

Managing a Cardiac Arrest: Evaluation of Final-Year Predoctoral Dental Students

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Abstract: An increasing proportion of the population is medically at risk. Dental providers can encounter a cardiac arrest (CA) while treating their patients. Several studies have assessed qualified dental surgeons on the management of medical emergencies, but to our knowledge there is no reported study about dental students. The aim of this study was to evaluate final-year dental students in their ability to recognize a cardiac arrest and to apply cardiopulmonary resuscitation (CPR). We evaluated, with a questionnaire, how seventy-six final-year dental students self-assessed their capacity in the management of CA. Then we randomly selected twenty-two of the final-year students and compared their answers on the self-assessment questionnaire to their objective ability to perform CPR. Though 53 percent of the students who answered the questionnaire felt they were able to manage a CA, the performance of the twenty-two students selected to demonstrate CPR was poor. Only two performed an appropriate CPR, and none combined an adequate CA diagnosis with an appropriate CPR. In conclusion, the predoctoral dental students evaluated in this study were not able to diagnose and manage a CA. The findings indicate that the teaching of cardiac arrest management should be revised. Students should learn and review the theoretical and practical components of cardiac arrest recognition and management in a more intensive manner.

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An increasing proportion of the population is medically at risk. According to the European Resuscitation Council, sudden cardiac arrest (CA) is a leading cause of death in Europe, affecting about 700,000 individuals a year.¹ Any practitioner or any bystander can be confronted with CA and must know how to handle it effectively.

Furthermore, dental treatment can increase risk, specifically due to invasive acts carried out on patients (anesthesia, surgery, etc.). The drugs and materials used everyday in dental practice (latex, resins, anesthetics, etc.) may also interact with an infection, a treatment, or a patient's particular susceptibility. Several studies conducted in France, England, and Germany reported cardiac arrest in the dental office, with a weak incidence in comparison with vasovagal syncope.²⁻⁵ Two of these found an incidence of 0.003 cardiac arrest per dentist per year.^{2,4} The two others report one and two cardiac arrests, respectively, in their studies.^{3,5} Though the incidence is low, dentists

may have to handle patients in cardiac arrest in their dental offices.

The gravity of these situations justifies the need for every practitioner to be at least able to perform the basics of cardiopulmonary resuscitation (CPR): chest compression and rescue breath. Indeed, during a cardiac arrest, in absence of CPR, chances of survival are reduced by 7 to 10 percent every minute after the event begins.¹

After the creation of the European higher education area, the Association for Dental Education in Europe wrote in 2004 a guideline about profile and competences for the European dentist.⁶ In this document, medical emergency teaching is recommended in European dental faculty.

Several studies have assessed qualified dental surgeons on the management of medical emergencies,⁷⁻⁹ but to our knowledge there is no reported study involving dental students. Accordingly, the objective of our study was to evaluate the ability of

final-year predoctoral dental students to manage a cardiac arrest.

Methods

This qualitative study was carried out over three months, from January to March 2007. The study focused on ninety-three dental surgery students in their sixth and final year at Paris Descartes University. All students had been trained for a First Aid Certificate (Attestation de Formation aux Premiers Secours) in their second year of study. During this training, they were taught the various aspects of dealing with cardiac arrest, chest compression, and rescue breath. Students did not receive other CPR training during the rest of the curriculum.

The study was conducted in two steps. First, a self-evaluation questionnaire relative to dealing with medical emergencies in general was distributed in January to the ninety-three students. In this questionnaire, the students were asked to self-evaluate their ability to carry out the basics of CPR: chest compression and rescue breathing. When the students answered the questionnaire, they did not know that they would be evaluated a few months later. Second, on one day in March, twenty-two students from this group were randomly selected and assessed on carrying out the basics of CPR. They were informed that a simulation exercise was forthcoming two days before. For the CPR assessment, each student was confronted with the discovery of an unconscious person lying on the ground. The situation was simulated with a dummy (AMBU), and various criteria were evaluated. For this practical evaluation, two elements were assessed: the method of diagnosis and the appropriateness of the CPR technique. Criteria were evaluated by three observers: a physician in critical care medicine, one dental surgeon, and one first aid instructor.

