emergencies, cannot recall, other:</p>
<p><b>26 Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 25 section autre (laquelle/ lesquelles ?)</b></p>	<p><b>26 Answer this question only if the following conditions are met: the answer was yes to question 25 section other (which one?)</b></p>
<p><b>27 Dans votre cabinet, disposez-vous de fiches réflexes sur la prise en charge des urgences médicales ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>27 In your practice, do you have any protocol sheets on the management of medical emergencies? *</b> Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>28 Qu'il s'agisse de votre formation initiale ou de formations continues, de quand date votre dernière formation à la prise en charge des urgences médicales ? *</b> Veuillez choisir <b>au plus</b> 1 réponse : moins de 1 an, entre 1 et 4 ans, plus de 4 ans, je n'ai jamais été formé</p>	<p><b>28 Whether it is during your initial training or continuing education, when was your last training in management of medical emergencies? *</b> Please select more than <b>one</b> answer: less than 1 year between 1 and 4 years, over 4 years, I've never been trained</p>
<p><b>29 Actuellement, pensez-vous devoir suivre (ou suivre à nouveau) une formation sur la prise en charge des urgences médicales ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>29 Currently, do you think you need training on the management of medical emergencies? *</b> Please select <b>one</b> of the following propositions: Yes, No</p>
<p><b>Ressenti face à l'urgence médicale</b></p>	<p><b>Estimation of self-efficacy in medical emergency management</b></p>
<p><b>30 Aujourd'hui, vous sentez-vous capable de prendre en charge un malaise dans votre cabinet (malaise vagal, hypoglycémie, hypotension orthostatique) ?</b> Veuillez choisir <b>au plus</b> 1 réponse : totalement capable, assez capable, pas assez capable, pas du tout capable</p>	<p><b>30 Today, do you feel able to handle a minor medical illness in your practice (vasovagal reaction, orthostatic hypotension or hypoglycemia)?</b> Please select <b>one</b> answer: fully capable, capable enough, not enough capable, not able at all, no answer</p>
<p><b>31 Aujourd'hui, vous sentez-vous capable de prendre en charge une autre situation d'urgence médicale dans votre cabinet (crise d'asthme, convulsions, inhalation de corps étrangers, allergie...) en dehors de l'arrêt cardiaque ?</b> Veuillez choisir <b>au plus</b> 1 réponse : totalement capable, assez capable, pas assez capable, pas du tout capable</p>	<p><b>31 Today, do you feel able to handle a serious medical emergency in your practice (asthma, seizures, inhalation of foreign bodies, allergies...) outside of cardiac arrest?</b> Please select <b>one</b> answer: fully capable, capable enough, not enough capable, not able at all, no answer</p>
<p><b>32 Aujourd'hui, vous sentez-vous capable de prendre en charge un arrêt cardiaque ?</b> Veuillez choisir <b>au plus</b> 1 réponse : totalement capable, assez capable, pas assez capable, pas du tout capable</p>	<p><b>32 Today, do you feel able to handle a cardiac arrest in your practice?</b> Please select <b>one</b> answer: fully capable, capable enough, not enough capable, not able at all, no answer</p>
<p><b>Type d'urgence</b></p>	<p><b>Emergency type</b></p>
<p><b>33 Durant les douze derniers mois (année civile 2011), avez-vous rencontré au moins une situation d'urgence médicale (y compris un malaise) dans votre cabinet ? *</b> Veuillez sélectionner <b>une seule</b> des propositions suivantes : Oui, Non</p>	<p><b>33 During the last twelve months (calendar year 2011), have you met at least one medical emergency (including malaise) in your office ? *</b> Please select one of the following propositions: Yes, No</p>

**Table I.** Continued.

Tableau I. Suite.

