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The frequency of medical emergencies in a sample of dental practices in South Africa and state of readiness of practitioners to manage the episode.

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2014-03-28
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THE FREQUENCY OF MEDICAL EMERGENCIES IN A SAMPLE OF DENTAL PRACTICES IN SOUTH AFRICA AND STATE OF READINESS OF PRACTITIONERS TO MANAGE THE EPISODE.

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of

Master of Science in Dentistry

Johannesburg, 2013

DECLARATION

I, Nikita Mizra declare that this research report is my own work. It is being submitted for the degree of Master of Science in Dentistry in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.



Nikita Mizra

Date: 1 July 2013

DEDICATION

To my family for their unconditional support throughout this journey.

ACKNOWLEDGEMENTS

I am most grateful to the following persons, without whom this research would not have been possible

I would like to thank my supervisors, Dr V Karic and Professor CP Owen for assistance with this report.

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LIST OF ABBREVATIONS

ME	Medical Emergency
GDP	General Dental Practitioner
ADA	American Dental Association
MI	Myocardial Infarction
AED	Automated External Defibrillator
BLS	Basic Life Support (refers to CPR with no equipment except protective device)
ALS	Advanced Life Support (life support which may include CPR, defibrillation and administration of drugs)
CPR	Cardio-Pulmonary Resuscitation (refers to chest compressions and ventilations)

DEFINITIONS

Medical emergency: A medical emergency is an injury or illness that is acute and poses an immediate risk to a person's life or long term health (Wikipedia).

Emergency equipment and drugs: The Resuscitation Council of UK publishes a list of recommended equipment which includes both drugs and equipment (Greenwood 2009). It is recommended that to accommodate the most common types of medical emergencies encountered in general dental practices, the following items should be kept:

List of drugs recommended:

a. Glyceryltrinitrate (GTN) spray (400micrograms/dose)
b. Salbutamol aerosol inhaler (100micrograms/actuation)
c. Adrenaline injection (1:1000, 1mg/ml)
d. Aspirin dispersible (300mg)
e. Glucagon injection 1mg
f. Oral glucose solution / tablets / gel / powder
g. Midazolam 5mg/ml or 10mg/ml (buccal or intranasal)
h. Oxygen

List of equipment recommended:

- Oxygen face mask & tubing
- Basic set of oropharyngeal airways (sizes 1,2,3 and 4)
- Pocket mask with oxygen port
- Self-inflating bag and mask apparatus with oxygen reservoir and tubing (Staff should be appropriately trained to use this)
- Variety of well fitting adult and child facemasks for attaching to self-inflating bag
- Portable suction with appropriate suction catheters and tubing

- Single use sterile syringes and needles
- ‘Spacer’ device for inhaled bronchodilators
- Automated blood glucose measurement device
- NIBP / Pulse Oximeter
- Automated External Defibrillator

Basic life support (BLS) is the level of medical care which is used for patients with life-threatening illnesses or injuries until the patient can be given full medical care at a hospital. It can be provided by trained medical personnel, including emergency medical technicians, paramedics, and by laypersons who have received BLS training (Wikipedia).

Advanced Life Support (ALS) is a set of life-saving protocols and skills that extend from Basic Life Support to further support the **c**irculation and provide an open airway and adequate ventilation (breathing) (Wikipedia).

Medical Condition is a broad term that includes all diseases and disorders (Wikipedia).

CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION

A medical emergency may occur at any time, and can be life threatening if left or incorrectly treated (Haas 2005; Regina *et al* 2008; Greenwood 2009). Dentists must be aware of possible medical emergencies that may occur in a practice, as well as their signs, symptoms and treatment. According to the American Dental Association (ADA), three out of four practitioners have experienced a medical emergency, and one in twenty general dental practitioners will have a patient with a cardiac arrest in their lifetime (ADA council of scientific affairs 2002). Studies carried out in many countries have shown that dentists were not confident in managing medical emergencies, and that some dentists did not have any emergency drugs and equipment in their practice (Chapman 1997; Müller *et al* 2008) or had never had any form of practical training in resuscitation (Gonzaga *et al* 2003). In other studies, dentists agreed that there was a need for further training and that hands-on courses would improve their preparedness (Atherton *et al* 2000, Broadbent and Thompson 2001). Girdler and Smith in 1999 stated that the lack of information on the prevalence of medical emergencies made it difficult to specify continuous education for general dental practitioners (Girdler and Smith 1999). Müller *et al* reported the same in 2008 (Müller *et al* 2008).

A PubMed search showed no previous studies have been carried out on medical emergencies for dental practices in South Africa.

1.2 IMPORTANCE OF THE STUDY

In patients with medical conditions, any stress and anxiety associated with a dental visit may increase their risk of having a medical emergency (Malamed 2000). The ability of a dentist to

recognise a problem quickly, and initiate treatment, reduces the risk of morbidity and mortality (Girdler and Smith 1999).

Regina *et al* in 2008 concluded from their study in Brazil that "... undergraduate dental students perceive a need for more intensive education in medical emergencies" (Regina *et al* 2008). After graduation, dentists should further undertake theory and practical based training in emergency medicine (Arsati *et al* 2010). It was also suggested that emergency management training should be included as part of the continuous educational programme for dentists. The ADA recommended that as procedures and drugs are continuously being updated, dentists should undergo training at least once a year (ADA Council of Scientific affairs 2002).

It is important to make dentists aware of the need for ongoing continuous education on emergency management (Mutzbauer *et al* 1996). They further stated "... by only refreshing emergency management training in short time intervals can the dentist respond to emergency situations adequately".

According to the ADA, certain insurance companies request a list of emergency drugs and equipment that are available in the dental practice (ADA Council of Scientific affairs 2002).

1.3 MEDICAL EMERGENCIES

A wide variety of emergency incidents has been reported with much variation as to the most prevalent. Mutzbauer *et al* in 1996 stated "The average age of the patients being treated by dentists is rising, and therefore dentists are encountering more cardiovascular, pulmonary and

endocrine disorders. This fact, and the patients' specific medication, elevates the risk of side effects and acute decompensation" (Mutzbauer *et al* 1996).

In a study conducted in Australia, Chapman reported that most respondents (94% of 811) mentioned at least one medical emergency, and the most common was adverse reactions to local anaesthetics (Chapman 1997). Calculated at a 40 year period, these adverse reactions were estimated to occur at a rate of seven-in-one practising lifetime. *Grand mal* seizures, angina, and insulin shock were collectively the second most common emergencies in the same time span (Chapman 1997).

