OPTIMAL TEACHING OF CARDIOPULMONARY RESUSCITATION IN SCHOOLS: BETTER EDUCATION, MORE LIVES SAVED

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OPTIMAL TEACHING OF CARDIOPULMONARY RESUSCITATION IN SCHOOLS: BETTER EDUCATION, MORE LIVES SAVED (Abstract). Teaching cardiopulmonary resuscitation in Romanian schools is a joint initiative of the Acute Cardiac Care Working Group of the Romanian Society of Cardiology, the Romanian National Resuscitation Council and the Romanian Society of Emergency Medicine and Disaster. Teaching young generations to save people in cardiac arrest requires a structural approach, whose starting point is the launching of a large-scale campaign in favor of introducing the basics of cardiopulmonary resuscitation (CPR) in the school curriculum. The training stages can be set according to the principle of repetition (i.e. every two years). Teachers seem to be the best candidates for the instructor position, taking into account the knowledge and skills they acquired throughout the teacher training programs, as well as their continuous contact with the students; consequently, training teachers to become CPR instructors represents a long term investment. All acquired knowledge will implicitly spread to a secondary level (trainee’s parents, relatives, etc.) and the number of individuals gaining access to CPR specific information will rise as a consequence. Entering the CPR training program should be promoted as a criterion for the accreditation and/or evaluation of primary schools, middle schools, and high schools. To begin with, this program must be implemented in Romania at first as part of the non-formal context of the special education week called “Școala altfel” (“School otherwise”). Keywords: RESUSCITATION, TRAINING, SCHOOL, CARDIAC ARREST.

Including basic cardiopulmonary resuscitation (CPR) in educational programs during schooling is a necessity of the modern world: with better education, more lives are saved. While in Norway, the country with the largest number of islands in Europe, CPR notions have been part of the school curriculum since 1961, an approach promoted only in 1992 as part of the European Resuscitation Council (ERC) policy (1, 2), this process has started in Romania only recently, as a result of the initiative of the Acute Cardiac Care Working Group of the Romanian Society of Cardiology,
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which was also joined by the Romanian National Resuscitation Council and the Romanian Society of Emergency Medicine and Disaster ("You Can Also Save a Life!" Project) (3).

**CPR in Romanian schools**

Preparing a whole generation to be able to save people in cardiac arrest requires the initiation of a large-scale campaign in favor of introducing the basics of cardiopulmonary resuscitation in the school curriculum. The national impact of such an approach would be a considerable one; according to data provided by the National Institute of Statistics (2011/2012), the distribution analysis by level of education shows that of the total population of 3,823,515 individuals belonging to the school population, 673,641 are preschool children, 1,629,406 are part of the primary and secondary school cycles (1st–4th grades: 803,902 students; gymnasium 5th to 8th grades: 809,339 students, and special education classes 1st-8th grades: 16,165 students), 888,768 are in high school, 12,382 are enrolled in vocational education, 79,466 are in post-secondary education and apprenticeships, and 539,852 are in higher education (4). Therefore, the training of all these categories requires a considerable organizational effort, especially as such an approach needs to be repeated as a sequence (training–evaluation of training quality–re-training) at different stages of education. Moreover, as 55.1% of its inhabitants live in rural areas associated with poverty, Romania has the lowest level of urbanization in the European Union (by comparison, urbanization rates of our neighbor countries are: Bulgaria - 70.9%, Hungary - 67.8%) (4). These differences between urban and rural areas relate to infrastructure development, household equipment, access to public utilities, but also to a lower school instruction, limited access to forms of secondary education and a rural-urban gap in what concerns medical services (5).

A re-conceptualization of children as social actors is necessary; it is time for children to be regarded neither as "captive audience" when analyzed from the perspective of the information reception, nor as "adults in waiting" when assessing their effective participation, but as future citizens among whom altruism (the “Good Samaritan” attitude) should be encouraged (6, 7). Children are more easily motivated, they can easily learn various sequences of actions, but they obviously have a limited life experience, so they rely largely on the knowledge and guidance of teachers, who, in turn, should receive regular training in this area to avoid dilution of their knowledge (8). The young people of Romania’s 2010-2020 decade are characterized by the presence of much more pragmatic values, which deserve to be brought to fruition.

In Romania, the “Good Samaritan Law” is currently in force, backed by the Law on Health Reform (Law 95/2006), which stipulates under Article 88 that “persons without medical training providing first aid on a voluntary basis, based on indications provided by a medical dispatcher or with some basic knowledge of first aid, acting in good faith and with the intention to save the life or health of a person, have no criminal or civil liability” (9). Thus, someone who wants to help can not be held liable even if something unpleasant happens to the victim.