<p><b>34 Si oui, laquelle (lesquelles) et combien de fois chacune ?</b> Veuillez choisir toutes les réponses qui conviennent et laissez un commentaire : malaise vagal, hypotension orthostatique, hypoglycémie, crise de tétanie, spasmophilie, crise d'hyperventilation, crise d'asthme, convulsions, crise hypertensive, inhalation de corps étrangers, ingestion de corps étrangers, réaction allergique mineure (urticaire isolée, prurit...), réaction allergique grave (œdème de Quincke, choc anaphylactique...), accident vasculaire cérébral, angor / infarctus du myocarde, arrêt cardiaque, autre :</p>	<p><b>34 If yes, which one (s) and how many times each?</b> Please select all that apply and leave a comment: vasovagal reaction, orthostatic hypotension, hypoglycemia, hyperventilation crisis, asthma attack, convulsions, hypertensive crisis, inhalation of foreign body, ingestion of foreign bodies, minor allergic reaction (isolated urticaria, pruritus ...), severe allergic reaction (angioedema, anaphylactic shock ...), stroke, angina / myocardial infarction, cardiac arrest, other:</p>
<p><b>35 Quel type de corps étranger a été inhalé ?</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 34 pour l'inhalation</p>	<p><b>35 What type of foreign body has been inhaled?</b> Answer this question only if the following conditions are met: the answer was yes to question 34 for inhalation</p>
<p><b>36 Quel type de corps étranger a été ingéré?</b> Répondre à cette question seulement si les conditions suivantes sont réunies : la réponse était oui à la question 34 pour l'ingestion</p>	<p><b>36 What type of foreign body has been ingested?</b> Answer this question only if the following conditions are met: the answer was yes to question 34 for ingestion</p>
<p><b>Commentaires personnels</b></p>	<p><b>Personal comments</b></p>
<p><b>37 Commentaires personnels :</b> Veuillez écrire votre réponse ici :</p>	<p><b>37 Personal comments:</b> Please write your answer here:</p>

## Statistical analysis

Data analyses were performed with SPSS® Statistics 17.0 (SPSS Inc, Chicago, Illinois, USA). Values are expressed as raw data, percentage or mean  $\pm$  standard deviation. We compared the age of the last emergency training and the self-confidence in management of medical emergencies. The Mann-Whitney was used for comparison since the data did not pass the normality test. A  $p$  value  $< 0.05$  was considered statistically significant.

## Results

A total of 25535 dentists were contacted by email, 22922 in France (ADF emailing list) and 2613 in Belgium (ADBF emailing list). During the 6 months of the study, a total of 1667 questionnaires were completed online, representing a response rate of 6.5%. 108 questionnaires were excluded because they were not complete, 131 because they were not answered by a French or a Belgian practitioner, 12 because responders were not dentists, leaving a total number of completed surveys of 1344 (1200 for France and 144 for Belgium). This number represents 3.0% of the 40599 dentists in France and 4.2% of 3454 French speaking dentists in Belgium.

### Demographic data

The mean age of respondents was  $46.9 \pm 0.3$  years and 617 were females (45.9%). Among respondents, 1284 (95.5%) were dentists, 38 (2.8%) orthodontists, 40 (3.0%) oral surgeons, and some reported practicing several dental specialties.

619 (46.1%) of respondents reported being in solo practice, 553 (41.1%) shared a private practice with other dentists, and 85 (6.3%) shared a private practice with other health professionals. 119 (8.9%) of respondents reported practicing in hospitals and 109 (8.1%) in health centers, and some working in multiple practice settings. Most of the practices (83.3%,  $n = 1119$ ) were in urban areas, one-tenth (11.2%,  $n = 150$ ) in rural areas and a small part of practitioners work in both (5.6%,  $n = 75$ ). The mean duration of professional career was  $21.4 \pm 0.3$  years.

### Emergency encounters in dental practice

More than half of respondents (53.2%,  $n = 715$ ) reported at least one medical emergency during their last twelve months of practice.