A British study done by Atherton *et al* reported that 23% of medical emergencies occurred before treatment, 37% during dental treatment, and 16% after treatment, with 20% occurring after administration of a local anaesthetic (Atherton *et al* 1999). Fifty two percent of the emergencies occurred during procedures such as restorative work, and 25% were associated with dentoalveolar surgery. These authors further reported that 20 deaths were recorded from this study, 14 as a result of cardiac arrest, 4 due to myocardial infarction, and 2 from cerebrovascular accident. The authors concluded that "Medical emergencies in general dental practice in Great Britain are rare events, occurring with an average frequency of between one in 3.6 and 4.5 practice years, or, on average, between nine and eleven emergency events per practising lifetime of 40 years".

Chapman stated "As practitioners are increasingly providing treatment for medically compromised patients, the likelihood of medical emergencies occurring will also correspondingly increase" (Chapman 2003). He reported that the most common cause of medical emergencies was adverse reactions to local anaesthetic, and that when using any

local anaesthetic agent, resuscitative equipment and drugs should be available to manage those reactions.

Table 1.1 represents the percentage of medical emergencies reported in Northern England, Germany and Brazil by three separate studies carried out by Girdler and Smith (1999), Müller *et al* (2008), and Arsati *et al* (2010) respectively.

Table 1.1 Prevalence of medical emergencies by dentists in three different countries.

Medical emergency	**Northern England (n = 302)** Girdler and Smith 1999	**Germany (n = 620)** Muller *et al* 2008	**Brazil (n = 374)** Arsati *et al* 2010
Syncope	62.9	58	12.7
Angina attack	11.9	-*	6.8
Epileptic Fit	9.9	7	6
Hypoglycaemia	9.6	4	5.6
Orthostatic hypotension	-	-	44.4
Asthma attack	4.6	4	15
Choking	4.6	0.8	2.2
Hypertensive crisis	0.9	7	15
Anaphylactic reaction	0.9	1	0.4
Myocardial infarction	0.7	-	0.2
Cardiac arrest	0.3	-	0.2
Stroke	-	0.6	-

* Not reported in the study

Although syncope was the most common medical emergency experienced by dentists in Northern England and Germany, in Brazil it was orthostatic hypotension. All three studies showed that angina attack, asthma attack, epileptic fit and hypoglycaemia were common medical emergencies experienced by the respondents. The lowest prevalence in all three studies, was from anaphylactic reaction, myocardial infarction and cardiac arrest.

Haas reported that between 19 to 44% of dentists had a medical emergency in one year in Japan (Haas 2005). Most of these complications were mild with only 8% being serious. The study also reported that 35% of patients who had an underlying medical condition experienced a medical emergency, and that over 60% of the emergencies were syncope (Haas 2005).

According to the American Heart Association approximately 220,000 people die each year from sudden cardiac arrest (Diane *et al* 2007). The authors further stated "Death will follow within minutes if the victim is not treated appropriately, and the only known treatment is defibrillation".

In a German study conducted by Müller *et al* in 2008, more than half (57% of 620) of the respondents experienced up to three emergencies, and more than one third (36%) had up to ten patients with medical emergencies in a 12 month period (Müller *et al* 2008). It was also reported that the most frequent emergency experienced was vasovagal syncope, and that there were 42 severe life-threatening events.

According to Anders *et al*, half of the patients visiting a dental school in New York for treatment had at least one underlying disease (Anders *et al* 2010). In this study it was also reported that the most common emergencies were cardiovascular events (15%), syncope (12%), anaesthesia complications (9%) and hypoglycaemia (9%).

Arsati *et al* stated "Presyncope and vasovagal syncope are precipitated mainly by the patient's fear and anxiety" (Arsati *et al* 2010). Chapman in 2003 also reported that stress related to dental treatment may precipitate an angina episode (Chapman 2003).

1.4 EMERGENCY EQUIPMENT AND DRUGS

Girdler and Smith stated that there was "… confusion amongst British dentists about which emergency drugs and equipment should be stocked in dental practice" (Girdler and Smith 1999). The authors reported that "The paucity of accurate and up-to-date information on the incidence of specific medical emergencies in dental practice means that there has been little attempt to target recommendations for emergency drugs and equipment to the likely occurrence of emergencies".

Table 1.2 represents emergency equipment and drugs reported in Germany and Great Britain by two separate studies carried out by Chapman (1997) and Atherton *et al* (1999a) respectively.

Table 1.2 Percentage of respondents possessing specified emergency equipment and drugs in Australia and Great Britain.

Equipment and drugs	**Australia (n=811)** Chapman 1997	**Great Britain (n=1093)** Atherton *et al* 1999a
Oxygen source	63	95
Manual resuscitator	27	9
Adrenaline 1:1000	22	93
Bronchodilator	13	70
Oral glucose	11	78
Gylceryltrinitrate	9	80
Injectable steroids	9	87

From table 1.2 it is shown that more than 90% of respondents from Great Britain possessed oxygen, as compared with 63% in Australia. Atherton *et al* stated that "More than 50% had the means of delivering air and more than 90% had the means of delivering oxygen, compared with 27% in Australia who possessed a 'manual resuscitator' and more than 90% possessed adrenalin in this survey compared with 22% in Australia" (Atherton *et al* 1999a).

According to the ADA epinephrine, an anti-histamine, oxygen, nitroglycerine, a bronchodilator, sugar and aspirin were the minimum drugs that should be available in a general dental practice (ADA council of scientific affairs 2002). Müller *et al* in 2008 reported in Germany that 5% of dentists did not have any equipment to treat emergencies which was similar to an Australian survey done by Chapman in 1997 which reported that 14% of dentists did not keep any emergency drugs or equipment (Müller *et al* 2008; Chapman 1997). The risk of mortality or serious morbidity can be reduced by ensuring that basic emergency equipment and medication are available in every dental practice (Wilson *et al* 2009).

A study in Ohio, USA (Diane *et al* 2007) reported that 86% of 244 respondents did not have an automated external defibrillator (AED) and that 98% had never used one. It was also reported that 11% of respondents had to administer GTN or perform cardio-pulmonary resuscitation (CPR) on a patient, thus indicating the need for an AED. They further stated that dentists who do not have an emergency service nearby or have skills and equipment for defibrillation, should obtain an AED, as "The public is becoming aware that the best protocol for dealing with cardiac emergencies is the use of an AED and may expect that that medical environments including dental offices will be well equipped to deal with cardiac emergencies should they arise". Some States in the USA such as Florida, Washington and Illinois have made it compulsory for the presence of an AED in dental offices (Rosenburg 2010).

Amirchaghmaghi *et al* reported that in Iran the most common equipment available were syringes and needles for injection (63%) and only 6.5% of the 186 dentists had the means of delivering air (Amirchaghmaghi *et al* 2010). The emergency drugs and equipment kept in the dental practice should also depend on the expertise and training undergone by the individual practitioner (Venkateswarlu and Vanaja 2010).