The criteria for the correct diagnostic method were checking for consciousness, clearing the upper airway by tipping the head back, checking for breathing, carrying out two mouth-to-mouth ventilations, checking circulation with a central pulse (carotid or femoral pulse), alerting the emergency services, and, finally, the order in which these actions were carried out. For each student, the number of missing or inadequate items was registered.

The CPR technique was considered effective if 50 percent of chest compressions and 50 percent of rescue breaths carried out were effective.¹ The chest compressions were considered effective if both

hands were correctly positioned (in the middle of the chest and on the sternum) and allowed the thorax to be depressed by 4 to 5 cm.¹ The chest compressions were considered inefficacious if they induced a thorax depression of more than 5 cm or if they induced a thorax depression of less than 4 cm. The thorax depression was objectified with a dial control on the dummy (not visible to the students). Chest compressions were also considered ineffective if they induced rib fractures. The rescue breaths were considered effective if they induced the rise of the thorax without gastric air passage.¹

Additionally, we evaluated other aspects taught to the students for their first aid certificate: frequency of the chest compressions (which should be 100 ± 15 per minute), removal of the patient's clothes from the chest area before starting compressions, and the ratio of chest compressions to rescue breaths (fifteen compressions for two rescue breaths, as taught in 2003 prior to the 2005 new guidelines of the European Resuscitation Council). The new ratio of thirty chest compressions for two rescue breaths had not been taught to students in the curriculum.

We carried out a descriptive analysis of the students' answers to the questionnaire and then analyzed the items evaluated during the practical evaluation.

Results

Seventy-six of the ninety-three final-year dental students answered the questionnaire (82 percent). Forty of the seventy-six students (53 percent) considered themselves totally or sufficiently qualified to carry out basics of CPR (Figure 1). The questionnaire results of the twenty-two students evaluated in CPR were comparable to the answers of all students.

None of the twenty-two students evaluated in CPR carried out the diagnostic method with all the items and in the correct order. The errors observed are summarized in Figure 2.

The two recurring and most frequent errors were not tipping the head back (fifteen students) and an incorrect sequence of events in the diagnostic method (fourteen students). Half of the students made at least four errors in their method of diagnosis (Figure 3).

Twelve students in the CPR group performed at least 50 percent effective chest compressions, and two students carried out at least 50 percent effective rescue breathing. Only two students displayed an adequate CPR technique. Out of the totality of the

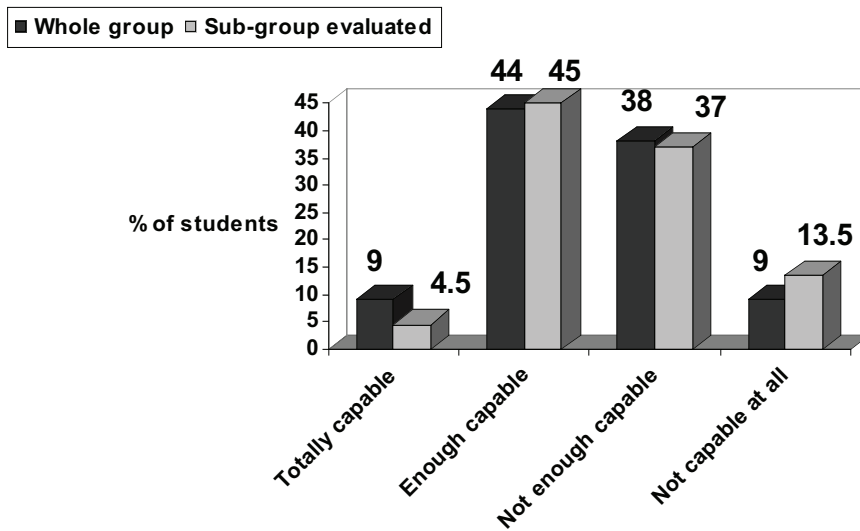


Figure 1. Students' self-evaluated ability to implement basics of CPR (chest compression and rescue breathing): comparison of whole group and the sub-group evaluated in a practical examination