**Basic Life Support (BLS) training in schools**

To meaningfully reduce the mortality in
out-hospital cardiac arrest (OHCA) cases, 15-20% of the population must know and perform BLS maneuvers (10). School is the place where such knowledge may be acquired. It is also a cost-effective and widely spread approach, as many local/ regional initiatives have proven: “ABC for life” (10), the Hampshire experience (11), the Washington experience (12), the Barcelona experience (13), or the Norwegian experience (14). However, the currently available data is still heterogeneous (15).

Optimal age for CPR training

There are studies on subjects at the kindergarten age (4-5 years) who were able to estimate the level of consciousness of a victim, whether the victim is breathing or not, to remember and dial the emergency alert service, to provide sufficient information to the dispatcher, to place the victim in the recovery position and to ensure the victim's airway permeability, skills that were maintained at a 2 months post-training examination (16). Two studies have found that children with a body mass index (17) over 15 or a minimum body weight (18) of 50 kg can correctly perform chest compressions.

The training of children in CPR must be differentiated according to age: young children involved in calling for aid, older children possibly involved in usual resuscitation maneuvers.

Optimal CPR training method

The manikin training is considered to be the most effective method (19), but video/DVD and interactive computer training can also help.

Theoretical training without practice turned out to be futile. In the case of participants without previous skills in resuscitation, training children to perform CPR using audio-visual animation available on mobile phones has proven to be more effective than that assisted by a dispatcher, in terms of completing the check list and complying to the time interval spent for performing each CPR maneuver (20).

A training program creating virtual avatars who participated in team (multiplayer online simulation) to the CPR efforts was recently tested and is well appreciated by high school students thus trained (21).

Optimal method for assessing the effectiveness of CPR training

In one study using a game-based assessment of children skills in performing CPR (the student’s outcome was equal to the number of cards collected by answering questions correctly as deemed by peers) the results were comparable to those obtained by the classical test method of paper-and-pencil (22).

Drawings are considered a familiar activity for children and one of their preferred means of communication; therefore, we can use this as an effective strategy for engaging them in CPR research (23). For example, in "You Can Also Save a Life!" Project, the pre- and post-training evaluations were performed by analyzing questionnaires and drawings (as non-verbal means of expression and communication) (3).

Several studies that analyzed the dilution of CPR information showed significant improvement in knowledge immediately after training, which suffered a regression towards baseline levels over time (24). Thus, the sequence submitted by us (training—evaluation of training quality—re-training at different stages of development: 2nd grade, 5th grade, 7th grade, 9th and 11th grade) is highly pragmatic.
CPR optimal instructors

Teachers seem to be most effective as instructors: they have adequate teacher training background and continuous contact with students; thus, training them to teach CPR represents a long term investment. It also raises the problem of the available training time, considering the school curriculum, the availability of training space and necessary equipment, as well as the need for a quality training of the trainers. CPR training caravans can be a solution as far as rural areas are concerned.

A questionnaire addressed to the primary, secondary or higher school teachers from Belgium comprising four distinct components (demographic, CPR knowledge and skills, attitudes towards their possible involvement in CPR training and personal experience CPR-related) found that only 59% of the respondents (2539/4273) were involved in doing CPR, mainly primary school teachers (69%) belonging to the age group 21-30 years (68%); compulsory training the CPR at school is backed by only 41% of the respondents, 61% stated that they do not feel able and do not want to teach CPR concepts especially due to insufficient knowledge and competence in CPR, 73% expressing willingness to undergo further training in this field (250). Training teaching staff of any level is particularly important: while in Romania there are 52,541 doctors (2011 data), the body of school teaching staff is larger: 37,391 teachers in pre-primary education, 120,927 teachers in primary and secondary education, 59,380 teachers in upper secondary education, 64 teachers in vocational training, 1,360 teachers in post-secondary education and apprenticeship, and 28,365 teachers in higher education (4).

The optimal instructor-trainees’ ratio was variable in different studies: from 1:10 to 1:25 (26).

Optimal duration of CPR training

A study was recently conducted in two secondary schools in Germany over a period of four years (26). It included pupils of different ages (10-13 years), with 3 hours training duration (one hour of theoretical training and two hours of individual training on the manikin). The training frequency was annual or biannual and there were two types of instructors (teachers of the school, and emergency physicians). Children who started training at the age of 13 had better results in terms of theoretical knowledge, but there was no difference in practical skills to those whose training started at the age of 10, even if the instruction was repeated biannually or not, if it was done by the teachers of the school or by emergency physicians (26). Moreover, the courses have doubled the number of children who said that they were confident that the newly gained knowledge would enable them to save lives.