1.5 COMPETENCE TO MANAGE MEDICAL EMERGENCIES

The ADA stated that dentists should have a well-defined protocol for activating emergency services (ADA council on scientific affairs 2002). Atherton *et al* reported that two-thirds of dentists in Great Britain did not feel prepared to handle medical emergencies (Atherton *et al* 1999b). In Northern England more than two thirds of dentists felt that they could manage vasovagal syncope, epileptic fit, angina attack, asthma, hypoglycaemia and choking, but one third felt they would not be able to manage a cardiac arrest (Girdler and Smith 1999). Arsati *et al* reported, in a self-administered questionnaire in Brazil, that only 41% of dentists felt they were capable of diagnosing the cause of an emergency, which was similar to the results reported by Girdler and Smith in Britain (Arsati *et al* 2010; Girdler and Smith 1999).

A qualitative study done by Regina *et al*, involving interviews carried out at a Brazilian dental school, found that the students indicated a need for more adequate education in medical emergencies (Regina *et al* 2008). Müller *et al* reported that only 49% of the German dentists surveyed felt competent in basic life support, and only 16% could perform basic airway management; this was probably due to only 41% having undergone emergency training (Müller *et al* 2008). Amirchaghmaghi *et al* evaluated dentists' knowledge on medical emergencies in Iran, and reported that 67% were poorly prepared (Amirchaghmaghi *et al* 2010).

A Brazilian study (Arsati *et al* 2010), showed that most dentists felt capable of treating the initial stages of presyncope, syncope, orthostatic hypotension, convulsions and choking. However, two-thirds felt uncertain if they could manage anaphylaxis, myocardial infarction or cardiac arrest. This and another study in Brazil showed that dentists were not fully prepared to manage medical emergencies, and that they had insufficient experience and training in CPR (Regina *et al*, 2008; Arsati *et al* 2010).

1.6 TRAINING IN MEDICAL EMERGENCIES

In is self-evident that all members of staff of a dental practice should be trained in basic life support and should have a team approach to the management of medical emergencies (Venkateswarlu and Vanaja 2010). Mutzbauer *et al* stated "Only by refreshing emergency management training in short time intervals can the dentist respond to emergency situations adequately" (Mutzbauer *et al* 1996).

Chapman in 1997 showed that 96% of respondents agreed that dentists should be competent in CPR, but studies have shown most dentists were unable to perform CPR properly (Chapman 1997; Regina *et al* 2008) or had no training in CPR (Arsati *et al* 2010).

A study conducted in Northern England by Girdler and Smith in 1999 stated that 84% of 302 dentists had basic life support training provided by a local ambulance service (Girdler and Smith 1999). Despite this, dentists felt they would not be competent to manage myocardial infarction (55%) and anaphylactic reaction (62%). The study also confirmed that dentists who reported that they felt incompetent, said this was due to a lack of availability of emergency training, and lack of experience in using emergency equipment.

Broadbent and Thomson indicated dentists in New Zealand were dissatisfied with the training they received as undergraduate students (Broadbent and Thomson 2001). Regina *et al* concluded that dental students were dissatisfied with their knowledge about medical emergencies (Regina *et al* 2008). The study further reported that dentists who had received training in management of medical emergencies, nevertheless expressed the need for further training, which reinforces the need for continuous educational courses. The ADA reported that dental practitioners should receive regular training in basic life support, and

recommended practical and hands-on courses on the prevention, recognition and management of common medical emergencies (ADA council on scientific affairs 2002).

Arsati *et al* reported that 70% of general dental practitioners had undergone emergency training only once and Atherton *et al* stated that 97% of respondents in Great Britain felt the need for further training as it was their lack of continuous training in using emergency equipment that made them unable to cope with medical emergencies (Arsati *et al* 2010; Atherton *et al* 1999b).

Collange *et al* reported that 23% of dentists in France had to call for a medical emergency service, indicating that they were not able to manage a medical emergency (Collange *et al* 2010). Anders *et al* stated that recent graduates from New York, complained about the lack of hands-on experience in emergency management (Anders *et al* 2010).

1.7 CONCLUSION

All the studies reviewed here have pointed to a less than ideal situation for the relationship between general dental practitioners' (and students') knowledge of, and practise in, medical emergencies. It seems clear that dental students should be taught practical medical procedures, to prepare them to be competent in using specific medical equipment in their practices. Thereafter there is a need for continuous updating of this training and continuous practise in using the necessary equipment and materials.

Medical emergencies do occur in dental practices but most of them are not life-threatening (Müller *et al* 2008). The literature review implies that dentists should have the appropriate drugs and equipment in their practices, acquire the skills, and undergo regular training, to effectively manage medical emergencies that may occur in a dental practice. It is not known to what extent dentists in South Africa conform to such requirements.

CHAPTER 2. AIMS AND OBJECTIVES

AIM

The aim of this research is to survey a sample of dentists in general practice in order to determine the prevalence of medical emergencies experienced by them and how prepared they were to manage those emergencies in their practice.

OBJECTIVES

The objectives of the research were:

- To record the number of medical emergencies experienced by dentists in a time period of one year.
- To determine the emergency drugs and equipment possessed by the dentists.
- To determine whether the dentists could perform certain procedures during a medical emergency.
- To establish the need for medical emergency training for practicing dentists.

The guide to preparedness for medical emergencies was obtained from the ADA (ADA Council of Scientific affairs 2002). The list was extensive and required dentists to have numerous emergency drugs and equipment available in their dental practices. This was used to draw up the list of emergency equipment and drugs for the questionnaire.

CHAPTER 3. METHOD

3.1 QUESTIONNAIRE DESIGN AND STRUCTURE

A questionnaire was devised using the following sources:

- Current literature (see literature review)
- Guidelines by the UK resuscitation council (Greenwood 2009)

The questionnaire comprised the following parts:

1. Demographics.
2. Emergency drugs and equipment possessed by dentists.
3. Number of medical emergencies experienced by dentists over a 12 month period.
4. Self-evaluation on specific medical procedures.
5. The need for training of dentists in managing medical emergencies.

A two phase approach was adopted. The main study was preceded by a pilot investigation aimed primarily at verifying and validating the questionnaire, and to identify any additional descriptors for the questions. A retrospective survey was conducted consisting of confidential voluntary questionnaires. The questionnaire recorded the number of medical emergencies that occurred in a dental practice in the past 12 months.

The relevant alterations were made and the questionnaire was finalised (see Appendix C). Ethical approval (Appendix A) for this study was obtained from the Committee for Research in Human Subjects at the University of the Witwatersrand. The clearance certificate number is M110410.