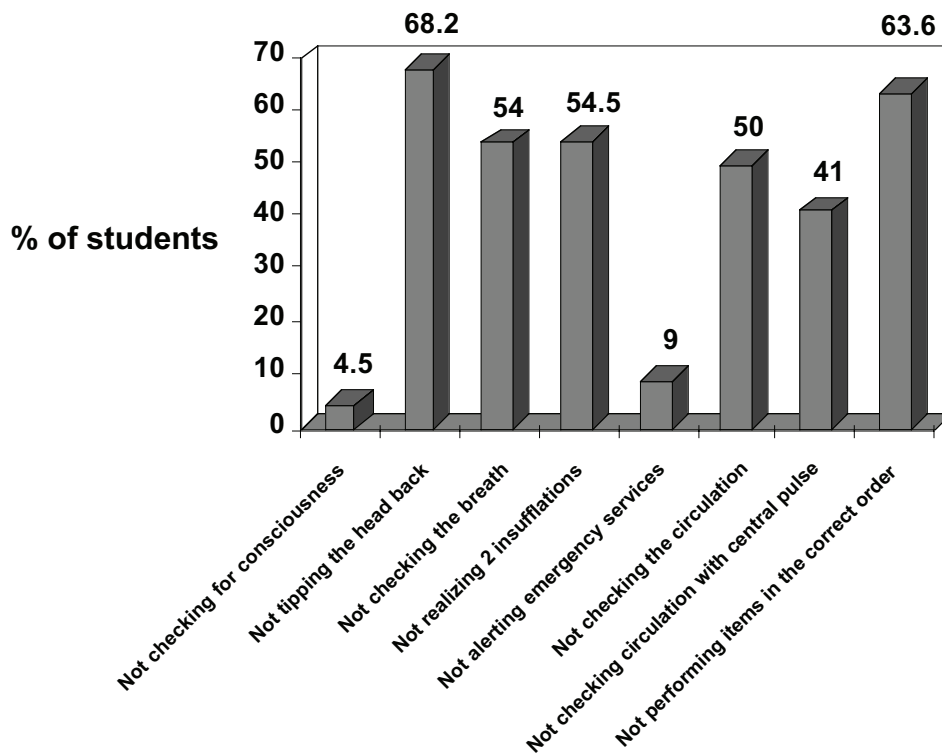


Figure 2. Errors made by twenty-two final-year dental students during diagnosis of cardiac arrest

actions carried out, only 12.6 percent of all rescue breathing carried out and 46.3 percent of all chest compressions carried out were efficacious (Figures 4 and 5). Out of the twenty-two students, eleven had declared themselves totally or sufficiently capable to carry out CPR in the questionnaire. However, none of these eleven carried out effective CPR. Conversely, the two students who did display an effective CPR technique did not believe themselves capable of doing so (Table 1).

None of the students evaluated displayed a correct diagnostic method associated with an effective CPR technique. The other items noted during the performance of CPR showed that 77 percent of the students did not respect the required frequency of chest compressions and 36 percent did not undress the patient to carry out CPR. Additionally, 27 percent did not apply the chest compression/rescue breathing ratio they had been taught and carried out five chest compressions for one rescue breathing.