Emergencies encountered by dental practitioners during these last twelve months of practice are summarized in Table II. Among those emergency cases, vasovagal syncope was the most frequent emergency in dental practices (1257 cases, 43.9%); only 39 serious medical emergencies (serious allergic reaction, inhalation of foreign bodies, stroke, angina and myocardial infarction) and 5 cardiac arrests were reported. This represents an incidence of 0.004 cardiac arrests per dentist per year. The incidence of any kind of medical emergency is 2.1 events per dentist per year.

Almost all dentists (94.3%,  $n = 1268$ ) reported encountering at least one minor medical problem in their office during their career (vasovagal response, orthostatic hypotension or low blood sugar). One third of them (35.2%,  $n = 473$ ) report encountering a serious medical emergency (acute asthma,

**Table II.** Medical emergencies encountered during the previous calendar year.

Tableau II. Urgences médicales rencontrées durant la dernière année.

Type of emergency	Number of dentist concerned	Number of event
Vasovagal reaction	629 (46.8%)	1257 (43.9%)
Orthostatic hypotension	283 (21.0%)	671 (23.5%)
Hypoglycemia	264 (19.6%)	460 (16.1%)
Minor allergic reaction	118 (8.8%)	151 (5.3%)
Hyperventilation crisis	126 (9.4%)	148 (5.2%)
Ingestion of foreign bodies	56 (4.1%)	63 (2.2%)
Asthma attack	27 (2.0%)	32 (1.1%)
Hypertensive crisis	18 (1.3%)	19 (0.7%)
Convulsions	20 (1.5%)	21 (0.7%)
Serious allergic reaction	12 (0.9%)	12 (0.4%)
Inhalation of foreign bodies	13 (1.0%)	13 (0.5%)
Cardiac arrest	5 (0.4%)	5 (0.2%)
Angina / Myocardial infarction	5 (0.4%)	5 (0.2%)
Stroke	4 (0.3%)	4 (0.1%)

**Table III.** Emergency equipment available in dental office.

Tableau III. Equipement d'urgence disponible dans les cabinets dentaires.

Equipment	Number of dentist equipped (percentage)
Oxygen	898 (66.8%)
Bag valve mask	801 (59.6%)
Blood pressure meter	685 (51%)
Defibrillator:	116 (8.6%)
- Manual	3 (2.6%)
- Semi-automated	45 (38.8%)
- Automated	50 (43.1%)
- Do not know	18 (15.5%)
Emergency drugs:	947 (70.5%)
- Epinephrine	861 (64.1%)
- Nitroglycerin	698 (51.9%)
- Short-acting $\beta$ 2-agonist	678 (50.4%)
- Glucagon	644 (47.9%)
- Steroids	718 (53.4%)
- Other	341 (25.4%)

seizures, allergies, inhalation of foreign bodies, acute coronary syndrome). Only a few respondents (7.1%,  $n = 95$ ) report encountering a cardiac arrest. Compared to the total number of years of practice, this is a frequency of 0.003 cardiac arrest per dentist per year of practice, which confirms the incidence previously found. Practitioners who encountered cardiac arrest, did so in their practice in 33.7% ( $n = 32$ ), outside work in 57.9% ( $n = 55$ ) and in 8.4% ( $n = 8$ ) practitioners have been confronted to it in both situations. There is a correlation between the experience of practitioners and the occurrence of vasovagal syncope ( $r = -0.135$ ,  $p < 0.001$ ).

### Emergency equipment available in dental practice

Among dentists who answered, 80.8% ( $n = 1086$ ) stated that they have emergency supplies in their offices (Tab. III). Nearly one out of five dentists in the survey (19.2%,  $n = 258$ ) declared they have no emergency equipment at all.