3.2 STUDY POPULATION

The study population was intended to be dentists registered with the Health Professions Council of South Africa (HPCSA). However, the HPCSA was unable to provide email addresses and so email addresses provided by the South African Dental Association (SADA) were used. There were 2,517 email addresses available which had significantly increased from 1,367 over the past years when compared with a research study conducted by Naidoo (Naidoo 2006). Table 3.1 shows the distribution of addresses per Province.

Table 3.1 Number of email addresses provided by SADA

Province	Number of addresses
Eastern Cape	53
Free State	92
Gauteng	1031
Kwa-Zulu Natal	597
Limpopo	41
Mpumalanga	108
North West	72
Northern Cape	34
Western Cape	597
Total	**2517**

3.3 DISTRIBUTION AND RETURN OF QUESTIONNAIRES

Although Leece *et al* reported that email surveys had a lower response rate when compared with postal surveys, time and financial considerations made this more favourable, as email produces a quicker response and was financially more viable (Leece *et al* 2004). It also enableda larger geographical area to be assessed with the use of minimum resources.

An information sheet (Appendix B) provided information to the participants regarding the nature and purpose of the research. Practitioners were given the option to respond by email,

fax or post but were encouraged to return the completed questionnaire as an email attachment. Reminder emails were sent out on four occasions to all the dentists, to improve the response rate. Procedures for determining sample size for continuous and categorical variables using Cochran's formulae (Bartlett *et al* 2001), were used to calculate the sample size based on a study population of 2517. At a confidence level of 95% and confidence interval of 5, a sample size of 239 was required.

3.4 CRITERIA

Inclusion:

- Dentists with a minimum of one year experience in private dental practice.
- Dental specialists.

Exclusion:

- Maxillo-facial and oral surgeons as it was assumed that they would have had extensive training during post-graduate studies.
- Dentists working in hospitals and clinics.

3.5 DATA ANALYSIS

Data were captured from the respondents' questionnaires into an Excel© spread sheet and then imported into the Statistical software, STATISTICA version 10.0 MR1. Descriptive statistics were used to summarise the demographics, incidence of medical emergencies occurring in private practice, as well as the equipment and drugs used by the dentists in medical emergencies. The average scores, in part 4 of the questionnaire, were used to determine which statements are the most and least important in the need for training in emergency management.

CHAPTER 4. RESULTS

Of the 2517 emails sent, 246 were rejected by the respective internet servers due to incorrect addresses or the recipients had already retired, and only 337 replies were received (13%) amongst which were 5 maxillo-facial and oral surgeons and 65 dentists working in hospitals or clinics which were therefore excluded. The final response rate was 10.5% or 267 respondents.

4.1 DEMOGRAPHICS

4.1.1 Practice Location

Eighty seven percent of the 267 respondents worked in Gauteng, Western Cape and Kwa-Zulu Natal. A lower response rate was received from the other provinces (table 4.1).

Table 4.1 Location of dental practices

Province	Number	Percentage
Gauteng	99	37
Western Cape	66	25
Kwa-Zulu Natal	67	25
Eastern Cape	11	4
Mpumalanga	9	3
Limpopo	7	3
North West	3	1
Free State	4	1
Northern Cape	1	1

4.1.2 Experience of practitioners

Questionnaires were received from dentists with a broad range of working experience, from one to more than 30 years. Table 4.2 represents the length of time the respondents were qualified in 5 cohorts. Eighty four percent (224 replies) of the dentists were practicing longer than 5 years.

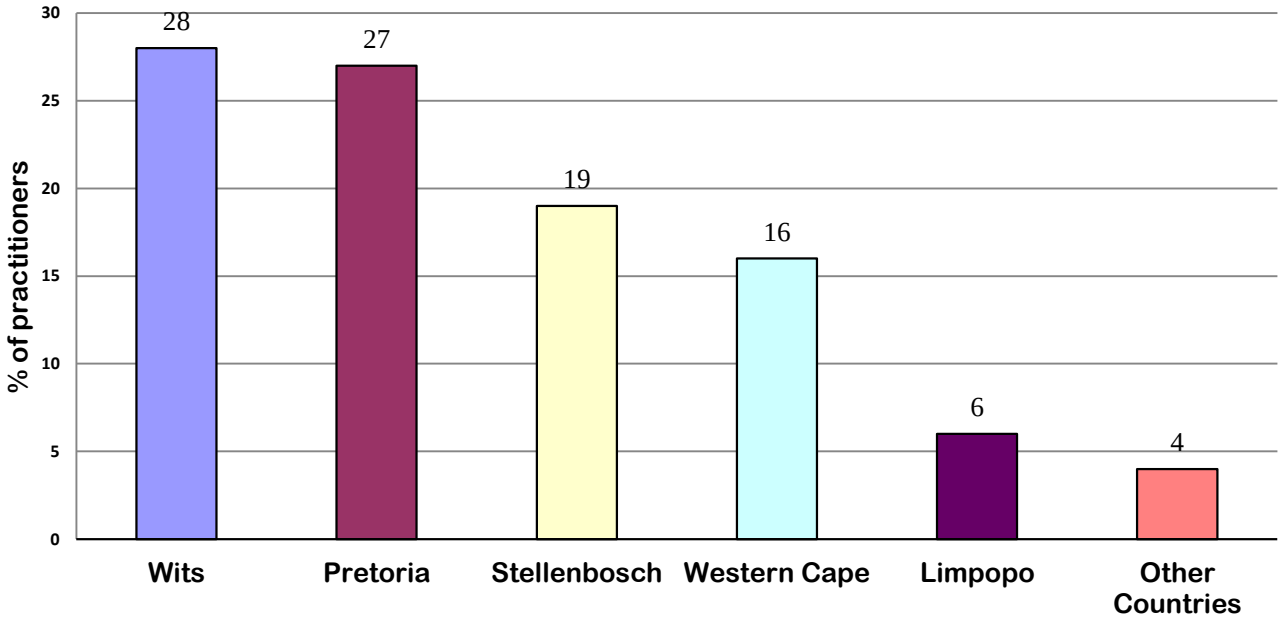
Table 4.2 Time period since primary dental qualification

Period qualified (years)	Number	Percentage
1<5yrs	43	16
5-10yrs	51	19
11-20yrs	76	28
21-30yrs	53	20
>30yrs	44	17

4.1.3 Institution of undergraduate training

The respondents were asked to indicate the university at which they completed their undergraduate dental training. The results are represented in Figure 4.1. More than half (55%) of the respondents in this survey graduated from the Witwatersrand (28%) and Pretoria (27%) universities. The remainder of the respondents graduated from Stellenbosch, Western Cape and Limpopo universities. Twelve respondents graduated from other countries.

