

# A ten year experience of medical emergencies at Birmingham Dental Hospital

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## In brief

Discusses the management of stress within the dental setting for both the patient and dental team.

Discusses the management of vasovagal syncope within the dental setting.

Provides a brief outline on conscious sedation techniques for the anxious dental patient.

**Background** Medical emergencies are a stressful experience for both the dental team and patients. It is imperative they are avoided where possible and managed efficiently when they occur, for the benefit of the patient's safety, with the subsequent advantage that treatment is not disrupted when such predicaments unfold. **Method** The frequency and nature of each reported medical emergency occurring at Birmingham Dental Hospital was examined over a ten-year period using Datix software (2006–2016). This system logs details regarding each incident and was also used to ascertain if paramedic help was requested. **Results** A total of 119 cases arose during this time, with vasovagal syncope (36.5%) being the most common medical emergency encountered. This was followed by: epileptic fits (12.2%); angina (8.7%); hypoglycaemic attack (8.7%); anaphylactic reaction (5.2%); asthmatic attack (2.6%); cardiac arrest, stroke and iatrogenic events (1.7%); and myocardial infarction (0.9%). During four instances, multiple emergencies occurred simultaneously. None of the above progressed to life-threatening conditions. Moreover, paramedics attended 48 out of the 119 cases (40.3%). **Conclusion** As vasovagal syncope is the most common medical emergency, dentists must recognise early physiological manifestations of anxiety and stress. Anxiety mitigating techniques should be considered, including deep-breathing to increase oxygen delivery to the brain or the appropriate use of conscious sedation.

## Background

Medical emergencies (MEs) in the dental setting are a stressful experience for both the dental team and patients. As the UK life expectancy continues to rise, individuals will have been exposed to more risk factors throughout their lifetime and are likely to suffer from multiple comorbidities.<sup>1</sup> Consequently, dentists should expect to encounter an increasing number of medically-compromised patients whose conditions may manifest acutely in response to dental treatment. It is therefore imperative that all clinical staff possess the competency to react towards such situations innately and provide the most appropriate intervention accordingly.

Previous research has looked into the frequency and nature of MEs both within the general dental practice and hospital environments.<sup>2–5</sup> A study by Atherton *et al.* found on average 1.8 emergency events per year were seen within the hospital setting.<sup>2</sup> Further studies have shown the most common ME reported is vasovagal syncope, with each dentist dealing with approximately 4.0 per annum.<sup>3,5,6</sup> Studies have shown that emergencies experienced did not usually progress to life-threatening states. For example, out of 1,277,920 patients treated in one year, only 42 critical events were documented; a 0.003% occurrence.<sup>7,8</sup>

Furthermore, MEs can elicit substantial amounts of stress upon the dentist due to the unstructured chain of events that ensue, especially if confidence and preparedness is lacking.

High levels of anxiety have been noted among students and newly qualified dentists when dealing with such issues.<sup>9,10</sup> Such stress comes with an added cost of paramedic involvement, where the average ambulance call-out ranged from £144–£216 in 2011.<sup>11</sup> This

indicates a need for ergonomic management of MEs in order to increase cost-effectiveness.

The aim of this study was to investigate the frequency and nature of each reported ME occurring at Birmingham Dental Hospital (BDH) over a ten-year period, between 2006 and 2016. Ultimately, a compilation of reliable data over an extended period of time will allow for improved outcomes, in terms of: service delivery, safety culture, tackling stress and improving preventative measures. The results of this study have implications for general dentists as these medical emergencies can present in primary care as well as in a hospital setting; therefore an understanding on the nature and frequency of medical emergencies is relevant to both sectors.

## Method

BDH uses Datix software, an online system allowing adverse events to be reported together with implementing risk assessment and management. BDH protocol for MEs requires two oral surgery staff members to carry the bleep

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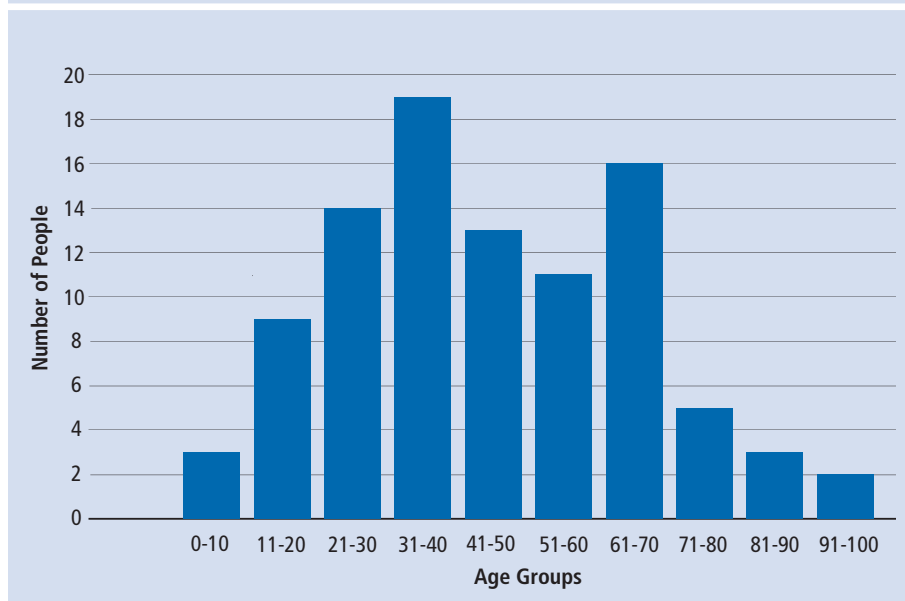
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**Fig. 1** A bar graph showing the age groups of people affected by medical emergencies at BDH