Among dentists equipped with oxygen, nearly 9 out of 10 respondents reported never having used their bottle of oxygen. 556 (61.9%) of dentists with oxygen report replacing their supply in the last 5 years, 164 (18.3%) reported last replacing their oxygen equipment between 5 and 10 years ago, 60 (6.7%) more than 10 years ago and 118 (13.1%) of dentists did not remember when their supplemental oxygen was last changed. Among dentists equipped with a blood pressure meter, 442 (64.5%) reported having used it, but only 9 dentists (7.7%) possessing a defibrillator reported having used it. Most practitioners (87.0%,  $n = 824$ ) equipped with emergency drugs have never used them (with the exception of oral glucose).

### Training

More than half of dentists (57.1%,  $n = 768$ ) reported formal training in the management of medical emergencies during their initial dental education. Two thirds (64.3%,  $n = 865$ ) were trained during post-graduate education and nearly one tenth reported never having been trained in this area (8.7%,  $n = 117$ ). Among the 91.3% ( $n = 1227$ ) of practitioners that reported formal training, for 176 (14.3%), the last training took place within the previous year, for 571 (46.5%) last training was between 1 to 4 years old, and for 480 (39.1%) last training was more than 4 years old. The majority of respondents, 939 (69.9%) reported they currently need refreshment training on the management of medical emergencies.

**Table IV.** Dentists feeling to manage emergencies.

Tableau IV. Ressenti des chirurgiens-dentistes concernant la prise en charge des urgences médicales.

	Fully capable	Capable enough	Not enough Capable	Not at all	Do not answer
Today, do you feel able to handle a minor medical illness in your practice (vasovagal reaction, orthostatic hypotension or hypoglycemia)?	40.6% (n = 545)	48.1% (n = 646)	10.5% (n = 141)	0.7% (n = 10)	0.1% (n = 2)
Today, do you feel able to handle a serious medical emergency in your practice (asthma, seizures, inhalation of foreign bodies, allergies...) outside of cardiac arrest?	9.3% (n = 125)	45.8% (n = 615)	38.5% (n = 517)	6.0% (n = 80)	0.5% (n = 7)
Today, do you feel able to handle a cardiac arrest in your practice?	5.4% (n = 72)	30.9% (n = 415)	42.7% (n = 574)	20.9% (n = 281)	0.1% (n = 2)

Protocol sheets on the management of medical emergencies are available in only 28.1% ( $n = 377$ ) of the offices.

#### Estimation of self-efficacy in medical emergency management

The self-efficacy of respondents regarding medical emergencies management is shown in Table IV. Practitioners whose last training was less than one year ago reported feeling more competent than practitioners who trained between 1 to 4 years ago ( $p < 0.001$ ). Similarly, practitioners whose last training was between 1 to 4 years ago felt more competent than practitioners who trained more than four years ago ( $p < 0.001$ ).

## Discussion

To our knowledge, this study is one of the largest studies dealing with medical emergencies in dental practice. Our data show that medical emergencies in dental practice are not frequent, but not rare, with an incidence of 2.1 events per dentist per year. Not surprisingly, we found that the most frequent emergency encountered by dental surgeon is vasovagal reaction, which is in accordance with previous studies [4-10]. As shown by Collange et al. [6] we found a correlation between the experience of practitioners and the occurrence of vasovagal syncope. Experienced practitioners have significantly less vasovagal reactions in their practice than novice ones. This may be explained by more experienced practitioners appreciating the risk and taking steps to prevent such reactions.

Confirming previous data, serious medical emergencies (serious allergic reaction, inhalation of foreign bodies, stroke, angina and myocardial infarction) and cardiac arrest are rare in dental practice but can occur. We found an incidence of 0.003 cardiac arrests per dentist per year of practice. This result is consistent with previous publications [4, 7, 11, 12]. As found

by Collange and al., dental practitioners are more likely to experiencing cardiac arrest outside of their offices than in professional exercise [6].

Recommendations about dental office emergency equipment may change depending on the country. However, dental practitioners can rely on the recommendations of the United Kingdom Resuscitation Council [3].