Fig 4.1 University of undergraduate training.



4.1.4 Type of practice

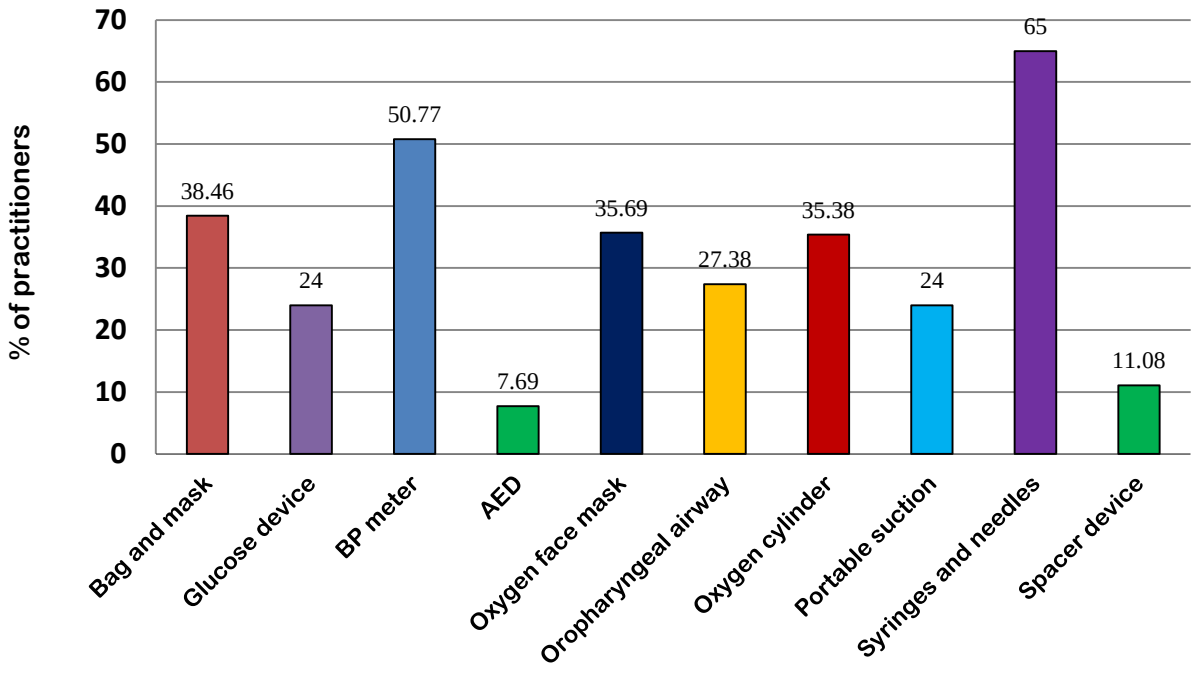
Ninety three percent of respondents were general dental practitioners and 7% were dental specialists. The specialists consisted of 9 specialists in oral medicine and periodontics, 8 orthodontists, 7 prosthodontists and a community dentist.

4.2 EMERGENCY EQUIPMENT AND DRUGS IN PRACTICES

4.2.1. Emergency equipment

Figure 4.2 shows the percentage of emergency equipment in dental practices. Only three respondents (1%) stated they had all the equipment required in their practice, and 39 respondents (15%) had no equipment to treat medical emergencies. More than half of the respondents had sterile syringes (65%) and blood pressure meters (51%) in their practices. Only 10% (32 respondents) had at least half of the required equipment.

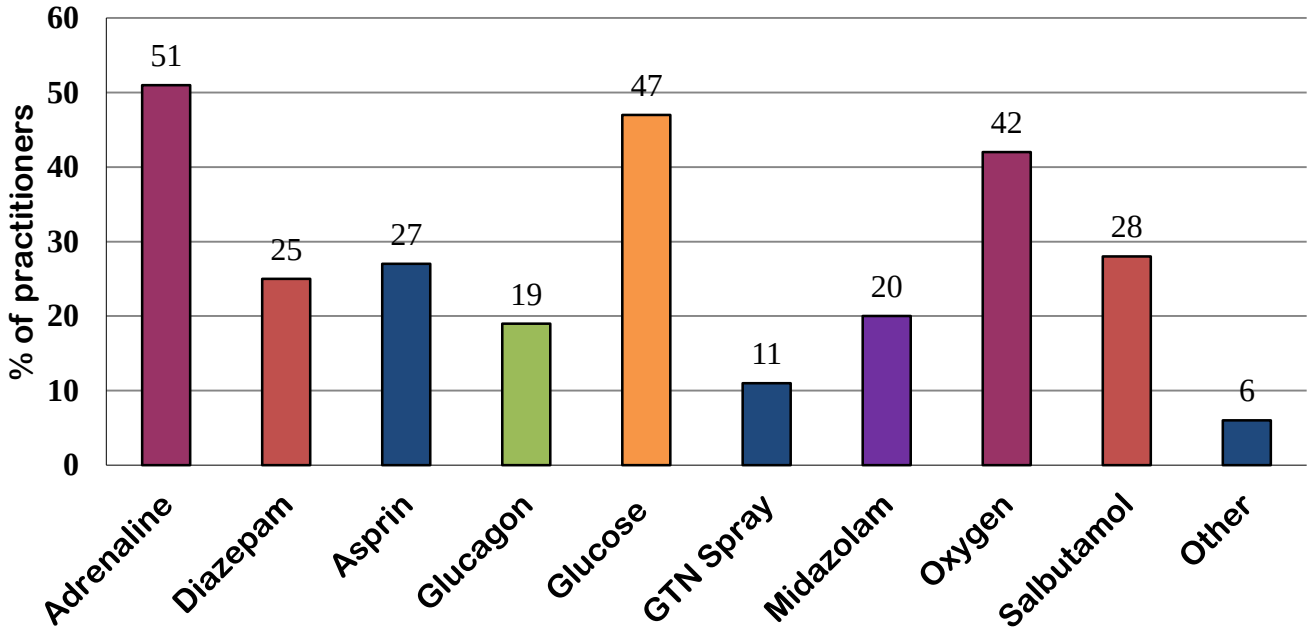
Figure 4.2 Emergency equipment



4.2.2 Emergency drugs

Less than 3% (8 respondents) had all the emergency drugs available in their practices and 32% (66 respondents) had no emergency drugs in their practices. Half of the required emergency drugs were available in only 10% (26 respondents) of practices. The most common drugs available were adrenaline (51%), glucose (47%) and oxygen (42%) as shown in figure 4.3. Other drugs included antihistamine and hydrocortisone.