Discussion

This study suggests that final-year students in dental surgery are not capable of competently managing a cardiac arrest, although more than half of the students considered themselves totally or sufficiently capable of carrying out CPR. To our knowledge there

is no reported study in the literature that evaluates the management of cardiac arrest by dental surgery students. There are, however, several studies that assess the performance of qualified dental surgeons. One survey evaluated the chest compression and artificial breathing techniques.⁹ Two studies assessed the self-evaluated ability of practitioners to manage a cardiac arrest.^{7,8} These studies found that a majority of practitioners believe that they should be able to carry out CPR, but at the same time highlighted the fact that a large number did not believe that they could actually implement CPR adequately if confronted with a situation requiring these actions.^{7,8} The only study assessing the techniques of CPR revealed that most practitioners used inadequate or ineffective actions.⁹

A study on medical emergencies was carried out in 2003 on qualified dental surgeons from the same university (Paris Descartes University).¹⁰ The results of this study indicated that a majority of practitioners believed that they did not know, or knew insufficiently, first aid actions and equipment. Most practitioners interviewed in that study felt a need for supplementary training in the area of medical emergencies.

Several researchers who have worked on the teaching and effectiveness of first aid actions have underlined the rapid loss of ability among trainees to carry out the physical actions six months after the

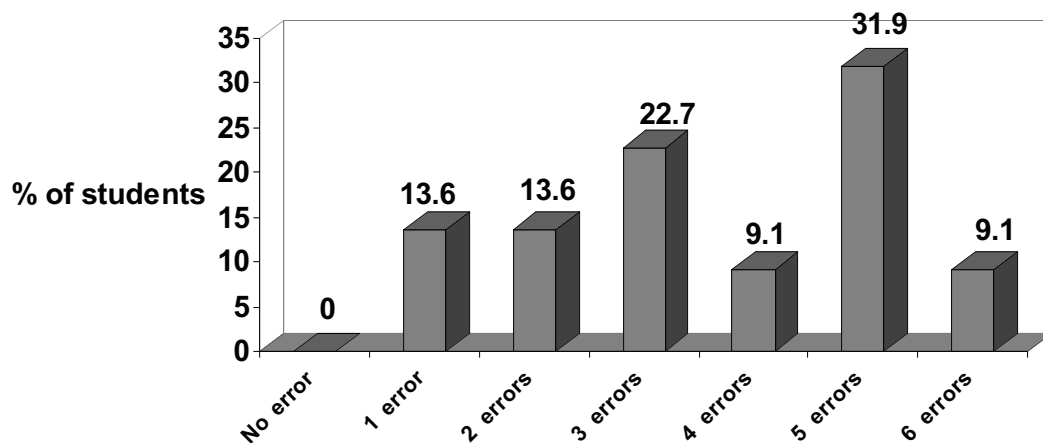


Figure 3. Number of errors made by students during the method of diagnosis

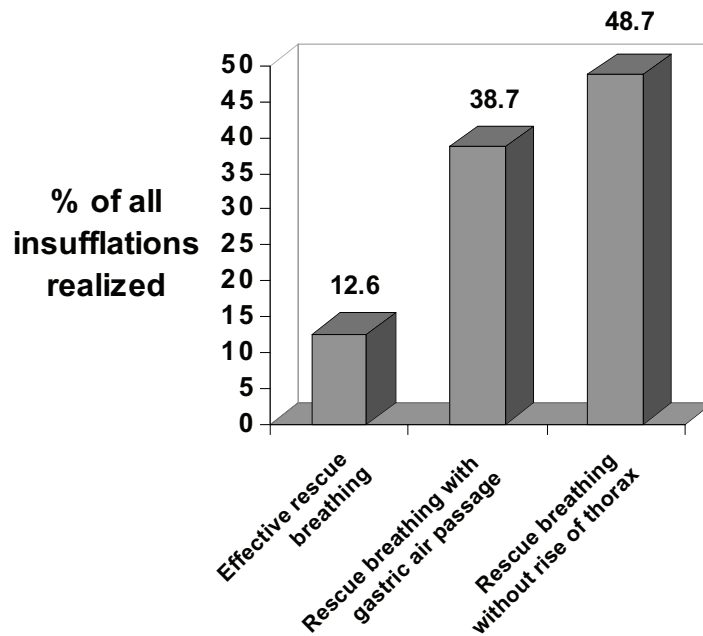


Figure 4. Efficacy of rescue breathing realized

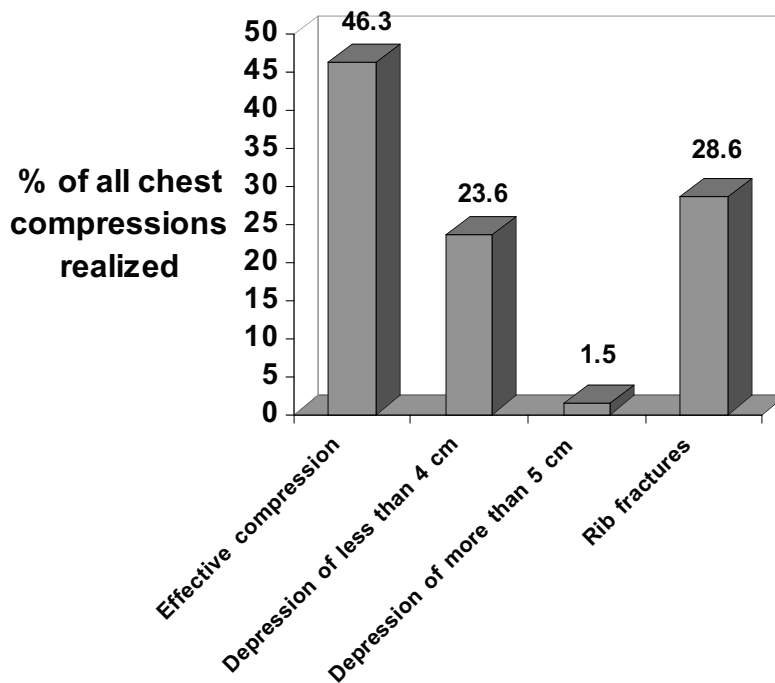


Figure 5. Efficacy of chest compressions realized

Table 1. Comparison of self-evaluated ability of the twenty-two students and their results during practical evaluation

Students' self-evaluated ability about carrying out basics of CPR: chest compression and rescue breath (number of students)

	Totally capable	Capable enough	Not capable enough	Not capable at all
Effective during practical evaluation	0	0	1	1
Not effective during practical evaluation	1	10	7	2