The majority of practitioners who answered our survey reported having emergency equipment but one out of five respondents have no equipment at all. From a deontological and legal point of view this is questionable. Two-thirds of the dentists are equipped with oxygen but it is often outdated (unchanged for more than five years). This is probably to be connected with the fact that nearly 90% of the respondents have never had use of their oxygen bottle. Similarly, most practitioners equipped with emergency drugs have never used them. A previous study conducted in 2008 among 200 Parisian dental surgeons showed that 17% thought that their drugs were outdated [13]. The maintenance and the management of medical equipment, when rarely or never used, is a recurring problem in the health care sector.

Defibrillators are also part of the recommended list of equipment for dental offices by the United Kingdom Resuscitation council [3]. Moreover, the European Resuscitation Council advocates that defibrillators should be available throughout outpatient medical facilities [2]. However, only a small portion of respondents to our study reported having a defibrillator but the rate of offices equipped with defibrillator is increased compared to previous studies [5, 8, 14]. This lack of defibrillator has been explained by the feeling of dental practitioners that this device is not necessary in dental office, too expensive and not mandatory [14]. This also reflects the low prevalence of cardiac arrest in dental offices.

Management of medical emergencies requires initial education and retraining. Our data clearly shows a lack among



dental practitioners. Two of five respondents have not been trained during their initial formation and quite one of ten had never been trained about medical emergencies. For almost 40% of trained practitioners, the last training was more than four years ago. The European Resuscitation Council and several studies report that knowledge and skill retention declines rapidly after initial resuscitation training [1, 12]. CPR skills such as calling for help, chest compressions and ventilations decay within three to six months after initial training [1]. The United Kingdom Resuscitation Council recommends that dental staff update their skills at least annually [3].

Self-confidence is the first step, necessary but not sufficient, to the competence. A large majority of respondents feel able to manage a malaise while less than half feel able to manage a cardiac arrest. Other studies which have examined dental practitioners self-confidence about medical emergencies observed that they are comfortable with the management of a malaise [4, 7]. However, it seems normal that practitioner feels capable of handling a situation they meet regularly and feel less comfortable with a situation they have probably never met. Good results reported by respondents should be moderate because self-estimation is not the reflection of the competence. Concerning resuscitation, several studies showed that self-estimation of competence is often higher than actual performance [12, 15].

The lack of data about medical emergencies in dental practice perpetuates unnecessary habits in equipment and in the education of dental surgeons. For example, a significant proportion of dental practitioners have intravenous injection equipment and intravenous drugs which may be unnecessary and inappropriate for this category of healthcare professionals [13, 16].

Our results must be moderated by the fact that our survey was based on a voluntary online questionnaire. This type of data collection is prone to selection bias. Furthermore because the survey involves recall, results reflect the respondent's recollection of events. Moreover, while the number of respondents is large, the actual response rate represents only a small proportion of the total population of French and Belgian dental practitioners.

## Conclusions

Dental practitioners encounter mostly minor medical emergencies, not uncommonly in practice. Even if life-threatening emergencies and cardiac arrest are rare in dental practice, those situations can occur. Dental staff should be equipped and prepared to face them.

A dentist will encounter an average of two medical emergencies per year in his office, mostly vasovagal reactions, orthostatic hypotension or hypoglycemia. Most of emergencies encountered in dental office do not require specific emergency equipment which may explain why a proportion of

dental practitioners do not equip themselves, especially with a defibrillator, or are equipped with outdated materials.

The training of dental practitioners to handle medical emergencies is not sufficient. The rate of practitioners never trained or for whom the last training took place more than four years ago is probably too high. Efforts should be made in the education of dental practitioners regarding the management of medical emergencies during initial and continuing dental education. Ideally, the training should be on an annual basis.

The recommended emergency equipment for dental practices should be kept to the minimum necessary in order to respond to the real needs of practitioners and increase the number of offices properly equipped.

All these data provide a better understanding of medical emergencies in dental practice and should improve the care of patients presenting with medical emergencies in dental practice, particularly through recognition of the most suitable equipment and training for dental practitioners.

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