Fig 4.3 Emergency Drugs



4.3 PREVALENCE OF MEDICAL EMERGENCIES

Table 4.3 Percentage of Medical emergencies over 12 month period

Medical emergency	Number	Percentage
Vasovagal syncope	245	92
Reaction to local anaesthetic	77	29
Seizures	45	17
Hyperventilation	39	15
Swallowed objects	34	13
Anaphylaxis	18	7
Diabetic coma	17	6
Asthma attack	11	4
Angina Pectoris	9	3
Acute steroid insufficiency	5	2
Cardiac arrest	3	1
Stroke	3	1
Myocardial infarction	0	0
Other:		
Tachycardia	2	1
Uncontrolled hypertension	1	0
Post-operative bleeding	1	0

Nineteen percent (52) of respondents encountered at least one medical emergency with 44% (117) having no emergencies at their practices. Thirty seven percent (98 respondents) experienced multiple emergencies over the 12 month period. The most common medical emergency experienced was vasovagal syncope (92%) followed by reactions to local anaesthetics (29%). Other reported medical emergencies encountered that were not in the questionnaire were tachycardia and uncontrolled hypertension.

4.4 COMPETENCE IN MANAGEMENT OF MEDICAL EMERGENCIES

Table 4.4 Competence in emergency management

Specified procedure	Percentage able to perform
Pulse check	95
Chest compression	89
Measuring blood pressure	80
Applying oxygen via face mask	80
Basic life support	77
Bag mask ventilation	70
Measuring blood glucose	54
Establishing intravenous access	47
Inserting oropharyngeal tube	34
Defibrillation	25
Advanced life support	9

The respondents were given a list of 11 emergency management procedures and they were asked to acknowledge whether they were competent in performing each specific procedure. Only 3% (9 respondents) were able to perform all the listed procedures. Only one respondent could not perform any of the procedures. In table 4.4, skills relating to the insertion of an oropharyngeal tube, defibrillation and advanced life support had the lowest scores of 34, 25 and 9% respectively. Skills such as measuring blood pressure, checking pulse and performing chest compressions had the highest average scores i.e. 80% or more.

4.5 TRAINING

Participants were requested to rate statements relating to emergency training on a scale 1 (strongly disagree) to 5 (strongly agree). Averages were then calculated for each statement shown in Table 4.5. Scores between 50 and 60% indicate an overall response to the statement as being neutral, which applied to only four questions. The remaining statements produced an

average score above 80%, indicating that most participants were in agreement with those statements.

Table 4.5 Average score for each question relating to dentists attitude towards training.

Statement	Average score
a) Undergraduate training has prepared you to manage medical emergencies.	58%
b) Dentists should have postgraduate training in emergency medicine.	86%
c) Dentists should participate in a medical emergency course once a year.	78%
d) Dental staff should undergo medical emergency training.	84%
e) Medical emergency courses should be a requirement for CPD accreditation.	81%
f) I can manage medical emergencies with the use of self study material.	55%
g) Dentists must be prepared to manage medical emergencies.	91%
h) Dentists require hands-on training in emergency medicine.	87%
i) There are adequate medical emergency courses available for dentists.	50%
j) The costs of medical emergency courses are reasonable.	58%
k) Emergency equipment and drugs must be available in every dental practice.	83%
l) There should be an emergency flow chart in every dental practice.	87%

CHAPTER 5. DISCUSSION

5.1. Introduction

Surveys of dentists in Germany (Müller *et al* 2008) and Northern England (Girdler and Smith 1999) recorded response rates of 21% and 34% respectively. However, studies amongst dentists in Britain (Atherton *et al* 1999) and Australia (Chapman 1997) yielded response rates of over 60%. The response rate for this survey was 11% and could possibly be attributed to the fact that this study was conducted by emailing questionnaires when compared with postal surveys (Leece *et al* 2004). Many requests by follow-up emails were made to dentists to complete the questionnaires otherwise the response rate would have been much lower. However, the number of respondents analysed exceeded the minimum sample size required for meaningful statistical analysis.

In the USA, the UK and Australia, medical emergency management procedures are continuously updated by their Resuscitation Councils to provide more efficient treatment to patients in a medical emergency. However, this information is not available in South Africa. The lack of a medical emergency programmes for dentists at a post-graduate level, could possibly account for the fact that only 30% of the respondents in this study had undertaken any further studies.

Most of the respondents (82%) had more than 5 years' working experience. It was therefore expected that they had adequate knowledge of practice management, as well as of what drugs and equipment that should be kept in their practices. The long period in private practices by the respondents would lead to an assumption that they were likely to have experienced some form of medical emergency during their careers.

5.2 Emergency equipment and drugs

Fifteen per cent of the respondents had no emergency equipment in their practices. This is similar to a study done in Australia 15 years ago which showed that 14% of those respondents had no medical emergency equipment (Chapman 1997). However, in a German study (Müller *et al* 2008) only 5% of their respondents did not have any emergency equipment. Thus comparing with a more recent study, South African dentists pose a higher risk of having a mortality or serious morbidity by not ensuring that they have the basic equipment and drugs in their dental practice.

The most common equipment available in the dental practices were sterile syringes and needles for injection (65%), and blood pressure meters (51%). This equipment was ranked much lower in other countries and would not necessarily be used in a life-threatening emergency. However, 8% of respondents did have a defibrillator, which was favourable in comparison with the German study (Müller *et al* 2008), where only 2% owned a defibrillator. A defibrillator is important for the treatment of patients with cardiac arrests, and South Africa has been ranked the 6th highest country with cardiac arrest patients (World Health Organization 2004).

Oxygen tanks (95%) and salbutamol inhalers (70%) are the most common equipment kept in dental practices in Great Britain (Atherton *et al* 1999a). This is due to the high usage of the equipment during medical emergencies. However, this study showed that only 40% of respondents in South Africa had an oxygen tank.

In this study, the most common emergency drug available was adrenaline (51%). The second most common drug was glucose (47%) which was much lower than the 77% reported in

Great Britain (Atherton *et al* 1999a). GTN spray was reported to have a high level of availability (80%) in Great Britain (Atherton *et al* 1999a). GTN is considered an important drug for the treatment of angina attack, but only 11% of respondents have reported having this drug.

Overall, it appears that it is likely that dentists in South Africa have less emergency equipment and drugs when compared to dentists in Great Britain (Atherton *et al* 1999a), Australia (Chapman 1997) and Germany (Müller *et al* 2008). This indicates that dentists are either unaware of the specific equipment and drugs required, or not concerned to possess such items.