Total	1	10	8	3

initial learning. In general, people forget the chronological order of treatment and how the emergency actions should be carried out.^{11,12} In addition, these studies show that the sooner and the more frequently the knowledge is recalled, the better the actions are carried out. For example, in the general population, one year after their training, 88 percent of people who had received life support training were not capable of carrying out effective CPR.^{11,12}

The results of our study are consistent with these findings. Most of the students forgot the steps of the management and/or were not able to carry them out in the correct order. The teaching of CPR at the beginning of dental studies does not provide good results if not brought back later in the curriculum with the opportunity for students to practice life support techniques.

The main explanation of gaps in the practitioners' knowledge of medical emergency management and ability to perform CPR properly was that the training had taken place too many years before. Though this is a reasonable explanation, our study suggests that if students at the time of graduation are not able to manage a patient in cardiac arrest, they certainly will not be able to do it in their future practices.

Moreover, we can note that the two students who performed effective CPR did not believe that they could. To our knowledge, there is no data about self-confidence in performing CPR versus performance of dental students. Even if the studied group is too small to draw conclusions, we can see an important difference between students' self-evaluated ability about carrying out CPR and their performance in practical evaluation. We did not evaluate students immediately after the CPR teaching. Therefore, it is possible that the initial teaching method can also be an explanation for this poor performance.

Conclusion

The students in their final year of their predoctoral dental education who were assessed in this study did not demonstrate competence in their handling of a patient in cardiac arrest.

The results indicate that it is necessary to provide dental students with improved teaching of CPR techniques, in particular through a reactivation of their knowledge and practice in order to enhance their capacity to recognize and manage cardiac arrest and to become well-qualified practitioners.

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