**Table 1** A table showing the frequency of medical emergencies encountered at BDH according to the Datix criteria

Medical emergencies	Frequency
Vasovagal syncope (faint)	42
Other	17
Epileptic fit	14
Hypoglycaemic attack	10
Angina	10
Not enough information	6
Allergy/Anaphylactic Reaction	6
Asthmatic attack	3
Stroke	2
Iatrogenic	2
Cardiac arrest	2
Myocardial infarction	1
Choking	0
Adrenal crisis	0

according to the ‘2222’ procedure. The number 2222 must be dialled to notify a dentist on-call of the location and nature of the incident. Once a patient has either been stabilised or transported by paramedics, a Datix entry form is submitted as a record of the incident, including the outcomes and personnel involved in the event.

For the purpose of this study, information from the last ten years was downloaded from the database as a password-protected Microsoft

Excel spreadsheet. All identifiable data were removed from the dataset to ensure anonymity. A coding system was compiled to categorise each type of ME to organise the data into a user-friendly format. Each ME was explored further with regards to patient age and whether paramedic assistance was required.

### Results

Between May 2006 and June 2016, a total of 119 Datix entries were made by hospital staff. Out of the completed entries, 24 cases were either missing information about the patient or the ME; thus these results had to be excluded.

Using the correctly completed data, it was established the age range was highly varied from seven to 98 years of age. Figure 1 demonstrates the 31- to 40-year-old age group had the highest number of MEs (20%), closely followed by the 61- to 70-year-old group (16.8%).

During the assessed period, vaso-vagal syncope constituted as the most common event at 36.5% as shown by Table 1. Epileptic seizures (12.2%) were the next most frequent ME, followed by hypoglycaemic attack and angina both being 8.7%. The remaining results were: anaphylactic reaction (5.2%); asthmatic attack (2.6%); cardiac arrest, stroke and iatrogenic events (1.7%); and myocardial infarction (0.9%). During four of these instances, more than one emergency occurred simultaneously, however, none of the above events progressed to a severe or life-threatening condition. Adrenal crisis and choking did not take place during this time. In

17 instances, emergencies other than those listed occurred, including: appendicitis, drowsiness due to medications, hypotension, multiple sclerosis, panic attacks, patient falls, patient intoxication, respiratory arrest, scarlet fever, complications due to tuberculosis, an undiagnosed bleeding disorder and vomiting. Figure 2 exemplifies the number of recognised emergencies and other emergencies attended by paramedics, which was 48 out of the 119 cases (40.3%).

### Discussion

The data derived from this study were based on information documented by clinical staff present at the time of the emergency.

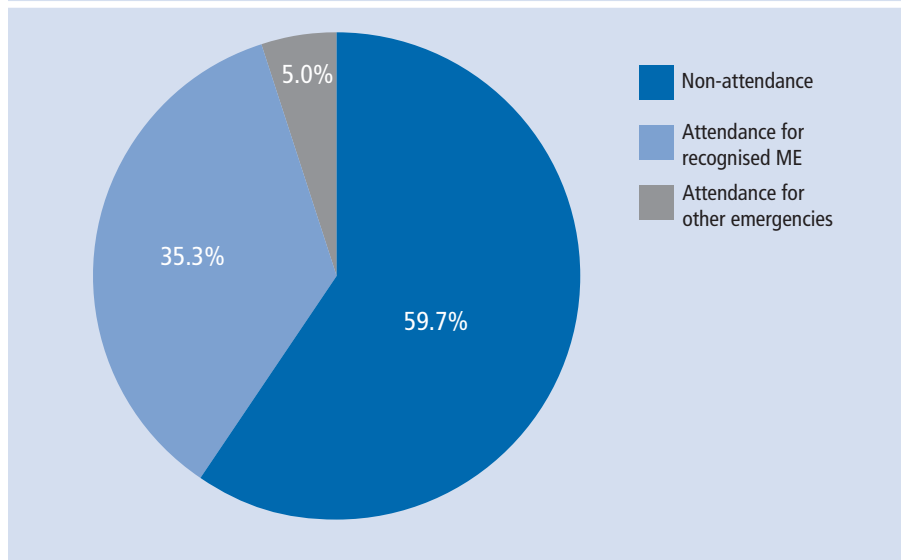
Out of the MEs reported, the mean age over the ten-year period was 45.2 years. The main age group affected by MEs was the 31- to 40-year-old category (20%); this could be due to more patients in this age category being treated at BDH. The second highest frequency of MEs occurred in the 61- to 70-year-old group (16.8%), which may correlate increasing age with the presence of comorbidities; resulting in a decline in health. Therefore, with such disparity within the cohort examined – having an awareness of the patient’s medical condition regardless of age is fundamental. It is necessary to have an appreciation about the existing trend in increasing complexity of medical conditions for an aging population. A thorough and up-to-date medical history is essential in determining whether a treatment plan is appropriate, or if it will need altering to ensure patients at risk can handle the procedure.<sup>6</sup>