5.3 Occurrences of medical emergencies in dental practices

From the respondents, 19% experienced at least one medical emergency in the previous 12 months. This was compared to the study in Germany, in which 57% of respondents, reported up to three emergencies in the same time period (Muller *et al* 2008). The most common medical emergency was syncope (92%) which was similarly reported as the most common emergency in Northern England (Girdler and Smith 1999), Australia (Chapman 1997) and Japan (Haas 2005) where the figures were 63%, 58% and 50% respectively. Dentists in South Africa experienced a much higher rate of patients with vasovagal syncope, and although this is not life threatening, dentists need to be aware of the correct emergency management procedures.

The next most common emergency experienced was the reaction to local anaesthetic (29%). Atherton *et al* in 1999 stated that 20% of medical emergencies occurred after the administration of local anaesthetics (Atherton *et al* 1999). Thus dentists need to have

appropriate resuscitative equipment in their practices. Seventeen per cent of the respondents experienced patients with seizures. This condition requires anti-epileptic drugs such a midazolam for treatment which was only stored by 20% of the respondents.

One percent (3 respondents) experienced patients with a stroke and cardiac arrest. This was similar to German dentists where 2 respondents treated patients with cardiac arrests in their practices (Muller *et al* 2008). Cardiac arrest was experienced by 3 of the respondents over a 12 month period. All three dentists had blood pressure meters, sterile syringes and needles and glucose. Only one of the dentists had additional equipment and drugs such as a bag and mask apparatus, an oxygen face mask with tubing, oropharyngeal airways, a portable oxygen cylinder, a portable suction, adrenaline, aspirin, glucagon, midazolam, oxygen and salbutamol. Only 8% of dentists had AED available in their practice, which is the most important equipment required to restore a normal heart rhythm and improve outcomes of the patient. If defibrillation is not provided, the patient can die within minutes (Dianne *et al* 2006) and in this study only 25% of respondents were able to perform defibrillation.

5.4 Management of medical emergencies

The fact that dentists responded positively in performing procedures such as checking of pulse rates; chest compressions; measuring of blood pressure; application of oxygen with face masks; performing basic life support; and bag/mask ventilation, confirms the suggestion previously made regarding the length of service experienced by dentists in private practice. They also compared favourably in performing chest compressions with dentists in Germany (Müller *et al* 2008) and Brazil (Arsati *et al* 2010).

Seventy per cent of South African dentists felt they were competent in performing bag/mask ventilation when compared to Germany (Müller *et al* 2008). The same could be said about

basic life support where South African dentists ranked themselves highly (77%) compared to dentists in Germany (Müller *et al* 2008) where less than half of the respondents (49%) could perform this function.

Less than half the respondents felt that they could perform intravenous access (47%), insertion of pharyngeal tube (34%) and defibrillation (25%). These three medical procedures are important, especially the use of a defibrillator, which is crucial in saving a patients' life during a cardiac arrest. Balmer in 2008 stated "Dental undergraduates must understand the different cardiac arrest rhythms and be trained in the safe use of an AED" (Balmer 2008). An alarming statistic published by Louw *et al* reported that less than half (49%) of general practitioners working in hospitals in the Western Cape, knew the indications for defibrillation (Louw *et al* 2010). This accords with the low percentage (25%) of respondents to this survey, that were able to perform defibrillation. Of concern also, is that procedures such as performing airway management (inserting oropharyngeal tube) and establishing intravenous access were able to be carried out by only 34% and 25% respectively of respondents.

5.5 Medical emergency training

Dentists agreed with 7 of the 11 statements. Although 2 of the 4 statements (statements (f) and (i)) had a negative response, the implication was that practicing dentists required more formal training. A study in New Zealand conducted by Broadbent and Thomson stated that more than half the respondents were dissatisfied with the training they had received for medical emergencies as undergraduate students (Broadbent and Thomson 2001). The results from this study, however, showed that the respondents were neutral to whether undergraduate training prepared them for medical emergencies. Given the correct training and advice on

equipment and drugs, dentists could adequately be prepared to manage most medical emergencies in the future.

The respondents clearly felt strongly about the need for being prepared to manage medical emergencies, and that training is an important part of ensuring continued success in treating patients in such circumstances. They were uncertain or neutral to the statements which implied that there are insufficient training courses available or that dentists are unaware of training courses that could prepare them for medical emergencies. Standardising and certifying emergency training would certainly improve the competency level of dentists and prepare their staff in managing such situations.

5.6 Limitations of the study

Some of the limitations of the research were recognised as being:

- The questionnaires were not distributed evenly due to the distribution of the number of dentists in the different regions.
- Dentist compliance was important for this study as it was a voluntary study.
- Questionnaire studies are limited as results may be biased by under or over reporting.
- These were self-administered questionnaires and thus the results may not exactly represent current practices.

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The need for caution in drawing conclusions from this study is noted as this was a baseline survey with a limited response rate. Despite these limitations, this study shows that South African dentists were similar in their ability to manage medical emergencies to dentists in developed countries, but that the results of all the surveys published give reason for concern. A smaller percentage of South African dentists stocked the correct equipment and drugs compared with those surveyed in other countries.

Medical emergencies do occur in dental practices and dentists need to be prepared. Dentists require more undergraduate training in emergency medicine, as well as the attendance of medical emergency courses, and the respondents of this study agreed that they would benefit from more regular training in medical emergencies.

6.2 Recommendations

Within the limitations of this study, the following recommendations are made:

- Compulsory medical emergency courses should be included as part of CPD accreditation requirements.
- A recommended list of specific equipment and drugs should be published by SADA for the management of medical emergencies.
- Further studies need to be carried out in South Africa to further assess the ability and knowledge of dental practitioners to manage medical emergencies in dental practices.

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APPENDIX A

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Nikita Mizra

CLEARANCE CERTIFICATE	M110410
PROJECT	The Frequency of Medical Emergencies in a Sample of Dental Practices in South Africa and the State of Readiness of Practitioners to Manage the Episode (new title)
INVESTIGATORS	Dr Nikita Mizra.
DEPARTMENT	School of Oral health Sciences
DATE CONSIDERED	01/11/2011
M1104100DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 06/05/2011 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Prof M Altini

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

APPENDIX B

The frequency of medical emergencies in a sample of Dental Practices in South Africa and the state of readiness of practitioners to manage the episode.

The School of Oral Health Sciences
The Faculty of Health Sciences
The University of the Witwatersrand, Johannesburg

INFORMATION SHEET

Dear Doctor/ Professor,

Re: Medical Emergencies experienced in Dental Practices

I am Dr Nikita Mizra, a postgraduate student registered at the University of the Witwatersrand for the degree Master of Dental Science. As part of the requirement for that degree, I am conducting a research project and write to request your kind agreement to participate in a survey which I am undertaking.