The use of automatic/semi-automatic external defibrillators (AED)

The current data on Public Access Defibrillators (PAD), although disparate, indicates that the incidence of the cardiac arrest is reduced in schools as compared to other locations, so placing AEDs in schools is currently recommended only in three cases: if there is a reasonable probability of a cardiac arrest occurring there in the next five years; if there is at least one school pupil with increased risk of cardiac arrest; if the response time (the "call-to-shock" time) of the emergency medical system is longer than 5 minutes (27).

In the case of 6-7-year-old children, the score obtained after training in the use of
an AED has made investigators note that “use of an AED is just as simple for them as using a TV remote control” (28). Training children in the use of AED is obviously much simpler if such a device is kept in school. Even if it is not used frequently, the school can be considered as a possible location for placing an AED in the PAD program. The obstacles posed by the costs of such a defibrillator can be surmounted by means of the collaboration between the Health Ministry and the National Resuscitation Council.

National CPR training program in schools

An updated version of the national CPR training program should include a chapter dedicated to CPR training in schools. Within this segment of human education, it is possible to easily pass knowledge-skills-attitudes related to the “Good Samaritan” intervention onto children belonging to all social classes and to all ethnic groups (29). Starting CPR maneuvers as early as possible after the cardiac arrest can thus become possible as a result of the altruism and empathy of these young resuscitators. Training should be repeated every two years; the level of knowledge provided can be increased gradually; also gradually, emphasis can be put on motivational dialogues, the amendment of incorrect skills and on increasing efficiency to carry out optimal maneuvers. Training stages will be tailored to children's age and will include specific goals adapted to each stage (Table I), respecting the principle of revisiting CPR notions every two years. Training time will be adapted to each stage: 30 minutes of theory plus 60 minutes of practice in the first two stages and 60 minutes of theory plus 60 minutes of practice for the last three stages. Emotional education, particularly important, will be conducted in each of the five stages and will have an affective component related to the victim (altruism, empathy, social responsibility), as well as a component relating to the resuscitator himself/herself (motivation, increased confidence in the need for the correct sequence and full compliance with the appropriate CPR maneuvers, together with the increased confidence in one’s own forces during CPR maneuvers) (30).

In stages 4 and 5 trainees can participate as volunteers assisting authorized instructors during the training of children in the initial stages on the basis of the principle of pyramidal distribution of the theoretical and practical information. All acquired knowledge spreads also to a secondary level represented by the trainee’s parents and relatives, increasing the number of people who have access to the information. Training of trainers is essential for an efficient transmission “in oil stain” (i.e. horizontal) of this educational approach dedicated to CPR. Knowledge-skills-attitudes must be thoroughly checked in a system that will provide candidates for the role of trainee, trainer and overseer of the entire educational process.

Costs can be minimized without compromising in terms of equipment and quality, according to AHA (31) at the level of the cost of teacher education (2-4 teachers from each school: travel cost, course cost, substitute teachers to fulfill classroom responsibilities cost), the cost of the necessary equipment (manikins for BLS training in each school, supplies for training in BLS, training AED, supplies for use the training AED); we must add the costs of all the training materials (instructors toolkits, students manuals and CPR cards).
Training children in schools has proven to be more cost-effective than in a training center setting. In order to convince schools to join the CPR training program, such a program should be promoted as a criterion for the accreditation or evaluation of primary schools, middle schools and high schools. In Romania, this program can be preliminarily implemented within the framework of the special education week.
called “Scoala altfel”, which is dedicated to extracurricular activities carried out in a non-formal context. This became an important component of the ‘applied cardiology’ strategy of the Romanian Society of Cardiology (32).

The role of the Minister of Education and Scientific Research is particularly important in this field. The “European Cardiac Arrest Awareness Day” (16 October, each year), set up by the European Parliament and adopted by the European Resuscitation Council and Romanian National Resuscitation Council already had three editions and the main element of both was the CPR education of children.

CONCLUSIONS

The knowledge and implementation of CPR maneuvers constitute a social binder (an individual can be saved by any other individual) contributing to the culture of cohesion and to the respect of life itself. Upon graduation, each student is supposed to own a range of useful knowledge about day-to-day life. The basics of CPR are a vital part of this knowledge and should be valued accordingly.

REFERENCES