Paramedic assistance was required in 40.3% of the total number of cases; exemplifying more than half of the MEs were brought to the attention of clinical staff and managed internally without necessitating outside assistance.

Vaso-vagal syncope was the most frequent ME encountered; which corresponds with previous research.<sup>5,6,10</sup> Consideration must be given to the causes of vaso-vagal syncope, which can be divided into physiological and psychogenic factors.<sup>6</sup>

In both situations, syncope results from a reduction in blood flow and oxygen to the brain, due to blood pooling peripherally at the extremities.<sup>12</sup> From a physiological perspective, an individual who is medically compromised or has been in the dental chair for a long period of time, will be prone to experiencing postural hypotension leading to syncope. Similarly, the body’s psychological ‘fight or flight’ response will be activated by anxiety and unforeseen pain leading to adrenaline release to prepare

Fig. 2 A pie chart showing the number of cases attended by paramedics at BDH



for muscle activity. However, being stationary in the chair would lead to blood pooling in the extremities. Fluctuations in bodily homeostasis can bring about hyperventilation, causing an imbalance in carbon dioxide and oxygen (respiratory alkalosis).

This imbalance results in hypocapnia leading to cerebral vasoconstriction, ultimately reducing cerebral perfusion – thus syncope can occur.<sup>13</sup>

Equipped with this knowledge, the dental team should promptly recognise early signs and symptoms displayed by a distressed patient. Examples of this include: pallor, clamminess, reports of nausea and light-headedness. In identifying such features, dental treatment should be paused and emergency procedures instigated immediately. Most often, quick measures such as elevating the patient's legs or loosening tight clothing may prevent a simple faint from progressing to a more profound faint. Important features to recognise in a profound faint would include: convulsions, eye movements (rapid deviation), hallucinations or incontinence.<sup>14</sup> Anxiolysis is particularly key in ensuring the patient is comfortable throughout the procedure and reducing the probability of adverse events occurring.

It could be suggested anxiolytic practices such as conscious sedation and breathing techniques are successful in reducing the likelihood of vaso-vagal syncope. Conscious sedation allows stress and anxiety to be minimised by depressing the central nervous system, allowing for a distressing procedure to be less traumatic for the patient.<sup>15</sup> Two main methods are the use of intravenous midazolam and

inhalation sedation; a combination of oxygen and nitrous oxide.<sup>16</sup> Midazolam induces mild amnesia, which is useful for preventing patient recollection of the procedure. On the contrary, the use of nitrous oxide allows patients to maintain a level of awareness in the absence of amnesia – thus decreasing anxiety and enabling the patient to relax.<sup>17</sup> As with any pharmacological approach, behavioural management should complement such methods.

Thorough assessment should be made of the patient's state of health to ensure the appropriateness of the use of conscious sedation.

Several studies have also shown how paced breathing can prevent vaso-vagal syncope from occurring.<sup>8,17,18</sup> In situations where patient apprehension is heightened, the dentist should provide reassurance to help control the patient's respiratory rate to restore the balance of carbon dioxide and oxygen within the blood. Dentists can check a patient's breathing rate during treatment by noting the number of times the chest rises, whereby a rate above 20 per minute could indicate hyperventilation even without evident signs. In recognising such warnings, the dentist should halt treatment and encourage the patient to breathe deeply and slowly.<sup>12,18</sup> Dentists should explore relaxation techniques which may facilitate the smoothness of treatment.

## Conclusion

The Birmingham Dental Hospital has a robust emergency protocol and recordkeeping system, which is vital in identifying and minimising risks. This organisational culture is critical in preventing MEs, as lessons can

be learnt from every adverse event. Therefore, clinicians are encouraged to self-evaluate their performance in handling such situations, which creates a safer working environment. Lastly, with vaso-vagal syncope being the most common ME encountered, careful patient observation together with appropriate relaxation management techniques can in many cases avert such situations.

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