My project will investigate the occurrence of medical emergencies in dental practices and also seeks to determine the drugs and equipment used by dentists in the management of such emergencies. An important outcome of the research may lead to an enhancement of the capacity and capability of Dental Practitioners and their staff to be more effectively prepared to manage medical emergencies in their practices.

I am inviting you to participate in this research study. A retrospective survey will be conducted consisting of anonymous voluntary questionnaires which will be handed or emailed to dentists in different regions of South Africa.It is hoped that approximately 360 dentists will participate, making this a comprehensive and relevant study. The questionnaire will request details on the number and character of medical emergencies that occurred in the respective dental practice over the past 12 months, together with enquiries on the drugs and equipment available.

There are no risks associated with your involvement in the study. Participation is voluntary and anonymous, with no possibility of identification of the respondents. Your participation will take a **few minutes** of your time. If you agree to voluntarily participate in this research study as described, please indicate your agreement by completing and returning the attached Informed Consent Form. Please retain this form for your reference and email completed questionnaire and informed consent to mscresearchdent@gmail.com or faxed to 086 731 9732 or posted to Dr Nikita Mizra, Unit H, 8 Village Road, Kloof, Durban, 3610.

The research study has been approved by the Ethics Committee of the University of the Witwatersrand. For further information or feedback please contact Dr Nikita Mizra, on 0826925371 or by email to nikitam@vodamail.co.za.
Should you have any queries or, perhaps, complaints / problems please contact the REC administrator and chair i.e. Prof Cleaton-Jones on (011) 717-1234.

Your kind cooperation will be deeply appreciated.

Yours sincerely,
Dr Nikita Mizra

Supervisor: Dr V Karic
Co Supervisor: Prof Owen

INFORMED CONSENT
PLEASE RETURN THIS SIGNED DOCUMENT TO DR MIZRA. Thank you.

This is to certify that I, ……have read the letter detailing the MSc (Dent) research survey being conducted by Dr Nikita Mizra and have understood the intent of the project. Further I acknowledge that my participation is entirely voluntary and entirely anonymous with no possibility of either my practice or my own identity being revealed.

I confirm the undertaking of the researcher that these signed Consent Documents will be kept separate from all other documents in the study and will be available only to the researcher.

Signed…….. Date…….

INFORMED CONSENT
PLEASE RETAIN THIS COPY FOR YOUR OWN RECORDS.

This is to certify that I, …… have read the letter detailing the MSc (Dent) research survey being conducted by Dr Nikita Mizra and have understood the intent of the project. Further I acknowledge that my participation is entirely voluntary and entirely anonymous with no possibility of either my practice or my own identity being revealed.

I confirm the undertaking of the researcher that these signed Consent Documents will be kept separate from all other documents in the study and will be available only to the researcher.

Signed …….. Date…….

APPENDIX C

Section A Please mark an 'X' in the appropriate box.

How many years have you been a qualified dental practitioner?

- Less than 1 year ☐
- 1 - 5 years ☐
- 5-10 years ☐
- 11-20 years ☐
- 21-30 years ☐
- More than 30 years ☐

Gender — Male ☐ Female ☐

At which university did you obtain your primary dental degree? _____

In which region are you practicing? _____

Are you a specialist? — Yes ☐ No ☐

If yes, please specify _____

Are you practicing in: — Hospital ☐ Clinic ☐ Private ☐

Did you have any postgraduate training in managing medical emergencies? — Yes ☐ No ☐

If yes, did it improve your ability to handle medical emergencies in your practice? — Yes ☐ No ☐

Section B

Part 1: Emergency drugs and equipment

Please mark an ‘X’ next to each of the emergency equipment that you have in your practice.

Equipment	
Bag and mask apparatus with oxygen reservoir	
Blood glucose measurement device	
Blood pressure meter	
Defibrillator	
Oxygen face mask with tubing	
Oropharyngeal airways	
Portable oxygen cylinder	
Portable suction	
Single use sterile syringes and needles	
Spacer Device for inhaled bronchodilators	
Other:	

Please mark an ‘X’ next to each of the emergency drugs that you have in your practice.

Drugs	
Adrenaline injection (1:1000, 1mg/ml)	
Diazepam	
Dispersible asprin	
Glucagon injection 1mg	
Glucose tablets/ sugar	
GTN spray	
Midazolam 10mg/ 5mg	
Oxygen for inhalation	
Salbutamol aerosol inhaler	
Other:	

How do you ensure the drugs are not expired?

Regular checks on expiry dates	
Other:	

Part 2: Medical emergencies

Which of the following emergencies have occurred in your clinical experience during the past 12 months?

Please indicate the number of occurrences of each incident.

Condition	No. of incidents
1. Angina pectoris	
2.Cardiac arrest	
3.Diabetic coma- Hypoglycaemia	
4. Drug reaction:	
Anaphylaxis	
Acute steroid insufficiency	
Local Anaesthetic	
5. Fits/ Seizures	
6.Myocardial infarction	
7. Respiratory distress:	
Acute asthma attack	
Inhaled foreign body	
Hyperventilation	
8. Stroke	
9. Swallowed objects	
10. Vasovagal syncope	
Other events, please state:	

Part 3: Management of medical emergency

Please mark an 'X' in the appropriate box relating to which of the following procedures you are able to perform during a medical emergency?

Taking blood pressure	Yes		No	
Applying oxygen via face mask	Yes		No	
Bag/Mask ventilation	Yes		No	
Insertion of pharyngeal tube	Yes		No	
Measure blood glucose	Yes		No	
Pulse check	Yes		No	
Establish Intravenous access	Yes		No	
Defibrillation	Yes		No	
Chest compressions	Yes		No	
Basic life support algorithm	Yes		No	
Advanced life support algorithm	Yes		No	

Part 4: Training

Rate the following statements with respect to emergency training. Please mark an 'X' in the appropriate box.

[1]=Strongly disagree [2]=Disagree [3]=Neutral [4]=Agree [5]=Strongly agree

	[1]	[2]	[3]	[4]	[5]
Undergraduate training has prepared you to manage medical emergencies.					
Dentists should have postgraduate training in emergency medicine.					
Dentists should participate in a medical emergency course once a year.					
Dental staff should undergo medical emergency training.					
Medical emergency courses should be a requirement for CPD accreditation.					
I can manage medical emergencies with the use of self study material.					
Dentists must be prepared to manage medical emergencies.					
Dentists require hands-on training in emergency medicine.					
There are adequate medical emergency courses available for dentists.					
The costs of medical emergency courses are reasonable.					
Emergency equipment and drugs must be available in every dental practice.					
There should be an emergency flow chart in every dental practice.					

I would welcome any further comments you may wish to add about medical emergencies. Thank you for your co-operation.